Origin User Guide

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OriginLab Corporation

One Roundhouse Plaza

Northampton, MA 01060

USA

(413) 586-2013

(800) 969-7720

Fax (413) 585-0126

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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 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.

Features that are new to this version of Origin 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 2018b, 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 2019, 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). You will also be asked if you want to transfer your User Files and other workplace settings. Origin 2017 and 2018/2018b all share a common license file so 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 2019 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 **Tools** menu, select **Transfer User Files**.

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.

2.3.1 Installing on a 64-bit Computer

When installing on a 64-bit computer, you have the option to install 32-bit or 64-bit Origin, or both. The 64-bit version has much more memory at its disposal, so it will handle larger data sets. See the Support area of the OriginLab website (**originlab.com/Support**) for more information about 32-bit versus 64-bit installations.

If you install 32-bit only (or 64-bit only), and you later want to install 64-bit (or 32-bit), 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.

2.3.2 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: Activate License**. Under “Or if you have purchased already” choose **Activate for this computer**. You will be asked to enter the **Product Key** that was generated when you registered your software 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).

2.3.3 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 **Add or Remove Files** 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 2018b, 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.
- If you are upgrading from Origin 2017, you will also be prompted to transfer the contents of your old UFF and your toolbar and workspace configurations.
- If you initially decline to copy your user files from an earlier version, you can do so by running the Origin software and selecting **Tools**: **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.
- 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 **Tools** 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**).

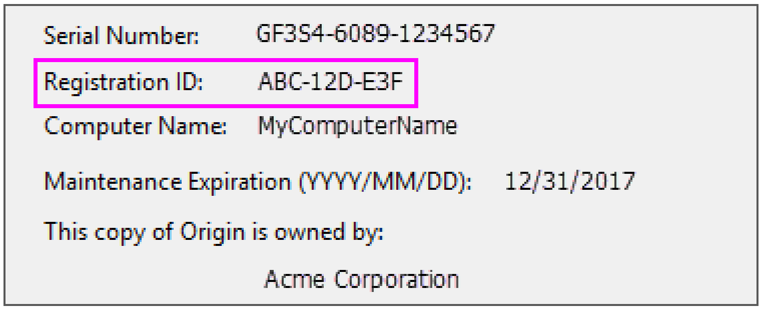
2.5.3 Dongle

A dongle (USB hardware key) is provided with the Origin package and must be present in the computer's USB port to run Origin. Dongles are version-specific. The dongle license is installed by Origin.

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** dialog, which provides direct access to Apps and App updates from your Origin software, requires that your installation be registered.

For **Node-locked** licenses, registration is completed automatically when you enter a **Product Key** into 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.



Serial Number: GF3S4-6089-1234567

Registration ID: ABC-12D-E3F

Computer Name: MyComputerName

Maintenance Expiration (YYYY/MM/DD): 12/31/2017

This copy of Origin is owned by:

Acme Corporation

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.

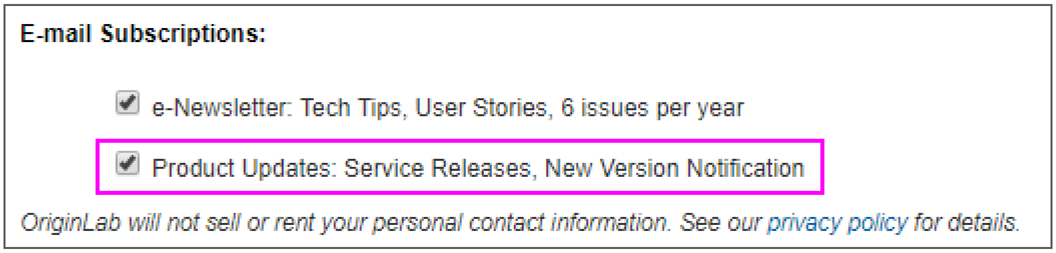
- To check if your Origin package includes Maintenance, select the **Help** menu and then select **About Origin**. If your package includes Maintenance, the About Origin dialog will show your Maintenance expiration date.
- To learn about the benefits of Maintenance, contact OriginLab or your local Origin 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 Upgrading your Origin Version

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".



E-mail Subscriptions:

☑ e-Newsletter: Tech Tips, User Stories, 6 issues per year

☑ Product Updates: Service Releases, New Version Notification

OriginLab will not sell or rent your personal contact information. See our privacy policy for details.

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:

Click the "go" link in the **Deactivation** column available by clicking **Manage my License** link under your portal and selecting the desired serial number.

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.

2.11.3 Dongles

A system transfer is not required when replacing a dongle-managed Origin computer.

2.12 Uninstalling Origin

To uninstall Origin, run the Origin **Add or Remove Files** 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**, **Remove**, or **Repair**. 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.

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 the **Chat** icon in the upper-right corner
User Forum	• Share information with and get help from the Origin user community	**originlab.com/Forum**
Training and Consulting	• Making optimal use of OriginLab products • Help in developing custom tools for your particular application	**originlab.com/Support**

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)
Help Files	• Online or local (CHM) Help for Origin (GUI, Programming)	**Help: 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.

	For Information On ...	Go Here
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 wide range of Origin's key features	**originlab.com/Videos**
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**

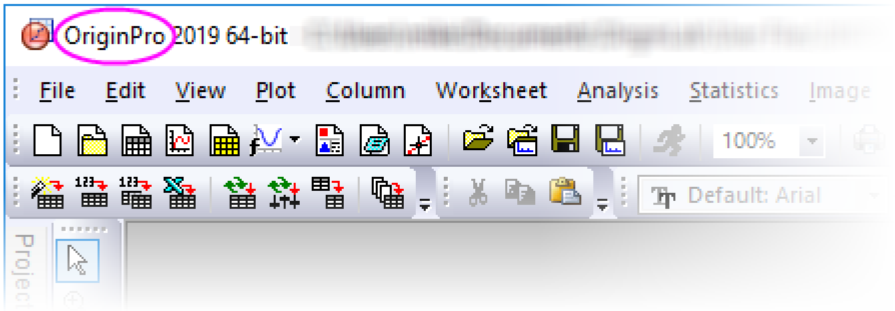
	For Information On ...	Go Here
Graph Gallery	• Outstanding examples of Origin graphs, many of them submitted by the Origin community	**originlab.com/GraphGallery**

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.



If you have already purchased the standard version of Origin, you can upgrade to OriginPro by contacting your Origin representative.

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).
- Batch peak analysis using a predefined Theme file.

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**:

- Peak Deconvolution App - *NEW*
- Design of Experiments - *NEW*
- Independent Component Analysis (Requires R software) - *NEW*
- Logistic Regression
- Sequential Fit
- Piecewise Fit
- Piecewise Smooth
- Principal Component Analysis
- Principal Component Analysis for Spectroscopy
- Slope Analyzer
- Global Peak Fit
- Cyclic Voltammetry
- Enzyme Kinetics
- Polynomial Surface Fit
- Heat Map with Dendrogram
- Simple Time Series Analysis
- Time-Frequency Analysis
- Monte Carlo Simulation
- General Linear Regression
- Chi-Square Test
- Sequential Fit
- 3D Confidence Ellipsoid

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

5 What's New in 2019

5.1 Origin 2019 New Feature Highlights

- **Windows-like Search**: Use keywords or phrases to search for and directly access menus, Apps, Help, Videos and X-Functions.
- **New Workbook Dialog Box**: New dialog with many built-in templates, plus ability to add user-templates and set any template as your default workbook template.
- **Add Sparkline Toolbar button**: Toolbar button for quickly adding sparklines to selected columns.
- **New Graph Types**: Double-Y Trellis Plots, Parallel Plots, Cluster Plot, Violin Plot, Row-wise Line Series, Contour Plot - Categorical Z, Heatmap with Labels, Tetrahedral Coordinates Plot.
- **Data Highlighter**: Highlight a data point in the graph and simultaneously select all data points in the graph window from the same worksheet row. Simultaneously selects the worksheet data row. Supports Shift/Ctrl multiple selection.
- **Data Point Tooltip**: Customizable tooltip displays data point information, including metadata and images, when mousing over 2D plots.
- **Data Plot Highlighter**: Click on a data plot in the Object Manager or the graph window and dim all other plots in the window.
- **Conditional Formatting of Worksheet Cells**: Format cells by mathematical expression. Color duplicate values. Directly create a heatmap by coloring cells based on contained numeric values.
- **Column List View**: Creates a rotated view of the worksheet that hides data. Particularly useful for viewing large worksheets with many column label rows (header rows) containing metadata.
- **New Apps**: Many new Apps including a Statistics Advisor for help in choosing the appropriate statistical test, plus Graph Publisher, Design of Experiments, etc. For more information, see the Apps section at the bottom of this page.

5.2 New Features by Category

5.2.1 Interface

- **Start Menu**: Windows-like search bar can be activated by clicking the red Start button in the lower left corner of the workspace; or when no dialog box is open, by pressing the F1 key.
- **New Workbook dialog box**: By default, the New Workbook dialog opens when you run Origin or start a new project. Choose from **System Templates**, **User Templates** or create a workbook on-the-fly. Options to choose a default template for startup or new projects; and hide the New Workbook dialog on startup/new project.
- **Template Preview Images**: Add an image preview to your workbook windows, templates and analysis templates, for display in the **New Workbook** dialog box.
- **Numeric Units in worksheet or graph**: Origin worksheet columns can now be configured to display units (e.g. "km") alongside numeric values in the cell and still have the worksheet treat the data as numeric.

- **Sparklines Toolbar button**: New button on **Column** toolbar adds sparklines to selected worksheet columns.
- **"Origin Central" becomes "Learning Center"**: The **Learning Center** replaces Origin Central. It is has been simplified, with links to sample graphing and analysis projects and online resources including videos, tutorials, the OriginLab blog and Origin social media pages.
- **Reorganized Help: Open Folder menu**: The **Help: Open Folder** menu item is expanded to give quick access to key Windows file folders including the User Files Folder, Program Folder, Autosave, Backup and Unsaved Projects folders, plus the current project folder.
- **New 2D Graph and 3D Graph toolbar buttons**: New buttons for **Violin Plots**, **Row-wise Line + Symbol**, **Multi-Y Colormapped Line Series**, **Contour Heatmap w/ Label** and **3D Tetrahedral Scatter**.
- **Clickable Spreadsheet Cell Notation icon**: Previous versions required opening the Workbook Properties dialog box and clearing a check box. Now, you can toggle spreadsheet cell notation (SCN) on or off by clicking the SCN icon in the upper-left corner of the workbook and selecting from a shortcut menu.
- **Color Selector**: Colors dialog can be opened by typing "colors" into the Script Window. Pick an onscreen color and dump the color's hex value (e.g. #FF0000) to the Script Window.
- **Project Explorer Improvements**: Creating and naming a folder is now one step. A **Show Folders** context menu item is added to the bottom panel.
- **New Date-Time systems**: Added to Origin's long-time adjusted Julian Date system, are (1) a true Julian Date system (no 12 hr offset) and (2) a "2018" system which establishes 0 as Jan 1, 2018 at 00:00. The 2018 system allows much greater precision when dealing with fractional seconds.
- **Origin Notifications**: A new fading notifications window will show in the upper-right corner of the workspace.
- **New Options Dialog Settings**: Add **Proxy** control to **Miscellaneous**, move **Bisection Search Points** to **Graph** tab and Footnote Size Ratio (renamed as **Footnote Size Ratio in Analysis Reports**) to **Text Fonts** tab.

5.2.2 Graphing

Data Visualization Enhancements

- **Data Point Tooltip**: Mouse over the data points in a plot to view key data point information. Information display is customizable by right-clicking on the tooltip and choosing **Properties**. Custom configurations can be saved as a Theme and reused.
- **Data Highlighter**: Click on a plotted point (or CTRL + click on multiple points) and the corresponding data row(s) are highlighted in the worksheet. Conversely, enter highlight mode in the graph window, then click on one or more worksheet rows to highlight the corresponding data points in the plot.
- **Compound Style for lines**: Compound line styles are now available for plotted lines. These can be selected from the **Line** tab of **Plot Details**.
- **Data Plot Highlighting**: Click on a plot and other plots in the graph window will fade. To highlight a plot that is part of a plot group, click twice on the plot; or select the plot in the **Object Manager**.

New Graph Types

- **Trellis with Double-Y Axes**: Plot Y variables on left and right Y axes with different scales.
- **Parallel Plots**: Support for plotting of numeric or categorical data, plus "curving" of plots. Plots can have color scales or the default legend for 2D graphs.
- **Cluster Plot**: Multi-layer panel graph with an option to arrange panels by variables in both the horizontal and vertical dimensions. Choice of line, symbol, line+symbol or column/bar plots. Control over layer spacing and linking. Specify number of columns or overlay all layers.
- **Row-wise Line Series with Error Bars**: Useful when data are arranged across rows (e.g. X data in the first column followed by alternating **Y** and **yEr±** columns).
- **Contour with Categorical Z Values**: When the "Z" column is Set As Categorical, you can create a contour plot with each category mapped to a color on a color scale.
- **Heatmap with Labels**: Create a mosaic with "Z" values used to label each XY combination (e.g. correlations between each combination of variables plotted on X and Y axes). Label format and string are customizable.
- **3D Tetrahedral**: For worksheet columns designated as XYZZ. Data are normalized by row and plotted in a tetrahedral (pyramidal) coordinate system. Options for scatter, line and line+symbol plots.
- **Violin Plot**: A derivative of the box plot, with the probability distribution plotted in place of the box. Like box plots, Violin plots typically display a mean or median and an interquartile range. As with box plots, Origin's Violin plots are highly-customizable, including a "Split Violin" variation for contrasting measurements on two independent variables (e.g. male vs female).
- **Stacked Histogram**: Previously, there was a multi-panel stacked graph of separate histograms. This is now named as a "Multi-panel Histogram". The new "Stacked Histogram" is a single-layer graph with bin counts stacked by group.

Graph Customization

- **Row Titles for Tick Label Tables**: Tick Label tables, used commonly in plots of categorical data, now support customizable row titles for each table row.
- **Wrap Legend Text using %(CRLF)**: Control wrapping of graph legend custom text by inserting %(CRLF) at the wrap point.
- **Image Plots support Missing Values**: Image Plots now support missing values.
- **Auto-reposition Box Chart Labels**: There is now an **Auto Reposition to Avoid Overlapping** check box on the Plot Details **Label** tab.
- **Label Median Value in Box Chart**: An option to display and label the median value in the box chart, is added.
- **"Long Minus" option in Axis Tick Labels**: Set a new graph property `page.longminus = 1` to enable display of a "long minus" sign.
- **Remove a Plot from the Group**: Use the **Object Manager** to remove individual plots from a plot group, without removing the entire group.

- **Edit Range shortcut menu command**: Right-click on a plot and choose **Edit Range** to modify the plot display range.

5.2.3 Worksheet

- **Conditional Formatting of Cells, by Expression**: Format cells by mathematical expression (e.g. set background color for all cell values > 0).
- **Conditional Formatting of Cells, Duplicates**: Format cells by duplicate values.
- **Conditional Formatting of Cells, Heatmap**: Format cells by applying a customizable color scale by cell values.
- **Conditional Formatting of Cells, Format Manager**: Use the Conditional Format Manager to view or edit conditional rules for the current worksheet.
- **Column List View for Worksheet**: This new worksheet view mode essentially transposes the worksheet, while removing data from the view. This is most useful when you have many worksheet columns and a large amount of metadata stored in worksheet header rows.
- **Support Non-English Sheet Name in Cell Formula**: Expansion of Unicode support added in Origin 2018.
- **Support for Copy-Paste of Leading Blank Rows**: Previously, leading rows of blanks cells in columns of copied data were removed when pasting. Revert to previous behavior using system variable **@CSB**.
- **Support Numeric Hex Display**: Support native display of hex numbers (up to 13 hex-digits) without need to convert hex values using a function like Origin's **Hex2Dec()** function.
- **Improved Percentage Support**: You can now enter or paste percentages directly into the worksheet and they will be converted to decimal numbers (e.g. "12%" is pasted as "0.12").
- **Copy and Paste Data Filters**: When you add a filter to a worksheet column, a **Filter** row is added to the worksheet column label rows. You can now right click the Filter row cell, copy the filter and apply the same filter condition to another column with an existing (empty) filter.
- **Zoom and Pan Improvements**: You can invoke a worksheet scrolling mode by clicking on the mouse wheel while hovering on a worksheet. Point towards a sheet edge to scroll. This can be quite useful when combined with the new worksheet cell conditional formatting features.
- **Split Worksheet to Retain 1st N Columns**. The Split Worksheet tool now gives you the option of outputting the first *N* columns of the current sheet, to the new output sheet.

5.2.4 Analysis

- **Block Recalculation Operations**: Selectively block recalculation operations by clicking a "lock" icon and choosing **Block Recalculation**.
- **Hide Recalculation Locks**: A lock icon is placed on the graph each time an analysis operation is performed. In some cases, these lock icons interfere with viewing of the graph. Clear the check beside **View: Show: Lock** to hide locks in the graph window.
- **Improved File Import, Batch Process**: Improvements to import of multiple files into multiple sheets in an Analysis Template.

- **More LabTalk/Set Values functions**: New functions added in in a number of categories, including integer-handling, engineering, math, complex, financial and statistical.

5.2.5 Import

- **Improved Import Wizard Support Date-Time**: Support for greater precision in specifying **Custom Date Format**.
- **LibXL Update**: Updated LibXL to version 3.7.1 to for future compatibility with MS Excel.
- **Import Wizard Supports OC relative path**: User Defined Filters page, Origin C Source File now lists App Folder in addition to User Files Folder and Data Folder.

5.2.6 Programming

- **Support for R 3.5.0**: Support for the latest **R** software release.
- **New LabTalk Linear Fit Functions**: New functions added for **slope()**, **intercept()** and **forecast()**.
- **Improved Integer and Bit Operations Support**: Support for integers and their bitwise operations has been extended from 32 to 52 bits.
- **Programmatically create OPX files**: An **InitFromIni** method is added to the **OPXFile** class to support using an OriginC function to create the App. Now, the user can create an OPX file without opening the **Package Manager** dialog box. This will be most useful to those who run Origin from the command line or from a Windows BAT file.
- **HTML Mode for Notes window**: LabTalk properties for configuring the active Notes window and for embedding various Origin objects in the page.
- **Dataset Storage Access**: Origin C and LabTalk support for getting the size of dataset storage.
- **New OC Functions**: New Origin C functions for font-handling, batch plotting, reorder plots in GraphLayer.
- **Improve JSON::FromString() and JSON::ToString()**: Support converting JS array to arbitrary OC vector types; support convert OC vector to JS array.
- **OriginExt for Python**: New OriginExt for Python 3.6.
- **Link to Matrix Book or Sheet**: Embed a matrix book or matrix sheet, in a worksheet cell.
- **LT command to select Column Label Row**: Added worksheet -sl switch to select worksheet column label rows.
- **New Functions for Python Date Value**: Added two functions to convert a date value to or from system time, for Origin's embedded Python implementation.
- **COM Interface for Search Project**: COM interface allows for full search ability within the Origin project file.

5.2.7 Installation and Licensing

- **Improvements to Group Installation**: Support for using a config.ini file under the setup (.EXE) folder.

  >> Prefill settings in installation - serial number, installation path, system type (32- or 64-bit) so that installers can simply run setup.

>> Preset license information, e.g. FlexNet server name, port number, etc.

>> Preset folders: User Files, Apps, AutoSave, Backup, etc. so that the user is not prompted when Origin first runs.

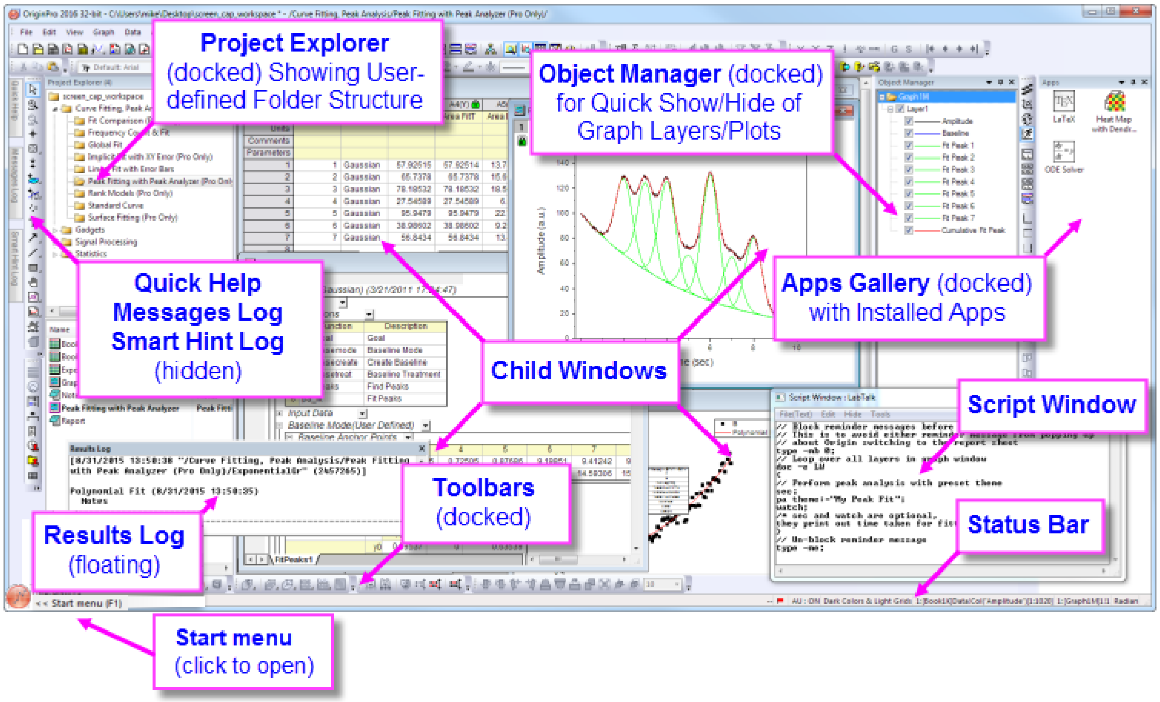
5.2.8 Apps for 2019

- **Graph Maker** (pre-installed): Create multi-panel and grouped plots and set attributes such as color and size by drag-and-drop of datasets.
- **Statistics Advisor** (pre-installed): Interactive dialog for choosing the appropriate statistical test, analysis tool or App.
- **Peak Deconvolution** PRO: Perform peak fitting/deconvolution with a friendly interface.
- **Design of Experiments** PRO: Design an experiment, fit a model to experimental data, and find best factor settings that optimize responses. Requires **R** software to be installed on your PC.
- **Independent Component Analysis** PRO: Decompose observed mixed signals into sub-components which are assumed to be independent from each other. Input data can be either columns or matrices. Requires **R** software to be installed on your PC.
- **Import LSM**: Import images from LSM files.
- **Gaussian Mixture Models** PRO: Fit Gaussian mixture models and cluster test data.
- **Image Object Counter** PRO: Object identification and measurement in images.
- **Global Fit, Multiple Functions** PRO: Perform global fit and share parameters between different functions.
- **Graph Publisher**: Help in preparing a graph for publication, with journal-specific assistance.
- **Align Peaks**: Align peaks of spectra by shifting, scaling, clipping and inserting data.

6 The Origin Interface

6.1 The Origin Workspace

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



Project Explorer (docked) Showing User-defined Folder Structure

Object Manager (docked) for Quick Show/Hide of Graph Layers/Plots

Quick Help
Messages Log
Smart Hint Log
(hidden)

Apps Gallery (docked) with Installed Apps

Child Windows

Script Window

Toolbars (docked)

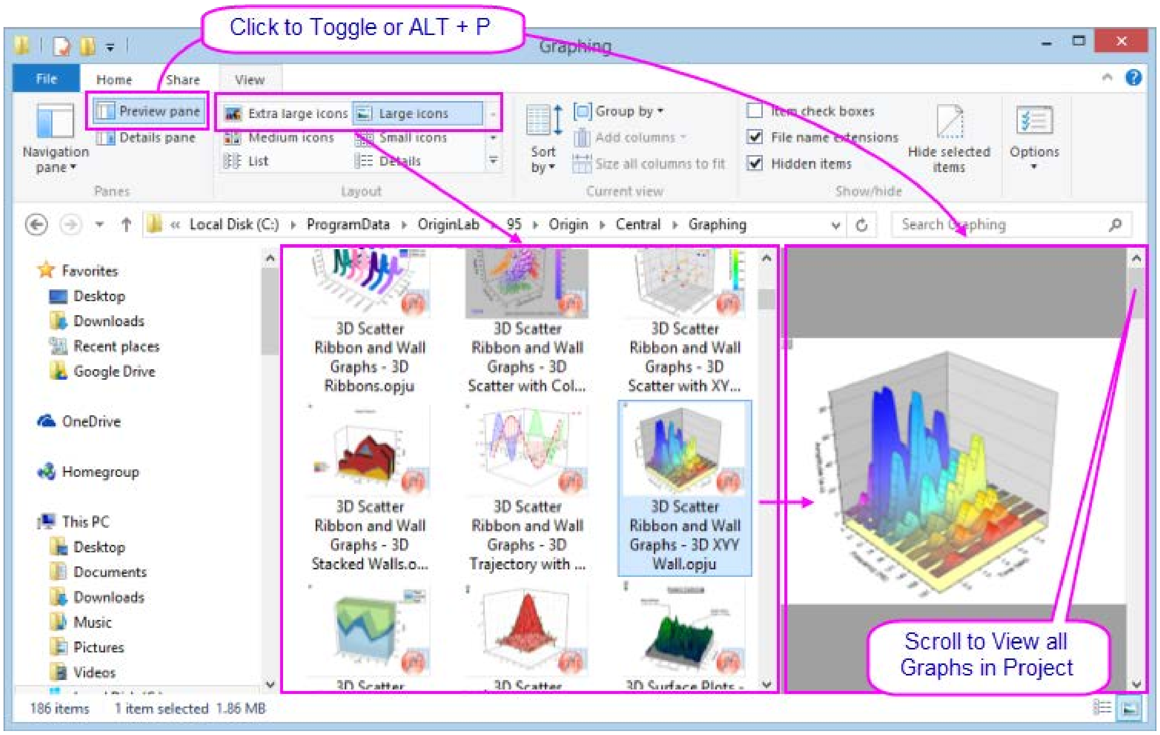
Results Log (floating)

Status Bar

Start menu (click to open)

6.1.1 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.



Click to Toggle or ALT + P

Scroll to View all Graphs in Project

Graphing
File
Home
Share
View
Navigation pane
Preview pane
Details pane
Panes
Extra large icons
Large icons
Medium icons
Small icons
List
Details
Layout
Sort by
Group by
Add columns
Size all columns to fit
Current view
Item check boxes
File name extensions
Hidden items
Hide selected items
Show/hide
Options
Local Disk (C:) ▸ ProgramData ▸ OriginLab ▸ 95 ▸ Origin ▸ Central ▸ Graphing
Search Graphing
Favorites
Desktop
Downloads
Recent places
Google Drive
OneDrive
Homegroup
This PC
Desktop
Documents
Downloads
Music
Pictures
Videos
3D Scatter Ribbon and Wall Graphs - 3D Ribbons.opju
3D Scatter Ribbon and Wall Graphs - 3D Scatter with Col...
3D Scatter Ribbon and Wall Graphs - 3D Scatter with XY...
3D Scatter Ribbon and Wall Graphs - 3D Stacked Walls.o...
3D Scatter Ribbon and Wall Graphs - 3D Trajectory with ...
3D Scatter Ribbon and Wall Graphs - 3D XYY Wall.opju
3D Scatter
3D Scatter
3D Surface Plots -
186 items
1 item selected 1.86 MB

- 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.

6.1.2 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 **Tools: Options** > **Miscellaneous** tab and clear the **Enable Collapsible Menus** box.

- **Most frequently 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.
- **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.

6.1.3 Origin Toolbars

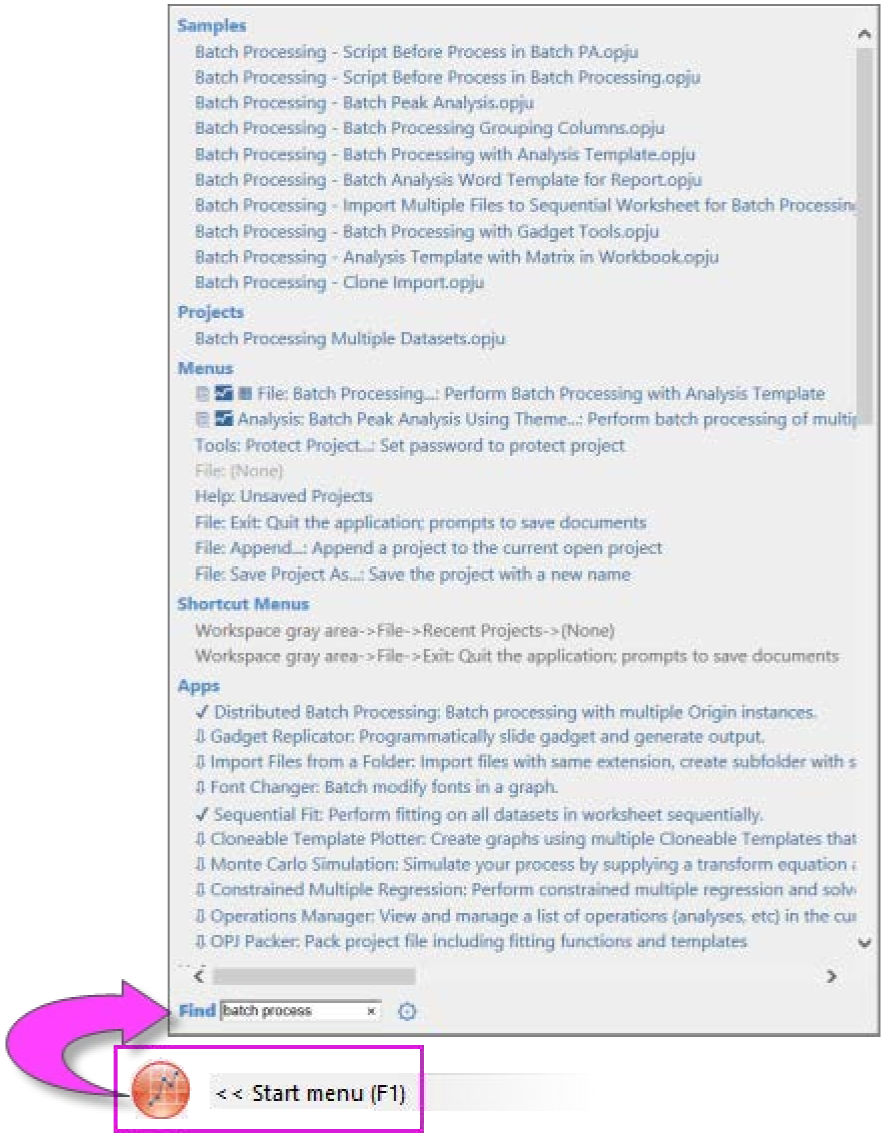
Use the **Customize Toolbar** dialog box (**View: Toolbars**) to control toolbar display and reset or reinitialize toolbars.

- **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 toolbar removes the toolbar from view. To restore a hidden toolbar, open the **Customize Toolbars** dialog box and select the toolbar.
- **Hide/Show a button**: Clicking the tiny arrow at the end of toolbar to turn on/off some buttons on a toolbar.
- **Move button location**: Alt+drag a button to move it to a new location within or among toolbars. Alt+drag to blank workspace to create a new toolbar. Alt+drag a button to child window till X shows to remove a button.

6.1.4 Start Menu

Enter keywords and phrases into the Start menu to return relevant **Menu** entries, **Apps**, **FAQs**, **Videos** and **X-Functions**. Open recently-opened **Files**, **Menus** and **Apps**.

Open the **Start** menu by pressing **F1** (no dialogs open) or by clicking the red Origin icon at the bottom left corner of the Origin workspace.



Samples
Batch Processing - Script Before Process in Batch PA.opju
Batch Processing - Script Before Process in Batch Processing.opju
Batch Processing - Batch Peak Analysis.opju
Batch Processing - Batch Processing Grouping Columns.opju
Batch Processing - Batch Processing with Analysis Template.opju
Batch Processing - Batch Analysis Word Template for Report.opju
Batch Processing - Import Multiple Files to Sequential Worksheet for Batch Processin
Batch Processing - Batch Processing with Gadget Tools.opju
Batch Processing - Analysis Template with Matrix in Workbook.opju
Batch Processing - Clone Import.opju

Projects
Batch Processing Multiple Datasets.opju

Menus
File: Batch Processing...: Perform Batch Processing with Analysis Template
Analysis: Batch Peak Analysis Using Theme...: Perform batch processing of multi
Tools: Protect Project...: Set password to protect project
File: (None)
Help: Unsaved Projects
File: Exit: Quit the application; prompts to save documents
File: Append...: Append a project to the current open project
File: Save Project As...: Save the project with a new name

Shortcut Menus
Workspace gray area->File->Recent Projects->(None)
Workspace gray area->File->Exit: Quit the application; prompts to save documents

Apps
✓ Distributed Batch Processing: Batch processing with multiple Origin instances.
⇩ Gadget Replicator: Programmatically slide gadget and generate output.
⇩ Import Files from a Folder: Import files with same extension, create subfolder with s
⇩ Font Changer: Batch modify fonts in a graph.
✓ Sequential Fit: Perform fitting on all datasets in worksheet sequentially.
⇩ Cloneable Template Plotter: Create graphs using multiple Cloneable Templates that
⇩ Monte Carlo Simulation: Simulate your process by supplying a transform equation
⇩ Constrained Multiple Regression: Perform constrained multiple regression and solv
⇩ Operations Manager: View and manage a list of operations (analyses, etc) in the cu
⇩ OPJ Packer: Pack project file including fitting functions and templates

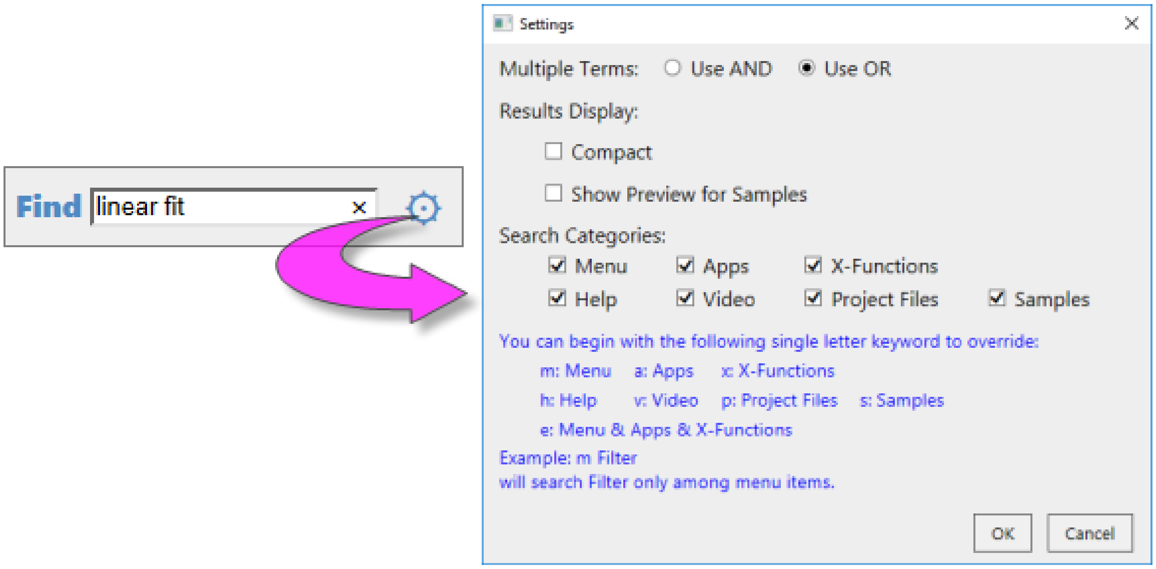
Find batch process

To narrow your search, type the following letters in front of the search term(s):

m = search only Menu entries
a = search only Apps
h = search only Help + FAQ
v = search only Videos
x = search only X-Functions
p = search your recent projects
s = search sample projects
e = search Menus + Apps + X-Functions (only executable)

Alternately ...

Click the "gear" icon beside the search field to open the **Settings** box. Here you can restrict search results and tweak other search settings.



Multiple Terms: ○ Use AND ● Use OR

Results Display:

☐ Compact

☐ Show Preview for Samples

Search Categories:

☑ Menu ☑ Apps ☑ X-Functions

☑ Help ☑ Video ☑ Project Files ☑ Samples

You can begin with the following single letter keyword to override:

m: Menu a: Apps x: X-Functions

h: Help v: Video p: Project Files s: Samples

e: Menu & Apps & X-Functions

Example: m Filter

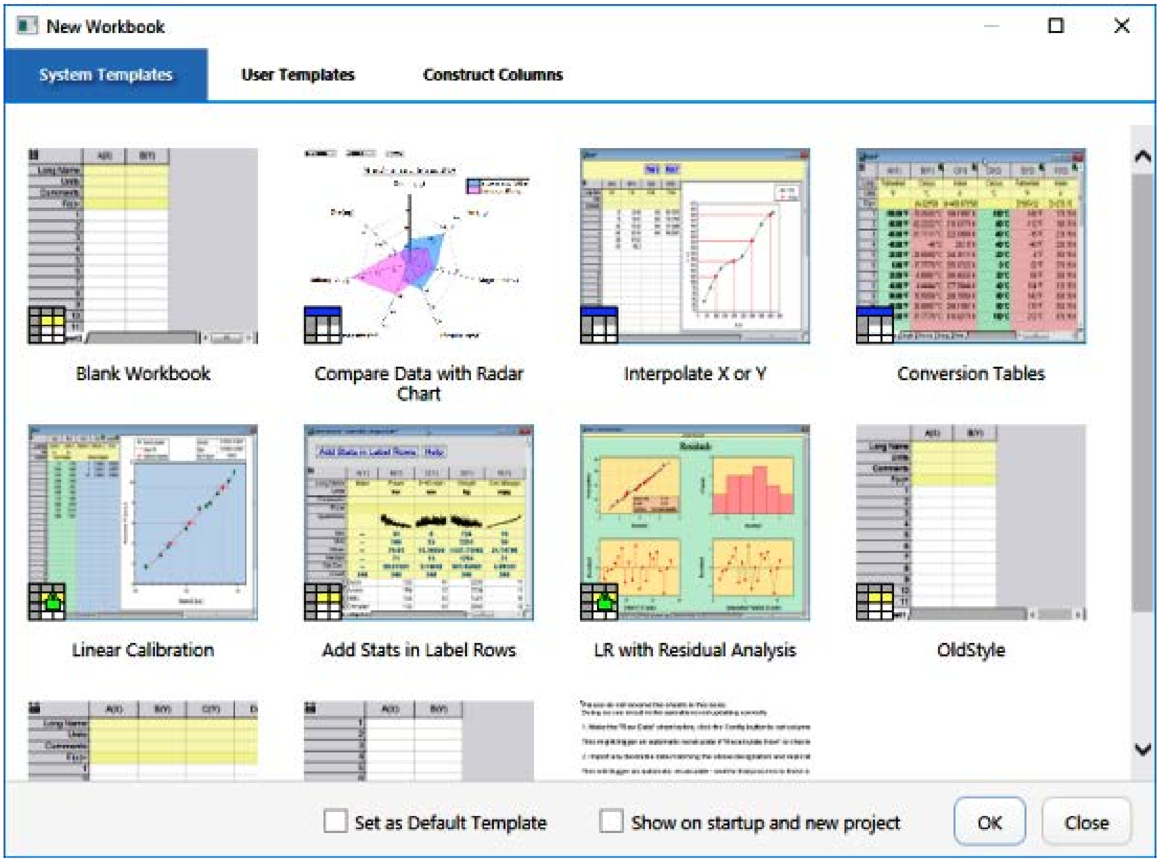
will search Filter only among menu items.

6.1.5 New Workbook Dialog

The workbook is central to most Origin tasks. It receives imported data, it contains data to be manipulated, plotted or analyzed and it can even be customized for batch analyses or for creating reports in PDF format. Each task often requires a unique set of data handling and format "instructions" -- a custom configuration set up by you, the user. Once so configured, a workbook window can be saved as a template file and reused any time you need to create the same or similar data handling and format instructions.

The primary purpose of the **New Workbook** dialog box is to help organize and access your workbook templates. Use the dialog to create workbook windows ...

- ... from built-in **System Templates**.
- ... from your own **User Templates**.
- ... on the fly, using controls on the **Construct Columns** tab.


New Workbook
System Templates
User Templates
Construct Columns
Blank Workbook
Compare Data with Radar Chart
Interpolate X or Y
Conversion Tables
Linear Calibration
Add Stats in Label Rows
LR with Residual Analysis
OldStyle
☐ Set as Default Template
☐ Show on startup and new project
OK
Close

There are also check boxes to:

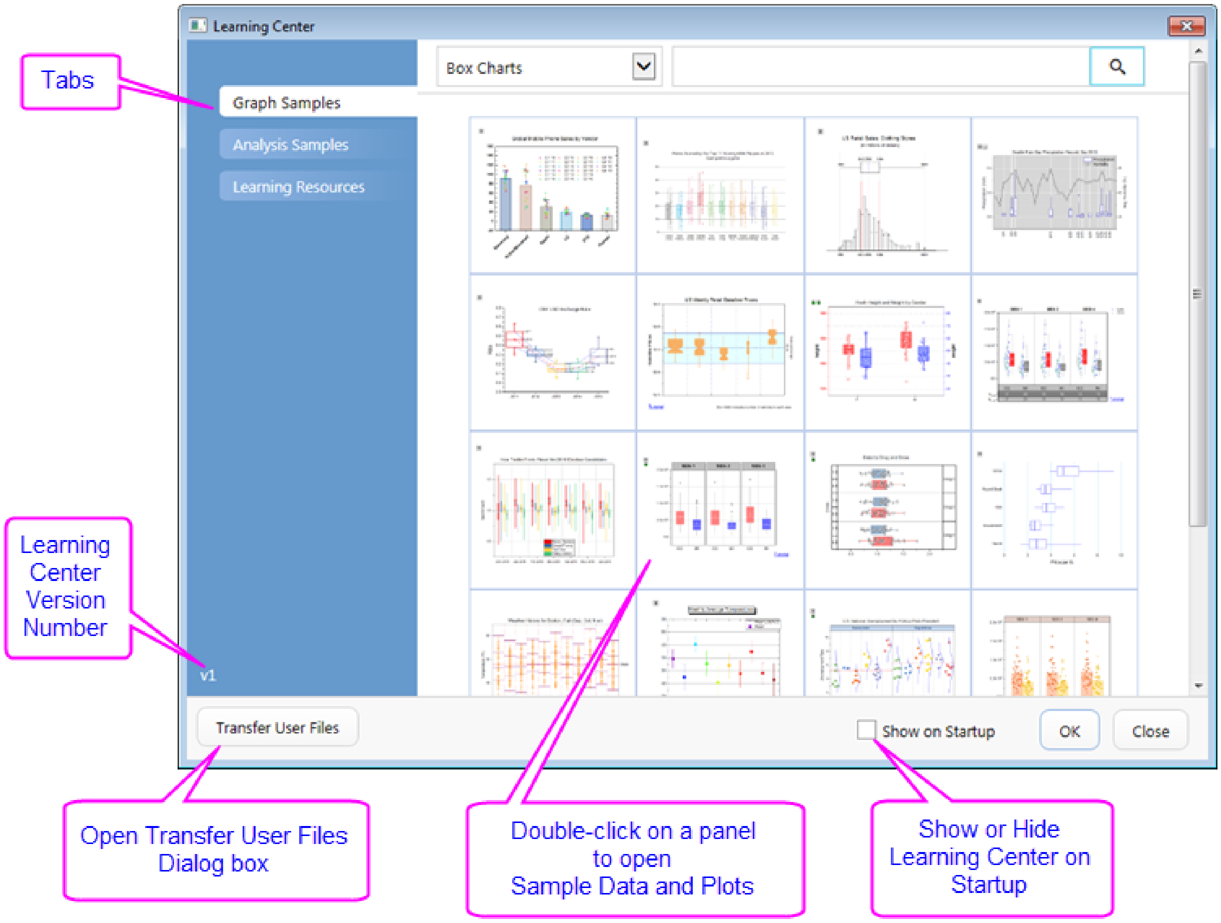
- Show the **New Workbook** dialog on startup or when you open a new project (**File: New Project**).
- To set the highlighted template as default on running Origin or when starting a new project.

The New Workbook dialog opens, by default, when you run Origin. If you later opt to hide the dialog on startup, you can open it at any time by choosing **File: New Workbook**.

6.1.6 Learning Center

Learning Center is a "startup" dialog intended to give you quick access to key files and support information. Learning Center was introduced in Origin 2017 and has been updated for 2019.

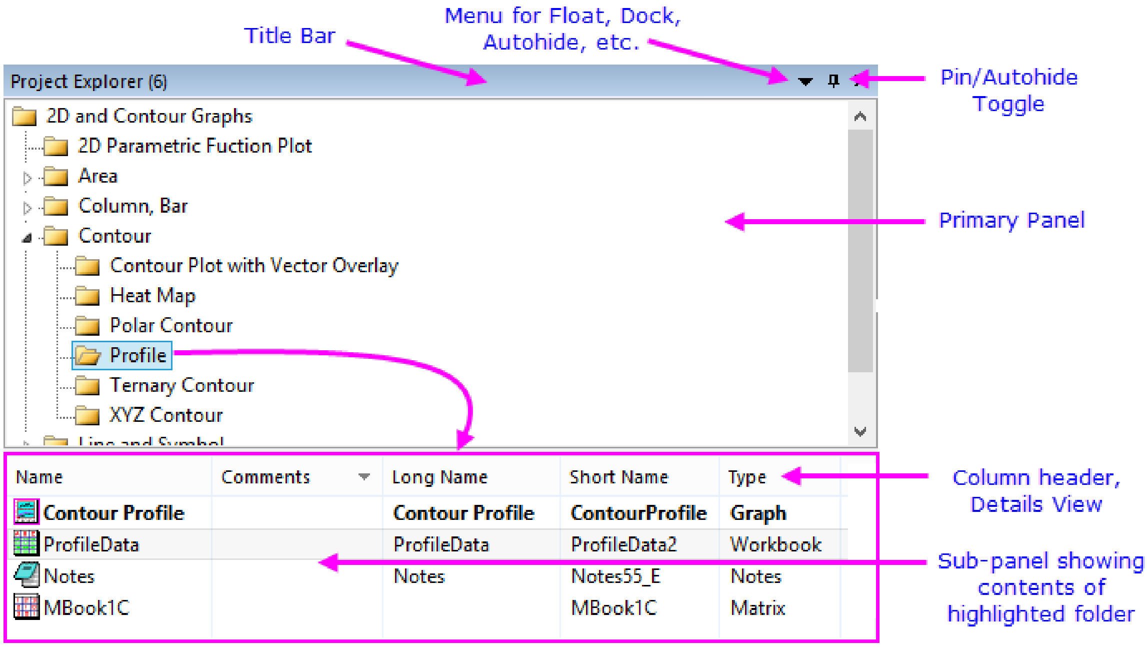
To open the dialog, choose **Help: Learning Center** or press F11.


Learning Center
Box Charts
Graph Samples
Analysis Samples
Learning Resources
v1
Transfer User Files
☐ Show on Startup
OK
Close
Tabs
Learning Center Version Number
Open Transfer User Files Dialog box
Double-click on a panel to open Sample Data and Plots
Show or Hide Learning Center on Startup

- 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.

6.1.7 Project Explorer

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


Project Explorer (6)
2D and Contour Graphs
2D Parametric Fuction Plot
Area
Column, Bar
Contour
Contour Plot with Vector Overlay
Heat Map
Polar Contour
Profile
Ternary Contour
XYZ Contour

Name	Comments	Long Name	Short Name	Type
Contour Profile		**Contour Profile**	**ContourProfile**	**Graph**
ProfileData		ProfileData	ProfileData2	Workbook
Notes		Notes	Notes55_E	Notes
MBook1C			MBook1C	Matrix

Title Bar

Menu for Float, Dock, Autohide, etc.

Pin/Autohide Toggle

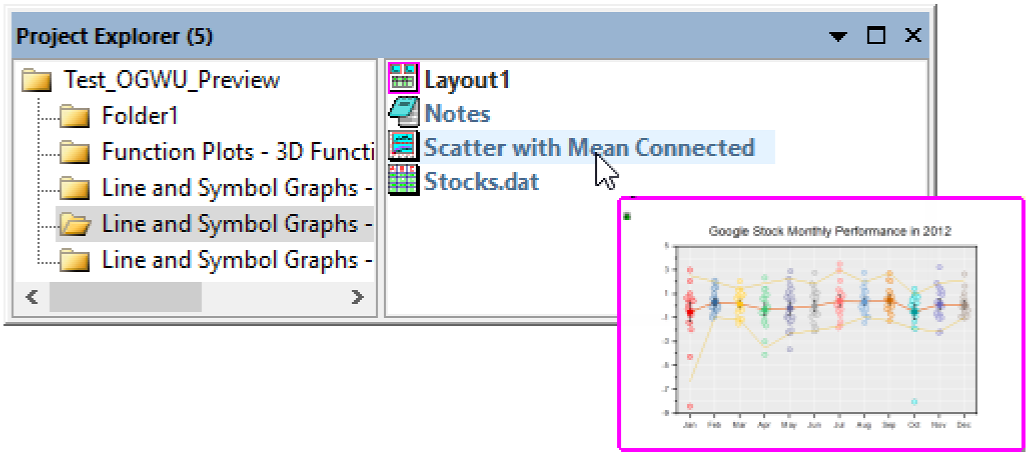
Primary Panel

Column header, Details View

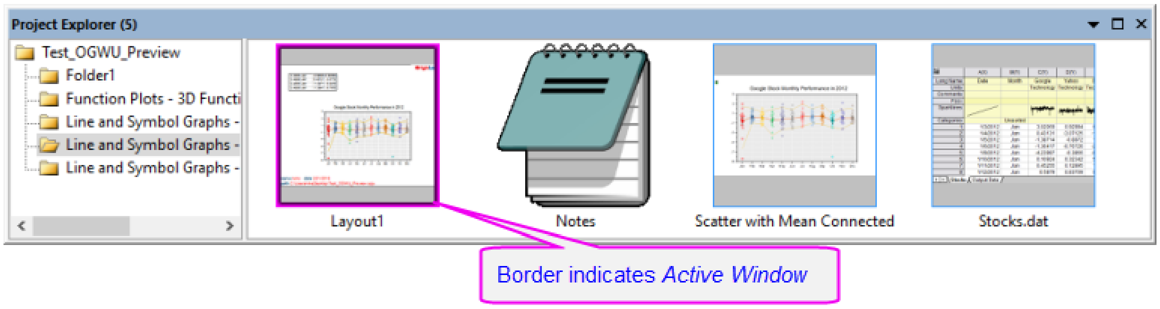
Sub-panel showing contents of highlighted folder

Project Explorer 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.

- 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 or layout window. Notes window content is shown in a tooltip.


Project Explorer (5)
Test_OGWU_Preview
Folder1
Function Plots - 3D Functi
Line and Symbol Graphs -
Line and Symbol Graphs -
Line and Symbol Graphs -
Layout1
Notes
Scatter with Mean Connected
Stocks.dat
Google Stock Monthly Performance in 2012

- When displaying windows as **Extra Large Icons**, the PE sub-panel displays a thumbnail of graphs, layout windows, workbooks and matrix books. Notes window content is shown in a tooltip.


Project Explorer (5)
Test_OGWU_Preview
Folder1
Function Plots - 3D Functi
Line and Symbol Graphs -
Line and Symbol Graphs -
Line and Symbol Graphs -
Layout1
Notes
Scatter with Mean Connected
Stocks.dat
Border indicates Active Window

To disable PE previews, open the Script Window (**Window: Script Window**) and type one or both of the following, then highlight the text and press Enter:

```
@PESS=-1; //turn off window preview in PE, show window comments as tooltip

@PESH=0; //turn off window comments tooltip
```

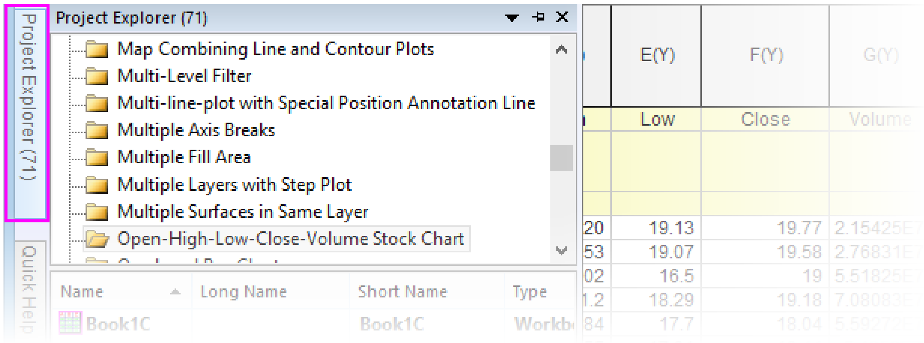
When you set the value of a system variable using the Script Window, you are altering Origin's behavior for the current session only. To set the value of a system variable across sessions, see this FAQ.

Prior to 2018, the sub-panel listed sub-folders under the selected folder. If you would like to restore the old behavior, open the Script Window (**Window: Script Window**), type the following and press <Enter>:

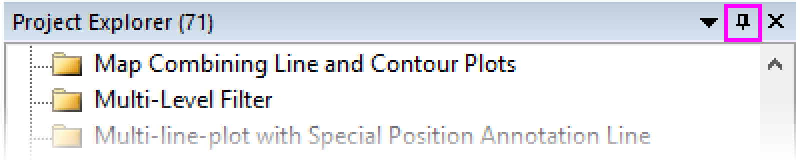
```
@PEF = 1
```

To permanently change the behavior, see [FAQ-708 How do I permanently change the value of a system variable?]()

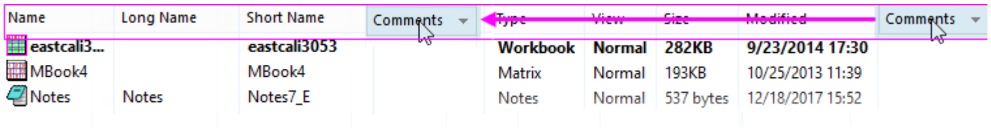
1. Select **Help: Open Folder: Program Folder**, click the **Samples** subfolder, then drag the file Tutorial Data.opj to your Origin workspace.
2. By default, Project Explorer is docked to the left side of the Origin workspace in auto-hide mode. Mouse over the **Project Explorer** tab to show the PE window.


Project Explorer (71)
Map Combining Line and Contour Plots
Multi-Level Filter
Multi-line-plot with Special Position Annotation Line
Multiple Axis Breaks
Multiple Fill Area
Multiple Layers with Step Plot
Multiple Surfaces in Same Layer
Open-High-Low-Close-Volume Stock Chart
Name
Long Name
Short Name
Type
Book1C
Book1C
Quick Help
E(Y)
F(Y)
G(Y)
Low
Close
Volume

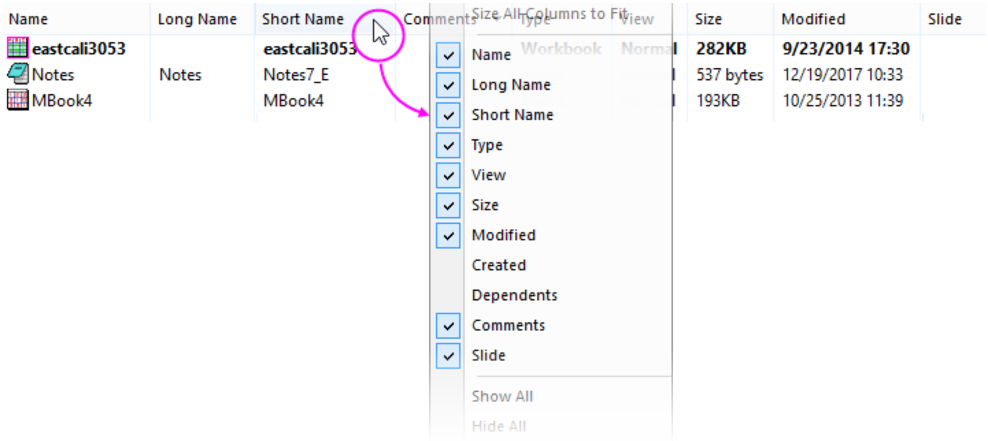
3. Click on the "push pin" icon on the PE title bar to pin the window in the docked position.


Project Explorer (71)
Map Combining Line and Contour Plots
Multi-Level Filter
Multi-line-plot with Special Position Annotation Line

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.

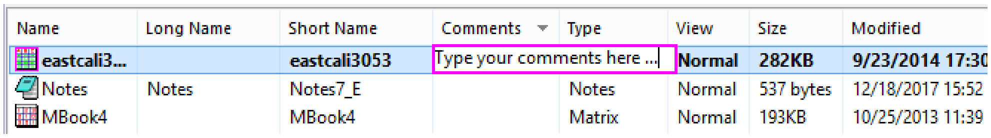

Name
Long Name
Short Name
Comments
Type
View
Size
Modified
Comments
eastcali3...
eastcali3053
Workbook
Normal
282KB
9/23/2014 17:30
MBook4
MBook4
Matrix
Normal
193KB
10/25/2013 11:39
Notes
Notes
Notes7_E
Notes
Normal
537 bytes
12/18/2017 15:52

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



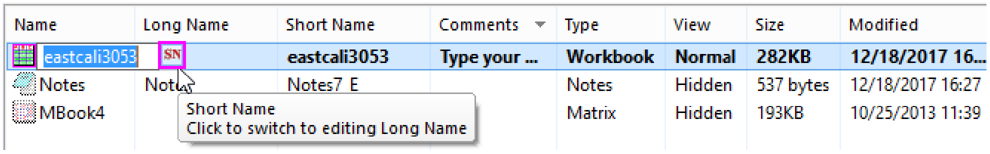
Name	Long Name	Short Name	Comments	Type	View	Size	Modified	Slide
eastcali3053		**eastcali3053**		Workbook	Normal	**282KB**	**9/23/2014 17:30**	
Notes	Notes	Notes7_E				537 bytes	12/19/2017 10:33	
MBook4		MBook4				193KB	10/25/2013 11:39	

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.



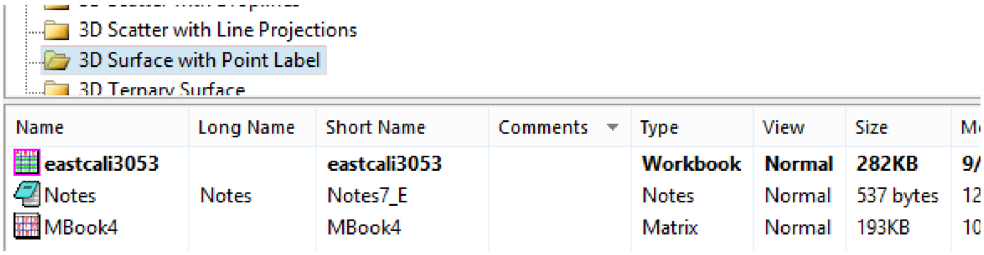
Name	Long Name	Short Name	Comments	Type	View	Size	Modified
eastcali3...		**eastcali3053**	Type your comments here ...		**Normal**	**282KB**	**9/23/2014 17:30**
Notes	Notes	Notes7_E		Notes	Normal	537 bytes	12/18/2017 15:52
MBook4		MBook4		Matrix	Normal	193KB	10/25/2013 11:39

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** (all windows must have a Short Name; Long Names are optional). To have the Name field display the window **Long Name**, click the **SN** button to the right-side of the editable **Name** field. If the Long Name does not exist, you can enter one.



Name	Long Name	Short Name	Comments	Type	View	Size	Modified
eastcali3053		**eastcali3053**	**Type your ...**	**Workbook**	**Normal**	**282KB**	**12/18/2017 16...**
Notes	Not	Notes7_E		Notes	Hidden	537 bytes	12/18/2017 16:27
MBook4				Matrix	Hidden	193KB	10/25/2013 11:39

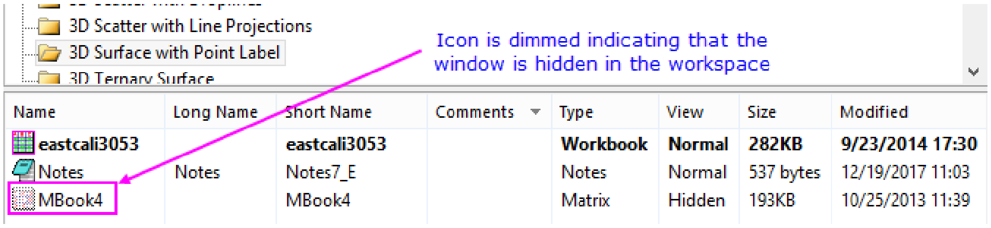
8. In the top panel of Project Explorer, scroll to the folder **3D Surface with Point Label** and click on it. The sub-panel shows that there are three windows in the folder. Note that the worksheet window eastcali3053 is bold indicating that it is the "active" window - the window that is being acted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



3D Scatter with Line Projections
3D Surface with Point Label
3D Ternary Surface

Name	Long Name	Short Name	Comments	Type	View	Size	M
eastcali3053		**eastcali3053**		**Workbook**	**Normal**	**282KB**	**9/**
Notes	Notes	Notes7_E		Notes	Normal	537 bytes	12
MBook4		MBook4		Matrix	Normal	193KB	10

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.



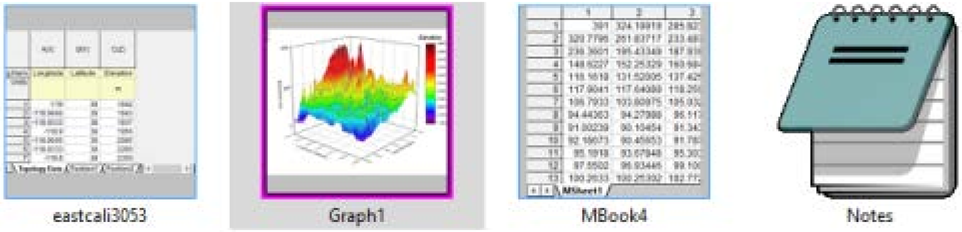
3D Scatter with Line Projections
3D Surface with Point Label
3D Ternary Surface

Icon is dimmed indicating that the window is hidden in the workspace

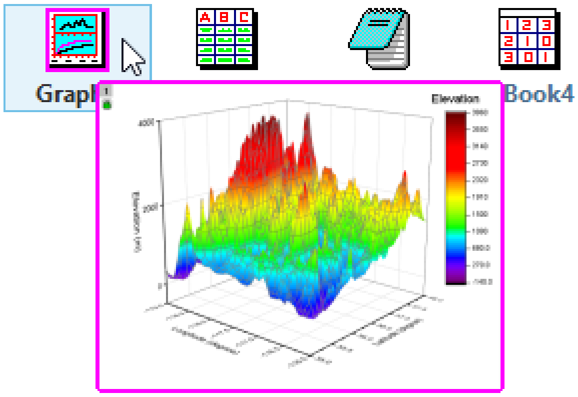
Name	Long Name	Short Name	Comments	Type	View	Size	Modified
eastcali3053		**eastcali3053**		**Workbook**	**Normal**	**282KB**	**9/23/2014 17:30**
Notes	Notes	Notes7_E		Notes	Normal	537 bytes	12/19/2017 11:03
MBook4		MBook4		Matrix	Hidden	193KB	10/25/2013 11:39

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.

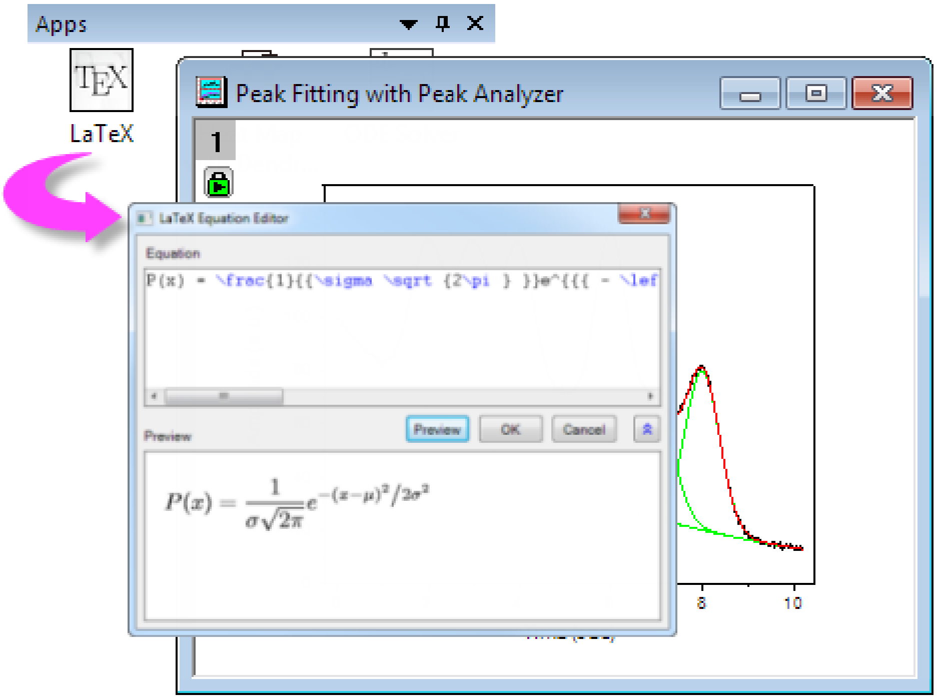


12. Right-click again and choose **View: Large Icons**. Note that windows are now represented by icons but if you hover on them, you can see the window contents as a pop-up.


Graph
Book4
Elevation

6.1.8 Apps Gallery and App Center

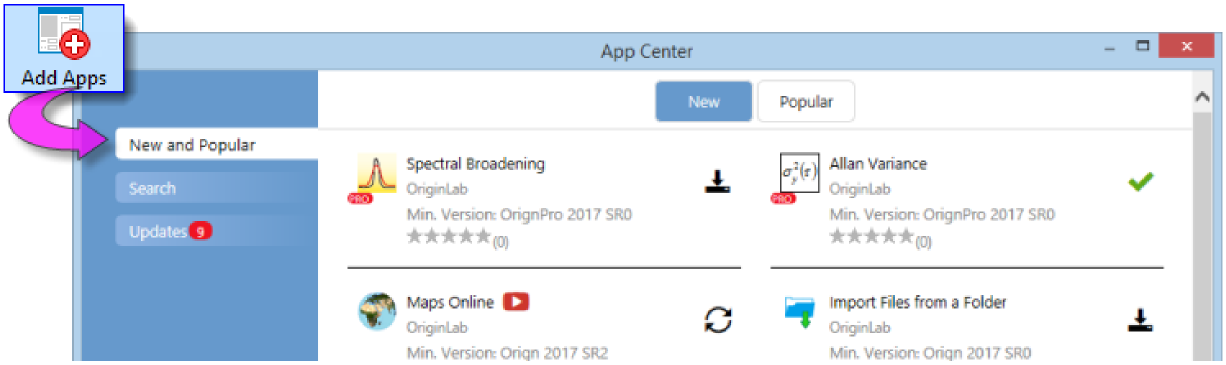
Apps are add-on applications for Origin that perform specific graphing and/or analysis tasks. A small number of Apps that are broadly applicable to science and engineering fields are pre-installed with your Origin software.


Apps
LaTeX
Peak Fitting with Peak Analyzer
1
LaTeX Equation Editor
Equation
Preview
Preview
OK
Cancel
8
10

P(x) = \frac{1}{{\sigma \sqrt {2\pi } }}e^{{ - \lef

$$P(x) = \frac{1}{\sigma\sqrt{2\pi}}e^{-(x-\mu)^2/2\sigma^2}$$

Origin 2018 introduced 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.


Add Apps
App Center
New
Popular
New and Popular
Search
Updates 9
Spectral Broadening
PRO
OriginLab
Min. Version: OrignPro 2017 SR0
(0)
Allan Variance
PRO
OriginLab
Min. Version: OrignPro 2017 SR0
(0)
Maps Online
OriginLab
Min. Version: Orign 2017 SR2
Import Files from a Folder
OriginLab
Min. Version: Orign 2017 SR0

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.

- 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 ⤓

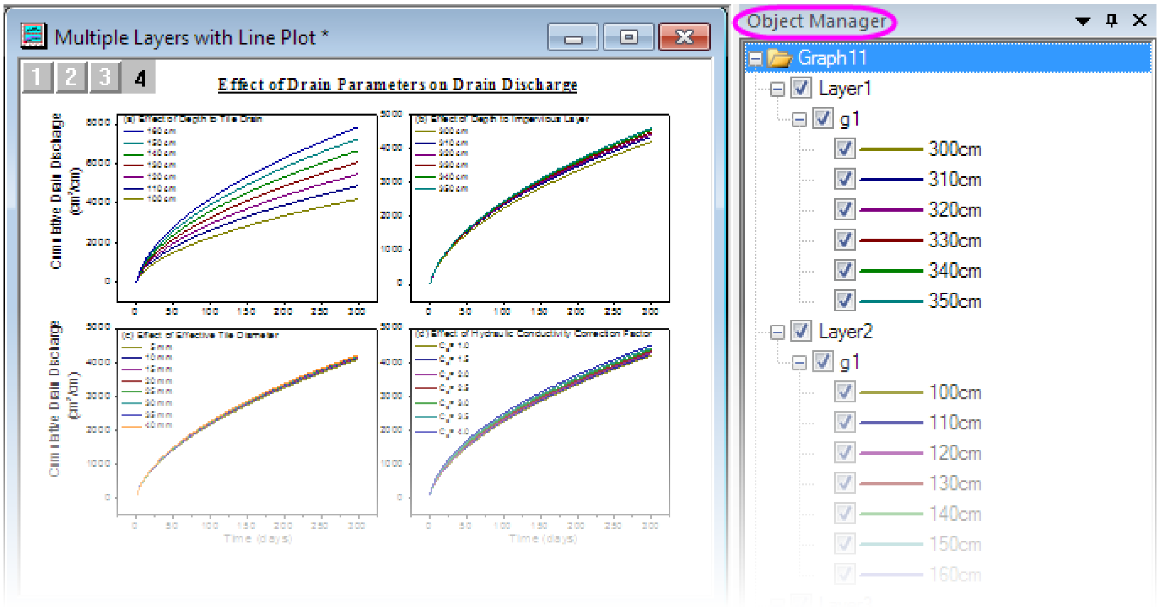
You can also see a list of installed Apps by browsing the **Apps Gallery**. Click **View: Apps** to open the Gallery if it is not open.

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

6.1.9 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 graph layers and data plots in the active graph window:

- 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*.
- Hide or show plot elements by clearing or selecting the corresponding check box in the Object Manager.

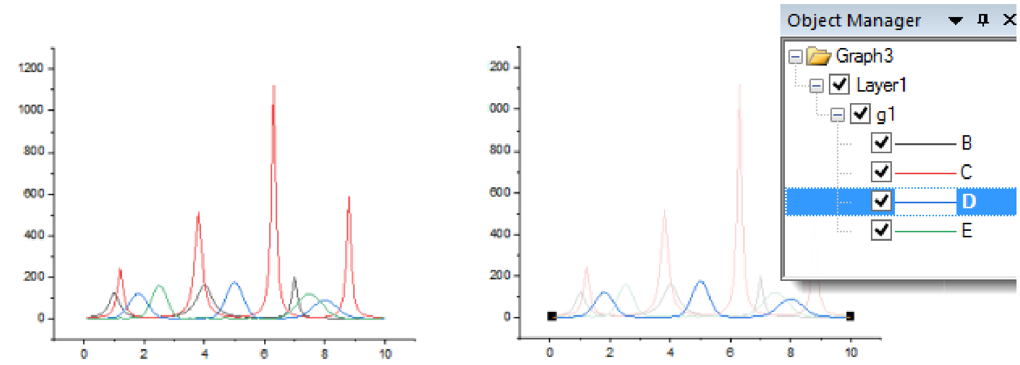

Multiple Layers with Line Plot *
1
2
3
4
Effect of Drain Parameters on Drain Discharge
Object Manager
Graph11
Layer1
g1
300cm
310cm
320cm
330cm
340cm
350cm
Layer2
g1
100cm
110cm
120cm
130cm
140cm
150cm
160cm
Time (days)

Right-click on an element in the Object Manager panel and choose from additional actions, including:

- At the graph level, change Object Manager list order.
- At the layer level, change layer order.
- At the plot level, show or hide plots of the same name.
- Within a plot group (labeled as g*N*), ungroup, toggle plot dependency, change plot type or re-order plots by dragging or by shortcut menu command.
- Remove a plot from the graph window (not the same as hiding).
- Access the **Plot Details**, **Layer Contents** and **Plot Setup** dialog boxes.

NEW

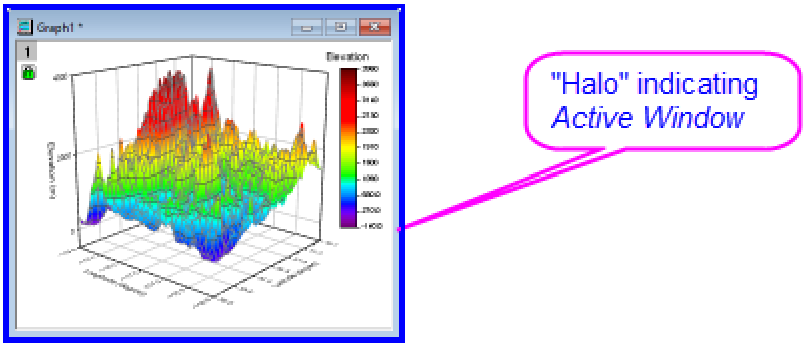
The **Object Manager** has been improved for Origin 2019 with more options for managing plots in layers and plot groups. Additionally, you can now click on a plot in Object Manager and dim other plots in the graph window.


1200
1000
800
600
400
200
0
0
2
4
6
8
10
Object Manager
Graph3
Layer1
g1
B
C
D
E

For more information, see **[The Object Manager](#)**, in the Origin Help file.

6.1.10 Origin Child Windows

Beginning with Origin 2018b, ***active windows*** -- the window that will be acted upon by graphing and analysis operations -- displays 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).



- **Origin 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.
- **Origin Matrix Books**: Like the worksheet, a matrix sheet 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 matrix book contains between 1 and 1,024 sheets. Each sheet can contain multiple matrix objects (up to 65,504 on a 64-bit OS).
- **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.
- **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 is a text-only window used for recording analysis procedures, making notes to students and colleagues, and cutting and pasting text from other applications.

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 any window title bar and choose **Save as...** 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...** context menu.

Origin 2018 added Unicode (UTF-8) support for Origin projects, child windows and templates. When you save a window file, you will have the option of saving a file with or without a "**u**" appended to the file type (*.opj or *.opju). 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:

- Select **File: Open Excel** menu to open a external Excel file. Or, you can click **Import Excel** button in the **Standard** toolbar or select **File: Import: 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 **Import Excel**, the Excel file is imported into an Origin workbook and all Origin features are available.

6.1.11 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 command.

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** provides some of the same functionality as the Command Window. It lacks some of the Command Window's features (no intellisense, no command prompt, no command history) but it is handy for issuing LabTalk commands and running Python scripts. 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.

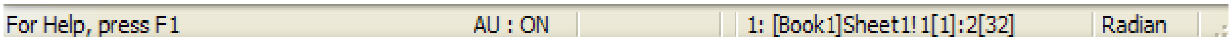
To open the Command Window:

- 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.

6.1.12 The Status Bar



For Help, press F1

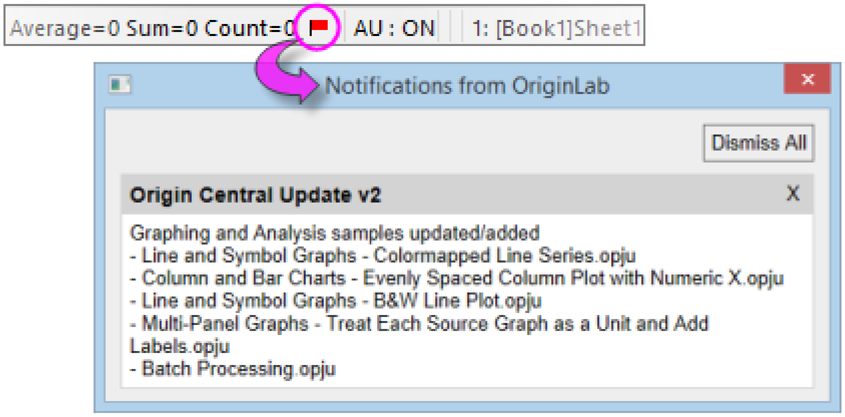
AU : ON

1: [Book1]Sheet1!1[1]:2[32]

Radian

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.



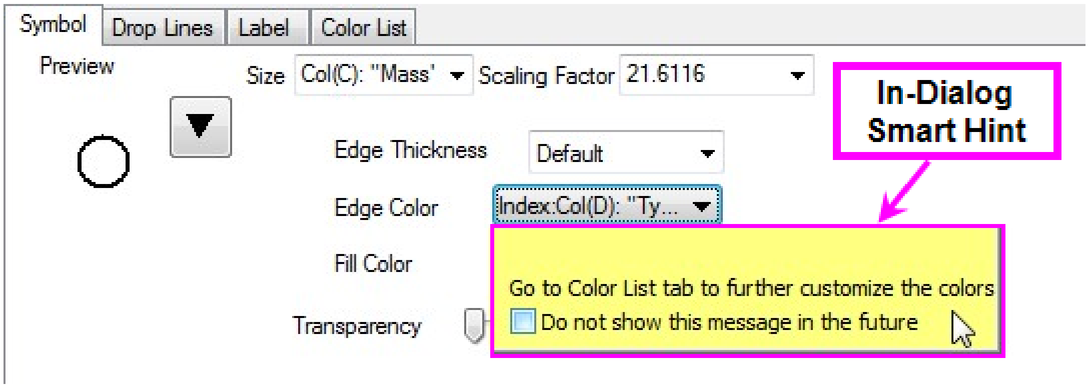
Origin Central Update v2

Graphing and Analysis samples updated/added
- Line and Symbol Graphs - Colormapped Line Series.opju
- Column and Bar Charts - Evenly Spaced Column Plot with Numeric X.opju
- Line and Symbol Graphs - B&W Line Plot.opju
- Multi-Panel Graphs - Treat Each Source Graph as a Unit and Add Labels.opju
- Batch Processing.opju

Note: You can select what shows in the Status Bar by right-clicking on the Bar and selecting (or clearing) items from the context menu. You can 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.

6.1.13 Smart Hints and the Smart Hint Log

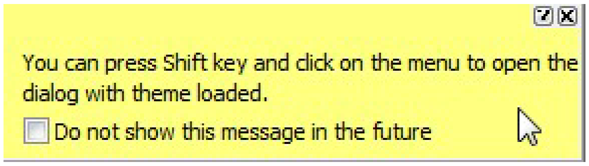
Smart Hints are triggered by user actions and are intended to give the user help with current task. These hints may appear briefly inside a dialog box, as in this example.



Size: Col(C): "Mass'
Scaling Factor: 21.6116
Edge Thickness: Default
Edge Color: Index:Col(D): "Ty...
Fill Color
Transparency

Go to Color List tab to further customize the colors
☐ Do not show this message in the future

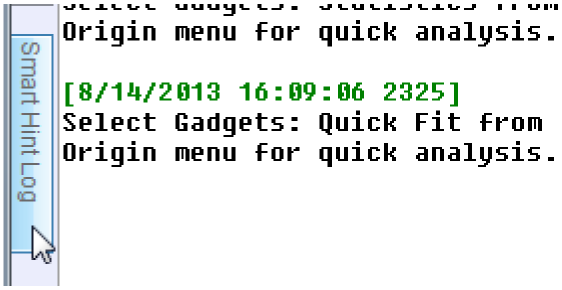
Alternately, Smart Hints may appear in the lower left corner of the Origin workspace, as in this example.



You can press Shift key and click on the menu to open the dialog with theme loaded.
☐ Do not show this message in the future

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).



Origin menu for quick analysis.

[8/14/2013 16:09:06 2325]
Select Gadgets: Quick Fit from
Origin menu for quick analysis.

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**.

You can customize general properties of Smart Hints by setting system variables @SHG and @SHO. See the system variable list for details.

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.

6.1.14 Code Builder

Origin's programming language is called **Origin C**. Origin C's integrated development environment (IDE) is called **Code Builder**. Code Builder provides tools for writing, compiling, and debugging your Origin C functions.Origin C, IDE

To open Code Builder:

1. From the Origin menu, select **View: Code Builder**. Alternately, click the **Code Builder** button on the Standard toolbar or press ALT+4.

6.1.15 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.

6.1.16 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**.

6.1.17 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**, **Messages Log**, and **Quick Help**. This allows you to customize your Origin workspace so as to maximize utility and save screen space.

6.2 Numbers in Origin

- **Displayed vs. Actual Cell Value**: When you import or type your data into a workbook or matrix book, 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.
- **Display of Numbers that Exceed Cell Width**: If a workbook or matrix book contains data that exceed the cell (column) width, Origin displays values as series of pound signs (**######**). This avoids confusion caused by a truncated display of cell values. Pound signs **######** will revert to numbers when you enter cell editing mode.
- **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 matrix sheet 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 matrix book 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.

For 2019, Origin offers two alternate time systems: (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 matrix books support the following **Data Types**:

Workbook	Matrix Book	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

6.3 Topics for Further Reading

- Project Explorer
- 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 Tools: Options

7 Origin File Types

7.1 Roundup of Origin File Types

NEW

A series of Unicode-compliant (UTF-8) file types was added for Origin 2018. Long-time users will recognize that some of the old familiar file types now have a Unicode counterpart, denoted by an appended '**u**' (e.g. ***.opj** => ***.opju**). Origin versions 2018 and later will read and write the older, non-Unicode file types. As the default is to save to Unicode-type files, be sure to set the **Save as type** drop-down when saving to the older file types.

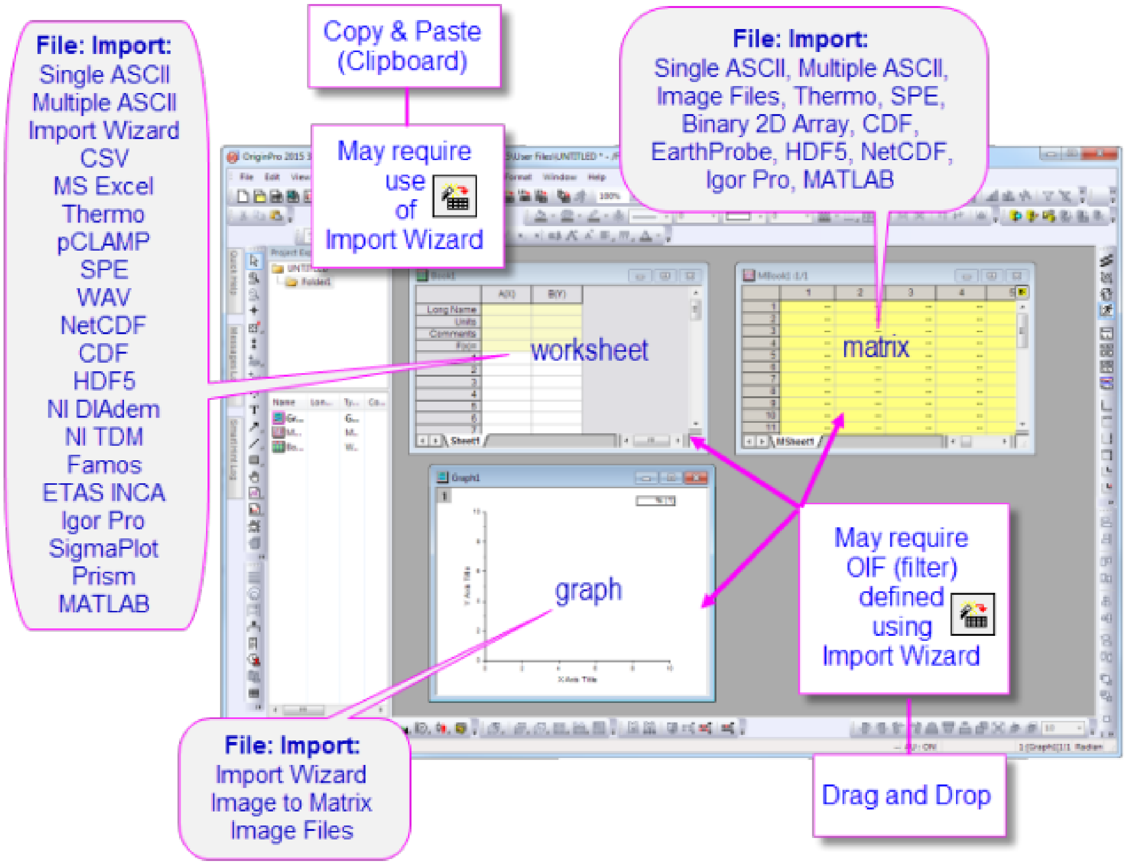
File Type	File Extension	Used As
Origin Project Files	*.opj(u)	A container for all data.
Child Window Files	*.ogw(u);*.ogg(u);*.ogm(u);*.txt	The child windows for workbooks (.ogw(u)), graph (.ogg(u)), matrix(.ogm(u)), notes (.txt).
Template Files	*.otp(u);*.otw(u);*.otm(u)	A stored customizable suite of data-handling and format options: graphs(.otp(u)), worksheets (.otw(u)), matrix(.otm(u)).
Theme Files	*.oth;*.ois;*.odt;*.ofp;	A saved suite of user-defined settings with multiple applications in Origin. A *.oth file applies to a graph/worksheet/matrix sheet/report table; A *.ois applies to analyses and dialogs; A *.odt applies to dialogs; A *.ofp applies to function plots.
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.
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.

File Type	File Extension	Used As
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.

7.2 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

8 Import Data


File: Import:
Single ASCII
Multiple ASCII
Import Wizard
CSV
MS Excel
Thermo
pCLAMP
SPE
WAV
NetCDF
CDF
HDF5
NI DIAdem
NI TDM
Famos
ETAS INCA
Igor Pro
SigmaPlot
Prism
MATLAB
Copy & Paste (Clipboard)
May require use of Import Wizard
File: Import:
Single ASCII, Multiple ASCII, Image Files, Thermo, SPE, Binary 2D Array, CDF, EarthProbe, HDF5, NetCDF, Igor Pro, MATLAB
worksheet
matrix
graph
May require OIF (filter) defined using Import Wizard
File: Import:
Import Wizard
Image to Matrix
Image Files
Drag and Drop

Origin imports many file types: ASCII, CSV, Excel, binary files, and many third-party formats, including Matlab, pClamp, NI TDM and NetCDF. When working with Excel files, you have the choice of importing Excel data into Origin workbook (recommended) or open Excel file inside Origin. Origin also supports importing database files.

Data files can be directly drag-and-dropped into Origin workspace, workbook, matrix or graph window to import them or by **File: Import** menu which will open dialog for user to customize the import further. For many import routines, multiple data files can be imported at once.

If data are changed inside Origin or data file is changed, use the **File: Re-Import Directly** menu to reload the data, or use **File: Re-Import...** menu to change the import settings and reload the data. Starting with **Origin 2015**, reimport also supports Excel files with multiple sheets.

Import settings can be saved inside the window to speed up the import process of data files with similar structure or saved as a dialog theme file (*.oth) for future use or share with others. When imported via the Import Wizard, settings can be saved to an Origin Import Filter file (*.oif) along with post-import processing instructions (in the form of LabTalk script).

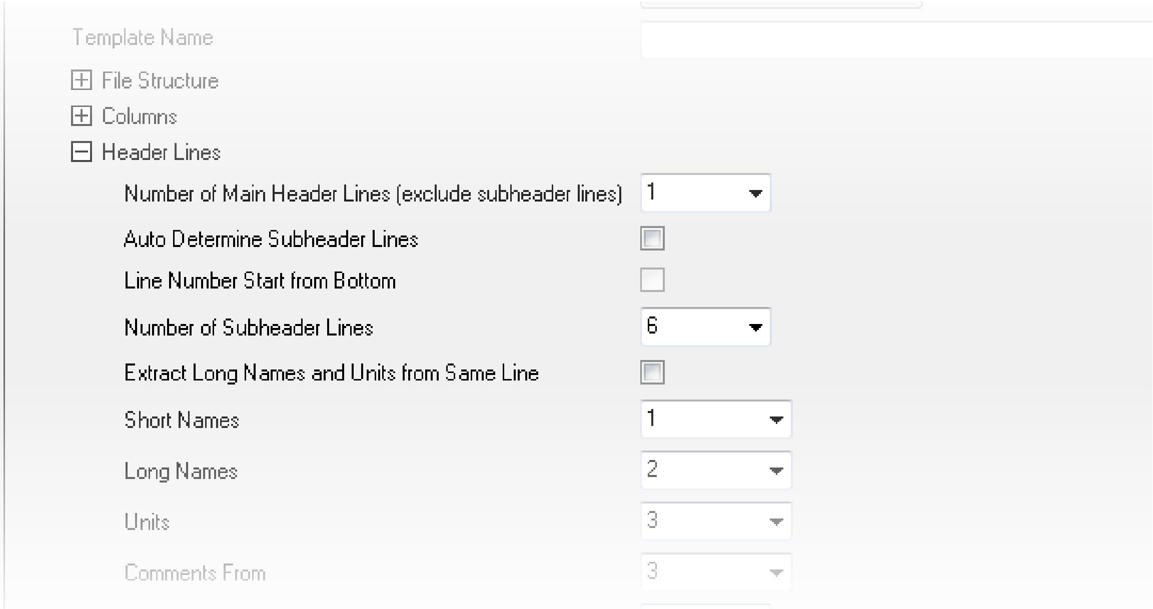
Finally the **File: Import menu** can be customized to show only the data types or saved import Themes that you use.

When copying and pasting, or importing percentages (e.g. "12%") from ASCII or MS Excel files, Origin now automatically converts values to a numeric decimal.

8.1 ASCII Import

The **File: Import: Single ASCII...** and **File: Import: Multiple ASCII...** methods are generally satisfactory for importing text files having a simple structure. These methods are also accessible from the and buttons located in the **Standard** toolbar. These methods will typically handle files with commonly-used delimiters and a simple header structure, without adjustments.

If a file imports with only minor complications, select the **Show Options Dialog** checkbox when selecting your files in the **ASCII** dialog (**File: Import: Single ASCII...** and **File: Import: Multiple ASCII...**). This will open the **impASC** dialog box prior to file import, allowing you to tweak the way that the files are handled.



Template Name
⊞ File Structure
⊞ Columns
⊟ Header Lines
Number of Main Header Lines (exclude subheader lines): 1
Auto Determine Subheader Lines: ☐
Line Number Start from Bottom: ☐
Number of Subheader Lines: 6
Extract Long Names and Units from Same Line: ☐
Short Names: 1
Long Names: 2
Units: 3
Comments From: 3

Once you've adjusted import settings, you can save them in one of two ways: (1) with the worksheet template or (2) as a Theme file from within the impASC dialog box. Saving import settings with the worksheet template offers portability. Saving import settings as a Theme offers the option of adding your import routine to the Import menu (**File: Import**).

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.

Note: For a more in-depth discussion of simple ASCII import, see the help topic:

Help: Origin: Origin Help > Importing and Exporting Data > Importing Simple ASCII Data Files

For import of complex ASCII files -- those not satisfactorily handled by the methods previously mentioned -- you can use the Origin Import Wizard (**File: Import: Import Wizard...**). The Wizard is also accessible from the button located in the **Standard** toolbar. Apart from its advantages for import of complex files, the Wizard also offers the following:

- Using wild cards, you can create filename-specific filters that are targeted to a group of similarly-named files. This is especially useful for drag-and-drop import operations because all you do is drop the files onto the workspace. Origin looks at the file name, matches it with the correct custom import filter and imports the file according to your specifications.
- Import data from the web pages using the Clipboard.
- Extract variables from the import file name and header.
- Specify custom delimiters and date formats.
- The ability to post-process your imported data using a custom LabTalk script.

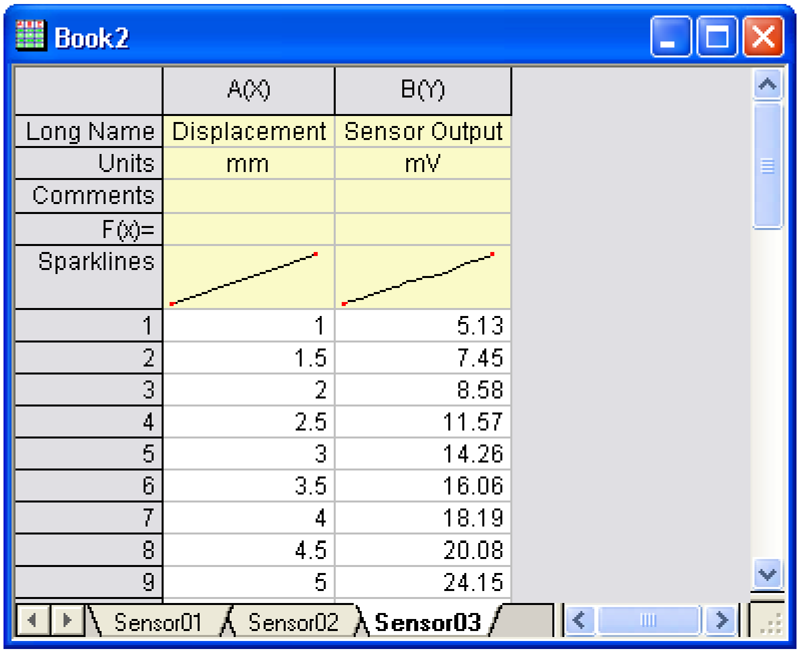
Note: For more information, view the help topic:

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

Tutorial: Importing Multiple Files into Worksheets

1. Click on the **New Workbook** button on the **Standard** toolbar to open a new workbook.
2. With the new workbook active, click on the **Import Multiple ASCII** button on the same toolbar. This opens the **ASCII** dialog.
3. In the **ASCII** dialog, select the files **Sensor01.dat**, **Sensor02.dat**, and **Sensor03.dat** from the **\Samples\Curve Fitting** subfolder of your Origin installation folder, and click the **Add File(s)** button. Then check the **Show Options Dialog** check box and press **OK**.
4. The **impASC** dialog will open. Under the **Import Options** node, change **Import Mode** to **Start New Sheets**. Expand the **(Re)Naming Worksheet** node and clear **Rename Book with (Partial) Filename**.
5. Press the arrow button ▶ at the top right of the dialog box, then select **Save As...** from the shortcut menu. In the dialog box that opens, enter a name such as **Import to sheets** and press **OK**. This will save your settings as a Theme that you can later use with other files.
6. Press **OK** to close the **impASC** dialog.

The three files will be imported, each into a worksheet, and the sheets will be renamed with the file name.



	A(X)	B(Y)
Long Name	Displacement	Sensor Output
Units	mm	mV
Comments		
F(x)=		
Sparklines		
1	1	5.13
2	1.5	7.45
3	2	8.58
4	2.5	11.57
5	3	14.26
6	3.5	16.06
7	4	18.19
8	4.5	20.08
9	5	24.15

You can quickly access your custom import theme from the **File: Recent Imports** menu item. You can also use the **File: Import: Customize...** menu to open the **Import Menu Customization** dialog box where you can select and add **User Themes** to the **File: Import** menu.

8.2 CSV Import

You can use **File: Import: Comma Delimited (CSV)...** to import comma delimited files into an Origin workbook file. Modifications to import file handling are made in the **impCSV** dialog box and changes can be saved as a Theme file for later use. Alternately, once you've successfully imported your .csv file into an Origin workbook, you can save the workbook as a workbook template file (*.ogw) and reuse the template for re-importing files of like structure.

You can skip columns or rows, when doing a partial file import of CSV files. For information, choose **File: Import: Comma Delmited (CSV)**, check **Show Options Dialog** and choose a file for import. In the **impCSV** dialog, expand the **Partial Import** branch and note the in-dialog syntax hints under **Custom**.

8.3 Binary Import

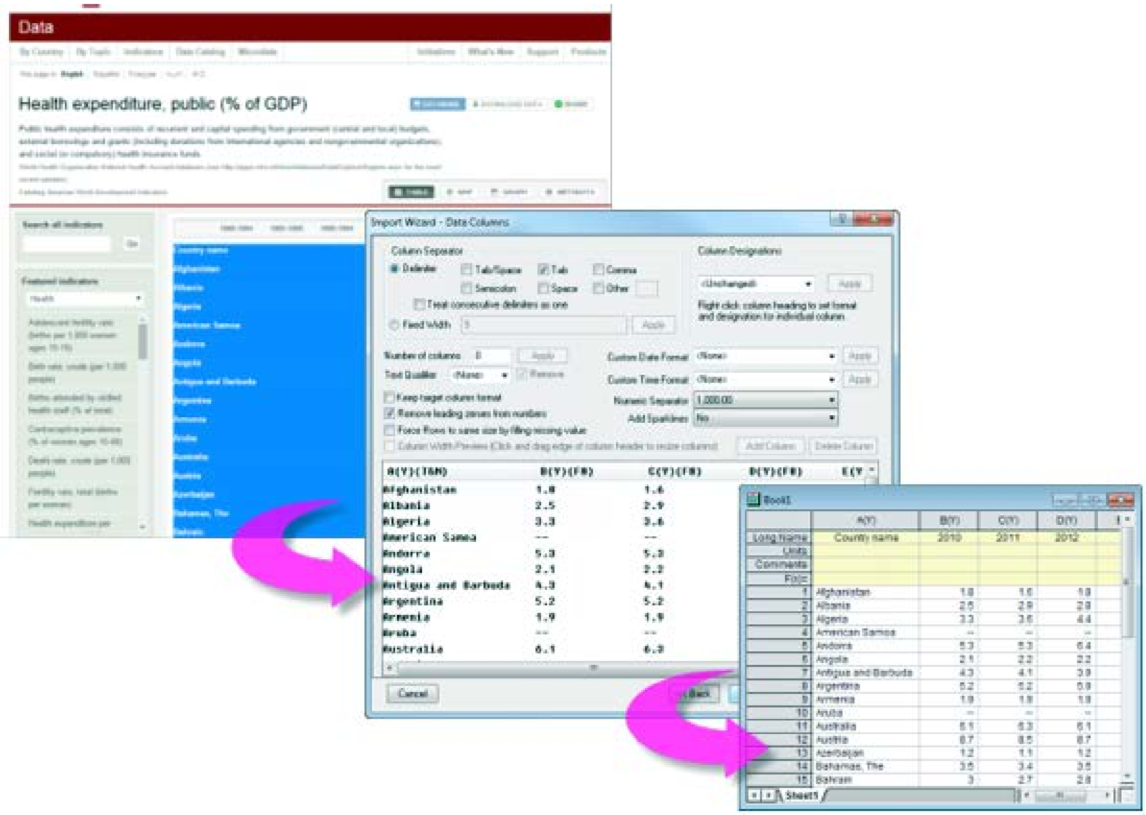
Files with an optional header section followed by a sequential binary structure, can be imported using the Origin Import Wizard (**File: Import: Import Wizard...**).

If the binary file format is commonly used in your field of work, please contact your Origin representative so we can consider adding support for such files in future versions.

8.4 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.



Data
Health expenditure, public (% of GDP)
Import Wizard - Data Columns
Column Separator
Column Designations
Cancel
Book1
Sheet1

Column Separator: ● Delimiter ☐ Tab/Space ☑ Tab ☐ Comma ☐ Semicolon ☐ Space ☐ Other
☐ Treat consecutive delimiters as one
○ Fixed Width
Column Designations: <Unchanged>
Right click column heading to set format and designation for individual column
Number of columns: 8
Text Qualifier: <None> ☑ Remove
Custom Date Format: <None>
Custom Time Format: <None>
Numeric Separator: 1,000.00
Add Sparklines: No
☐ Keep target column format
☑ Remove leading zeros from numbers
☐ Force Rows to same size by filling missing value
☐ Column Width Preview (Click and drag edge of column header to resize columns)

```
A(Y)(T&N)            B(Y)(F8)      C(Y)(F8)      D(Y)(F8)      E(Y
Afghanistan          1.8           1.6
Albania              2.5           2.9
Algeria              3.3           3.6
American Samoa       --            --
Andorra              5.3           5.3
Angola               2.1           2.2
Antigua and Barbuda  4.3           4.1
Argentina            5.2           5.2
Armenia              1.9           1.9
Aruba                --            --
Australia            6.1           6.3
```

	A(Y)	B(Y)	C(Y)	D(Y)
Long Name	Country name	2010	2011	2012
Units				
Comments				
F(x)=				
1	Afghanistan	1.8	1.6	1.8
2	Albania	2.5	2.9	2.8
3	Algeria	3.3	3.6	4.4
4	American Samoa	--	--	--
5	Andorra	5.3	5.3	5.4
6	Angola	2.1	2.2	2.2
7	Antigua and Barbuda	4.3	4.1	3.9
8	Argentina	5.2	5.2	5.9
9	Armenia	1.9	1.9	1.9
10	Aruba	--	--	--
11	Australia	6.1	6.3	6.1
12	Austria	8.7	8.5	8.7
13	Azerbaijan	1.2	1.1	1.2
14	Bahamas, The	3.5	3.4	3.5
15	Bahrain	3	2.7	2.8

8.5 Excel

There are three ways to work with Excel data in Origin:

- You can import your Microsoft Excel workbook into an Origin workbook. To do this, use the **File: Import: Excel (XLS, XLSX, XLSM)...** menu command, or click the button located in the **Standard** toolbar. You can also update the imported data by using **File: Re-Import Directly** or use Ctrl+4 keys to re-import Excel sheets with same settings as before.
- You can copy Excel data to the Clipboard and paste or paste link that data into Origin.
- You can open your Excel workbook in Origin as an Excel workbook. To do this, use the **File: Open Excel...** menu command.

When you import or paste your Excel workbook data into an Origin workbook, you have full access to Origin's powerful graphing and analysis features. When you open your Excel workbook as an Excel workbook, you are actually running an OLE instance of Excel inside of the Origin workspace. In this case, you have access to Excel's menus and features, but limited access to Origin's graphing and analysis features.

Things to know:

- To re-import multiple sheets from Excel to Origin, you need to have Origin 2015 or later.
- To open an Excel file in Origin as an Excel workbook, you need to have Office 97 or later installed on your computer.
- To import an Excel file in Origin, the file needs to be of file type .xls, .xlsx or .xlsm.
- Starting with Origin 2017, you can *import* Excel files without having MS Excel installed (*open* as Excel still requires Office 97 or later).
- Origin does not support dynamically linking a formula in an Excel workbook to source data in another Excel workbook.
- You can link your Origin project file to an external Excel file. That way updates to the Excel file will trigger updates to dependent graphs etc. when you open the Origin project file.

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

Help: Origin: Origin Help > Working with Microsoft Excel

Origin 2018 added more naming options on the Excel import (**(Re)Naming Worksheet and Workbook** branch of the impMSExcel dialog).

In addition, you can now do partial import of your Excel data by defining rows and column ranges. A flexible syntax is provided for including or excluding data ranges. For information, choose **File: Import: Excel (XLS, XLSX, XLSM)**, check **Show Options Dialog** and choose a file for import. In the **impMSExcel** dialog, expand the **Partial Import** branch and note the in-dialog syntax hints under **Custom**.

8.6 Third Party Formats

Origin imports many widely-used third party data formats, including pClamp, NI TDM, and NetCDF. As with ASCII import, 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) NI TDM (TDM, TDMS) 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 Image	**File: Import:**	**> Importing Third Party Files**

Note: Some of these 3rd party file formats are hidden by default. Turn them on by choosing **File:Import:Add/Remove File Types...**. This will add file types to the **File:Import** menu. To insert separators between menu commands, right-click in the right-hand panel of **Import Menu Customization** and choose **Add Separator**.

Drag-and-drop support for various file extensions can be customized using the **Filter Manager** dialog accessible from the **Tools: Import Filter Manager...** menu item.

8.7 Database

File: Database Import menu and **Database Access toolbar** are provided to import data from database. There are two ways to build the query:

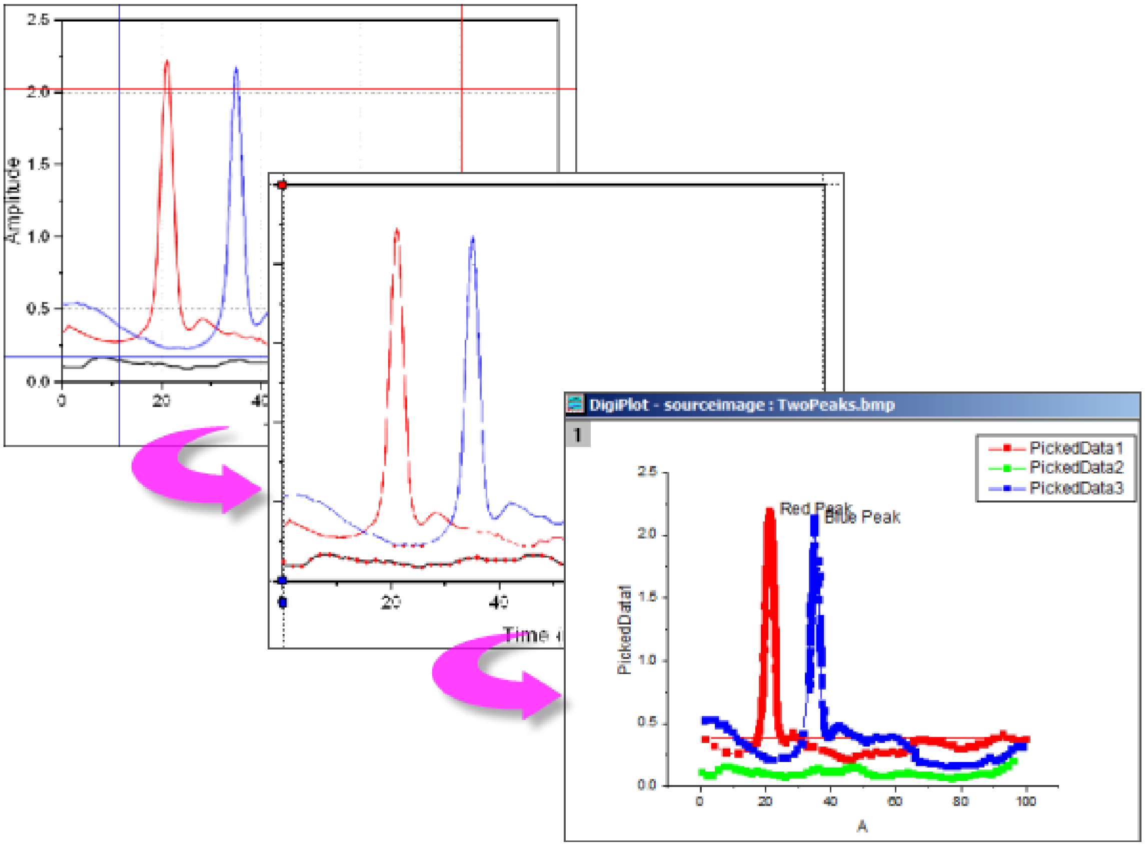
- SQL Editor: A simple SQL editor to setup database connect and enter SQL query. It's available in both Origin 32-bit and 64-bit.
- Query Builder: A graphical query builder that assists you in creating an SQL query. It's only available in Origin 32-bit. The query built by it can be loaded and run in Origin 64-bit.

Note: For more information, see the Origin Help

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

8.8 Digitizer

At times, you may only have a graphic representation of some data that you would like to explore further. In such cases, Origin's **Digitizer** tool may prove handy. 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.


Amplitude
2.5
2.0
1.5
1.0
0.5
0.0
0
20
40
Time
DigiPlot - sourceimage : TwoPeaks.bmp
1
PickedData1
PickedData2
PickedData3
Red Peak
Blue Peak
PickedData1
2.5
2.0
1.5
1.0
0.5
0.0
0
20
40
60
80
100
A

- 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.

8.9 Re-Importing Data Files

There are two re-import commands in the **File** menu:

- **Re-Import Directly**. When you import a file into an Origin worksheet or matrix sheet, 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, direct re-import is a quick way to update your Origin project file.

- **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.

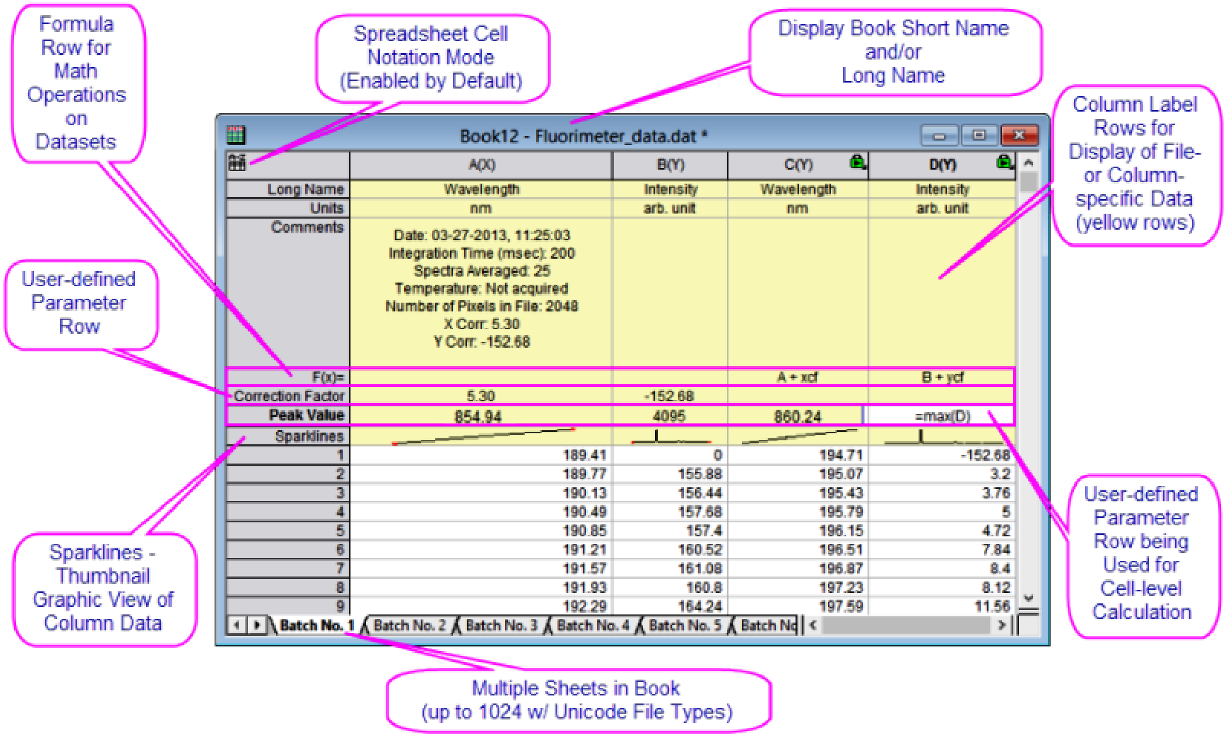
Notes:

- 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 matrix sheet, 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 **File: Re-Import...**, the **Import Single ASCII** 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.

8.10 Topics for Further Reading

- Importing Simple ASCII Data Files
- Customizing the ASCII Import Options
- Import and Reimport Excel Data
- Importing Third Party Files
- Tutorial: Updating Graphs by Re-importing Data from a Database
- Importing Data from a Database
- Drawing or Deleting Data Points
- Tutorial: The Digitizer

9 Workbooks Worksheets Columns



	A(X)	B(Y)	C(Y)	D(Y)
Long Name	Wavelength	Intensity	Wavelength	Intensity
Units	nm	arb. unit	nm	arb. unit
Comments	Date: 03-27-2013, 11:25:03 Integration Time (msec): 200 Spectra Averaged: 25 Temperature: Not acquired Number of Pixels in File: 2048 X Corr: 5.30 Y Corr: -152.68			
F(x)=			A + xcf	B + ycf
Correction Factor	5.30	-152.68		
Peak Value	854.94	4095	860.24	=max(D)
Sparklines				
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
4	190.49	157.68	195.79	5
5	190.85	157.4	196.15	4.72
6	191.21	160.52	196.51	7.84
7	191.57	161.08	196.87	8.4
8	191.93	160.8	197.23	8.12
9	192.29	164.24	197.59	11.56

Formula Row for Math Operations on Datasets

Spreadsheet Cell Notation Mode (Enabled by Default)

Display Book Short Name and/or Long Name

Column Label Rows for Display of File- or Column-specific Data (yellow rows)

User-defined Parameter Row

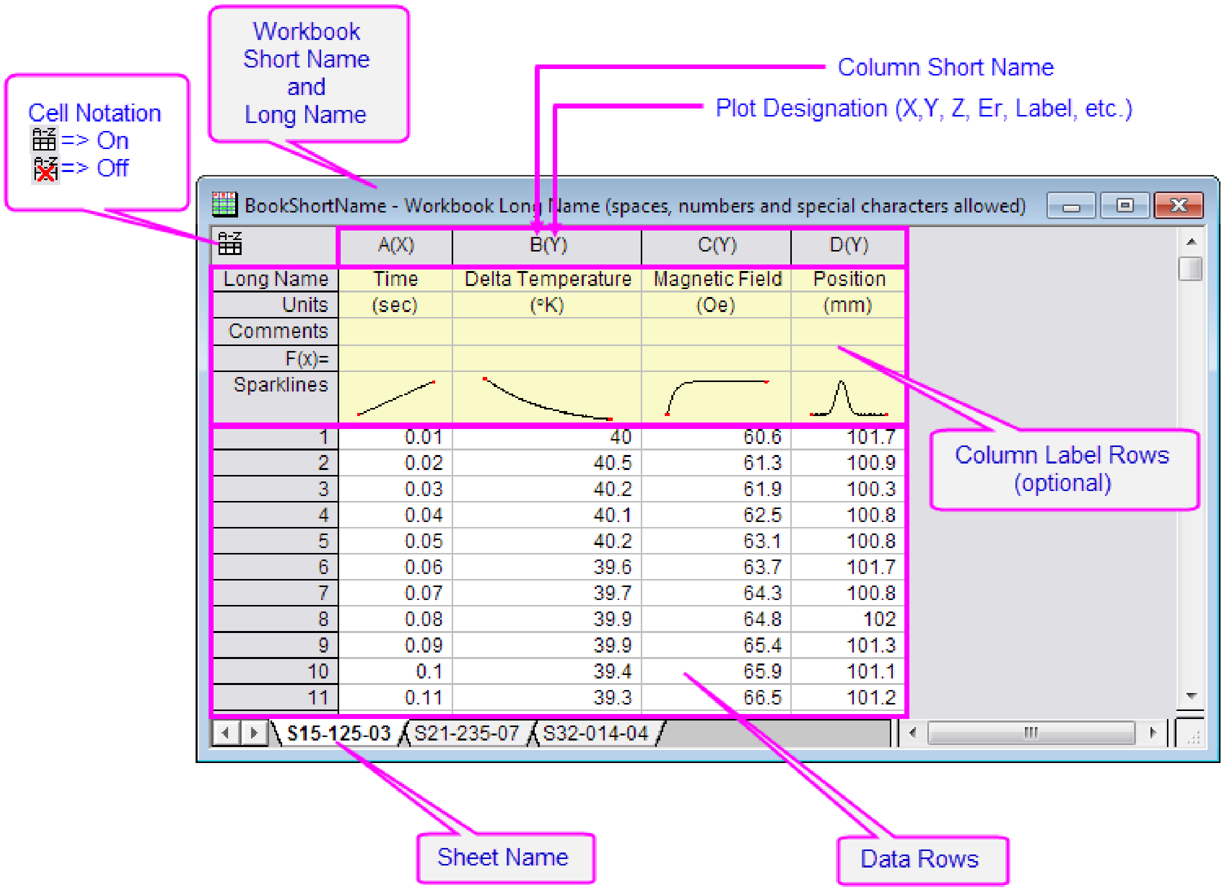
Sparklines - Thumbnail Graphic View of Column Data

User-defined Parameter Row being Used for Cell-level Calculation

Multiple Sheets in Book (up to 1024 w/ Unicode File Types)

9.1 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. Each worksheet contains a collection of columns and each column contains rows of cells.


Cell Notation
=> On
=> Off
Workbook Short Name and Long Name
Column Short Name
Plot Designation (X,Y, Z, Er, Label, etc.)
Column Label Rows (optional)
Sheet Name
Data Rows

BookShortName - Workbook Long Name (spaces, numbers and special characters allowed)

	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
7	0.07	39.7	64.3	100.8
8	0.08	39.9	64.8	102
9	0.09	39.9	65.4	101.3
10	0.1	39.4	65.9	101.1
11	0.11	39.3	66.5	101.2

S15-125-03 S21-235-07 S32-014-04

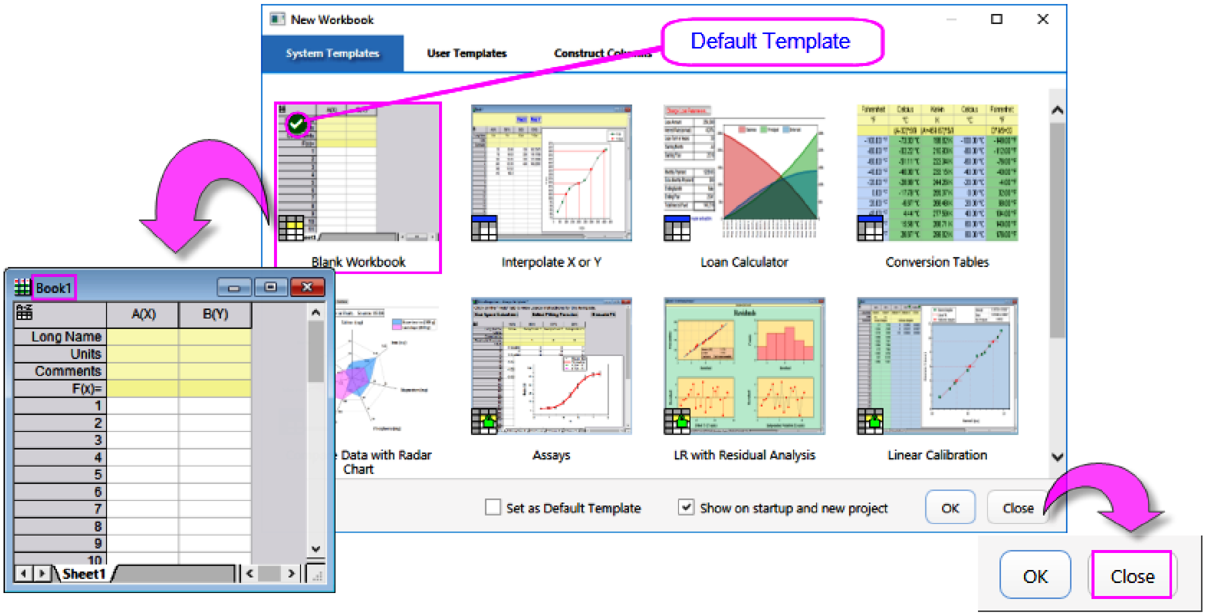
9.1.1 Naming Workbooks, Worksheets and Columns

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.

<table>
<tr><td>Worksheets</td><td>• A Worksheet has a Short Name and optional Long Name and Comments.
• The Short Name must be unique in a workbook.
• A Worksheet Short Name has a 64 character limit, including spaces. It can contain special characters but must begin with an alpha-numeric character. These special characters are not allowed: {}|"<>()![].
• A Worksheet 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 worksheet, double-click on the sheet tab, then right-click on the tab and choose Sheet Name to Show. Alternately, right-click on the tab and choose Name and Comments.</td></tr>
<tr><td>Columns</td><td>• 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, as indicated by this icon A-Z, 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 (Tools: Options: Miscellaneous). Otherwise, Short Names are used.</td></tr>
</table>

9.1.2 Workbooks

By default, when you start an Origin session or open a new project, You are presented with [the **New Workbook** dialog box](#).


New Workbook
System Templates
User Templates
Construct Columns
Default Template
Blank Workbook
Interpolate X or Y
Loan Calculator
Conversion Tables
Data with Radar Chart
Assays
LR with Residual Analysis
Linear Calibration
☐ Set as Default Template
☑ Show on startup and new project
OK
Close
Book1
A(X)
B(Y)
Long Name
Units
Comments
F(x)=
Sheet1
OK
Close

If you click the **Close** button, the dialog box closes and, simultaneously, a new workbook window based on the **Default Template** is added to the workspace. This workbook will be the same one that is added to the workspace when you click the **New Workbook** button on the **Standard** toolbar. Each time you click this button, a copy of this template is added to the workspace. There is much more to say about templates. To read further, begin by looking over the section below on [**Workbook Templates**](#).

By default, an added workbook window is assigned a Short Name of **Book*N***, with ***N*** reflecting the order of window creation. You can rename the workbook with something more meaningful:

1. Right-click on the workbook window title bar and choose **Properties...**.
2. Give your workbook a **Long Name** (optional) and/or a **Short Name** and choose to display either or **Both** in the window title bar. See the above table for rules on workbook naming.

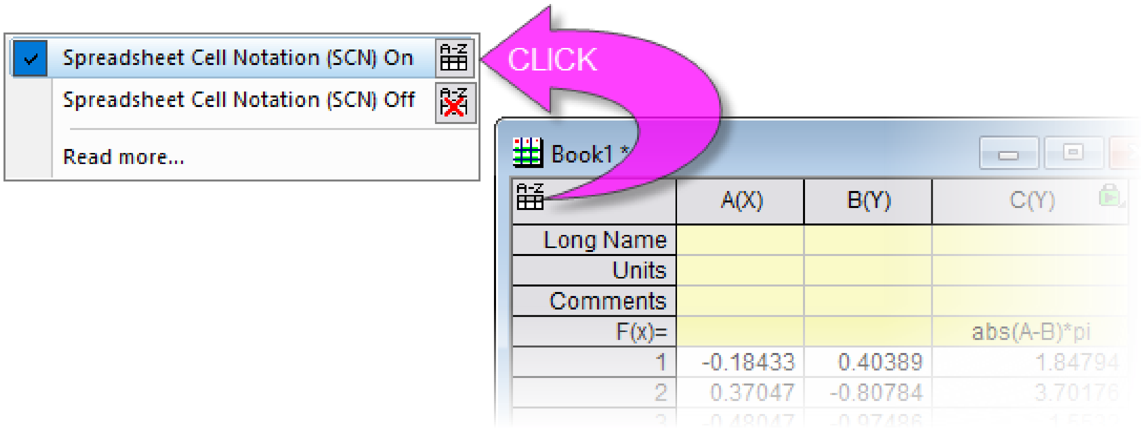
The **Properties** dialog has a **Comments** box for entering text. These Comments display as [a workbook window tooltip](#) in **Project Explorer** and become searchable when using the **Edit: Find in Project** tool.

9.1.2.1 Spreadsheet Cell Notation (SCN)

Long-time users who have recently upgraded to the newest version of Origin may notice a this icon in the upper-left corner of the workbook window. Origin 2018 added what is called **Spreadsheet Cell Notation** (SCN), which supports the sort of cell-level calculations that are familiar to users of spreadsheets ([more details below](#)).

- When you see the icon above, SCN is *On*; and for most of your new work you will likely want to leave it on.

- If you open an older project file in Origin 2019 or a later version, you may see this icon in the upper-left corner of the workbook, indicating that SCN is turned *Off* in the workbook. You can leave the book in this state if you prefer but you will not be able to use SCN in this book.
- To enable or disable SCN, click on the icon (either state) and choose **...On** or **...Off** from the menu.


Spreadsheet Cell Notation (SCN) On
Spreadsheet Cell Notation (SCN) Off
Read more...
CLICK
Book1 *

	A(X)	B(Y)	C(Y)
Long Name			
Units			
Comments			
F(x)=			abs(A-B)*pi
1	-0.18433	0.40389	1.84794
2	0.37047	-0.80784	3.70176

- You can also turn SCN *On* or *Off* by right-clicking on the workbook window title bar and choosing **Properties**. You will see a **Spreadsheet Cell Notation** box near the center of the dialog.

9.1.3 Worksheets

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

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** (found in UFF 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 control worksheet tab name display:

1. Right-click on the worksheet tab.
2. Select **Sheet Name to Show: Long Name if available / Short Name / Long Name** from the shortcut menu.

To change the **Short Name** or **Long Name** that displays on the worksheet tab:

1. Double-click on the worksheet name or right-click on the worksheet tab and choose **Name and Comments**. See the above table for rules on worksheet naming. If you are editing the **Short Name** and you exceed 64 characters, Origin automatically truncates your entry to create the **Short Name**. If **Long Name** did not previously exist, the unmodified text becomes the **Long Name**.

> **Note:** When mousing over the worksheet tab, the worksheet **Short Name**, **Long Name** and **Comments** appear as a tooltip.

9.1.3.1 Worksheet Properties

The Worksheet Properties dialog box is used 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).

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

For more information, see The Worksheet Properties dialog box.

9.1.4 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.

9.1.4.1 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.

9.1.4.2 Formatting Worksheet 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.

Origin offers greatly expanded support for custom formatting of worksheet data in Origin 2019, including support for **hexadecimal numbers**. For more information, see the table under **Other Custom Display Formats**.

9.1.4.2.1 Numeric Display Formats

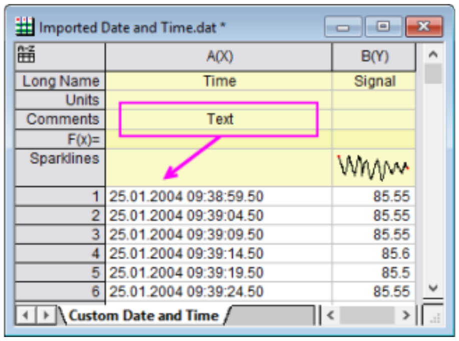
1. Double-click on a column heading to open the **Column Properties** dialog.
2. Click the **Properties** tab, then set **Format** = **Numeric**.
3. Set **Display** to **Decimal: 1000**, **Scientific: 1E3**, **Engineering: 1K**, **Decimal: 1,000** or **Custom** (see below).

9.1.4.2.2 Date and Time Formats

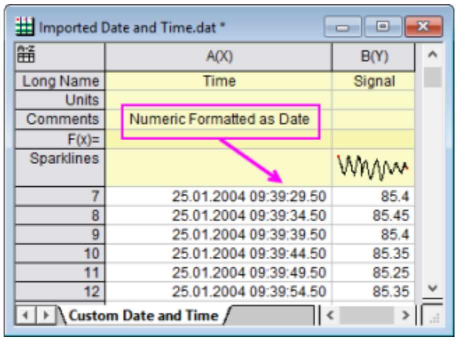
By default, Origin uses a modified Julian Day value for date-time calculations. Frequently, however, you wish to display your data in a standard date-time format in the worksheet:

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 you import date-time data into the worksheet, by default, Origin will treat this data as text. 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 chose the proper **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, displaying in a date-time format.



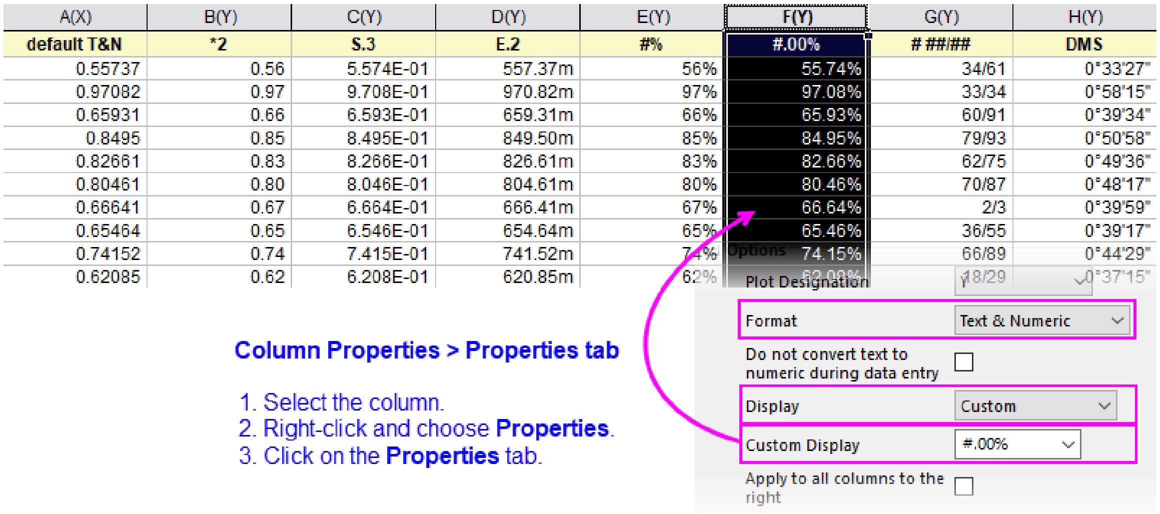
	A(X)	B(Y)
Long Name	Time	Signal
Units		
Comments	Text	
F(x)=		
Sparklines		
1	25.01.2004 09:38:59.50	85.55
2	25.01.2004 09:39:04.50	85.55
3	25.01.2004 09:39:09.50	85.55
4	25.01.2004 09:39:14.50	85.6
5	25.01.2004 09:39:19.50	85.5
6	25.01.2004 09:39:24.50	85.55



	A(X)	B(Y)
Long Name	Time	Signal
Units		
Comments	Numeric Formatted as Date	
F(x)=		
Sparklines		
7	25.01.2004 09:39:29.50	85.4
8	25.01.2004 09:39:34.50	85.45
9	25.01.2004 09:39:39.50	85.4
10	25.01.2004 09:39:44.50	85.35
11	25.01.2004 09:39:49.50	85.25
12	25.01.2004 09:39:54.50	85.35

9.1.4.2.3 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)**).



A(X)	B(Y)	C(Y)	D(Y)	E(Y)	F(Y)	G(Y)	H(Y)
default T&N	*2	S.3	E.2	#%	#.00%	# ##/##	DMS
0.55737	0.56	5.574E-01	557.37m	56%	55.74%	34/61	0°33'27"
0.97082	0.97	9.708E-01	970.82m	97%	97.08%	33/34	0°58'15"
0.65931	0.66	6.593E-01	659.31m	66%	65.93%	60/91	0°39'34"
0.8495	0.85	8.495E-01	849.50m	85%	84.95%	79/93	0°50'58"
0.82661	0.83	8.266E-01	826.61m	83%	82.66%	62/75	0°49'36"
0.80461	0.80	8.046E-01	804.61m	80%	80.46%	70/87	0°48'17"
0.66641	0.67	6.664E-01	666.41m	67%	66.64%	2/3	0°39'59"
0.65464	0.65	6.546E-01	654.64m	65%	65.46%	36/55	0°39'17"
0.74152	0.74	7.415E-01	741.52m	74%	74.15%	66/89	0°44'29"
0.62085	0.62	6.208E-01	620.85m	62%	62.09%	18/29	0°37'15"

Options

Plot Designation

Format: Text & Numeric

Do not convert text to numeric during data entry ☐

Display: Custom

Custom Display: #.00%

Apply to all columns to the right ☐

Column Properties > Properties tab

1. Select the column.
2. Right-click and choose **Properties**.
3. Click on the **Properties** tab.

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 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*

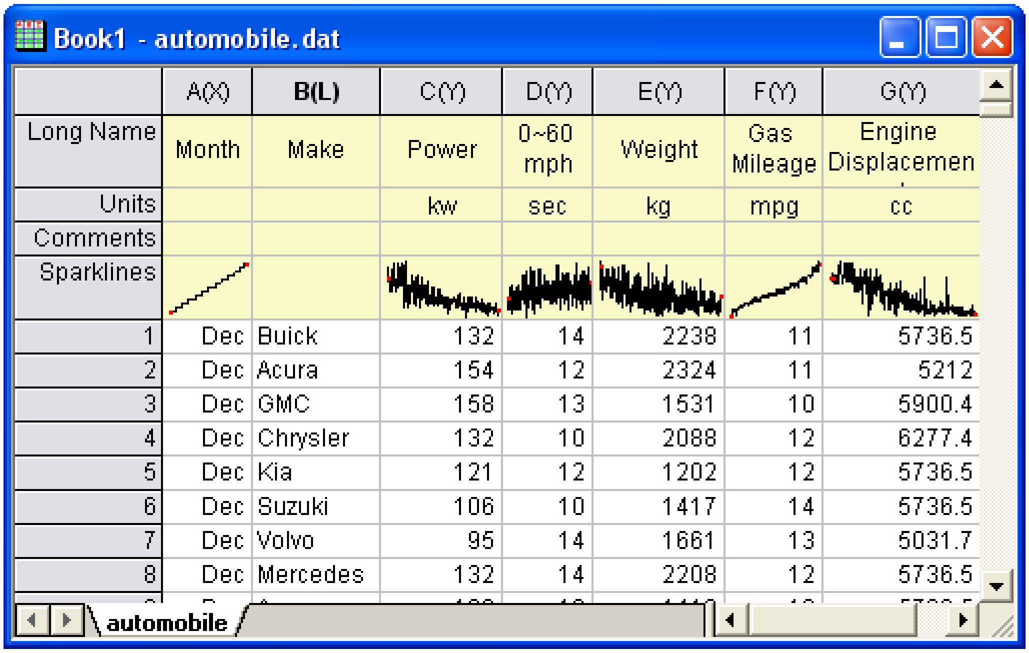
Format	Description	Example if cell value = 123.456
##+##	Display a number as two digits, a "+" separator, then two digits (e.g. surveying stations).	**##+##** displays *01+23*
#+##M	Display a number as one digit, a "+" separator, then two digits, plus a suffix of "M".	**#+##M** displays *1+23M*
#*n*	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 minutes, and 1 minute = 60 seconds.	**DMS** displays *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*

Format	Description	Example if cell value = 123.456
%#0*n*I64X	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.	**%#014I64X** returns *0X00000000007B*

9.1.5 Column Label Rows

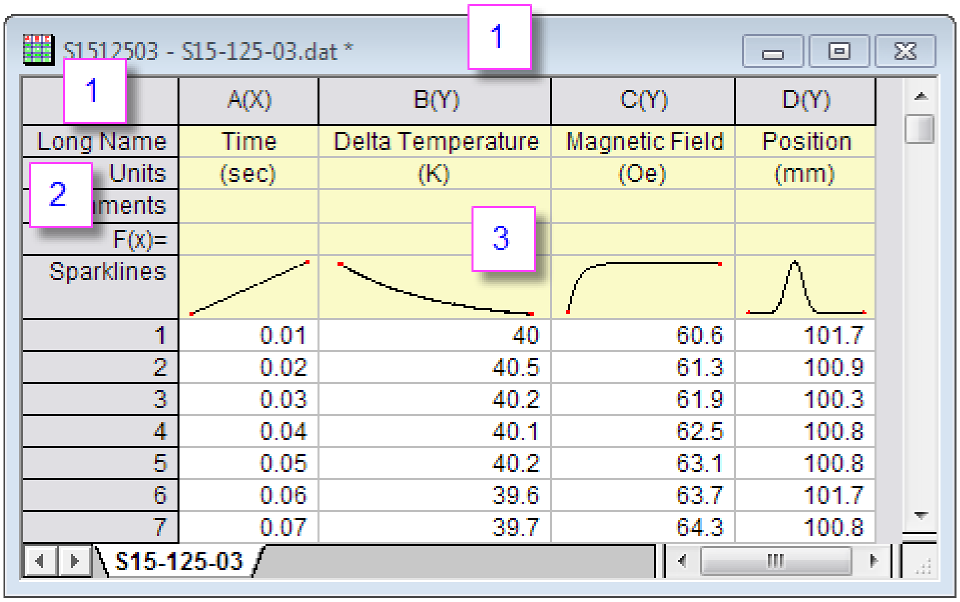
Column label rows store metadata -- data that is used to describe other data. Typically, this metadata may be brought in as header information in imported files, or it may be manually entered. Display of column label rows is optional and the user can selectively show them or hide them, as needed.

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. 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.



	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

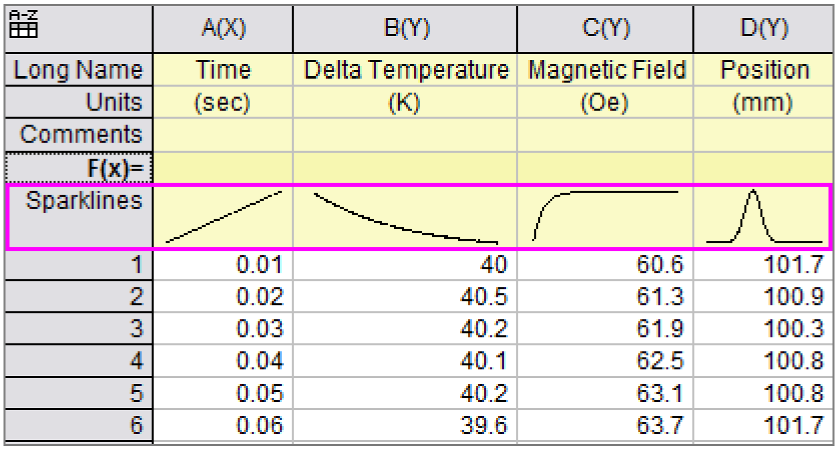
Display of column label rows is controlled by shortcut menu commands:



	A(X)	B(Y)	C(Y)	D(Y)
Long Name	Time	Delta Temperature	Magnetic Field	Position
Units	(sec)	(K)	(Oe)	(mm)
ments				
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
7	0.07	39.7	64.3	100.8

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 for global control of row labels and row and column header display.

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.



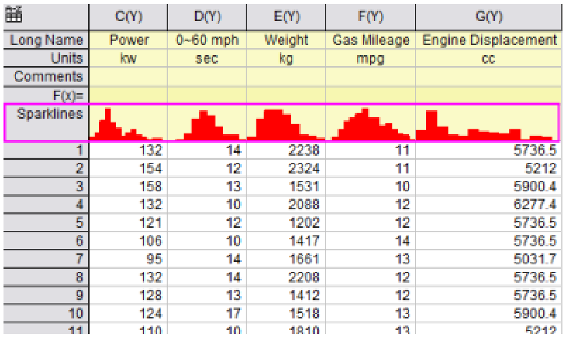
	A(X)	B(Y)	C(Y)	D(Y)
Long Name	Time	Delta Temperature	Magnetic Field	Position
Units	(sec)	(K)	(Oe)	(mm)
Comments				
F(x)=				
Sparklines				
1	0.01	40	60.6	101.7
2	0.02	40.5	61.3	100.9
3	0.03	40.2	61.9	100.3
4	0.04	40.1	62.5	100.8
5	0.05	40.2	63.1	100.8
6	0.06	39.6	63.7	101.7

To Show or Hide Sparklines:

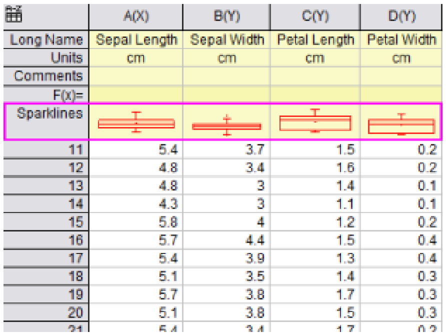
- Show Sparklines by clicking **Column: Add or Update Sparklines**. This opens the **sparklines** dialog.
- Show Sparklines for selected columns by clicking the **Add Sparklines** button on the **Column** toolbar.
- Right-click on the worksheet's **Sparklines** column label row and choose **Add or Update 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 right-click and choose **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



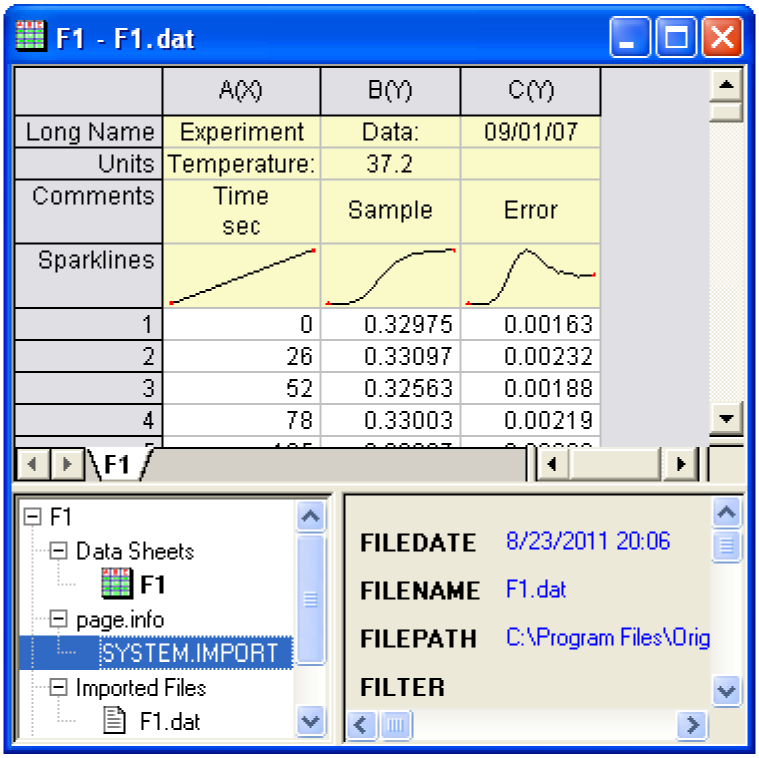
	A(X)	B(Y)	C(Y)	D(Y)
Long Name	Sepal Length	Sepal Width	Petal Length	Petal Width
Units	cm	cm	cm	cm
Comments				
F(x)=				
Sparklines				
11	5.4	3.7	1.5	0.2
12	4.8	3.4	1.6	0.2
13	4.8	3	1.4	0.1
14	4.3	3	1.1	0.1
15	5.8	4	1.2	0.2
16	5.7	4.4	1.5	0.4
17	5.4	3.9	1.3	0.4
18	5.1	3.5	1.4	0.3
19	5.7	3.8	1.7	0.3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

9.1.6 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 a workbook's Organizer panel right-click on the workbook title bar and select **Show Organizer** (note that this action toggles the panel on or off). The Organizer provides a tree-view listing of metadata stored with a particular workbook.


F1 - F1.dat
F1
F1
Data Sheets
F1
page.info
SYSTEM.IMPORT
Imported Files
F1.dat

	A(X)	B(Y)	C(Y)
Long Name	Experiment	Data:	09/01/07
Units	Temperature:	37.2	
Comments	Time sec	Sample	Error
Sparklines			
1	0	0.32975	0.00163
2	26	0.33097	0.00232
3	52	0.32563	0.00188
4	78	0.33003	0.00219

FILEDATE	8/23/2011 20:06
FILENAME	F1.dat
FILEPATH	C:\Program Files\Orig
FILTER	

9.1.7 Some Workbook, Worksheet and Column Limits

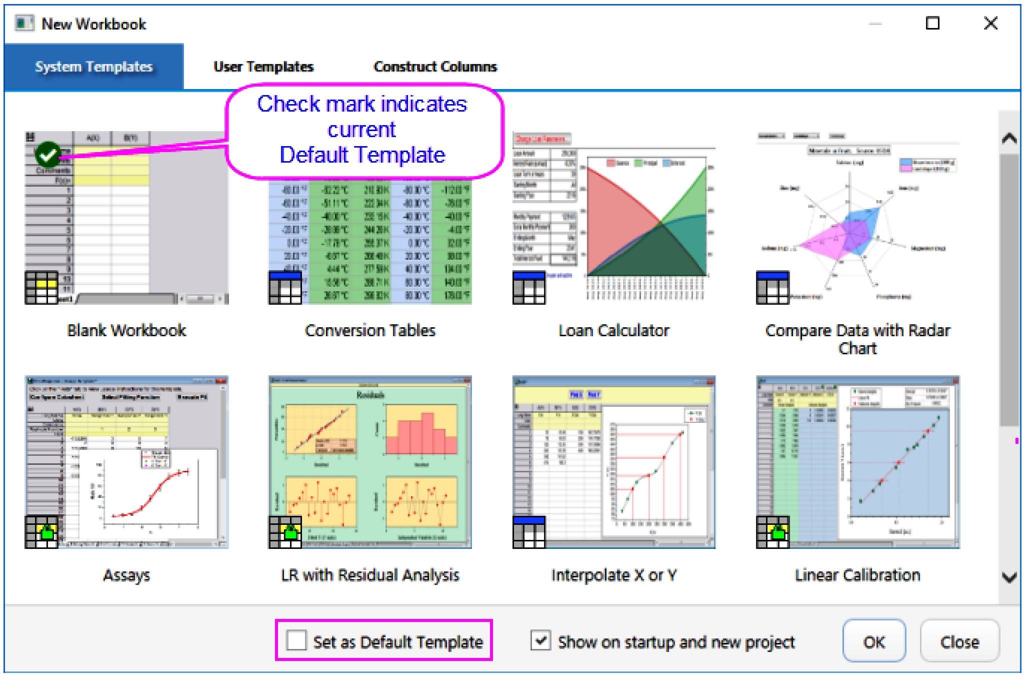
Maximum Number of...	32Bit OS	64Bit OS
Worksheets in a workbook	1024†	1024†
Rows in a worksheet, 1 column	90,000,000	90,000,000
Rows in a worksheet, 5 columns	14,000,000	90,000,000
Rows in a worksheet, 32 columns	3,700,000	90,000,000
Columns in a worksheet, 1 row	65,500	65,500
Columns in a worksheet, 100 rows	65,500	65,500
Columns in a worksheet, 1000 rows	65,500	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.

9.2 Workbook Templates

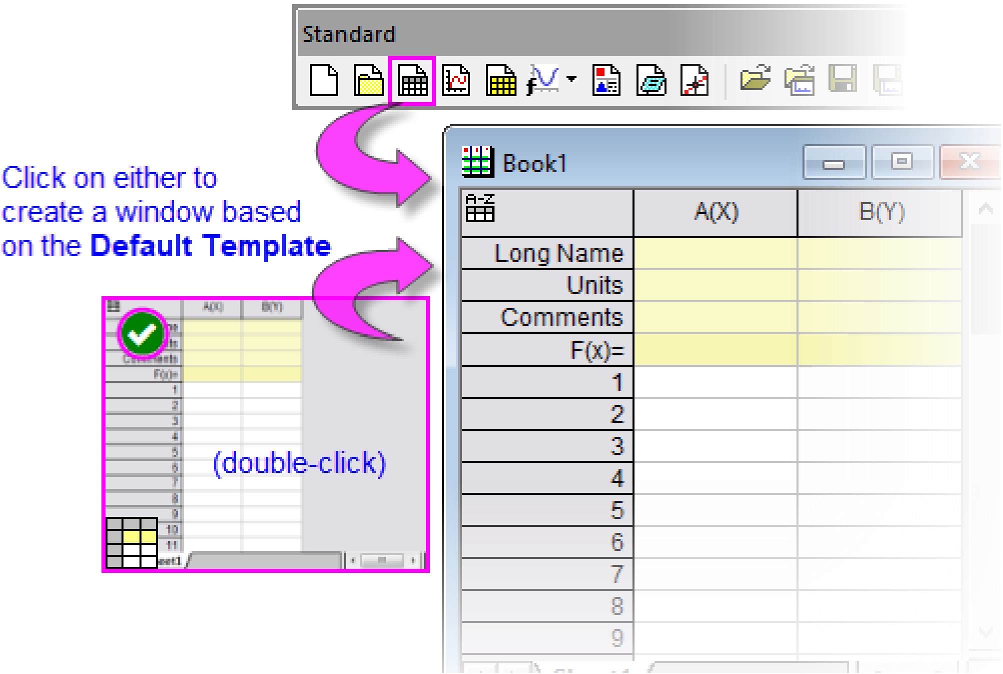
When you start an Origin session or open a new project, You are presented with the **New Workbook** dialog box. The dialog has three tabs -- **System Templates**, **User Templates** and **Construct Columns**:

- The **System Templates** tab lists built-in templates supplied by OriginLab.
- The **User Templates** tab lists your custom templates, with filters for **Analysis Templates** (*.OGWU + saved operations), workbook **Templates** (*.OTWU) and **Workbook Files** (*.OGWU).
- The **Construct Columns** tab has controls for constructing a workbook from pre-designated columns, by specifying a sequence of letters and numbers (in-dialog examples are given).


New Workbook
System Templates
User Templates
Construct Columns
Blank Workbook
Conversion Tables
Loan Calculator
Compare Data with Radar Chart
Assays
LR with Residual Analysis
Interpolate X or Y
Linear Calibration
☐ Set as Default Template
☑ Show on startup and new project
OK
Close

Check mark indicates current Default Template

- The default template is a simple, one sheet, two-column workbook created from the default ORIGIN.otwu workbook template, and located on the **System Templates** tab.
- Whether you keep this as your default template, or designate another default template on either the **System** or **User Templates** tabs, the default will be the template that opens when you click the **New Workbook** button on the **Standard** toolbar.
- When the **New Workbook** dialog is open, you can double-click on any template in the **System** or **User Templates** tabs, to open a window that is built from that template.
- To designate a template on either the **System** or **User Templates** tabs as the default template, **(1)** click once on the template to select it, **(2)** check the **Set as Default Template** box and **(3)** click **OK** to close the dialog box.



Click on either to create a window based on the **Default Template**

(double-click)

For more information on use of the New Workbook dialog box, see the **New Workbook** dialog box.

You can modify any file in the New Workbook dialog -- **System Templates** or **User Templates** -- and save your changes. When you modify **System Templates** and save, the modified file is written to your **User Files Folder** (you cannot overwrite the original system file) and the modified file then displays on the **User Templates** tab.

9.2.1 Saving a Modified Template

There are several types of files listed on the **System Templates** tab of the New Workbook dialog box:

Icon	Description of File
▦	**Template** - These are of the basic Origin workbook template file type. They contain *no data* and *no analysis operations*. - To save a modified Template, choose **File: Save Template As**. Specify a name, file path and optionally, a description[†] and/or a preview image[‡].
▦	**Workbook** - This type of file differs from a Template in that it *can be saved with data and operations*. - To save a modified Workbook, choose **File: Save Window As**. Specify a file path, name and optionally, a comment[†] and and/or a preview image[‡].
▦	**Analysis Template** - This type of file saves *no data* but it *MUST store analysis operations*. If you open an Analysis Template, you will see little green lock icons 🔒 on output data columns or report sheets. - To save a modified Analysis Template choose **File: Save Workbook as Analysis Template**. Specify a file path, name and optionally, a comment[†] and/or preview image[‡].

[†] A comment or description produces a tooltip when you hover on a file in the New Workbook dialog box.
[‡] A preview image allows you to see an image of your saved file in the New Workbook dialog box.

When creating preview images of your customized templates, it works best to save your image (BMP, JPG, PNG) with dimensions of about 160 pixels wide by 130 pixels high. Use your image capture program to resize your image before saving and adding to your file as a preview image.

For more information see "What is Saved with the Workbook Template?"

9.3 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...**

Action	Toolbar Button	Menu Command
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.

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:

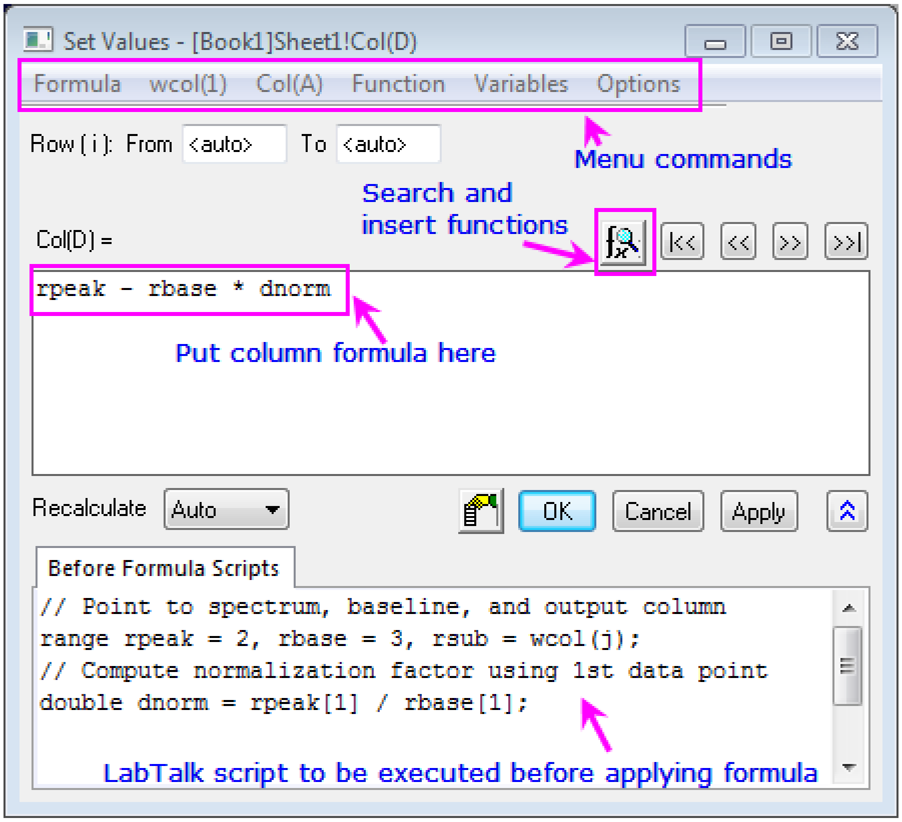
```
col(1)={0:0.01:4*pi};

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

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

9.4 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 expression and a **Before Formula Scripts** panel (usage optional) intended for data pre-processing and defining of variables used in your one-line expression.


Set Values - [Book1]Sheet1!Col(D)
Formula
wcol(1)
Col(A)
Function
Variables
Options
Menu commands
Search and insert functions
|<<
<<
>>
>>|
Put column formula here
OK
Cancel
Apply
Before Formula Scripts
LabTalk script to be executed before applying formula

Row (i): From <auto> To <auto>

Col(D) =

```
rpeak - rbase * dnorm
```

Recalculate: Auto

```
// Point to spectrum, baseline, and output column
range rpeak = 2, rbase = 3, rsub = wcol(j);
// Compute normalization factor using 1st data point
double dnorm = rpeak[1] / rbase[1];
```

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").

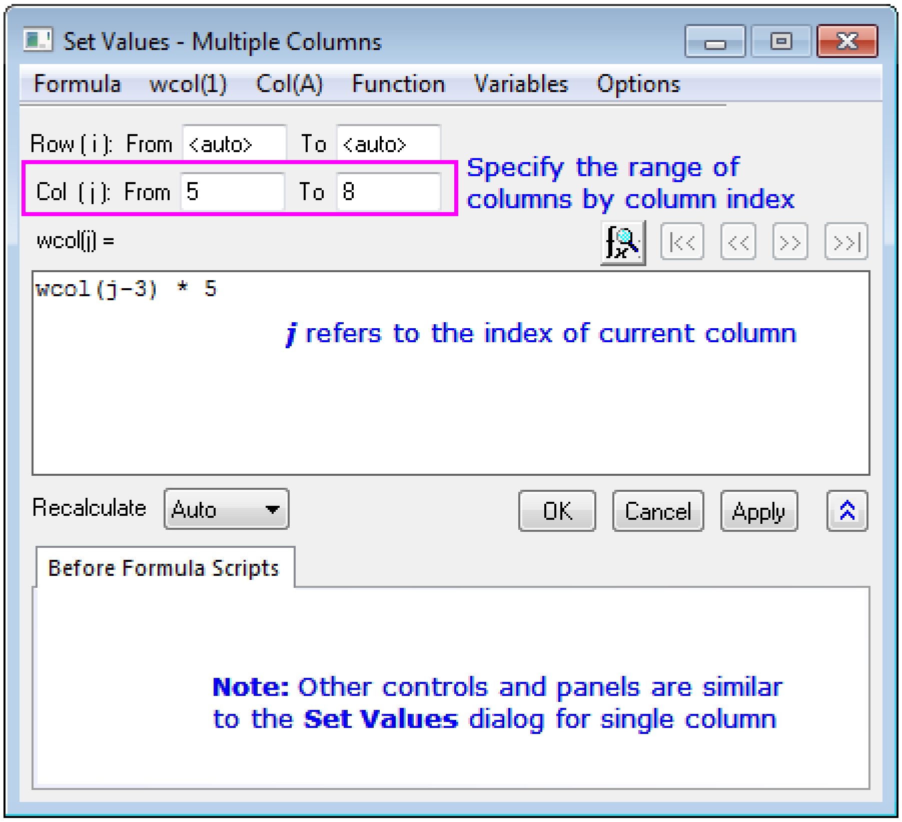
When this spreadsheet cell notation is enabled (default), you will see an ▦ icon in the upper-left corner of the workbook (applies to all sheets). Spreadsheet cell notation can *only* be used in defining the column formula. It *cannot* be used in the **Before Formula Scripts** panel of Set Values, nor 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.


Set Values - Multiple Columns
Formula
wcol(1)
Col(A)
Function
Variables
Options
Recalculate
OK
Cancel
Apply
Before Formula Scripts

Row (i): From <auto> To <auto>

Col (j): From 5 To 8

Specify the range of columns by column index

wcol(j) =

```
wcol(j-3) * 5
```

j refers to the index of current column

Recalculate: Auto

Note: Other controls and panels are similar to the **Set Values** dialog for single column

9.4.1 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.

When you mouse over one of the functions listed in the **Function** menu in **Set Values** dialog, 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.

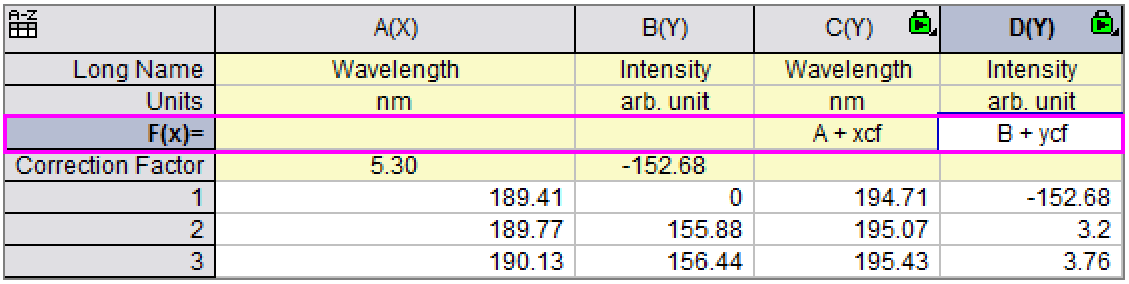
Use the **Before Formula Scripts** panel to define variables, LabTalk functions, or run LabTalk scripts before the expression in the upper panel is evaluated.

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

9.4.2 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

9.4.3 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

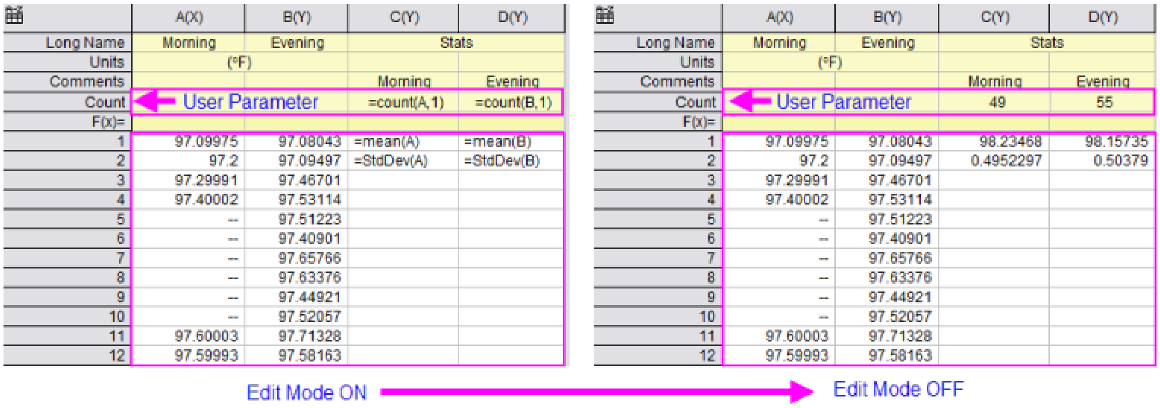
1. Create a new project by clicking the **New Project** button on the **Standard** toolbar.
2. Click the **Import Multiple ASCII** button to import the files *F1.dat* and *F2.dat* in the *<Origin Folder>\Samples\Import and Export* path. In the **impASC** dialog, set **Multi_File (except 1st) Import Mode** 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.

9.5 Setting Cell Values

Beginning with version 2018, 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.



	A(X)	B(Y)	C(Y)	D(Y)
Long Name	Morning	Evening	Stats	
Units	(°F)			
Comments			Morning	Evening
Count			=count(A,1)	=count(B,1)
F(x)=				
1	97.09975	97.08043	=mean(A)	=mean(B)
2	97.2	97.09497	=StdDev(A)	=StdDev(B)
3	97.29991	97.46701		
4	97.40002	97.53114		
5	--	97.51223		
6	--	97.40901		
7	--	97.65766		
8	--	97.63376		
9	--	97.44921		
10	--	97.52057		
11	97.60003	97.71328		
12	97.59993	97.58163		

	A(X)	B(Y)	C(Y)	D(Y)
Long Name	Morning	Evening	Stats	
Units	(°F)			
Comments			Morning	Evening
Count			49	55
F(x)=				
1	97.09975	97.08043	98.23468	98.15735
2	97.2	97.09497	0.4952297	0.50379
3	97.29991	97.46701		
4	97.40002	97.53114		
5	--	97.51223		
6	--	97.40901		
7	--	97.65766		
8	--	97.63376		
9	--	97.44921		
10	--	97.52057		
11	97.60003	97.71328		
12	97.59993	97.58163		

- To use cell formulas, **Spreadsheet Cell Notation** must be enabled (appears in upper-left corner of sheet).
- 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.

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

9.5.1 Set Cell Values Tutorials

Tutorial 1: Extending a cell formula to other cells

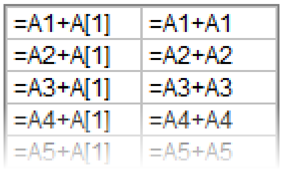
1. Click the **New Workbook** button to open a new book.
2. Click on the column A heading to select, then right-click and choose **Fill Column with Row Numbers**.
3. Click on cell B1 and enter:

```
=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 drag to the end of the column, extending your cell calculation to other cells. This will add the quantity in A1 to values in column A.
6. Click the **Add New Columns** button to add column C.
7. Click on the Cell in C1 but this time enter (omitting the square bracket on the second "1"):

```
=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 drag to the end of the column, extending your cell calculation to other cells. Note that this time, the resulting values are different.
10. Click **Edit: Edit Mode** to display the underlying cell formulas. Note that the square brackets in column B "protected" the second cell *A1* reference so that it didn't change but that the *A1* reference in column C changed 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

Tutorial 2: Quickly finding maximum values in multiple columns of data

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 **File: Import: 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 **File: Import: 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*.

9.6 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 the active window.

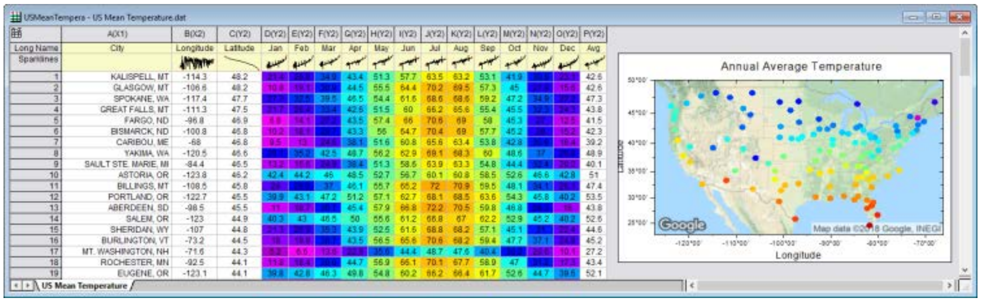
Utility	Menu Access
- Sorting Data	**Worksheet: Sort Range** **Worksheet: Sort Columns** **Worksheet: Sort Worksheet** **Worksheet: Sort Columns by Label**
- Find - Replace - Go To (sheet row/column)	**Edit: Find in Project** **Edit: Find in Sheets** **Edit: Replace** **Edit: Go To**
- Hide Column - 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	**Worksheet: Append Worksheet**

Utility	Menu Access
- Split Columns - Split Worksheet - Split Workbook	**Worksheet: Split Columns** **Worksheet: Split Worksheet** **Worksheet: Split Workbooks**
- Worksheet Transpose	**Worksheet: Transpose**
- Stack Multiple Columns into One with Grouping - Unstack Grouped Data into Multiple Columns	**Worksheet: Stack Columns** **Worksheet: Unstack Columns**
- Summarize Data with Pivot Table	**Worksheet: Pivot Table**
- Filter data by defining conditions on one or more columns	**Column: Filter** menu, or **Worksheet Data** toolbar NEW You can now choose **Copy Filter** from a data filter's context menu, or click in the **Filter** cell in the worksheet column label rows and press Ctrl+C to copy the filter. Next, select your target column(s) and press Ctrl+V to paste the filter and apply it to data in those columns. ***See Also*:** **Data Masking**
- Data Reduction	**Worksheet: Remove/Combine Duplicated Rows** **Worksheet: Reduce Columns** **Worksheet: Reduce Rows** **Analysis: Data Manipulation: Reduce Duplicate X Data** **Analysis: Data Manipulation: Reduce by Group** **Analysis: Data Manipulation: Reduce to Evenly Spaced X**
- Apply Conditional Formatting to Worksheet Cells	**Worksheet: Conditional Formatting: Highlight** **Worksheet: Conditional Formatting: Heatmap** **Worksheet: Conditional Formatting: Duplicates**
- Reverse Order	**Column: Reverse Order**

Some of these worksheet data processing utilities are available from a shortcut menu. For access, select your data and right-click.

Origin 2019 adds **Conditional Formatting** support to the worksheet. 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.

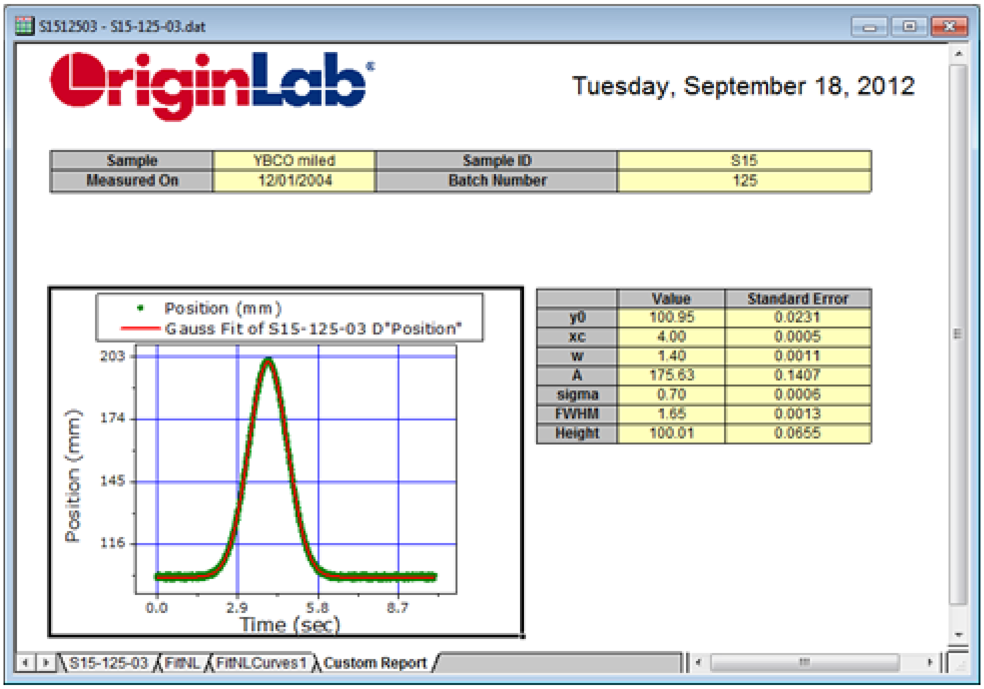


	A(X1)	B(X2)	C(Y2)	D(Y2)	E(Y2)	F(Y2)	G(Y2)	H(Y2)	I(Y2)	J(Y2)	K(Y2)	L(Y2)	M(Y2)	N(Y2)	O(Y2)	P(Y2)
Long Name	City	Longitude	Latitude	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
Sparklines																
1	KALISPELL, MT	-114.3	48.2	[illegible]	[illegible]	34.9	43.4	51.3	57.7	63.5	63.2	53.1	41.9	[illegible]	[illegible]	42.6
2	GLASGOW, MT	-106.6	48.2	10.8	[illegible]	[illegible]	44.5	55.5	64.4	70.2	69.5	57.3	45	[illegible]	[illegible]	42.6
3	SPOKANE, WA	-117.4	47.7	27.7	32.5	39.5	46.5	54.4	61.6	68.6	68.6	59.2	47.2	34.9	[illegible]	47.3
4	GREAT FALLS, MT	-111.3	47.5	21.7	[illegible]	33.4	42.5	51.5	60	66.2	65.6	55.4	45.5	[illegible]	[illegible]	43.8
5	FARGO, ND	-96.8	46.9	6.8	14.1	[illegible]	43.5	57.4	66	70.6	69	58	45.3	[illegible]	12.5	41.5
6	BISMARCK, ND	-100.8	46.8	10.2	18.1	[illegible]	43.3	56	64.7	70.4	69	57.7	45.2	[illegible]	15.2	42.3
7	CARIBOU, ME	-68	46.8	9.5	13	[illegible]	38.1	51.6	60.8	65.6	63.4	53.8	42.8	[illegible]	[illegible]	39.2
8	YAKIMA, WA	-120.5	46.6	[illegible]	35.2	42.5	48.7	56.2	62.9	69.1	68.3	60	48.6	37	[illegible]	48.9
9	SAULT STE. MARIE, MI	-84.4	46.5	13.2	[illegible]	[illegible]	38.4	51.3	58.6	63.9	63.3	54.8	44.4	[illegible]	[illegible]	40.1
10	ASTORIA, OR	-123.8	46.2	42.4	44.2	46	48.5	52.7	56.7	60.1	60.8	58.5	52.6	46.6	42.8	51
11	BILLINGS, MT	-108.5	45.8	[illegible]	[illegible]	37	46.1	55.7	65.2	72	70.9	59.5	48.1	[illegible]	[illegible]	47.4
12	PORTLAND, OR	-122.7	45.5	39.9	43.1	47.2	51.2	57.1	62.7	68.1	68.5	63.6	54.3	45.8	40.2	53.5
13	ABERDEEN, SD	-98.5	45.5	11	[illegible]	[illegible]	45.4	57.9	66.8	72.2	70.5	59.8	46.8	[illegible]	16	43.8
14	SALEM, OR	-123	44.9	40.3	43	46.5	50	55.6	61.2	66.8	67	62.2	52.9	45.2	40.2	52.6
15	SHERIDAN, WY	-107	44.8	[illegible]	[illegible]	[illegible]	43.9	52.5	61.6	68.8	68.2	57.1	45.1	[illegible]	[illegible]	44.6
16	BURLINGTON, VT	-73.2	44.5	18	[illegible]	[illegible]	43.5	56.5	65.6	70.6	68.2	59.4	47.7	37.1	[illegible]	45.2
17	MT. WASHINGTON, NH	-71.6	44.3	[illegible]	6.6	[illegible]	[illegible]	[illegible]	44.4	48.7	47.6	40.4	[illegible]	[illegible]	10.1	27.2
18	ROCHESTER, MN	-92.5	44.1	[illegible]	[illegible]	[illegible]	44.7	56.9	66.1	70.1	67.7	58.9	47	[illegible]	[illegible]	43.4
19	EUGENE, OR	-123.1	44.1	39.8	42.8	46.3	49.8	54.8	60.2	66.2	66.4	61.7	52.6	44.7	39.6	52.1

9.7 Workbooks for Analysis and Reporting

Apart from text and numeric data, the workbook can contain various other types of information -- 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 -- say, the application of a data filter and 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.


S1512503 - S15-125-03.dat
OriginLab
Position (mm)
Gauss Fit of S15-125-03 D"Position"
203
174
145
116
Position (mm)
0.0
2.9
5.8
8.7
Time (sec)
S15-125-03
FitNL
FitNLCurves1
Custom Report

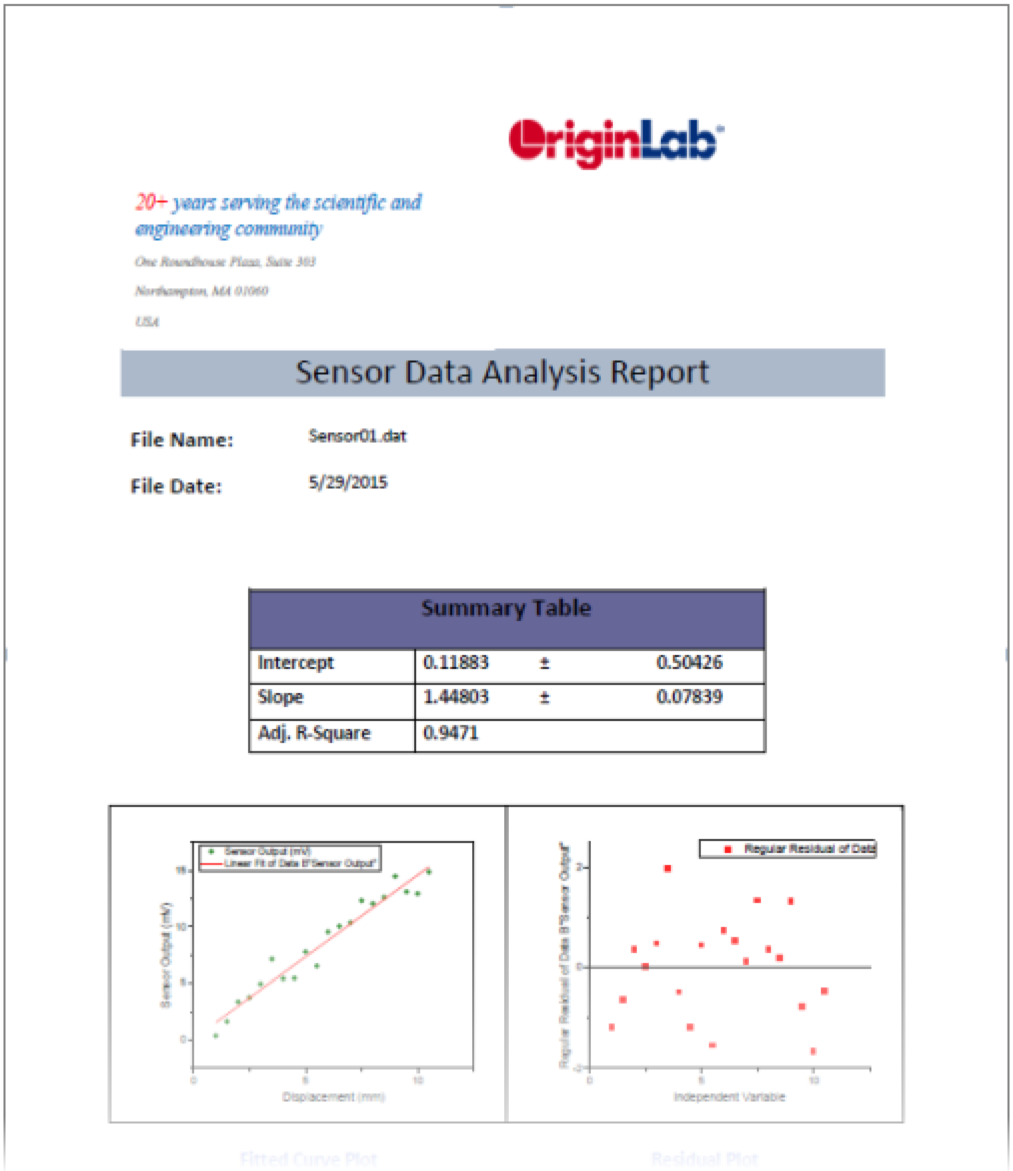
Tuesday, September 18, 2012

Sample	YBCO miled	**Sample ID**	S15
Measured On	12/01/2004	**Batch Number**	125

	Value	Standard Error
y0	100.95	0.0231
xc	4.00	0.0005
w	1.40	0.0011
A	175.63	0.1407
sigma	0.70	0.0006
FWHM	1.65	0.0013
Height	100.01	0.0655

One attractive option for generating reports 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.



OriginLab

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One Roundhouse Plaza, Suite 303

Northampton, MA 01060

USA

Sensor Data Analysis Report

File Name: Sensor01.dat

File Date: 5/29/2015

Summary Table			
Intercept	0.11883	±	0.50426
Slope	1.44803	±	0.07839
Adj. R-Square	0.9471		

Sensor Output (mV)
Linear Fit of Data 8"Sensor Output"
Sensor Output (mV)
0
5
10
15
0
5
10
Displacement (mm)
Regular Residual of Data
Regular Residual of Data 8"Sensor Output"
-2
0
2
0
5
10
Independent Variable

Fitted Curve Plot

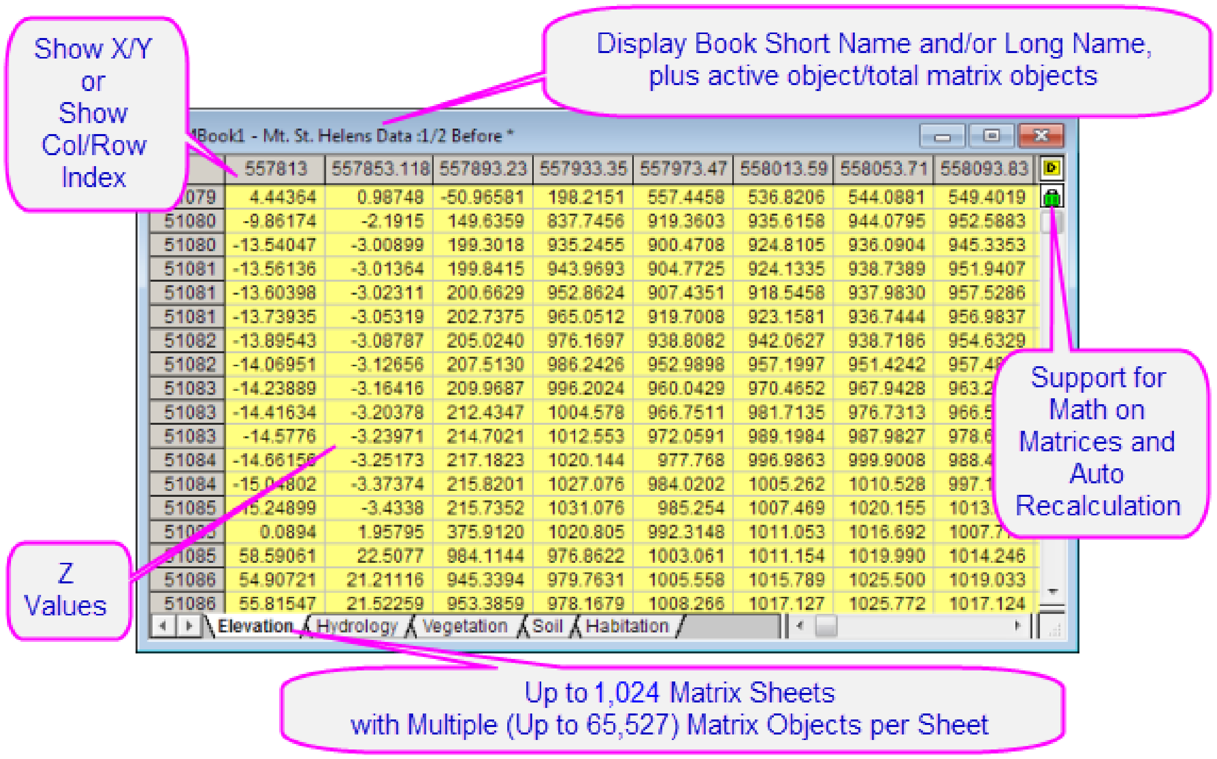
Residual Plot

9.8 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

10 Matrix Book Matrix Sheet Matrix Objects


Show X/Y or Show Col/Row Index

Display Book Short Name and/or Long Name, plus active object/total matrix objects

Support for Math on Matrices and Auto Recalculation

Z Values

Up to 1,024 Matrix Sheets with Multiple (Up to 65,527) Matrix Objects per Sheet

MBook1 - Mt. St. Helens Data :1/2 Before *

	557813	557853.118	557893.23	557933.35	557973.47	558013.59	558053.71	558093.83
079	4.44364	0.98748	-50.96581	198.2151	557.4458	536.8206	544.0881	549.4019
51080	-9.86174	-2.1915	149.6359	837.7456	919.3603	935.6158	944.0795	952.5883
51080	-13.54047	-3.00899	199.3018	935.2455	900.4708	924.8105	936.0904	945.3353
51081	-13.56136	-3.01364	199.8415	943.9693	904.7725	924.1335	938.7389	951.9407
51081	-13.60398	-3.02311	200.6629	952.8624	907.4351	918.5458	937.9830	957.5286
51081	-13.73935	-3.05319	202.7375	965.0512	919.7008	923.1581	936.7444	956.9837
51082	-13.89543	-3.08787	205.0240	976.1697	938.8082	942.0627	938.7186	954.6329
51082	-14.06951	-3.12656	207.5130	986.2426	952.9898	957.1997	951.4242	957.4
51083	-14.23889	-3.16416	209.9687	996.2024	960.0429	970.4652	967.9428	963.2
51083	-14.41634	-3.20378	212.4347	1004.578	966.7511	981.7135	976.7313	966.5
51083	-14.5776	-3.23971	214.7021	1012.553	972.0591	989.1984	987.9827	978.6
51084	-14.66156	-3.25173	217.1823	1020.144	977.768	996.9863	999.9008	988.4
51084	-15.04802	-3.37374	215.8201	1027.076	984.0202	1005.262	1010.528	997.1
51085	15.24899	-3.4338	215.7352	1031.076	985.254	1007.469	1020.155	1013.
510	0.0894	1.95795	375.9120	1020.805	992.3148	1011.053	1016.692	1007.7
1085	58.59061	22.5077	984.1144	976.8622	1003.061	1011.154	1019.990	1014.246
51086	54.90721	21.21116	945.3394	979.7631	1005.558	1015.789	1025.500	1019.033
51086	55.81547	21.52259	953.3859	978.1679	1008.266	1017.127	1025.772	1017.124

10.1 Matrix Books, Matrix Sheets and Matrix Objects

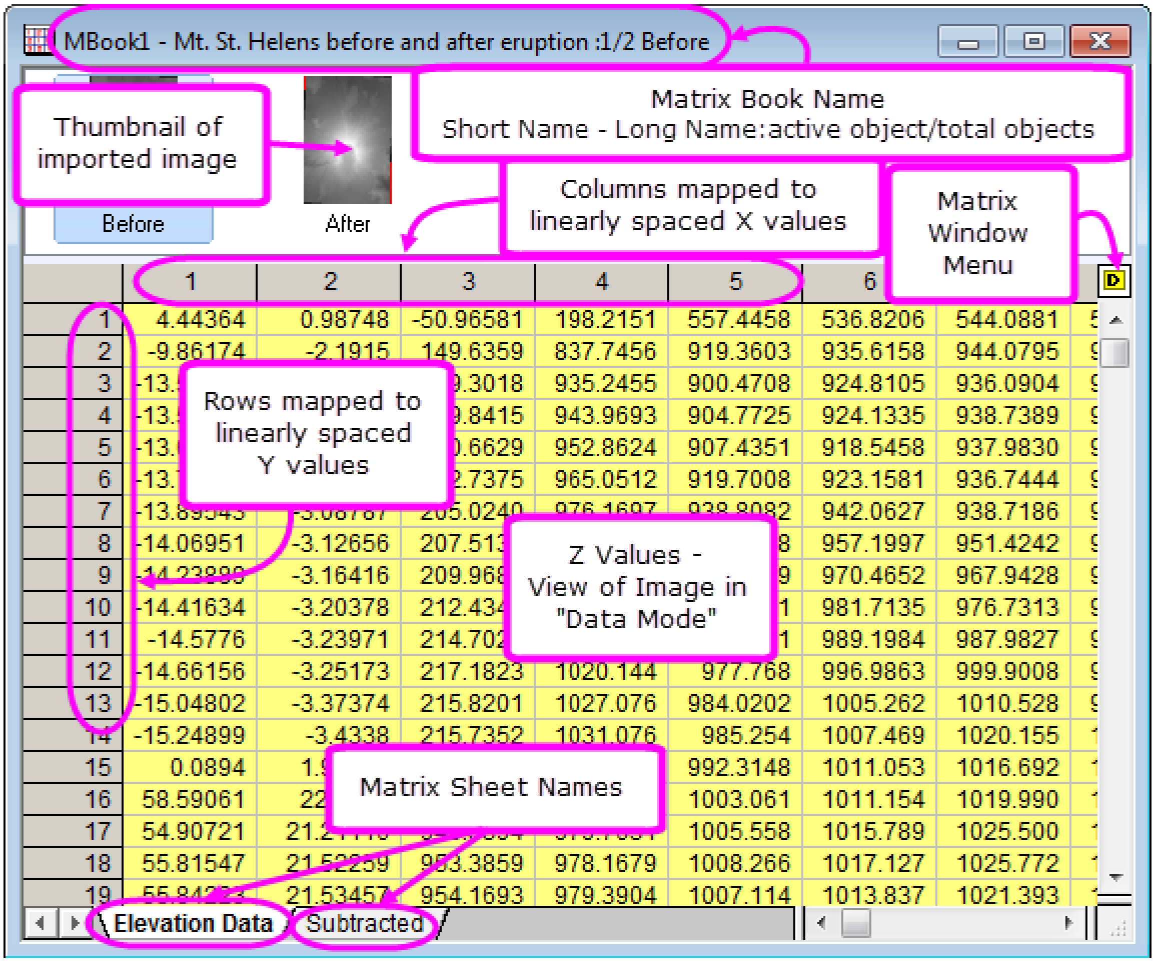
A matrix is a dataset of Z values arranged as an array of columns and rows which are linearly mapped to X and Y values. The following table summarizes some important matrix book limits:

Maximum Number of...	32Bit OS	64Bit OS
Matrix sheets in a matrix book **Matrix objects in a matrix sheet** **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.

10.1.1 Naming Matrix Books, Matrix Sheets and Matrix Objects


MBook1 - Mt. St. Helens before and after eruption :1/2 Before
Matrix Book Name
Short Name - Long Name:active object/total objects
Thumbnail of imported image
Before
After
Columns mapped to linearly spaced X values
Matrix Window Menu
Rows mapped to linearly spaced Y values
Z Values - View of Image in "Data Mode"
Matrix Sheet Names
Elevation Data
Subtracted

Matrix Book	• The matrix book 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.

<table>
<tr><td>Matrix Sheets</td><td>● The sheet Short Name (a Layer object) must be unique within the matrix book and is limited to 32 characters.
● Can contain spaces, numbers and special characters.
● Can begin with a letter, number or special character.
● These special characters are not allowed: `!%"|()[]{}<>.</td></tr>
<tr><td>Matrix Objects</td><td>● Origin assigns a Short Name -- the matrix object index number -- to each matrix object, as it is created. This name/index number cannot be changed.
● You can add an optional Long Name to the object by clicking on the yellow object icon - D for a data matrix or I for an image matrix - in the upper right corner of the matrix sheet and choosing Rename from the menu.</td></tr>
</table>

10.1.2 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.

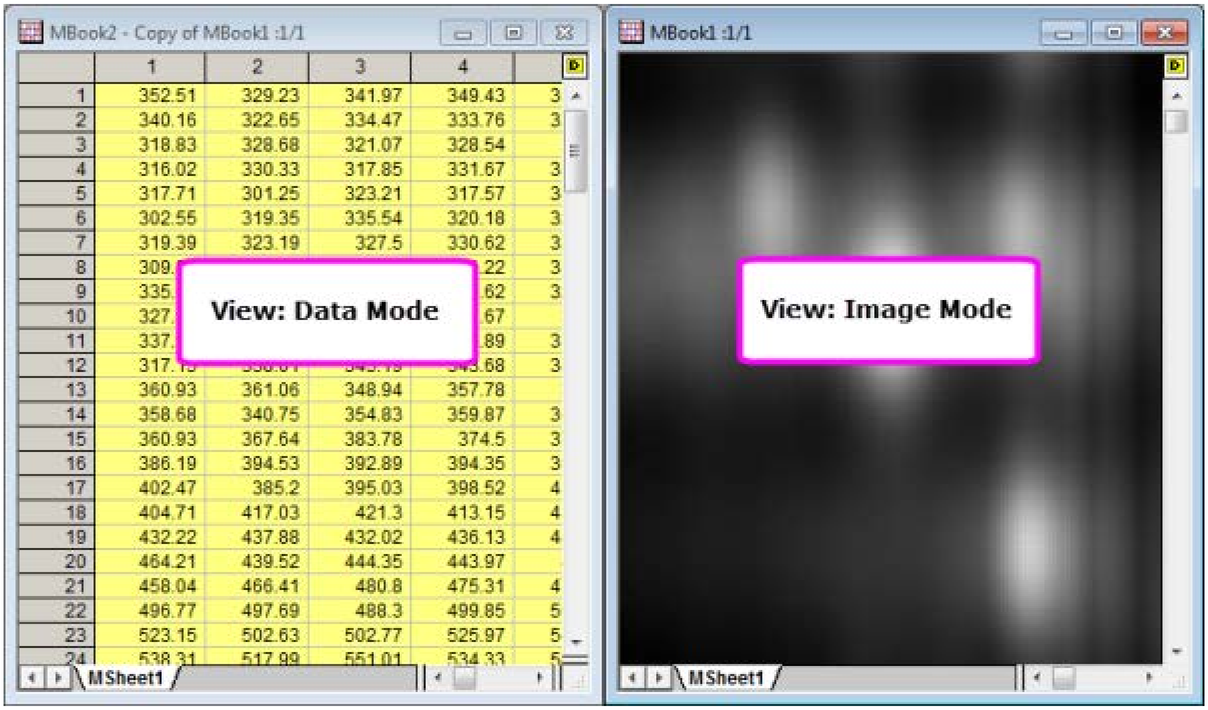
- Matrix columns are mapped to linearly-spaced X values.
- Matrix rows are mapped to linearly-spaced Y values.

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:

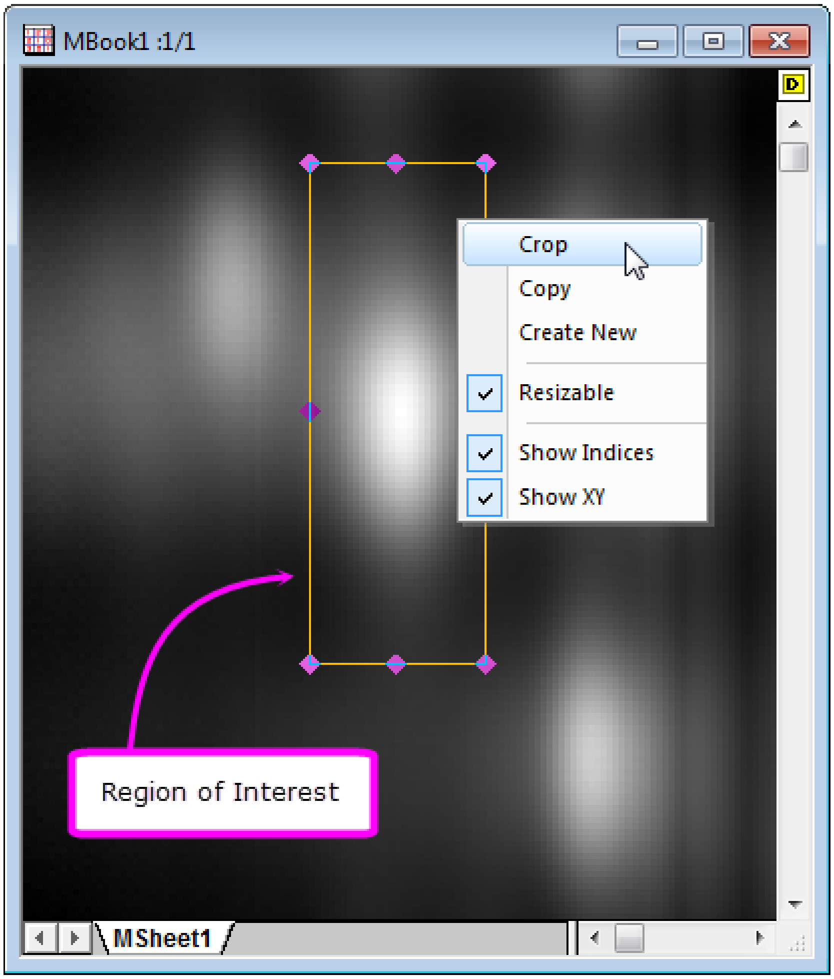
- In Data Mode (**View:Data Mode** from the menu or press **Ctrl+Shift+D**), the matrix object displays as raw numbers.
- In Image Mode (**View:Image Mode** from the menu or press **Ctrl+Shift+I**), the matrix object displays as either a gray scale image or a color image, depending upon the type of data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



	1	2	3	4	
1	352.51	329.23	341.97	349.43	3
2	340.16	322.65	334.47	333.76	3
3	318.83	328.68	321.07	328.54	
4	316.02	330.33	317.85	331.67	3
5	317.71	301.25	323.21	317.57	3
6	302.55	319.35	335.54	320.18	3
7	319.39	323.19	327.5	330.62	3
8	309.	[illegible]	[illegible]	.22	3
9	335.	[illegible]	[illegible]	.62	3
10	327.	[illegible]	[illegible]	.67	
11	337.	[illegible]	[illegible]	.89	3
12	317.	[illegible]	[illegible]	.68	3
13	360.93	361.06	348.94	357.78	
14	358.68	340.75	354.83	359.87	3
15	360.93	367.64	383.78	374.5	3
16	386.19	394.53	392.89	394.35	3
17	402.47	385.2	395.03	398.52	4
18	404.71	417.03	421.3	413.15	4
19	432.22	437.88	432.02	436.13	4
20	464.21	439.52	444.35	443.97	
21	458.04	466.41	480.8	475.31	4
22	496.77	497.69	488.3	499.85	5
23	523.15	502.63	502.77	525.97	5
24	538.31	517.99	551.01	534.33	5

An image in a matrix can be cropped within the existing window or it can be cropped and copied to create a new matrix window:

1. Make sure that there is a check mark beside **Region of Interest Tools** on the **Tools** menu. If this menu item is not checked, select it.
2. Click the **Rectangle Tool** ▨ button on the **Tools** toolbar.
3. Drag out a rectangular area on the image.
4. Right-click on the rectangle and select **Crop** from the shortcut menu.

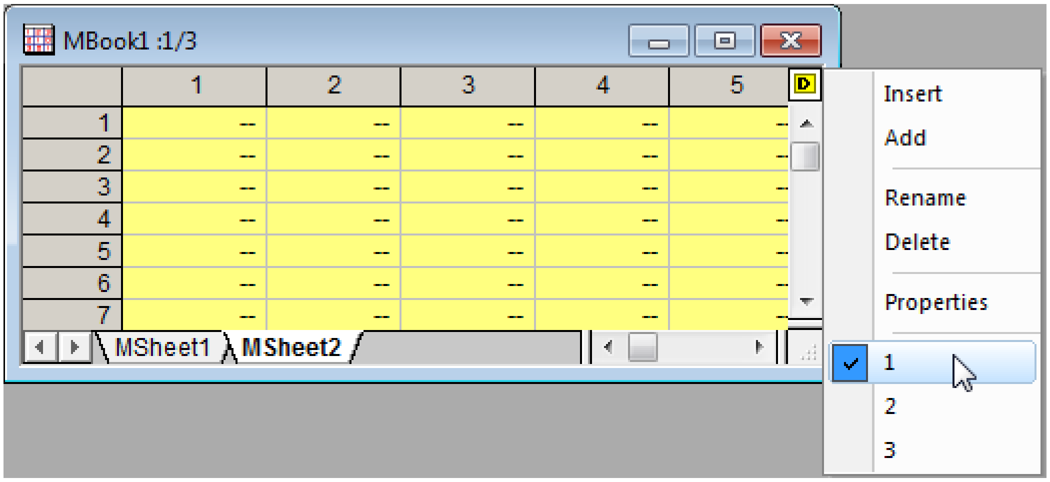


Note: If the matrix object is an image, the object icon will display as I whether you are viewing the matrix object as an image (**View:Image Mode**) or as numbers (**View:Data Mode**). Likewise, when the matrix object contains numbers, the object icon will display as D regardless of view mode.

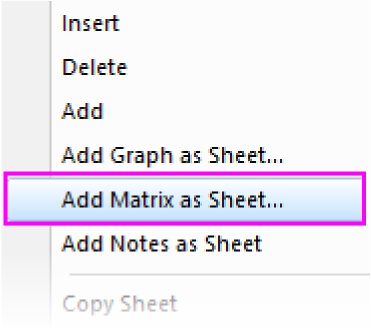
10.1.3 Matrix Books

Like the workbook window, the matrix book 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 matrix sheets, matrix dimensions, data type, math functions, data import handling instructions as well as various style and format options.

When you create a new matrix book, 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 matrix sheet. 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).


MBook1 :1/3
1
2
3
4
5
MSheet1
MSheet2
Insert
Add
Rename
Delete
Properties
1
2
3

Previously, you could right-click on a worksheet tab and add a graph or notes window as a sheet in the workbook. Now, in Origin 2018b, you can **Add Matrix as Sheet**, allowing you to insert a matrix book into a workbook. This gives you more flexibility when building your Analysis Templates.


Insert
Delete
Add
Add Graph as Sheet...
Add Matrix as Sheet...
Add Notes as Sheet
Copy Sheet

10.1.4 Matrix Sheets

Prior to Origin 2018, an Origin matrix book could 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 matrix book can have up to 1024 matrix sheets. The default matrix book template - ORIGIN.otmu - has a single matrix sheet containing 32 rows and 32 columns. Each matrix sheet can differ in dimensions(number of rows and columns and X & Y range).

To specify the dimensions of the matrix sheet:

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.

10.1.5 Matrix Objects

A matrix sheet can contain up to 65,504 matrix objects (64-bit, 32-bit max = 43,339), 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.

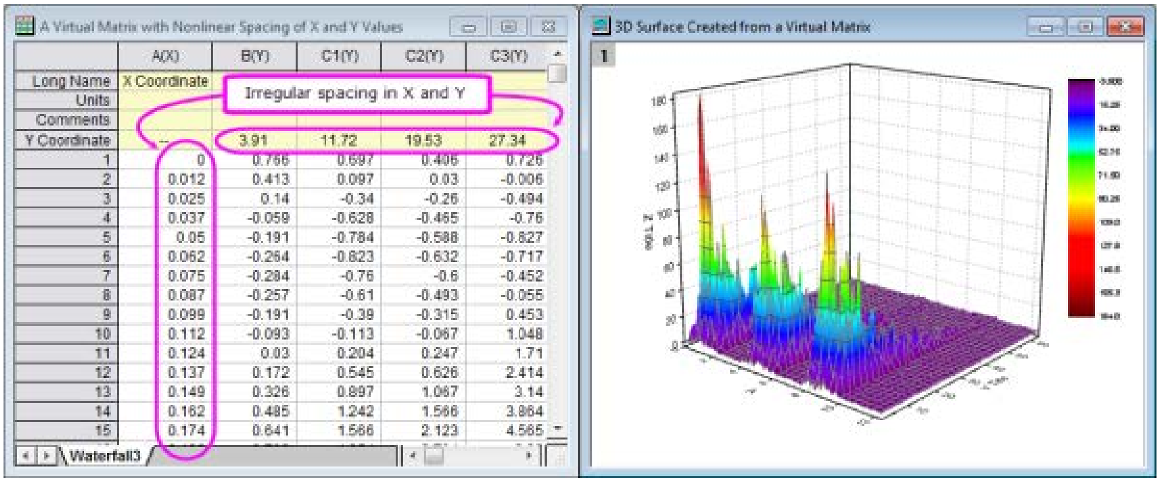
Matrix object properties are set in the user interface via the Matrix Properties dialog box. To open the dialog box:

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 boxes by clicking the Previous or Next buttons at the top of the dialog box.

10.2 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).


A Virtual Matrix with Nonlinear Spacing of X and Y Values
Irregular spacing in X and Y
Waterfall3
3D Surface Created from a Virtual Matrix
1

	A(X)	B(Y)	C1(Y)	C2(Y)	C3(Y)
Long Name	X Coordinate				
Units					
Comments					
Y Coordinate	--	3.91	11.72	19.53	27.34
1	0	0.766	0.697	0.406	0.726
2	0.012	0.413	0.097	0.03	-0.006
3	0.025	0.14	-0.34	-0.26	-0.494
4	0.037	-0.059	-0.628	-0.465	-0.76
5	0.05	-0.191	-0.784	-0.588	-0.827
6	0.062	-0.264	-0.823	-0.632	-0.717
7	0.075	-0.284	-0.76	-0.6	-0.452
8	0.087	-0.257	-0.61	-0.493	-0.055
9	0.099	-0.191	-0.39	-0.315	0.453
10	0.112	-0.093	-0.113	-0.067	1.048
11	0.124	0.03	0.204	0.247	1.71
12	0.137	0.172	0.545	0.626	2.414
13	0.149	0.326	0.897	1.067	3.14
14	0.162	0.485	1.242	1.566	3.864
15	0.174	0.641	1.566	2.123	4.565

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."

10.3 Matrix Templates

Matrix windows are created from a matrix template file (*.otmu). The template file saves such things as the number of sheets in the matrix book, the number of rows and columns in each sheet, internal memory allocated for each sheet, mathematical formula used to fill the matrix with numbers and certain ASCII import and export options.

Note: Data are NOT saved with the matrix template file.

To save the active matrix window as a template:

1. With the matrix window active, choose **File: Save Template As** from the main menu. This opens the **template_saveas** X-Function dialog box.
2. Select a category from the **Category** drop-down list or enter a new category.
3. Select or type a file name in the **Template Name** box (the .otmu extension is automatically added).
4. Enter a description into the **Template Description** text box (optional).
5. Type the file path for the template or click the browse button to locate your folder. Typically, you would save your template to your **User Files** folder.

The following table lists some of the kinds of things that are saved with the matrix template file. It also tells you where to find these controls.

Dialog Box	What is Saved?	Menu Access
--	• The Organizer • The Script Panel • The Matrix Image Thumbnails	Right-click on window title bar and choose: • **Show Organizer** • **Show Script Panel** • **Show Image Thumbnails**

Dialog Box	What is Saved?	Menu Access
Matrix Properties	• Matrix Long Name, Units, Comments. • Column width settings. • Column number Display (decimal, scientific, engineering). • Column Digits and data storage requirements.	**Matrix:Set Properties**
Matrix Dimensions and Labels	• Numbers of rows and columns in the matrix, xy coordinates, XYZ axis labels.	**Matrix:Set Dimensions/Labels...**
Set Values	• Formula used to create or transform matrix values.	**Matrix: Set Values ...**
ASCII Import Options	• ASCII import options pertinent to the matrix window are saved with the template.	**File:Import:Single ASCII** **File:Import Multiple ASCII**

10.4 Simple Manipulation of Matrix Data

Utility	Menu Access
• Flip or Rotate	**Matrix: Rotate90** **Matrix: Flip: Vertical** **Matrix: Flip: Horizontal**
• Expand (by interpolation)	**Matrix: Expand**
• Shrink (by averaging)	**Matrix: Shrink**
• Transpose	**Matrix: Transpose**
• Convert to Worksheet	**Matrix: Convert to Worksheet**

10.5 Setting Matrix Values

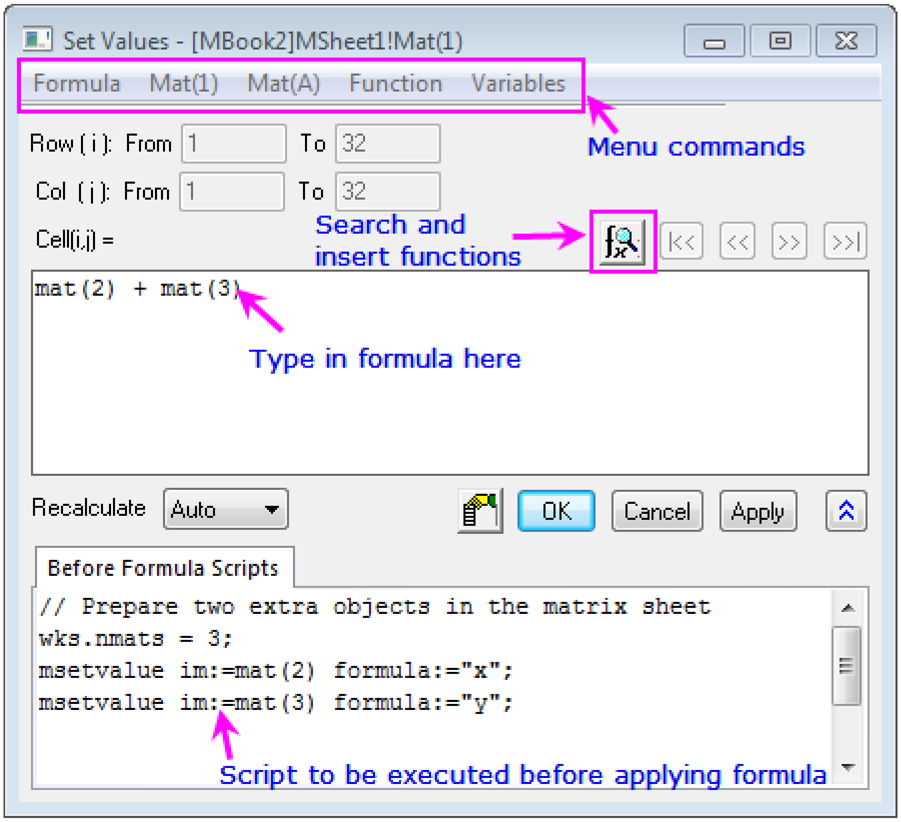
The **Set Values** dialog box is used to generate or transform data in a matrix object.

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.


Set Values - [MBook2]MSheet1!Mat(1)
Formula
Mat(1)
Mat(A)
Function
Variables
Cell(i,j) =
|<<
<<
>>
>>|
OK
Cancel
Apply
Before Formula Scripts

Row (i): From 1 To 32

Col (j): From 1 To 32

```
mat(2) + mat(3)
```

Recalculate: Auto

```
// Prepare two extra objects in the matrix sheet
wks.nmats = 3;
msetvalue im:=mat(2) formula:="x";
msetvalue im:=mat(3) formula:="y";
```

Menu commands

Search and insert functions

Type in formula here

Script to be executed before applying formula

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.

10.6 Converting Worksheets to Matrixes

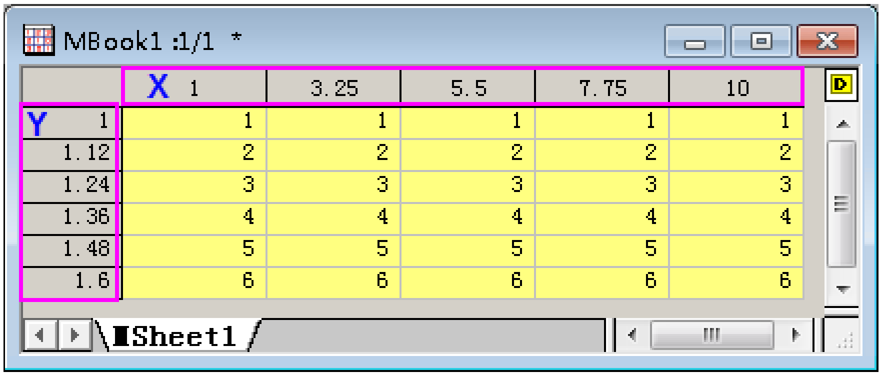
There are four methods for converting worksheet data to matrix data.

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.
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.

Method	Conversion Type	Notes
XYZ Gridding	- **Regular** - **Sparse** - **Random (Renka Cline)** - **Random (Shepard)** - **Random (Thin Plate Spline)** - **Random (Kriging Correlation)** - **Random (Weighted Average)**	Conversion Type depends upon XY spacing: - Choose **Regular** applied for data that are regularly 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.
XYZ Log Gridding	Methods same as **XYZ Gridding**	Calculates logarithmic values for X and Y, then performs **XYZ Gridding**.

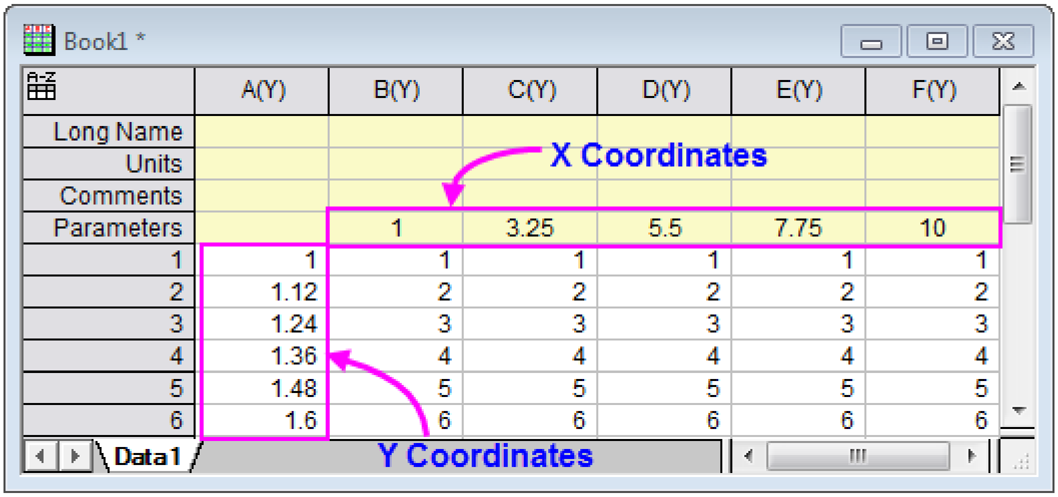
10.7 Converting Matrixes to Worksheets

There are two methods for converting matrix data to worksheet data:



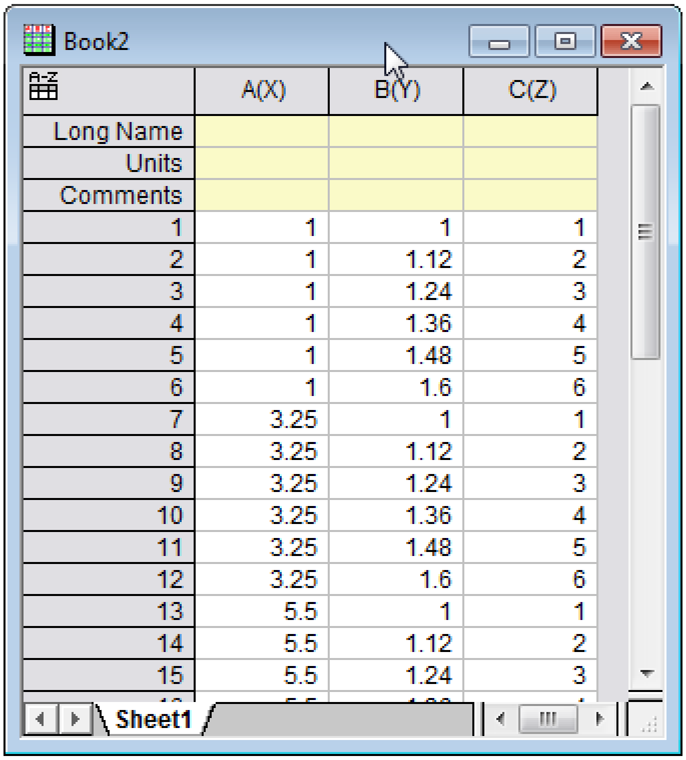
Y \ X	1	3.25	5.5	7.75	10
1	1	1	1	1	1
1.12	2	2	2	2	2
1.24	3	3	3	3	3
1.36	4	4	4	4	4
1.48	5	5	5	5	5
1.6	6	6	6	6	6

- **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.



	A(Y)	B(Y)	C(Y)	D(Y)	E(Y)	F(Y)
Long Name						
Units						
Comments						
Parameters		1	3.25	5.5	7.75	10
1	1	1	1	1	1	1
2	1.12	2	2	2	2	2
3	1.24	3	3	3	3	3
4	1.36	4	4	4	4	4
5	1.48	5	5	5	5	5
6	1.6	6	6	6	6	6

- **XYZ Columns**: This method produces a worksheet with three columns: an X, a Y and a Z column. The X and Y columns contain the X and Y coordinate values of the matrix Z values. The matrix Z values are contained in the worksheet Z column.



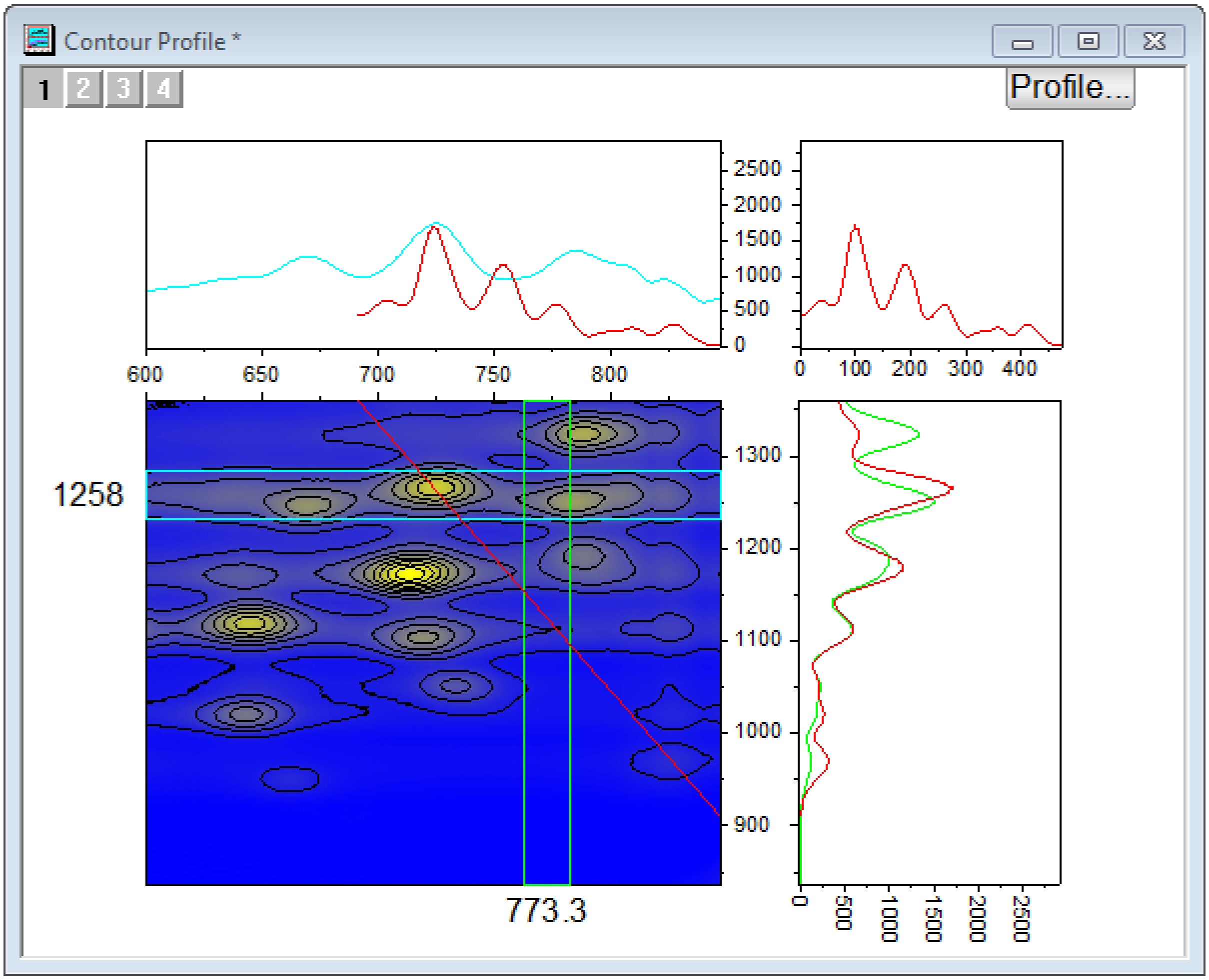
	A(X)	B(Y)	C(Z)
Long Name			
Units			
Comments			
1	1	1	1
2	1	1.12	2
3	1	1.24	3
4	1	1.36	4
5	1	1.48	5
6	1	1.6	6
7	3.25	1	1
8	3.25	1.12	2
9	3.25	1.24	3
10	3.25	1.36	4
11	3.25	1.48	5
12	3.25	1.6	6
13	5.5	1	1
14	5.5	1.12	2
15	5.5	1.24	3

10.8 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.


Contour Profile *
1
2
3
4
Profile...
2500
2000
1500
1000
500
0
600
650
700
750
800
0
100
200
300
400
1258
1300
1200
1100
1000
900
773.3
0
500
1000
1500
2000
2500

10.9 Topics for Further Reading

- Matrix Books, Matrix Sheets and Matrix Objects
- Matrix Book and Matrix Sheet 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

11 Graphing

11.1 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.

11.1.1 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 **File: Import: Single ASCII...** 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 > 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 > 2D: Multi-Panel: 4 Panel** menu item. Note that a very different plot is created using the same datasets.

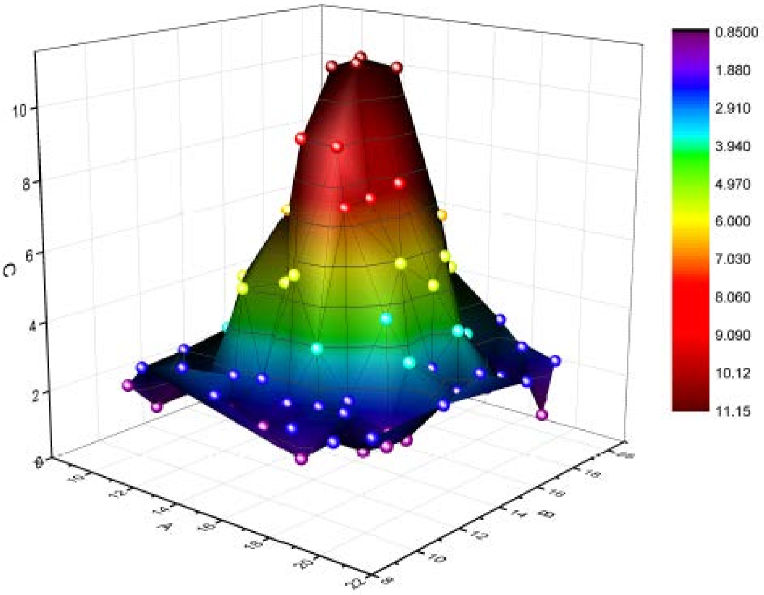
We were able to quickly create two different graphs using the same data. The chapter Customizing Graphs discusses customizing graphs and saving templates in more depth.

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: Surface: 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 A 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.

11.1.1.1 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.

11.1.1.2 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**.

11.1.2 Creating a Graph from Matrix Data

As discussed in the Matrix Book, Matrix Sheets 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* in the Manipulating Data Plots section of this chapter.

11.1.2.1 The Virtual Matrix

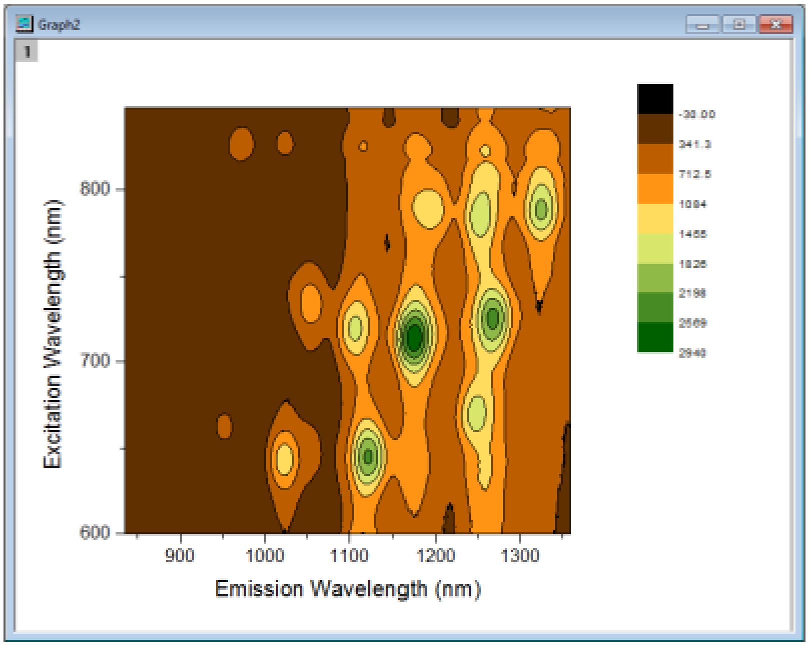
The Virtual Matrix concept was covered in the *Matrix Book, Matrix Sheet and Matrix Object* chapter of this Guide. To recap, a virtual matrix is a block of worksheet cells which contain Z values, with X and Y coordinates in the first row or column label row, and first column. X and Y coordinates don't 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 **File: Import: 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 > 2D: 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:


Graph2
1
Excitation Wavelength (nm)
800
700
600
900
1000
1100
1200
1300
Emission Wavelength (nm)
-30.00
341.3
712.5
1084
1455
1826
2198
2569
2940

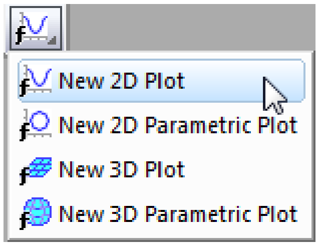
Once you customize your contour levels and colors, you can save your settings as a Theme, or simply copy-paste your customizations from one graph to another. To save a Theme, right-click on the graph and choose **Save Format as Theme**; or use the **Colormap Theme** controls on the **Colormap/Contours**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

11.1.3 2D and 3D Function Plots

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)

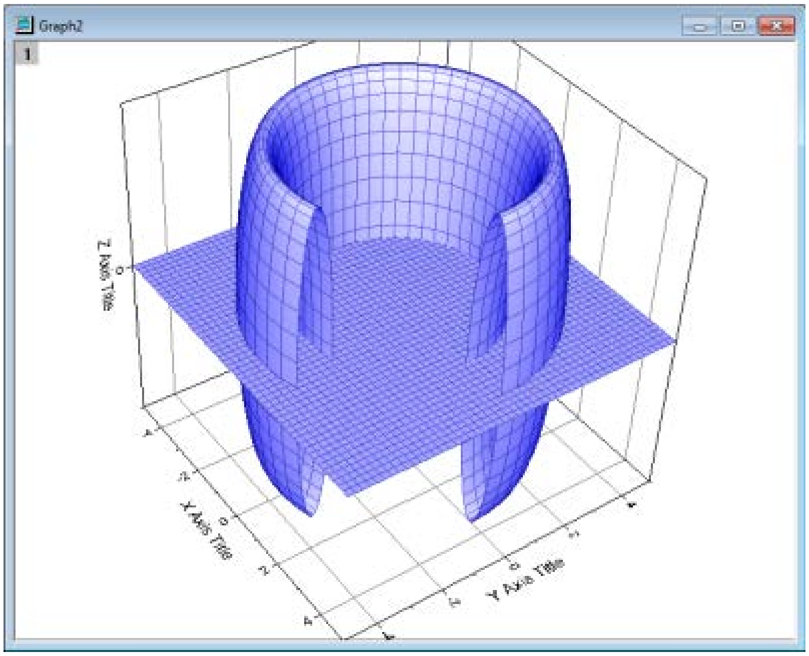
These plot types are also accessible from the function plot buttons on the **Standard** toolbar.



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.
- 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.

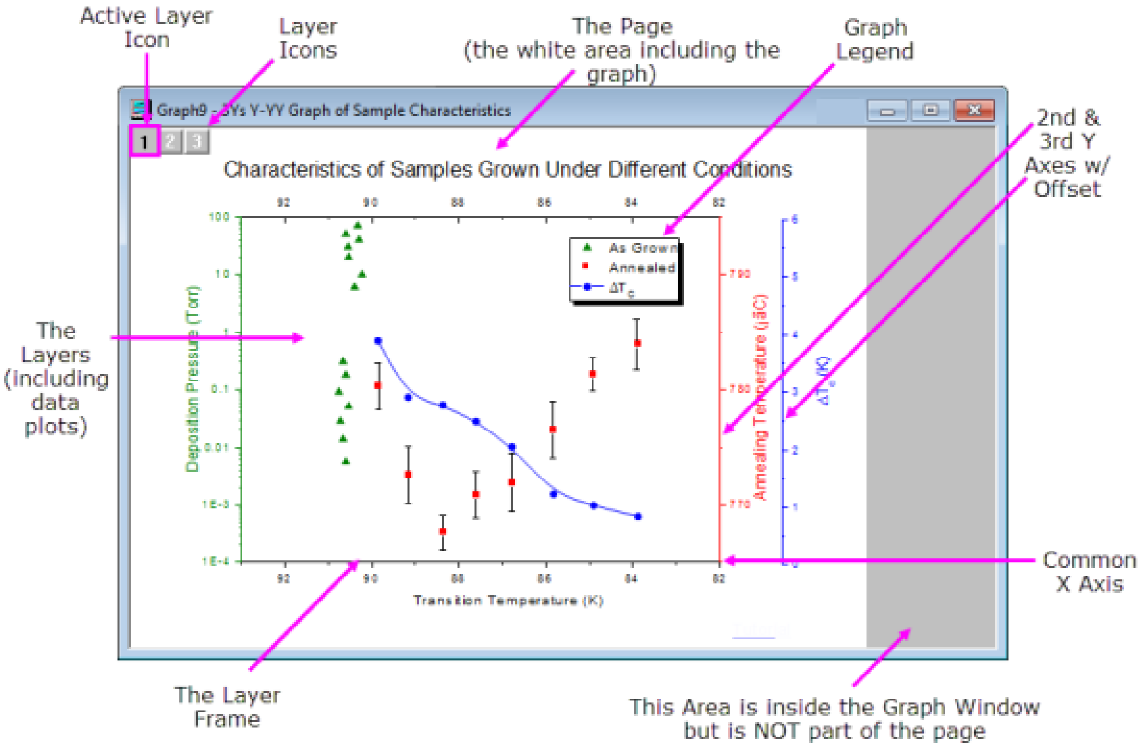
11.2 Plotting without Using Column Plot Designations

While Column Plot Designations remain an important concept, they are no longer required by many Origin graphing and analysis operations. For instance, the **Plot Setup** dialog box allows you to freely specify which column is used as X, Y, etc. when plotting, thereby overriding the Column Plot Designations.

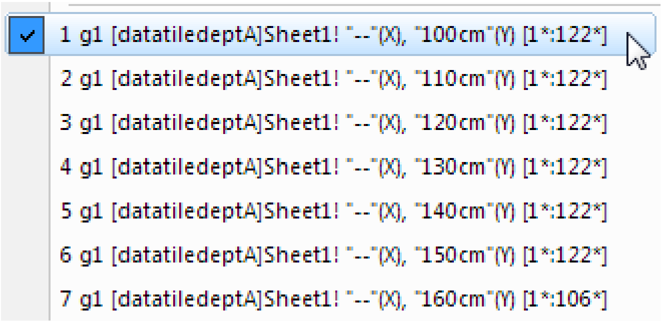
In order to make full use of the **Plot Setup** dialog box, you need to have some familiarity with the hierarchy of objects contained in the Origin graph window.

11.2.1 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.


Active Layer Icon
Layer Icons
The Page (the white area including the graph)
Graph Legend
2nd & 3rd Y Axes w/ Offset
Graph9 - 3Ys Y-YY Graph of Sample Characteristics
1
2
3
Characteristics of Samples Grown Under Different Conditions
As Grown
Annealed
ΔTc
Deposition Pressure (Torr)
Annealing Temperature (jäC)
ΔTc (K)
Transition Temperature (K)
92
90
88
86
84
82
100
10
1
0.1
0.01
1E-3
1E-4
790
780
770
6
5
4
3
2
1
0
The Layers (including data plots)
Common X Axis
The Layer Frame
This Area is inside the Graph Window but is NOT part of the page

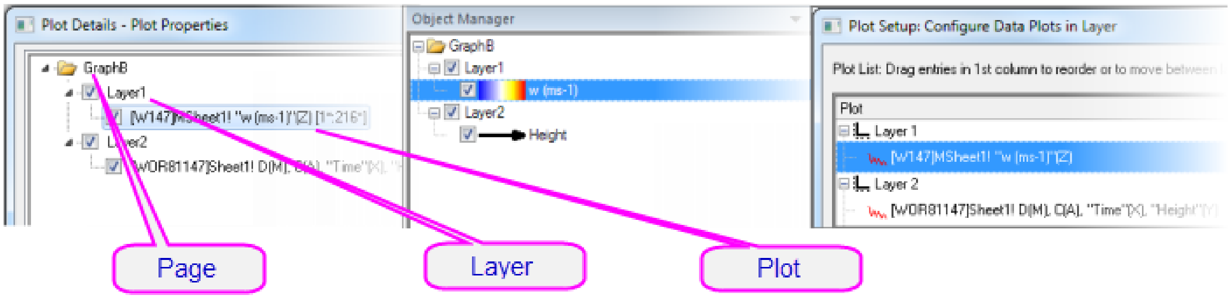
- The graph page must contain at least one, and may contain as many as 1024, graph layers.
- Each graph layer generally contains one or more data plots (graphical depictions of datasets). Note that the graph in the image above contains *three graph layers*, represented by the three non-printing *layer icons* in the upper-left corner of the graph page. Note that there is one layer icon which is highlighted, indicating 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.



✓ 1 g1 [datatiledeptA]Sheet1! "--"(X), "100cm"(Y) [1*:122*]
2 g1 [datatiledeptA]Sheet1! "--"(X), "110cm"(Y) [1*:122*]
3 g1 [datatiledeptA]Sheet1! "--"(X), "120cm"(Y) [1*:122*]
4 g1 [datatiledeptA]Sheet1! "--"(X), "130cm"(Y) [1*:122*]
5 g1 [datatiledeptA]Sheet1! "--"(X), "140cm"(Y) [1*:122*]
6 g1 [datatiledeptA]Sheet1! "--"(X), "150cm"(Y) [1*:122*]
7 g1 [datatiledeptA]Sheet1! "--"(X), "160cm"(Y) [1*:106*]

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

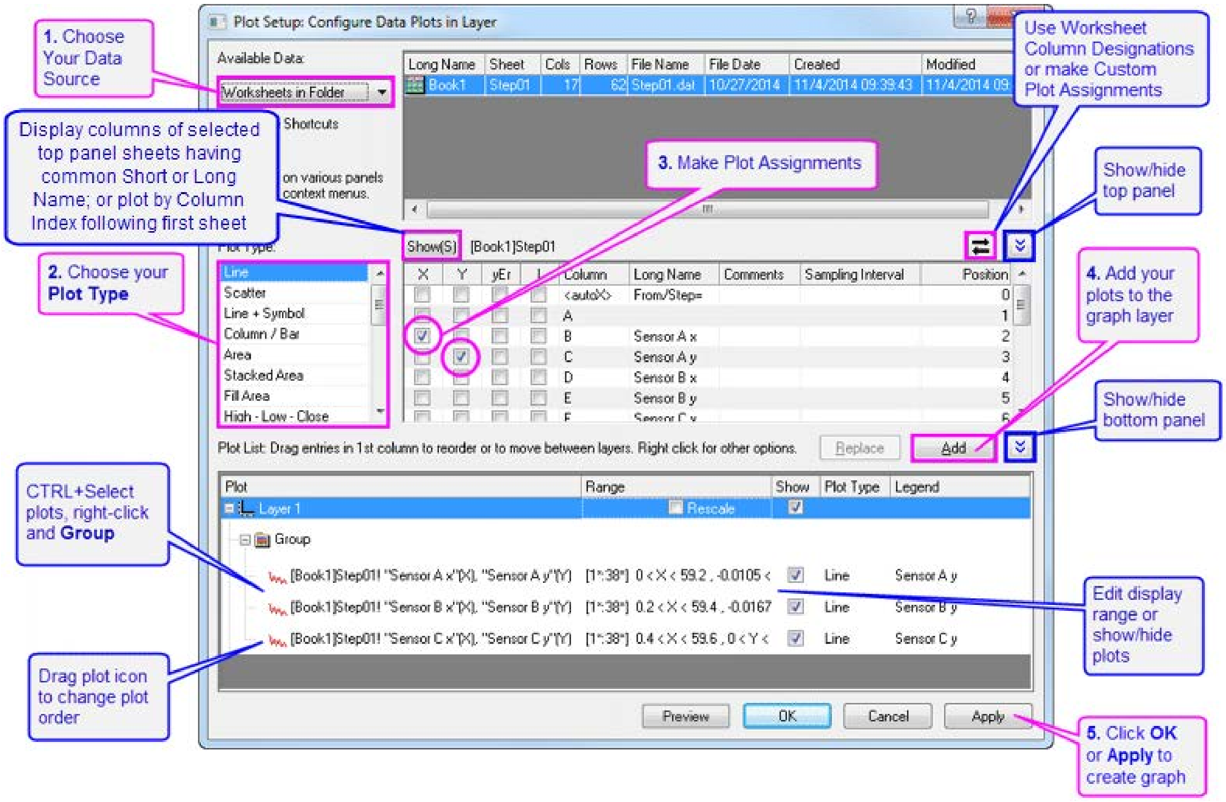
- The **Plot Details** Dialog Box (**Format: Page Properties ...**)
- The **Object Manager** (**View: Object Manager**)
- The **Plot Setup** Dialog Box (**Graph: Plot Setup...**)


Plot Details - Plot Properties
GraphB
Layer1
[W147]MSheet1! "w (ms-1)"[Z] [1*:216*]
Layer2
[WOR81147]Sheet1! D[M], C[A], "Time"[X], "
Object Manager
GraphB
Layer1
w (ms-1)
Layer2
Height
Plot Setup: Configure Data Plots in Layer
Plot List: Drag entries in 1st column to reorder or to move between
Plot
Layer 1
[W147]MSheet1! "w (ms-1)"[Z]
Layer 2
[WOR81147]Sheet1! D[M], C[A], "Time"[X], "Height"[Y]
Page
Layer
Plot

11.2.2 The 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, matrix books, 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.


Plot Setup: Configure Data Plots in Layer
Available Data:
Worksheets in Folder
Long Name
Sheet
Cols
Rows
File Name
File Date
Created
Modified
Book1
Step01
17
62
Step01.dat
10/27/2014
11/4/2014 09:39:43
Shortcuts
on various panels
context menus.
Show(S)
[Book1]Step01
Plot Type:
Line
Scatter
Line + Symbol
Column / Bar
Area
Stacked Area
Fill Area
High - Low - Close
X
Y
yEr
Column
Long Name
Comments
Sampling Interval
Position
<autoX>
From/Step=
A
B
C
D
E
F
Sensor A x
Sensor A y
Sensor B x
Sensor B y
Sensor C x
Plot List: Drag entries in 1st column to reorder or to move between layers. Right click for other options.
Replace
Add
Plot
Range
Show
Plot Type
Legend
Layer 1
Rescale
Group
[Book1]Step01! "Sensor A x"(X), "Sensor A y"(Y)
[1*:38*] 0 < X < 59.2 , -0.0105 <
Line
Sensor A y
[Book1]Step01! "Sensor B x"(X), "Sensor B y"(Y)
[1*:38*] 0.2 < X < 59.4 , -0.0167
Line
Sensor B y
[Book1]Step01! "Sensor C x"(X), "Sensor C y"(Y)
[1*:38*] 0.4 < X < 59.6 , 0 < Y <
Line
Sensor C y
Preview
OK
Cancel
Apply

1. Choose Your Data Source

Display columns of selected top panel sheets having common Short or Long Name; or plot by Column Index following first sheet

2. Choose your **Plot Type**

CTRL+Select plots, right-click and **Group**

Drag plot icon to change plot order

Use Worksheet Column Designations or make Custom Plot Assignments

Show/hide top panel

3. Make Plot Assignments

4. Add your plots to the graph layer

Show/hide bottom panel

Edit display range or show/hide plots

5. Click **OK** or **Apply** to create graph

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).

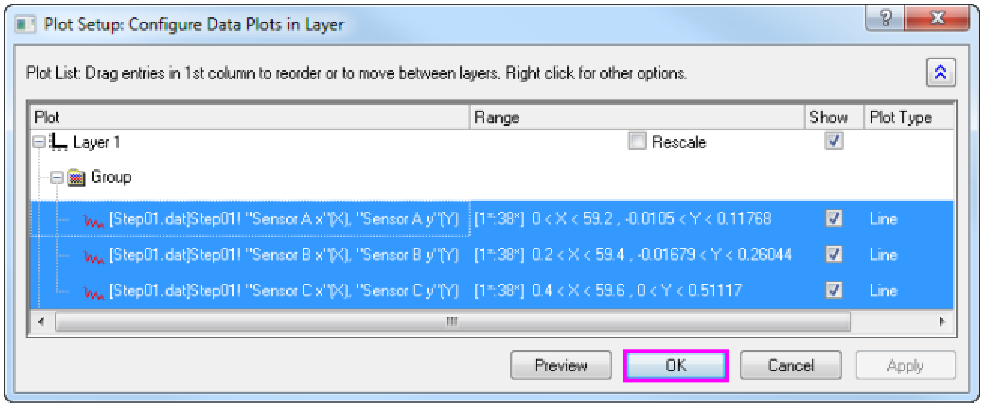
To open the **Plot Setup** dialog for an existing graph window, right-click on any layer icon in the upper left corner of the graph window and select **Plot Setup...**, or choose menu **Graph: Plot Setup...**.

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

1. Click the **New Workbook** button on the **Standard** toolbar.
2. Click **File: Import: 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 > 2D: Line: 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.



Plot Setup: Configure Data Plots in Layer

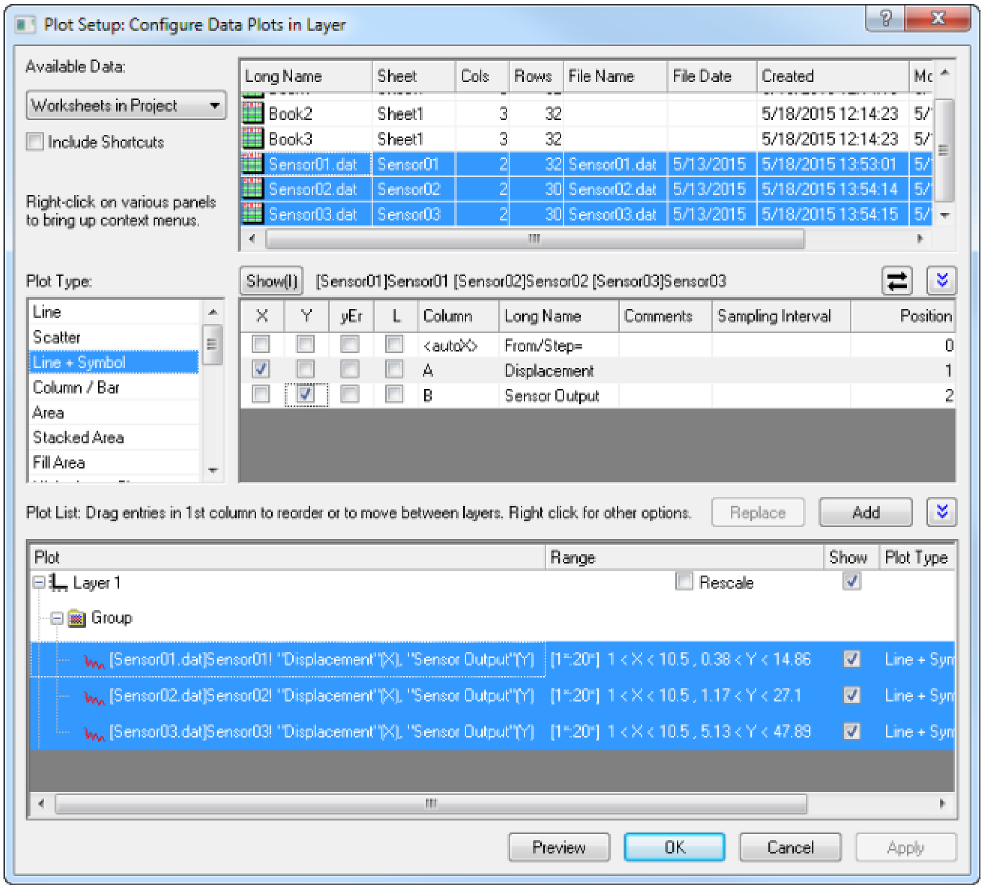
Plot List: Drag entries in 1st column to reorder or to move between layers. Right click for other options.

Plot	Range	Show	Plot Type
Layer 1	☐ Rescale	☑	
Group			
[Step01.dat]Step01! "Sensor A x"(X), "Sensor A y"(Y)	[1*:38*] 0 < X < 59.2 , -0.0105 < Y < 0.11768	☑	Line
[Step01.dat]Step01! "Sensor B x"(X), "Sensor B y"(Y)	[1*:38*] 0.2 < X < 59.4 , -0.01679 < Y < 0.26044	☑	Line
[Step01.dat]Step01! "Sensor C x"(X), "Sensor C y"(Y)	[1*:38*] 0.4 < X < 59.6 , 0 < Y < 0.51117	☑	Line

Tutorial: Creating a Graph with Data from Multiple Worksheets

1. Click the **New Workbook** button on the **Standard** toolbar.
2. Click **File: Import: 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 > 2D: Line+Symbol: 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.



Right-click on various panels to bring up context menus.

Long Name	Sheet	Cols	Rows	File Name	File Date	Created	Mc
Book2	Sheet1	3	32			5/18/2015 12:14:23	5/
Book3	Sheet1	3	32			5/18/2015 12:14:23	5/
Sensor01.dat	Sensor01	2	32	Sensor01.dat	5/13/2015	5/18/2015 13:53:01	5/
Sensor02.dat	Sensor02	2	30	Sensor02.dat	5/13/2015	5/18/2015 13:54:14	5/
Sensor03.dat	Sensor03	2	30	Sensor03.dat	5/13/2015	5/18/2015 13:54:15	5/

[Sensor01]Sensor01 [Sensor02]Sensor02 [Sensor03]Sensor03

X	Y	yEr	L	Column	Long Name	Comments	Sampling Interval	Position
☐	☐	☐	☐	<autoX>	From/Step=			0
☑	☐	☐	☐	A	Displacement			1
☐	☑	☐	☐	B	Sensor Output			2

Plot List: Drag entries in 1st column to reorder or to move between layers. Right click for other options.

Plot	Range	Show	Plot Type
Layer 1	☐ Rescale	☑	
Group			
[Sensor01.dat]Sensor01! "Displacement"(X), "Sensor Output"(Y)	[1*:20*] 1 < X < 10.5 , 0.38 < Y < 14.86	☑	Line + Sym
[Sensor02.dat]Sensor02! "Displacement"(X), "Sensor Output"(Y)	[1*:20*] 1 < X < 10.5 , 1.17 < Y < 27.1	☑	Line + Sym
[Sensor03.dat]Sensor03! "Displacement"(X), "Sensor Output"(Y)	[1*:20*] 1 < X < 10.5 , 5.13 < Y < 47.89	☑	Line + Sym

- 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.

11.3 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.

The following methods of manipulating data plots in the graph window are fairly easy to use. Thus, you may want to choose **File: Open Template** and pick your template to create a blank graph window. Then, using the methods below you can add and group data plots in the graph.

11.3.1Changing 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 Properties** 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.

11.3.2 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**. This menu item allows you to change the assignment of X data to another data column in the same worksheet.
- **Change Y**. This menu item allows you to change the assignment of Y data to another data column in the same worksheet.
- **Change Worksheet**. This menu item allows you to replace both X and Y with data from another worksheet. The selected worksheet should have the same Short Names, the same Column Plot Designations and the same row index range as the current worksheet.

If you have a grouped data plot, then clicking once on any of the plots in the group will select the entire group. Click a second time to select a particular member of the group. The context menu options to change worksheet, X, or Y are available only when a single data plot is selected.

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: Symbol: 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 perform 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.

11.3.3 Adding, Removing and Hiding Data Plots

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

11.3.3.1 Adding Data with the Add Plot to Layer Menu Command

This is a simple method for adding a range of data to an existing **Line**, **Scatter**, **Line + Symbol**, **Column** or **Area** graph:

1. Highlight your worksheet data.
2. Go to the graph window where you want to add data. If there are multiple layers in the graph, press the layer icon to activate the desired layer.
3. From the menu, choose **Graph: Add Plot to Layer: *Graph Type***.

- You can use the **Graph: Add Error Bars...** menu item to add error bars, calculated from statistics such as standard deviation.
- Error data will be output beside the data column in the worksheet. This only works for the active plot. You can set the active plot from the **Data** menu. The active plot has a check mark beside it.

11.3.3.2 Adding Data by Drag and Drop

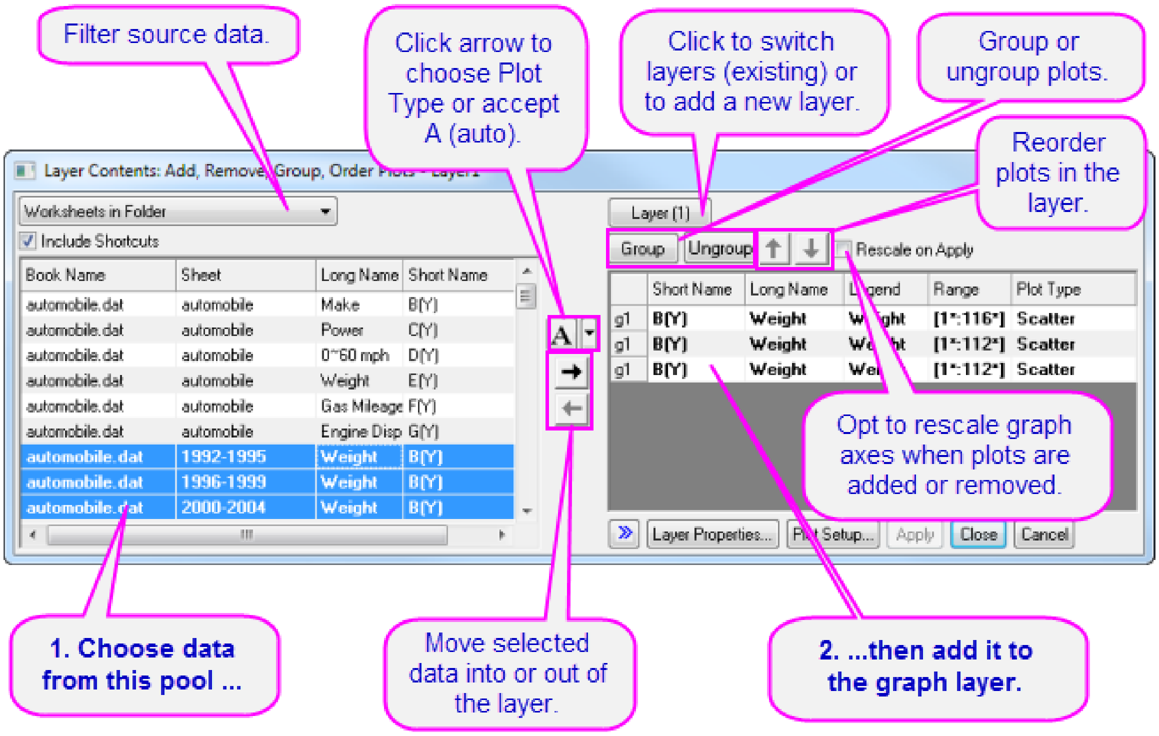
You can add data to a graph by drag and drop. When using this method, Origin relies on worksheet Column Plot Designations to create the plot.

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 **Tools: Options...** from the main menu. Go to the **Graph** tab and change the global **Drag and Drop** plot type.

11.3.3.3 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.



Book Name	Sheet	Long Name	Short Name
automobile.dat	automobile	Make	B(Y)
automobile.dat	automobile	Power	C(Y)
automobile.dat	automobile	0~60 mph	D(Y)
automobile.dat	automobile	Weight	E(Y)
automobile.dat	automobile	Gas Mileage	F(Y)
automobile.dat	automobile	Engine Disp	G(Y)
automobile.dat	1992-1995	Weight	B(Y)
automobile.dat	1996-1999	Weight	B(Y)
automobile.dat	2000-2004	Weight	B(Y)

	Short Name	Long Name	Legend	Range	Plot Type
g1	B(Y)	Weight	W ght	[1*:116*]	Scatter
g1	B(Y)	Weight	We ht	[1*:112*]	Scatter
g1	B(Y)	Weight	Wei	[1*:112*]	Scatter

Filter source data.

Click arrow to choose Plot Type or accept A (auto).

Click to switch layers (existing) or to add a new layer.

Group or ungroup plots.

Reorder plots in the layer.

Opt to rescale graph axes when plots are added or removed.

1. Choose data from this pool ...

Move selected data into or out of the layer.

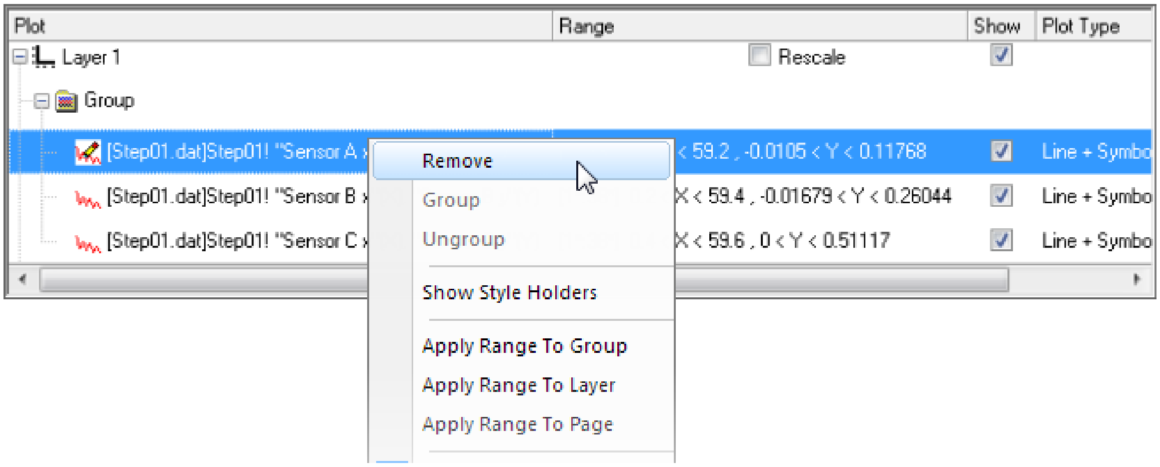
2. ...then add it to the graph layer.

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.

11.3.3.4 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.


Plot
Range
Show
Plot Type
Layer 1
☐ Rescale
☑
Group
[Step01.dat]Step01! "Sensor A
< 59.2 , -0.0105 < Y < 0.11768
☑
Line + Symbo
[Step01.dat]Step01! "Sensor B
X < 59.4 , -0.01679 < Y < 0.26044
☑
Line + Symbo
[Step01.dat]Step01! "Sensor C
X < 59.6 , 0 < Y < 0.51117
☑
Line + Symbo
Remove
Group
Ungroup
Show Style Holders
Apply Range To Group
Apply Range To Layer
Apply Range To Page

11.3.3.5 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.

11.3.3.6 Adding Data by Copying and Pasting a Plot

You can copy a plot from an existing graph window and paste it into the same or another window.

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

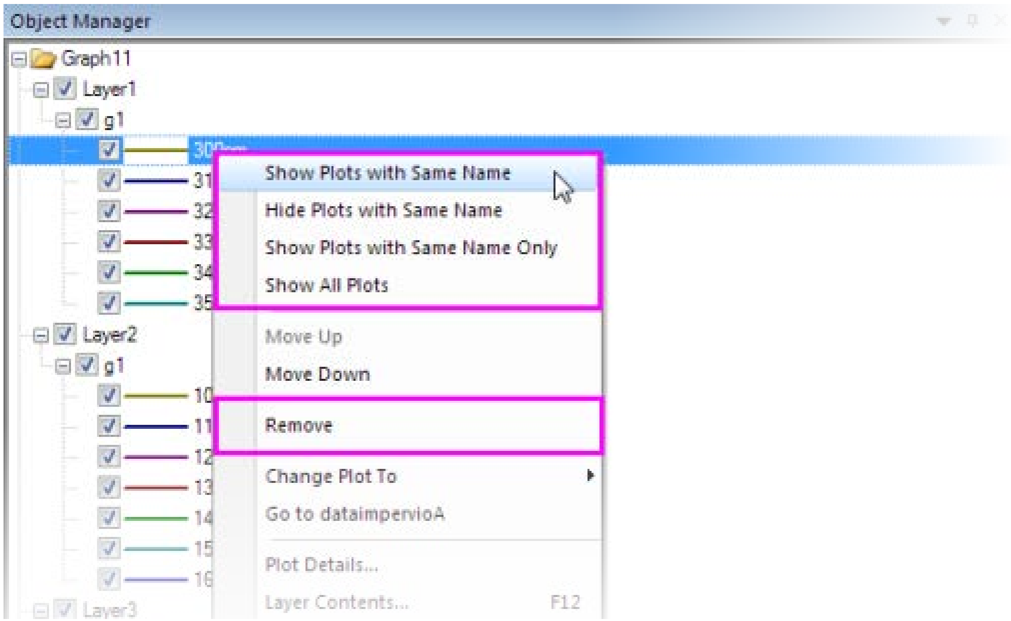
Simultaneously, a Clipb*N* worksheet is created. You can open this worksheet by double-clicking on the plot, then clicking the **Workbook** button at the bottom of Plot Details; or right-click on the plot in the graph window or in the Object Manager and choose **Create worksheet Clipb*N***.

You can also "paste" a copied plot to a worksheet cell. Select a cell and press CTRL+V to fill the column(s) with plot data.

11.3.3.7 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:

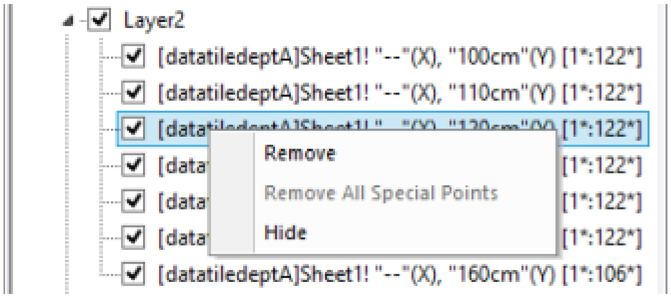

Object Manager
Graph11
Layer1
g1
Layer2
g1
Layer3
Show Plots with Same Name
Hide Plots with Same Name
Show Plots with Same Name Only
Show All Plots
Move Up
Move Down
Remove
Change Plot To
Go to dataimpervioA
Plot Details...
Layer Contents... F12

- To show or hide plots of the same Long Name.
- Show all plots.
- Remove a plot from the graph window (not the same as hiding).

- When you right-click on a plot, there is a **Remove** shortcut menu item. If the plot is part of a group, the entire group will be removed.
- When you right-click on a plot, you can use the **Hide Data Plot** and **Hide Others** shortcut menu items to quickly hide selected plots (restore plots by enabling their display in the **Object Manager** or in **Plot Details**).

11.3.3.8 Removing or Hiding Data with Plot Details

In the left panel of the Plot Details dialog box (**Format: Plot Properties**), 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.



☑ Layer2
☑ [datatiledeptA]Sheet1! "--"(X), "100cm"(Y) [1*:122*]
☑ [datatiledeptA]Sheet1! "--"(X), "110cm"(Y) [1*:122*]
☑ [data [1*:122*]
☑ [data [1*:122*]
☑ [data [1*:122*]
☑ [data [1*:122*]
☑ [datatiledeptA]Sheet1! "--"(X), "160cm"(Y) [1*:106*]

11.3.3.9 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. This action does not delete worksheet or matrix data. To restore the deleted plots, choose **Edit: Undo Remove Plot** from the main menu.

11.3.3.10 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.

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

11.3.4 Grouping 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**.

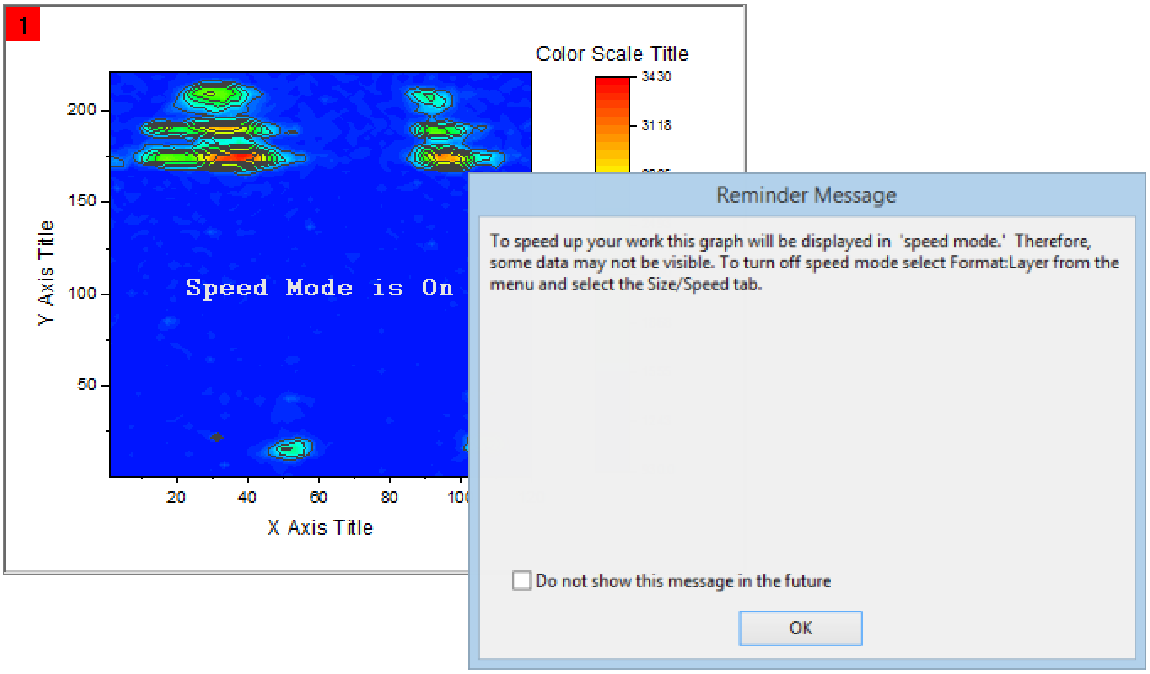
- ***Via the Plot Setup dialog box***

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.

11.3.5 Speed Mode

With **Speed Mode**, you can control the number of data points displayed in a graph layer. This option is most useful when working with large data sets. 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** watermark appears in the layer. The watermark is *not included when printing, copying, or exporting the graph*.



To speed up your work this graph will be displayed in 'speed mode.' Therefore, some data may not be visible. To turn off speed mode select Format:Layer from the menu and select the Size/Speed tab.

☐ Do not show this message in the future

To adjust Speed Mode settings:

1. With your graph active, select **Format: Layer Properties** from the Origin menu.
2. Select the **Size/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 a number of options for where your changes should apply (**Target**) as well as a range of Speed Mode settings from **Off** to **On - High**.

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** watermark:

1. Select **Tools: 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.

Notes on Speed Mode:

- The Speed Mode controls on the **Size/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.
- All 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 caution when using Speed Mode. Since Speed Mode systematically weeds out a portion of your data points, it should be kept in mind that 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.

11.4 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 graph page as an image file (raster or vector).
- Send Graphs to Powerpoint.
- Printout.
- Slideshow within Origin.
- Create Movies.

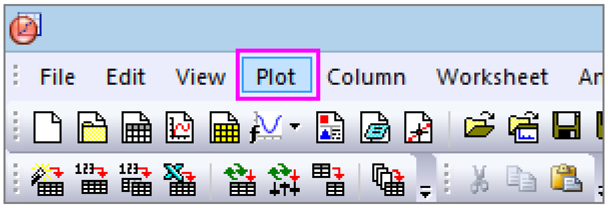
Please read details in the Publishing and Export chapter of this User Guide and the "Topics for Further Reading" there.

11.5 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: Origin Central**; or click on the Origin workspace to activate Origin and press **F11** on your keyboard.

The tables below list all Origin **2D** and **3D** graph types, grouped as they appear in the **Plot** menu:



- 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.

11.5.1 2D Graphs

Beginning with **Origin 2018b**, 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.

Plot Menu Group	Graph Types	Notes
Line	**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.

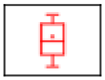
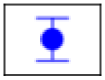
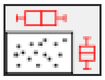
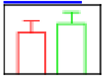
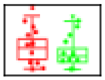
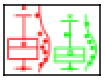
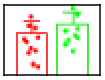
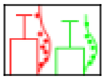
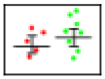
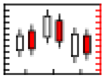
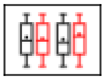
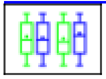
Plot Menu Group	Graph Types	Notes
Scatter	**Scatter** **Scatter Central** **Column Scatter** **Y Error** **XY Error** **Vertical Drop Line** **Bubble** **Color Mapped** **Bubble + Color Mapped** **Error Band**	• Start with a **Worksheet**. • If there is an associated X column, X column supplies X values; otherwise, Y sampling interval or row number is used. • For specific data requirements, follow links in the **Graph Types** column.

Plot Menu Group	Graph Types	Notes
Line + Symbol	Line + Symbol Line Series 2 Point Segment 3 Point Segment Spline Connected Row-wise	• 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. • For Row-wise plots, select two more more columns, plus optional error bar columns (xyyEr). • 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.
Function	New 2D Plot New 2D Parametric Plot	• Function plots are not created from physical data. • Once a function plot is created, you can obtain the derived dataset. • For more information on function plots, follow links in the **Graph Types** column.

Plot Menu Group	Graph Types	Notes
Bar	Column Column + Label **Bar** Stacked Column Stacked Bar 100% Stacked Column 100% Stacked Bar Floating Column Floating Bar Grouped Columns - Indexed Data	• 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, select two or more Y columns. • For Grouped Columns, an additional column supplies grouping info. • 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.
Pie	3D Color Pie Chart 2D B&W Pie Chart	• 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.

Plot Menu Group	Graph Types	Notes
Area	Area Stacked Area 100% Stacked Area Fill Area Fill 2 Colors	- 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.
Multi-Y	Double-Y 2Ys, Column-Line&Symbol Double-Y Column Graph 3Ys Y-Y-Y 3Ys Y-YY 4Ys Y-YYY 4Ys YY-YY Multiple Y Axes... Stacked Lines by Y Offsets Colormapped Line Series	- Start with a **Worksheet**. - Select two or more Y columns. - 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.

Plot Menu Group	Graph Types	Notes
Multi-Panel	Vertical 2 Panel Horizontal 2 Panel 4 Panel 9 Panel Stack... Multiple Panels by Label... Cluster Plot...	• 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 Cluster Plots, you should have at least two Y columns, one of which provides grouping information. • For specific data requirements, follow links in the **Graph Types** column.
Zoom	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.

Plot Menu Group	Graph Types	Notes
Box	 Box Chart  Interval Plot  Marginal Box Charts  Bar Chart  Box Overlap  Box Normal  Bar Overlap  Bar Normal  Scatter Interval  Double Y Box	• 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.
Grouped Box	 Grouped Box Charts - Indexed Data  Grouped Box Charts - Raw Data	• 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. • For more information, follow the link in the **Graph Types** column.

Plot Menu Group	Graph Types	Notes
Violin Plot	**Violin Plot** **Violin with Box** **Violin with Point** **Violin with Quartile** **Violin with Stick** **Split Plot** **Half Violin**	- 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.
Histogram	**Histogram** **Histogram + Probabilities** **Multi-Panel Histograms** **Marginal Histograms** **Distribution** **Histogram with Labels** **Stacked Histograms**	- 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.

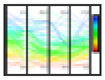
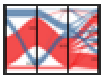
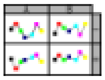
Plot Menu Group	Graph Types	Notes
2D Kernel Density	2D Kernel Density	- Start with a **Worksheet**. - Select at least one Y column or a range from at least one Y column. - For specific data requirements, follow the link in the **Graph Types** column.
Scatter Matrix	Scatter Matrix	- Start with a **Worksheet**. - Select two Y columns or a range from two Y columns. - For specific data requirements, follow the link in the **Graph Types** column.
Probability	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.
Pareto	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.

Plot Menu Group	Graph Types	Notes
QC (X-bar R) Chart	**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.
Contour	**Contour - Color Fill** **Contour B/W Lines + Labels** **Gray Scale Map** **Contour - Categorical Z**	- 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 **Graph Types** column.
Heatmap	**Heatmap** **Heatmap with Labels**	- Start with a **Virtual Matrix** or **Matrix**. - For specific data requirements, follow links in the **Graph Types** column.
Vector	**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.

Plot Menu Group	Graph Types	Notes
Ternary	Ternary Ternary, Line+Symbol Ternary, Line Ternary Contour Piper	- Start with a **Worksheet**. - For specific data requirements, follow links in the **Graph Types** column.
Stock	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.
Bridge Chart	**Bridge Chart** **Stacked Bridge Chart** **Stacked Total Bridge Chart** **Horiz-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 Charts.

Plot Menu Group	Graph Types	Notes
Profile	**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.
Smith Chart	**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.
Wind Rose	**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 specific data requirements, follow links in the **Graph Types** column.

Plot Menu Group	Graph Types	Notes
Radar	**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 and Spider Charts are created from the same basic Origin plot type. - For more information, see **Spider Charts**.
Polar	**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** **Polar Contour theta(X), r(Y)** **Polar Contour r(X), theta(Y)**	- Start with a **Worksheet** (Polar, Polar Contour) or **Matrix** (Polar Contour only). - For data requirements and other information on all polar graphs except polar contour graphs, see **Polar Graph**. - For data requirements and other information on polar contour graphs from XYZ 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**.

Plot Menu Group	Graph Types	Notes
Parallel Plot	 Parallel Plot  Parallel Sets Parallel Index	- 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. - 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 Plots". - For more information, follow links in the **Graph Types** column.
Trellis Plot	 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.

Plot Menu Group	Graph Types	Notes
Double Y Trellis Plot	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.

11.5.2 3D Graphs

Beginning with **Origin 2018b**, 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.

Plot Menu Group	Graph Types	Notes
Line + Symbol	3D Scatter 3D Scatter + Error Bar 3D Line 3D Trajectory	- Data requirements vary by plot type. See links in the **Graph Types** column.
Function	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.

Plot Menu Group	Graph Types	Notes
Vector	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.
Bar	3D Bar Graph 3D Stacked Bars Graph 3D 100% Stacked Bar Graph	- 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.
Surface	Color Fill Surface X Constant with Base Surface Y Constant with Base Surface Color Map Surface Color Map Surface with Projection Wire Frame Wire Surface	- Start with a **Worksheet** or **Matrix**. - For specific data requirements, follow links in the **Graph Types** column.

Plot Menu Group	Graph Types	Notes
Ternary	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	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.
Waterfall	Waterfall Waterfall: Y Color Mapping Waterfall: Z Color Mapping 3D Waterfall 3D Waterfall: Y Color Mapping 3D Waterfall: Z Color Mapping	• 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.

Plot Menu Group	Graph Types	Notes
Multi-Y	**XYY 3D 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 Ribbons	**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.

Plot Menu Group	Graph Types	Notes
Walls	**3D Wall Graph** **3D Stacked Wall Graph** **3D 100% Stacked Wall Graph**	• 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.

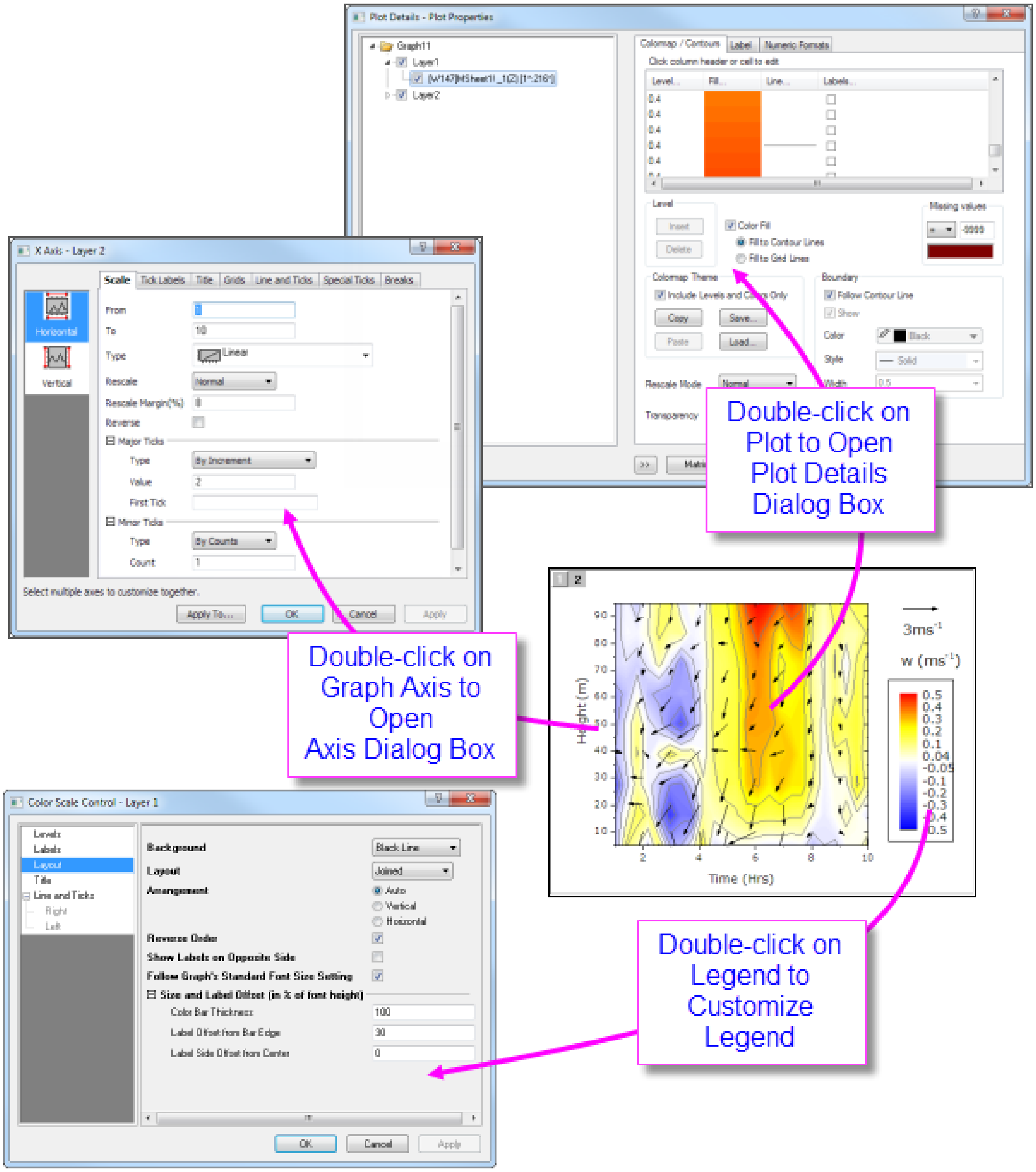
For an overview of Origin's 3D graph types and their source data requirements, see these topics:

- Creating 3D Graphs
- 3D and Contour Graphing
- Creating Contour Graphs
- Creating 3D and Contour Graphs from Virtual Matrix

11.6 Topics for Further Reading

- The Page-Layer-Plot Hierarchy
- Page Viewing Modes
- Graph Axes
- Creating Graphs from Graph Templates
- 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
- Plotting Mathematical Functions
- Appendix 2 - Complete Listing of Origin Graph Types

12 Customizing Graphs



Double-click on Plot to Open Plot Details Dialog Box

Double-click on Graph Axis to Open Axis Dialog Box

Double-click on Legend to Customize Legend

Plot Details - Plot Properties
X Axis - Layer 2
Color Scale Control - Layer 1
Height (m)
Time (Hrs)
3ms^{-1}
w (ms^{-1})

12.1 Introduction

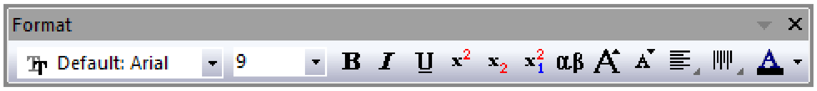
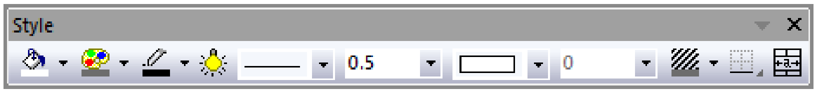
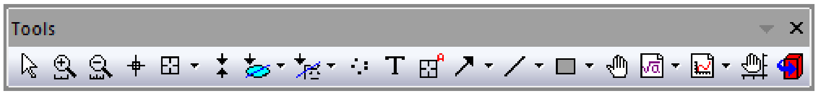
This chapter introduces you to various aspects of graph customization. All Origin graphs start from a graph template. If the graph you are making is fairly standard for its type, the options that were stored in the graph template may be entirely adequate to produce a polished-looking graph. The business of basic graph creation was covered in the last chapter, **Graphing**.

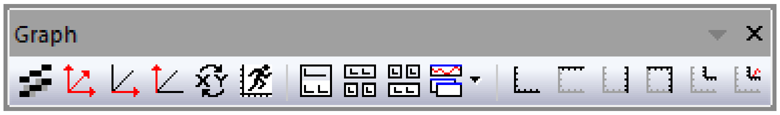
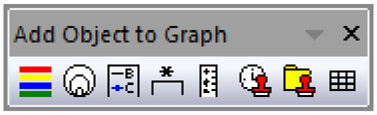
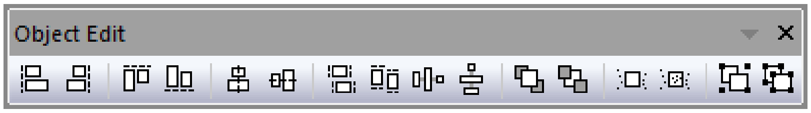
Sooner or later, however, you are going to want to add annotations, modify axis scales, or change plot colors. Hence, the purpose of this chapter is to introduce you to some key Origin graph customization tools and techniques, as well as to point you toward resources that will help you manage more complex 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.

12.2 Toolbars

Toolbar buttons useful for graph-customization tasks:

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, arrows, rectangles/circles/polygons.	

Description	Toolbar (default configuration)
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.	

12.3 Menus and Dialog Boxes

Many graph customizations are initiated via commands on the the **Graph** menu. Options for customization are explained in the sections below.

The following table lists key dialog boxes used for 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 Properties...** menu • **Format: Layer Properties...** menu • **Format: Plot Properties...** menu
Customize Axes	• **Axis Dialog**	• Double-click on axes or tick labels • **Format: Axes...** menu • **Format: Axis Tick Labels...** menu • **Format: Axis Titles...** menu
Add or Customize Legend	• (**Text Object -**) **Legend** dialog • **Update Legend** dialog • **Legends/Titles** tab at Page level of **Plot Details** dialog	• Ctrl + double-click on the legend object text • Right-click legend and choose **Legend: Update Legend** or choose **Graph: Legend: Update Legend...** • Double-click on the legend plot symbol
Merge multiple graph windows into one graph window	• **Merge Graphs** dialog	• **Graph: Merge Graph Windows...** menu

Task	Dialog Name	Method
Layer level customizations: resize, move, swap, align, or add layers	• **Layer Management** dialog	• **Graph: Layer Management...** menu
Save settings as graph template	• **Save Template As** dialog	• **File: Save Template As...** menu • Right-click graph window title and choose **Save Template As...**
Manage graph templates, add plots to a template	• **Template Library** (custom graph templates) • **System Templates** (built-in graph templates)	• **Plot > Templates: Template Library** menu • **Plot > Templates: System Template Library** menu
Save settings as graph Theme	• **Save Format as Theme** dialog	• Right-click and choose **Save Format as Theme...** context menu
Manage Graph Themes: edit, combine, apply Theme, set as System Theme	• **Theme Organizer** dialog	• **Tools: Theme Organizer..** > **Graph** tab. • F7 hotkey.

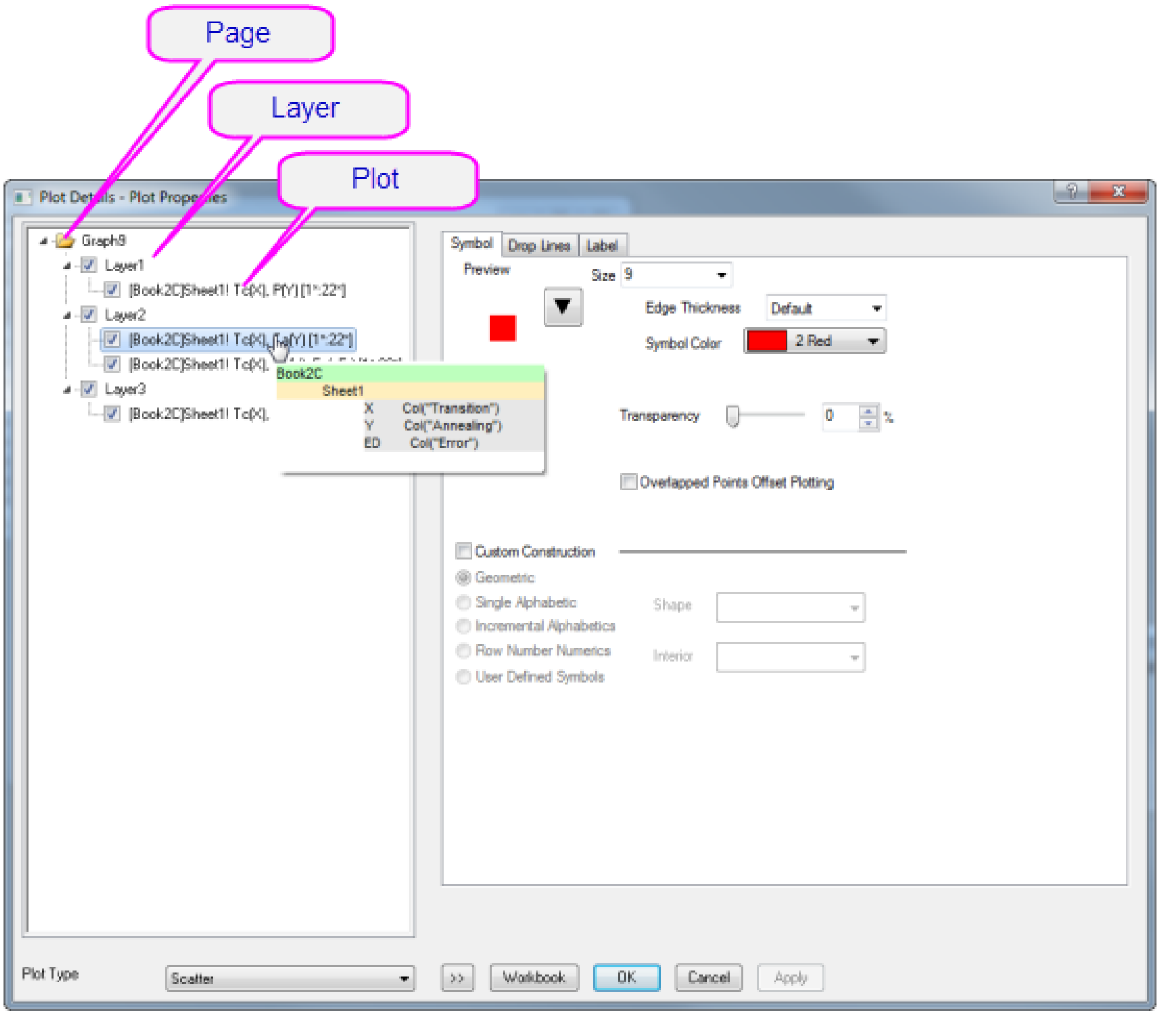
12.4 Customizing Page, Layer and Data Plots

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 and data plot levels.

Quick formatting of some graph properties can be done using toolbar buttons, as mentioned above. However, the vast majority of properties are customized via Origin's **Plot Details** dialog box. To open Plot Details, (1) double-click on your plot or (2) click the **Format** menu, then choose **Page Properties**, **Layer Properties** or **Plot Properties**.

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.



Graph9
- ☑ Layer1
  - ☑ [Book2C]Sheet1! Tc(X), P(Y) [1*:22*]
- ☑ Layer2
  - ☑ [Book2C]Sheet1! Tc(X), Ta(Y) [1*:22*]
  - ☑ [Book2C]Sheet1! Tc(X),
- ☑ Layer3
  - ☑ [Book2C]Sheet1! Tc(X),

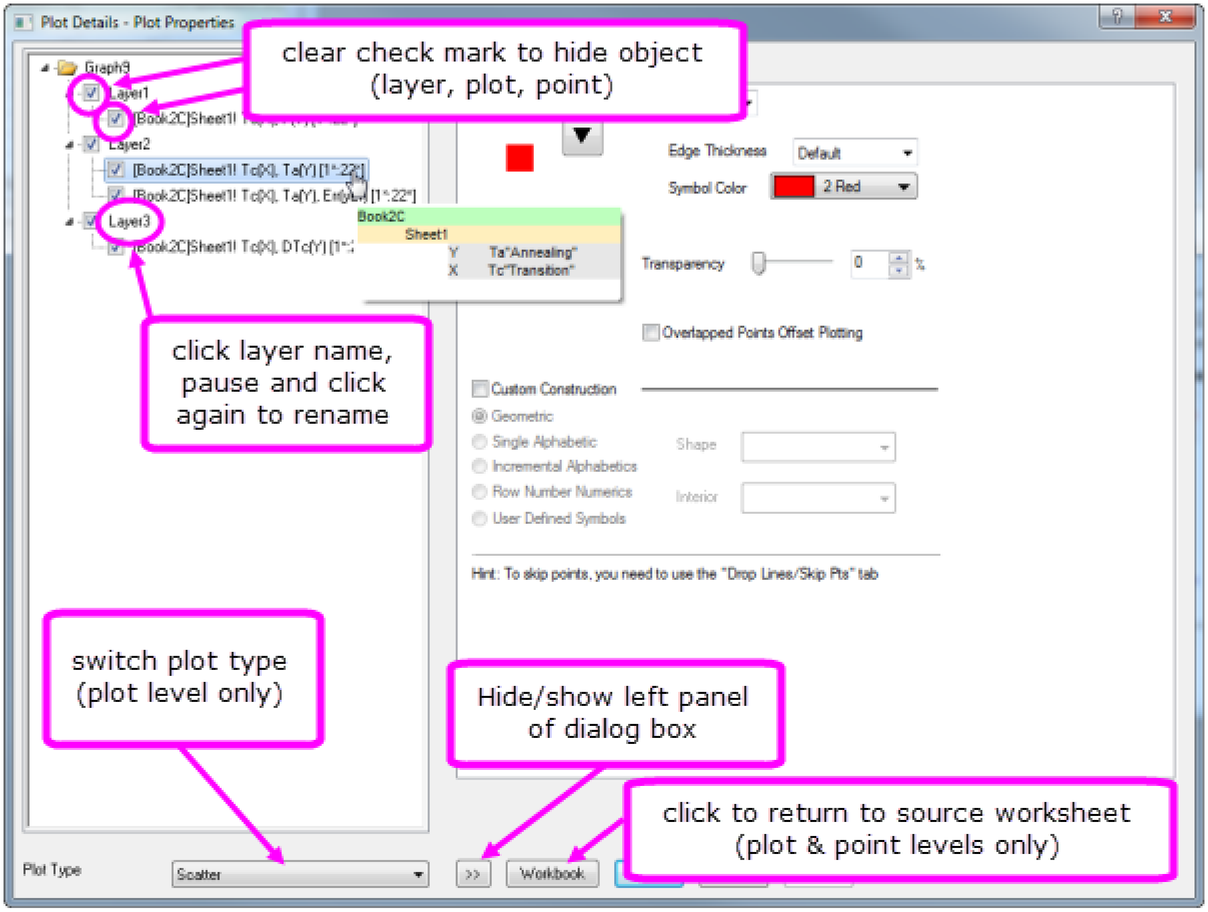
Book2C
Sheet1
X Col("Transition")
Y Col("Annealing")
ED Col("Error")

Size 9
Edge Thickness Default
Symbol Color 2 Red
Transparency 0 %
☐ Overlapped Points Offset Plotting
☐ Custom Construction
● Geometric
○ Single Alphabetic
○ Incremental Alphabetics
○ Row Number Numerics
○ User Defined Symbols
Shape
Interior
Plot Type Scatter

Selected Left Panel Object	Right Panel, Controls for...
Page	Print/Dimensions, layer drawing orders, page display color, legends/titles.
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.
Data Plot	Plot specific properties. The tabs and controls are pertinent to the plot type.
Data Point	Point specific properties. Available for some plot types. The tabs and controls are generally similar to those available at the Data Plot level.

You can UNDO customizations made in the **Plot Details** dialog box. Click OK to close Plot Details and choose **Edit: Undo Modify Page** or press CTRL + Z.

:



clear check mark to hide object (layer, plot, point)

click layer name, pause and click again to rename

switch plot type (plot level only)

Hide/show left panel of dialog box

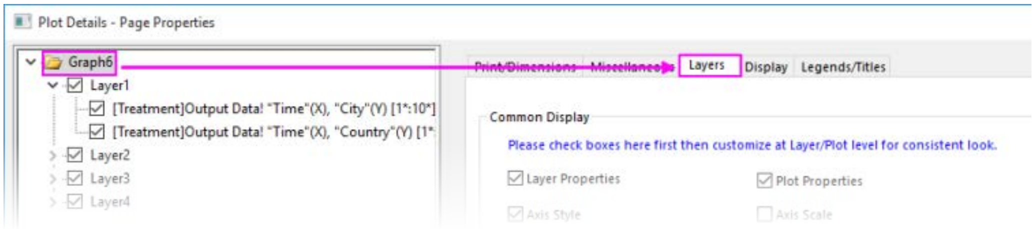
click to return to source worksheet (plot & point levels only)

Plot Details - Plot Properties
Graph9
Layer1
[Book2C]Sheet1!
Layer2
[Book2C]Sheet1! Tc(X), Ta(Y) [1*:22*]
[Book2C]Sheet1! Tc(X), Ta(Y), Err(yEr) [1*:22*]
Layer3
[Book2C]Sheet1! Tc(X), DTc(Y) [1*:
Book2C
Sheet1
Y Ta"Annealing"
X Tc"Transition"
Edge Thickness
Default
Symbol Color
2 Red
Transparency
0
%
Overlapped Points Offset Plotting
Custom Construction
Geometric
Single Alphabetic
Incremental Alphabetics
Row Number Numerics
User Defined Symbols
Shape
Interior
Plot Type
Scatter
>>
Workbook

Hint: To skip points, you need to use the "Drop Lines/Skip Pts" tab

Prevent text and label objects from scaling when resizing layer, by going to the **Display** tab of Plot Details (at the Layer level) and setting **Fixed Factor** to **1**.

Origin 2018b added a **Layer** tab at the **Page** Level in Plot Details. Use controls on this tab to customize a graph layer and contained plots, then apply those customizations to other layers and plots in the page. This is particularly useful for modifying the appearance of stack or panel graphs. Previously, for instance, if you wanted to customize a 9-panel graph you had to customize each panel individually. Now, you can apply multiple customizations to all plots, simultaneously. For more information, see **The (Plot Details) Layer Tab**.



Plot Details - Page Properties
Graph6
Layer1
[Treatment]Output Data! "Time"(X), "City"(Y) [1*:10*]
[Treatment]Output Data! "Time"(X), "Country"(Y) [1*
Layer2
Layer3
Layer4
Print/Dimensions
Miscellaneous
Layers
Display
Legends/Titles
Common Display

Please check boxes here first then customize at Layer/Plot level for consistent look.

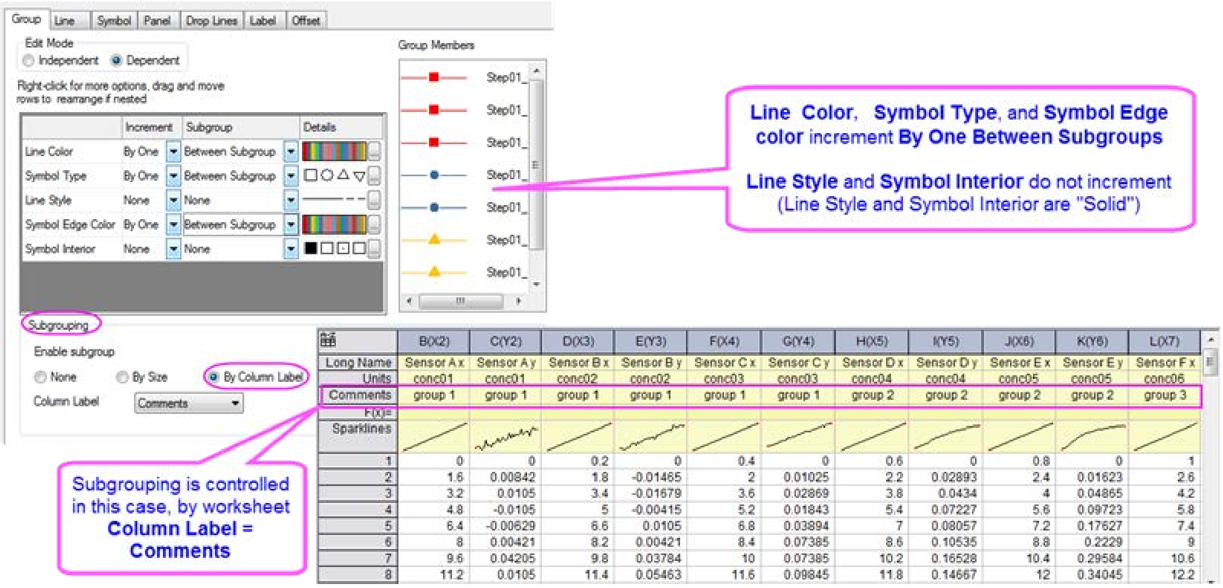
☑ Layer Properties
☑ Plot Properties
☑ Axis Style
☐ Axis Scale

12.4.1 Customizing Grouped Plots

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.).

Usually, some properties are configured to increment "by one" for each plot (e.g. line color) and some will be configured *not* to increment (e.g. line style), though this is ultimately controlled by the user. In any case, these 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.

:



Edit Mode
○ Independent ● Dependent

Right-click for more options, drag and move rows to rearrange if nested

	Increment	Subgroup	Details
Line Color	By One	Between Subgroup	
Symbol Type	By One	Between Subgroup	□ ○ △ ▽
Line Style	None	None	
Symbol Edge Color	By One	Between Subgroup	
Symbol Interior	None	None	■ □ ⊡ □

Enable subgroup
○ None ○ By Size ● By Column Label
Column Label: Comments

Line Color, **Symbol Type**, and **Symbol Edge color** increment **By One Between Subgroups**

Line Style and **Symbol Interior** do not increment (Line Style and Symbol Interior are "Solid")

Subgrouping is controlled in this case, by worksheet **Column Label = Comments**

	B(X2)	C(Y2)	D(X3)	E(Y3)	F(X4)	G(Y4)	H(X5)	I(Y5)	J(X6)	K(Y6)	L(X7)
Long Name	Sensor A x	Sensor A y	Sensor B x	Sensor B y	Sensor C x	Sensor C y	Sensor D x	Sensor D y	Sensor E x	Sensor E y	Sensor F x
Units	conc01	conc01	conc02	conc02	conc03	conc03	conc04	conc04	conc05	conc05	conc06
Comments	group 1	group 1	group 1	group 1	group 1	group 1	group 2	group 2	group 2	group 2	group 3
F(x)=											
Sparklines											
1	0	0	0.2	0	0.4	0	0.6	0	0.8	0	1
2	1.6	0.00842	1.8	-0.01465	2	0.01025	2.2	0.02893	2.4	0.01623	2.6
3	3.2	0.0105	3.4	-0.01679	3.6	0.02869	3.8	0.0434	4	0.04865	4.2
4	4.8	-0.0105	5	-0.00415	5.2	0.01843	5.4	0.07227	5.6	0.09723	5.8
5	6.4	-0.00629	6.6	0.0105	6.8	0.03894	7	0.08057	7.2	0.17627	7.4
6	8	0.00421	8.2	0.00421	8.4	0.07385	8.6	0.10535	8.8	0.2229	9
7	9.6	0.04205	9.8	0.03784	10	0.07385	10.2	0.16528	10.4	0.29584	10.6
8	11.2	0.0105	11.4	0.05463	11.6	0.09845	11.8	0.14667	12	0.34045	12.2

The above image shows the Plot Details **Group** tab settings for a line + symbol plot in the upper-left. The first column lists **Line Color**, **Symbol Type**, **Line Style Symbol Edge Color** and **Symbol Interior**. **Line Color**, **Symbol Type** and **Symbol Edge Color** are set to increment **By One Between Subgroups** (grouping occurs using the column **Long Name**), 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:

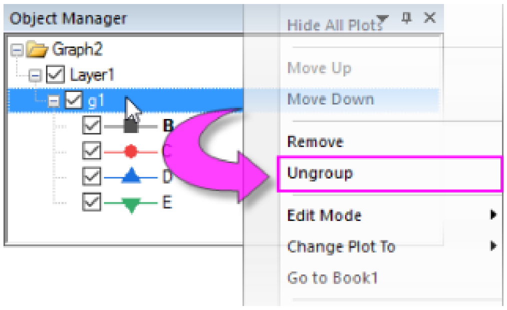
- To find out more about customizing of grouped and subgrouped plots, see The Plot Details Group Tab Controls.
- To find out more about saving graphs as templates, see Graph Template Basics.

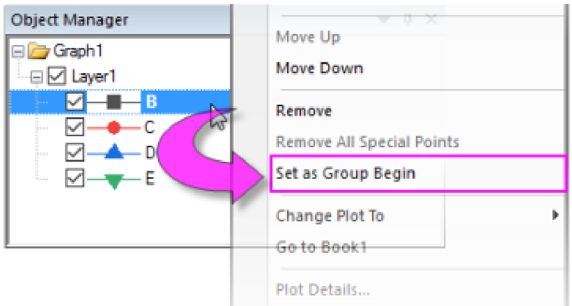
12.4.1.1 Using Object Manager with Grouped Plots

NEW

The **Object Manager**, docked by default to the right side of your Origin workspace, is a convenient tool for managing your grouped plots. While this feature has been part of Origin for some time, functionality has been greatly enhanced for **Origin 2019**.

- Use Object Manager 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**.


Object Manager
Hide All Plots
Graph2
Layer1
g1
B
C
D
E
Move Up
Move Down
Remove
Ungroup
Edit Mode
Change Plot To
Go to Book1


Object Manager
Graph1
Layer1
B
C
D
E
Move Up
Move Down
Remove
Remove All Special Points
Set as Group Begin
Change Plot To
Go to Book1
Plot Details...

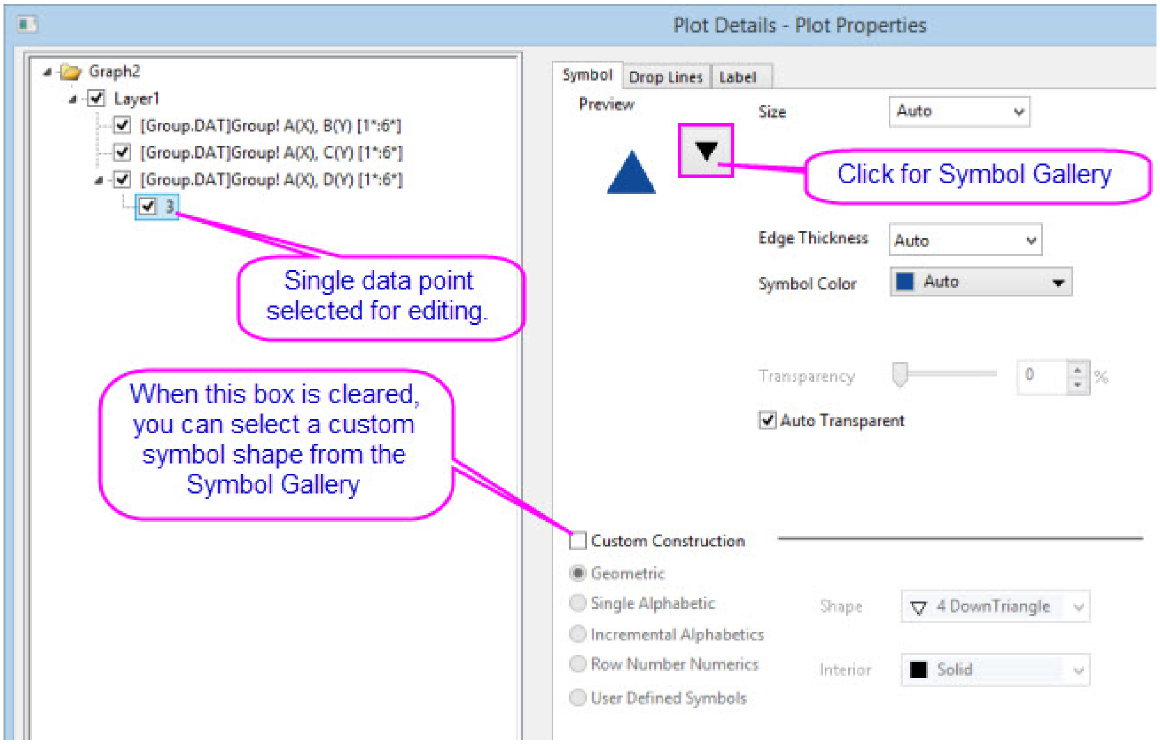
- To reorder plots in the layer, drag a plot icon within the group; or right-click on the plot (in Object Manager) and choose **Move Up** or **Move Down**.
- To remove a plot from the layer, right-click on the plot and choose **Remove** (does not delete data).
- To move a series of plots *out* of the group, right-click the last plot that you want to keep in the group and choose **Set as Group End**.
- To highlight a single plot in the graph window (grouped or ungrouped), click once on the plot in Object Manager; or click (*once* if ungrouped, *twice* if grouped) on the plot in the graph window. All other plots in the graph window are dimmed.
- 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**.

12.4.2 Customizing Individual Data Points

For some plot types such as scatter and column, you can modify the display properties of a single data point. This is another plot customization that happens via the **Plot Details** dialog box.

To edit a single point:

1. Press the CTRL key and double-click on the data point in the graph. This opens the Plot Details dialog box with the focus set to edit this data point. The data point will be identified in the left-panel of Plot Details by its row index number. # Use the controls on the tabs in the right panel to modify the appearance of the data point. Changes you make to the appearance of this point will not affect the appearance of other points in the same plot.


Plot Details - Plot Properties
Graph2
Layer1
[Group.DAT]Group! A(X), B(Y) [1*:6*]
[Group.DAT]Group! A(X), C(Y) [1*:6*]
[Group.DAT]Group! A(X), D(Y) [1*:6*]
3
Symbol
Drop Lines
Label
Preview

☑ [Group.DAT]Group! A(X), D(Y) [1*:6*] — ☑ 3

Single data point selected for editing.

When this box is cleared, you can select a custom symbol shape from the Symbol Gallery

Click for Symbol Gallery

Size: Auto

Edge Thickness: Auto

Symbol Color: Auto

Transparency: 0 %

☑ Auto Transparent

☐ Custom Construction

● Geometric

○ Single Alphabetic

○ Incremental Alphabetics

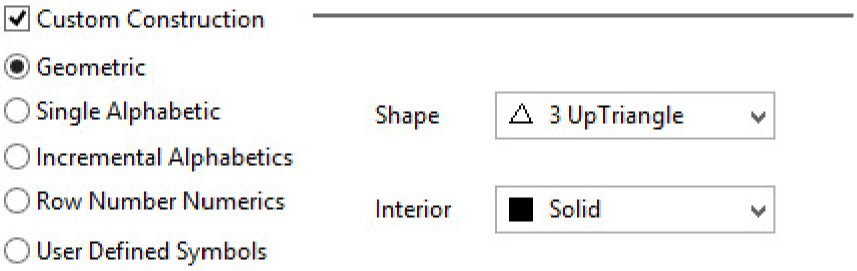
○ Row Number Numerics

○ User Defined Symbols

Shape: 4 DownTriangle

Interior: Solid

Alternately, when the **Custom Construction** box is checked, you can [use these controls to customize the symbol](#).



☑ Custom Construction

● Geometric

○ Single Alphabetic

○ Incremental Alphabetics

○ Row Number Numerics

○ User Defined Symbols

Shape: 3 UpTriangle

Interior: Solid

To remove customizations made to a single data point:

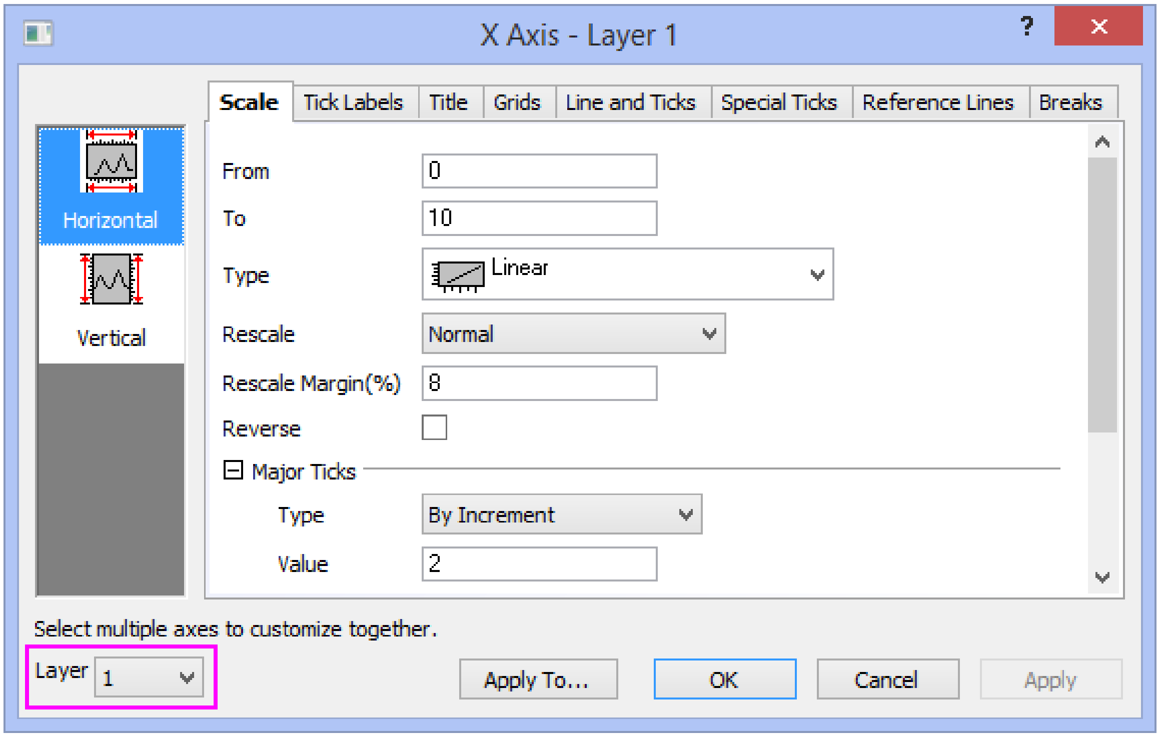
- Right-click the single point in the left panel of the Plot Details dialog and choose **Delete**.
- In the graph window, click on the single point to select it, then press DELETE on the keyboard.

The point properties revert to those of the containing dataset.

12.5 Customizing Graph Axes

Most graph axis customizations are made via the **Axis Dialog** box. Double-click on the graph axis or tick labels to open the **Axis Dialog - Layer *N*** dialog box.

This image shows the tab-based axis dialog used by most 2D and 3D graphs.


X Axis - Layer 1
Scale
Tick Labels
Title
Grids
Line and Ticks
Special Ticks
Reference Lines
Breaks
Horizontal
Vertical
Apply To...
OK
Cancel
Apply

From: 0
To: 10
Type: Linear
Rescale: Normal
Rescale Margin(%): 8
Reverse: ☐
⊟ Major Ticks
Type: By Increment
Value: 2

Select multiple axes to customize together.

Layer: 1

In earlier versions of Origin, you had to customize each layer's axes from separate Axis dialogs. Starting with Origin 2017, you can switch layers inside the **Axis** dialog using the **Layer** drop-down at the bottom of the dialog box.

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.

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. NEW Origin 2019 has greatly expanded support for custom tick label formats including percentages, fractions, pi, and geographic (Lat/Lon) formats.
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.

Tab	Controls for
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	Placement of reference lines and "recession bars" (shaded areas with transparency, that can be added on top of the data plot).
Breaks	Enable line breaks and configure each break.

Click the **Apply To...** button to apply the axis format settings of the currently selected axis to another axis.

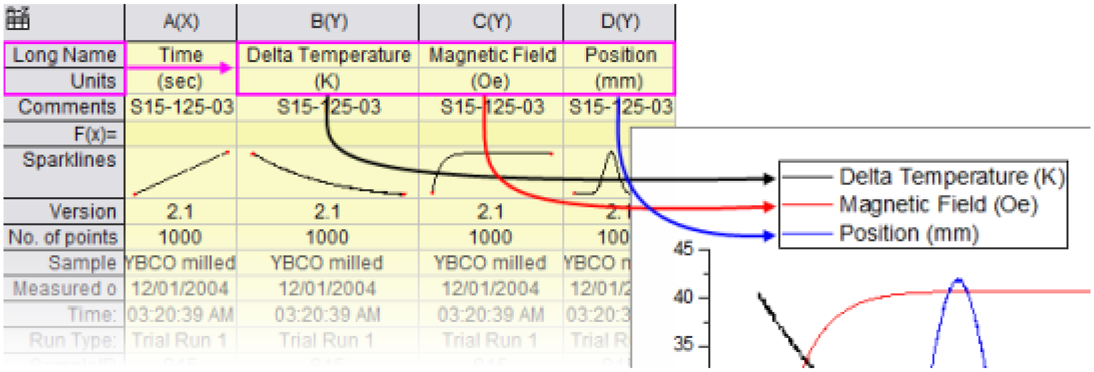
Note: For more information on axis customization and for axis controls for specialized graph types (e.g. polar, ternary, radar chart.etc), refer to:

Help: Origin: Origin Help > Graphing > Graph Axes

12.6 Graph Legends

12.6.1 How the Default Legend is Created

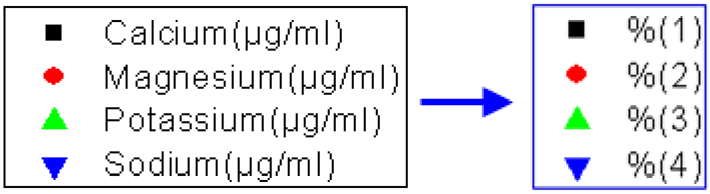
A graph legend is automatically created when you plot data. For 2D and some 3D graph templates, Origin creates a default legend that combines (A) **plot style information** stored with the graph template, with (B) **dataset information stored in the worksheet column label rows**, and places the resulting legend object on the graph page.



	A(X)	B(Y)	C(Y)	D(Y)
Long Name	Time	Delta Temperature	Magnetic Field	Position
Units	(sec)	(K)	(Oe)	(mm)
Comments	S15-125-03	S15-125-03	S15-125-03	S15-125-03
F(x)=				
Sparklines				
Version	2.1	2.1	2.1	2.
No. of points	1000	1000	1000	100
Sample	YBCO milled	YBCO milled	YBCO milled	YBCO m
Measured o	12/01/2004	12/01/2004	12/01/2004	12/01/2
Time:	03:20:39 AM	03:20:39 AM	03:20:39 AM	03:20:3
Run Type:	Trial Run 1	Trial Run 1	Trial Run 1	Trial R

The default legend object is created using LabTalk script. The reason for this is:

- The legend object is able to incorporate identifying information such as data that has been entered into the worksheet column headings (entered manually or automatically added on file import).
- The legend object is dynamically linked to the plotted data so that the legend can be updated when data are added or removed from the graph. The substitution notation becomes visible when you double-click inside of the legend object (as if to edit it).



The notation used for legend texts is controlled by [the **Translation mode of %(1), %(2)** list] in the **Legends/Titles** tab of the **Plot Details** dialog box (**Format: Page Properties...**). Custom formatting of the notation(s) is supported.

Origin 2019 adds support for wrapping of legend text. To make use of this, open the Plot Details Legends/Titles tab, set **Translation mode of %(1), %(2)** to **Custom**, then enter your custom legend notation with the characters **%(CRLF)** at the point where you want text to wrap.

12.6.2 Graph Editing Tips

- If you do not want a legend automatically added to your graph each time you create the graph, delete the legend object and save the graph template.
- Right-click the legend object for some useful controls such as **Reverse Order**, **Show Legend for Visible Plots Only**, and **Hide Legend for Fitted Curves**.
- Select the legend object; then press CTRL while dragging a selection handle to change the layout of the legend (e.g. drag horizontally to create a legend that is all on one line).
- Ctrl + double-click on the legend text to enter in-place edit mode (for overwriting legend text).
- Double-click the legend text to open the **Legend** dialog box.
- Double-click a legend symbol to open the **Plot Details** dialog box with corresponding plot selected.

12.7 Customizing Legends

There are a number of reasons for modifying the default graph legend. We suggest that you look at this topic to see what sort of customizations are supported.

For the standard data plot legend used with most 2D plots (line, line+symbol, bar/column, pie, etc.), customizations are done using the (Text Object) Legend dialog box. To open the Legend dialog box, double-click on the legend text. This dialog gives the best access for line-by-line customization of the data plot legend. Note that there is a separate dialog box for customization of color scales.

- Ctrl + double-click on the legend text or right-click and choose **Properties....**. The Legend dialog includes controls for customizing legend text and symbols, legend object frame and background, and associating LabTalk scripts with the legend object.
- Double-click on the legend symbol or right-click on the graph legend and choose **Plot Details**. Modify the size, color, line width and data plot symbols associated with each plot.
- Click on the legend border (if shown) to view border line controls for adjusting padding between the legend entry (symbol + text) and the legend border.

12.7.1 Adding and Updating the Default Legend

The table below lists tasks associated with adding, updating and reconstructing the default legend, and where to find controls for each. Before proceeding, you should know the difference between **updating** a legend and **reconstructing** a legend:

- **Updating** will preserve any previous customizations, including size and position adjustments and legend symbol and text customizations.
- **Reconstructing** will overwrite previous customizations, defaulting to legend settings stored in the graph template.
- 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. For more information, see Legend Update Mode.

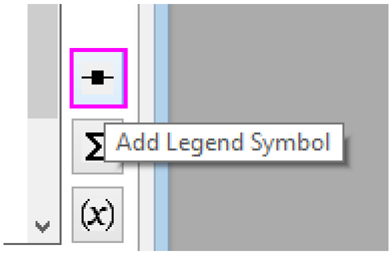
Task	Method (graph is active)
Add or reconstruct legend	• **Graph: Legend: Reconstruct Legend** menu. • **Reconstruct Legend** button (**Add Object to Graph** toolbar). • CTRL+L. **Note:** Customizations made to an existing legend will be lost when you use these commands.
Update legend	Open the **legendupdate** dialog box: • **Graph: Legend: Update Legend** menu. • Right-click on legend and select **Legend: Update Legend**.

Task	Method (graph is active)
Advanced legend customizations	Right-clicking the legend object provides several advanced options to customize the graph legend. Applies primarily to: • Categorical data plots. • Box charts. • Legends constructed point-by-point.
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**. • **Graph: New Color Scale** menu. • For multiple color-mapped plots with different color scale in one graph, click on each plot to select it and add corresponding color scale.
Control color scale	Available when a color scale object is 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 **Graph: New 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.

Task	Method (graph is active)
Control bubble scale	Available when bubble scale object is 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 offer options for incorporating metadata properties such as the **Long Name**, **Comment**, **User Parameters**, etc., in the graph legend. For information on constructing legend text from metadata, see Legend Substitution Notation.

Origin 2018 added an interface tool to manually **Add Legend Symbols** to the graph legend. Right-click on the legend object and choose **Properties**. Click the **Add Legend Symbol** button in the lower-right corner of the dialog box.



Note: For more information on creating and customizing graph legends, see:

Help: Origin: Origin Help > Graphing > **Graph Legends and Color Scales**

12.7.2 Controlling Legend Update

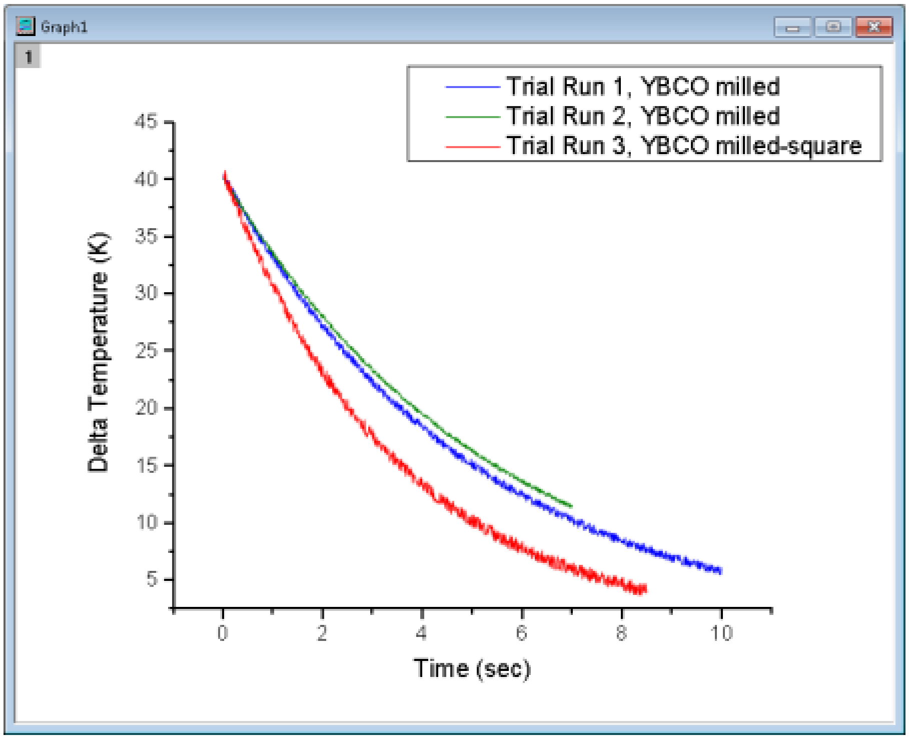
When a data plot is added or removed from a graph layer, the default behavior is to update the legend. The **Legend/Titles** tab at the graph page level in the **Plot Details** provides a Legend Update Mode drop-down to control this behavior.

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.


Graph1
1
Trial Run 1, YBCO milled
Trial Run 2, YBCO milled
Trial Run 3, YBCO milled-square
Delta Temperature (K)
45
40
35
30
25
20
15
10
5
0
2
4
6
8
10
Time (sec)

12.7.3 Special Legend Types

Origin also has several special legends used with certain graph types. These legends can be customized and updated similarly to the default legend object.

Legend Type	Menu Access	Used When..
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 symbol style is controlled by data indexing, or 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.

12.8 Annotating Your Graph

Origin 2018 added Unicode (UTF-8) support.

Annotating a graph can be as simple as adding a static text object and formatting it with **Format** toolbar tools. Or you might add a more complex object that is linked to some LabTalk script that is executed whenever some user-specified event occurs (e.g. object is moved, window is activated, graph axes are rescaled, etc.).

Task	Method
Label Data Points	• Choose **Format: Plot Properties**, then click the **Label** tab and select **Enable** (not available for all plot types). • To annotate individual points, see "Annotate a Data Point", below.

Task	Method
Add Text Objects	- Click the **Text Tool** T button, then click on graph to place object. - Right click on the graph and choose **Add Text** from the shortcut menu. - Double click on text to do rich text editing.
Add Layer Title	- Right-click on graph and choose **Add/Modify Layer Title** from the shortcut menu to add/modify layer title in active layer.
Add Vertical/Horizontal Line	- With 2D graph active, use the **Graph: Add Straight Line...** menu item.
Annotate a Data Point	- 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, Freehand Draw. - Rectangle, Circle, Polygon, Region.
Insert Equation, Word Object, Excel Object, Other OLE Object	- Insert Equation group on the **Tools** toolbar.
Insert Image	- Right click on the graph and choose **Insert Images From Files**.

Task	Method
Add Table	• Click the **New Link Table** button on the **Add Object to Graph** toolbar and then click on the graph. • Right click on the graph and choose **New Table** from the context menu. • Double click the table object to edit and customize the table.
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. Manually adjust the size and placement of brackets by dragging handles on the object.
Add XY Scale	This is useful when using a nonlinear xy scale. • **New XY Scale** button and click on a graph layer. • Right click on a graph layer and choose **New XY Scale** from the shortcut menu.

12.8.1 Tips for Editing Your Graph Annotations

- Pressing CTRL when drawing with the **Rectangle** or **Circle** tools, will draw a square or circle (as opposed to a rectangle or ellipse).
- Right-click an object and choose **Properties...** to edit the properties of the text or drawing object and set the default.
- Use the **Format** and **Style** toolbar buttons to quickly modify some plot elements including plot colors and axis title font face or size.
- For text objects, including the axis titles, 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.

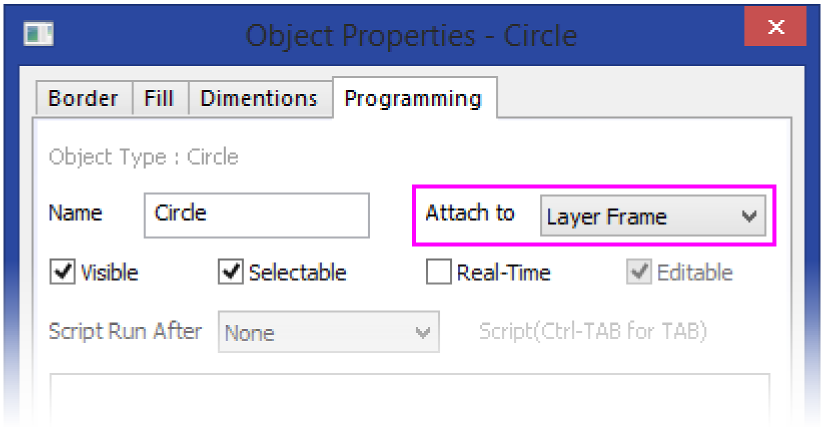
- Do NOT set font size while in "In-place Edit Mode" unless you need to mix font sizes. The correct way to change font size is to click the text object once so that the green selection handles appear, then select font size from the **Format** toolbar. If you set while in In-place Edit mode, Origin will 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 the contents 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** from the shortcut menu. Pasted data is static; Paste Linked data is dynamic and will change if the linked cell data changes.
- Also, when in In-place Edit mode, you can right click and choose **Insert Info. Variable...** to insert information related to plotted data, 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.
- You can use controls on the Programming tab to associate 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. The table object is editable.

12.8.2 Object Attachment and Scaling

When you add a text or drawing object to an Origin graph window, the object becomes part of the active graph layer. This is important because if you resize or delete that graph layer, you could resize or delete the object.

To view or change a text or drawing object's attachment method:

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.



Object Properties - Circle

Object Type : Circle

Name: Circle

Attach to: Layer Frame

☑ Visible ☑ Selectable ☐ Real-Time ☑ Editable

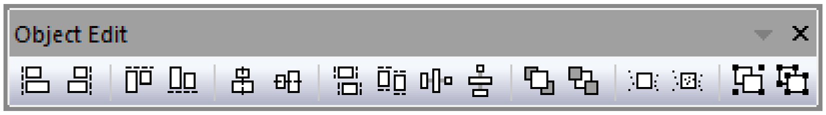
Script Run After: None

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, resize and move with the layer frame, but are not tied to axis scales and, thus, are unaffected 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.

Note: Each object has a default object attachment method that determines how an object behaves when graph layers are resized. For more information on object attachment methods, see Default Object Attachment Methods.

12.8.3 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 text labels and drawn objects using the tools on the 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:

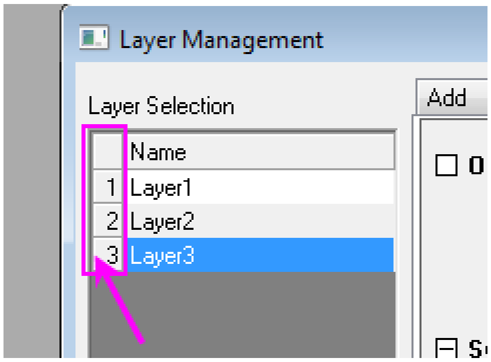
Help: Origin: Origin Help > Graphing > **Adding Text and Drawing Objects**

You can also use **Object Edit Toolbar** manipulate graph layers. Selected graph layers respond just like text or drawing objects. Use it to align and set a uniform size for multiple graph layers or to swap layer order.

12.9 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 multi-panel graphs and trimming white space.
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.

Task	Method
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, **Extracted Layers** is set to **1:0**, which specifies that all layers be extracted. To act only on certain layers, clear **Auto** and use the **layextract** X-Function's comma/colon notation to point to specific layers. 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.
Add, arrange, resize, position, swap, align, or link layers	**Graph: Layer Management...** menu. **Hint:** to physically swap inplane positions for layers (don't reassign layer number), use the Layer Management tool's **Swap** control (**Graph: Layer Management**,**Size / Position** tab).
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.

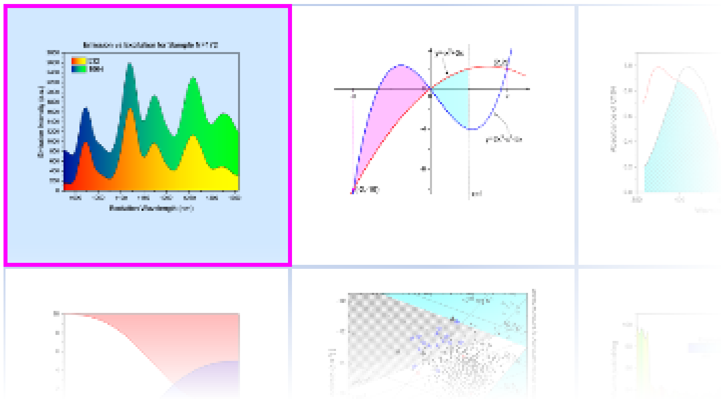
Task	Method
Reorder layers	There are several ways to reorder graph layers (reassign Layer number for each Layer). Learn more about reassigning layer numbers in the **mini tutorial** below this table. - **Method 1**: Open the **Layer Management** dialog and click the row header (shown in image below) and drag it up or down to change the Layer order.  Layer Management Layer Selection Name 1 Layer1 2 Layer2 3 Layer3 Add 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, you can right-click on the graph layer icon and change layer order using shortcut menu commands. **Note:** Reordering layers may break layer linking relationships.
Exchange X-Y Axes	- **Graph: Exchange X-Y Axes** menu command - **Exchange Axes** button on the **Graph** toolbar.

Task	Method
Move a plot(s) to another layer	• **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 `laymplot -d;` (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. You can move a plot by Copying(**CTRL+C** or **Copy Range** context menu) and Pasting(**CTRL+V** or **Paste** context menu) operations, between different layers or different graphs. Please note, the pasted plot won't be associated with the source data of copied plot, but exists as a loose dataset.

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.

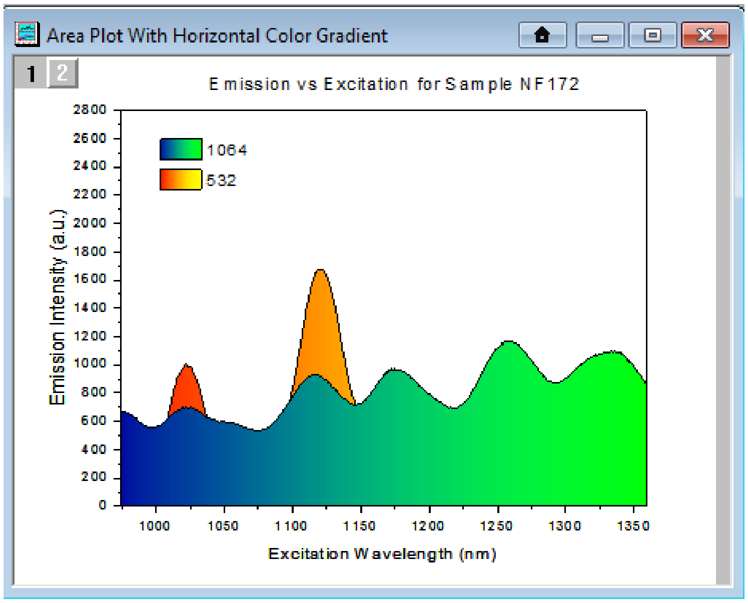
This mini tutorial shows you how layer reassignment works. Use the preview window to see how layer number reassignment affects your graph.

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:

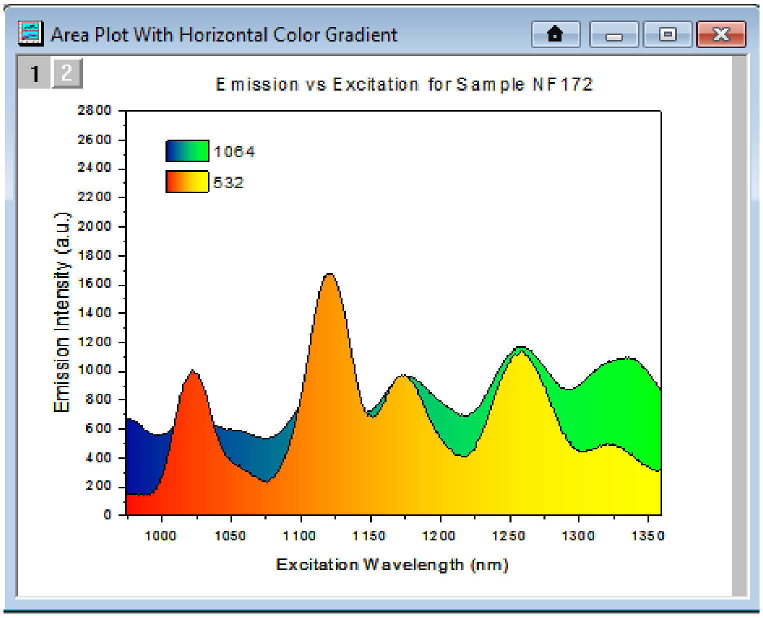


3. Activate the graph **Area Plot With Horizontal Color Gradient**, then click the **Extract to Layers** button on the **Graph** toolbar. Set both number of rows and columns to 1, click OK, then, click OK again for the page spacing. The green layer is on the top of the yellow layer in the figure. The 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.


Area Plot With Horizontal Color Gradient
1
2
Emission vs Excitation for Sample NF172
1064
532
Emission Intensity (a.u.)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
1000
1050
1100
1150
1200
1250
1300
1350
Excitation Wavelength (nm)

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.


Area Plot With Horizontal Color Gradient
1
2
Emission vs Excitation for Sample NF172
1064
532
Emission Intensity (a.u.)
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
1000
1050
1100
1150
1200
1250
1300
1350
Excitation Wavelength (nm)

Alternate Method: Beginning with Origin 2017, 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. Just as with the previous method by dragging row header in **Layer Management**, 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 **Graph: 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 > Adding and Arranging Layers

Help: Origin : Origin Help > Graphing > Reference > The Merge Graph Dialog Box

12.10 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

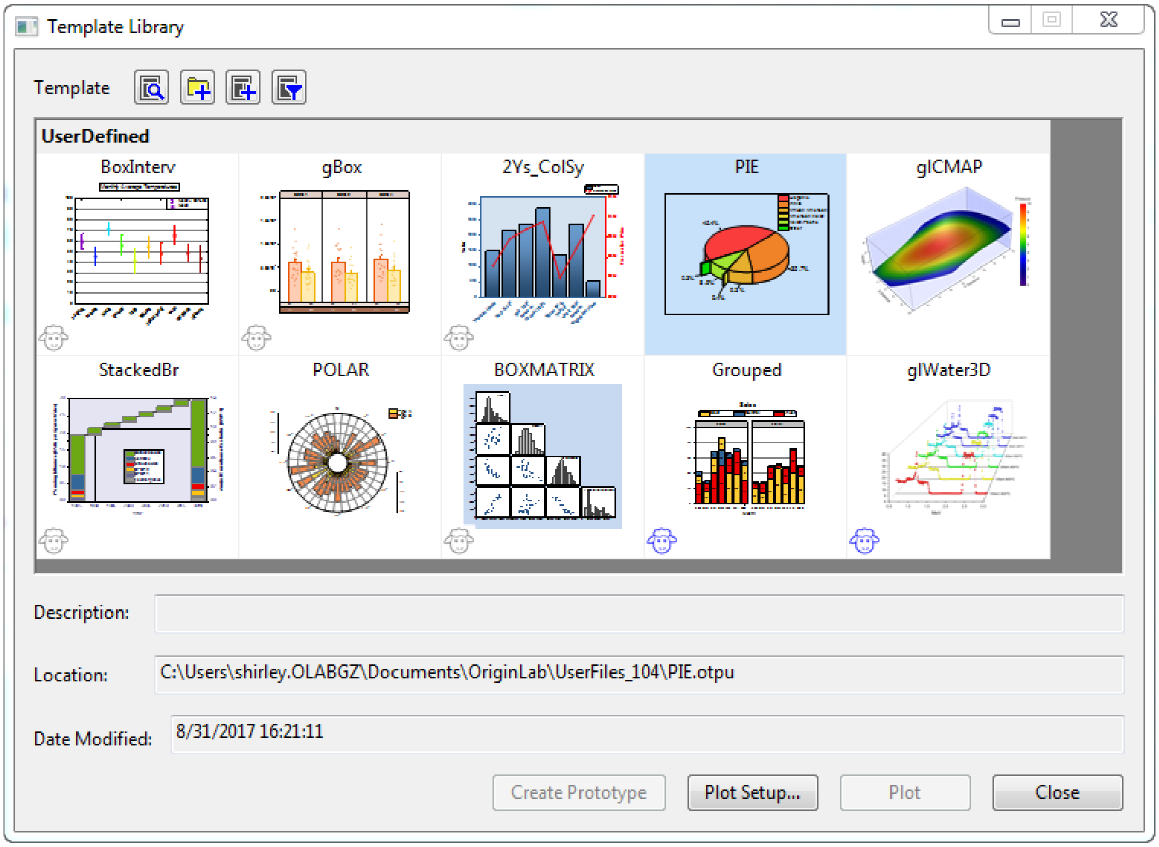
12.10.1 Templates

Customizations to your graph can be saved to template files for repeat use. For example, you can customize a graph page to add multiple layers, set relationships between layers, modify data plot properties, and then save all of these attributes as a graph template (.otpu) file. You can further specify that the graph template be "cloneable" allowing you to link these graph customizations to dataset Long Name, Short Name or worksheet column index number and quickly re-create your graph with new data.

A few things to note:

- By default, new, blank 2D graphs are created from the ORIGIN.otpu template. Other graph windows use different templates, saved with a set of customizations pertinent to a specific template.

- Origin ships with over 100 built-in graph templates. These "system" templates are installed to the Origin software folder. These templates are customizable but you cannot overwrite the template files in your software folder (*see next*).
- You can customize and save a system template to the same file name, in your User Files Folder. If the system template was the default template associated with a menu command or toolbar button (e.g. ORIGIN.otpu and the New Graph toolbar button), the customized template becomes the new default template associated with the command or button.
- To view system or custom graph templates, click **Plot** (workbook or matrix should be active) and under **Templates**, choose **User** or **System Templates**.
- You can save a graph template anywhere and with any name that you like -- it does not need to be saved with the name of a system template. However, by saving your templates to your User Files Folder, they will be collected in one, easily-remembered place and from there, they can easily be transferred to your new User Files Folder when you upgrade your Origin software.


Template Library
Template
UserDefined
BoxInterv
gBox
2Ys_ColSy
PIE
glCMAP
StackedBr
POLAR
BOXMATRIX
Grouped
glWater3D
Create Prototype
Plot Setup...
Plot
Close

Description:

Location: C:\Users\shirley.OLABGZ\Documents\OriginLab\UserFiles_104\PIE.otpu

Date Modified: 8/31/2017 16:21:11

- 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.

12.10.2 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 (e.g. a Theme could be as simple as axis major and minor tick direction settings, a colormap for a plot, or a combination of page dimensions, layer background, axis scales, color palettes used in a plot, etc.).

Themes allow you to quickly change one or more object properties in an existing graph; or to apply a consistent set of properties for all graph windows. For example, you might apply a black-and-white Theme to one of your color graphs in order to prepare it for journal publication; or you could change the font in all of your graph windows to Times New Roman.

The properties that can be saved as a Theme differ depending upon the selected object. At a basic level, it works like this:

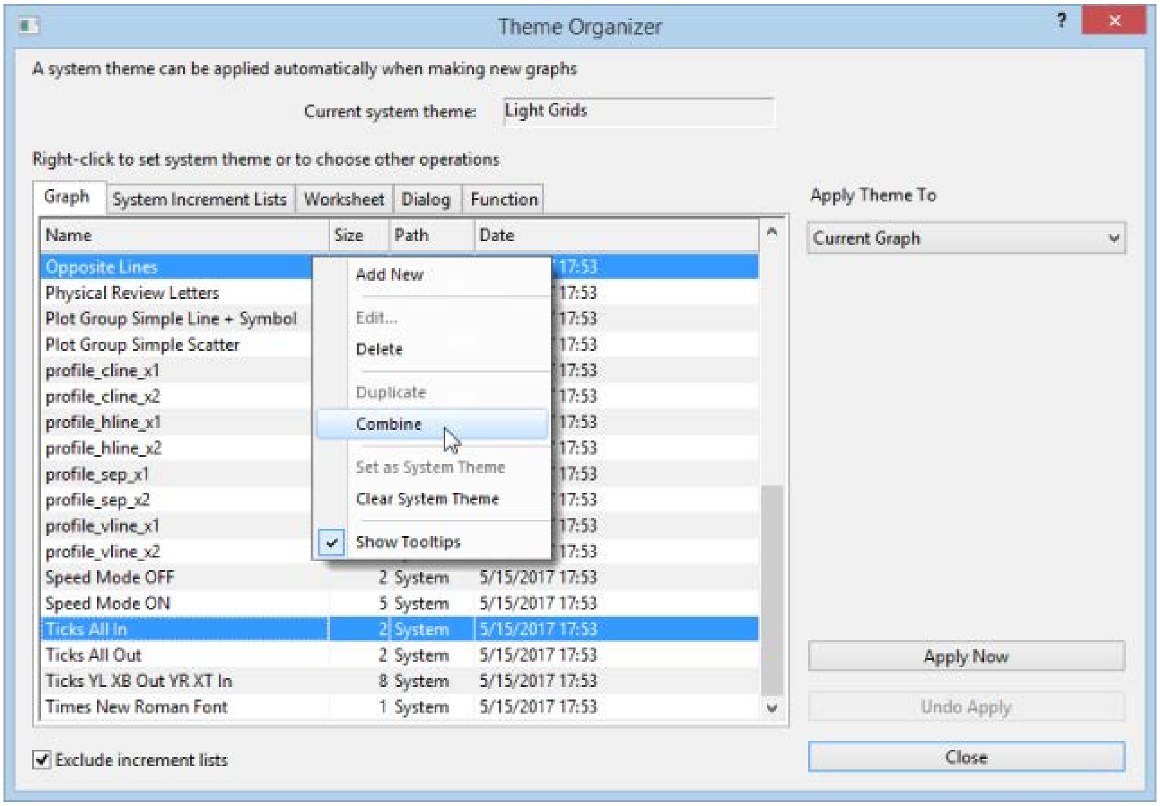
1. Right-click on an object in a graph window, e.g. a plot and choose **Copy Format**. Depending on what you click on, there may be sub-menu items under the **Copy Format** shortcut menu, which give you the option as to what exact format to copy.
   - To apply the copied formats to a single graph, right-click 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 graph should be applied to your target graph.
   - 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. You can do the above on-the-fly copy and paste format or you can choose the **Save Format As a Theme...** shortcut menu item instead of **Copy Format**, then use **Tools: Theme Organizer** to apply the Theme in the future.

12.10.2.1 Theme Organizer

Use the **Theme Organizer** (**Tools: 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.


Theme Organizer
Graph
System Increment Lists
Worksheet
Dialog
Function
Add New
Edit...
Delete
Duplicate
Combine
Set as System Theme
Clear System Theme
Show Tooltips
Apply Now
Undo Apply
Close

A system theme can be applied automatically when making new graphs

Current system theme: Light Grids

Right-click to set system theme or to choose other operations

Apply Theme To: Current Graph

Name	Size	Path	Date
Opposite Lines			17:53
Physical Review Letters			17:53
Plot Group Simple Line + Symbol			17:53
Plot Group Simple Scatter			17:53
profile_cline_x1			17:53
profile_cline_x2			17:53
profile_hline_x1			17:53
profile_hline_x2			17:53
profile_sep_x1			17:53
profile_sep_x2			17:53
profile_vline_x1			17:53
profile_vline_x2			17:53
Speed Mode OFF	2	System	5/15/2017 17:53
Speed Mode ON	5	System	5/15/2017 17:53
Ticks All In	2	System	5/15/2017 17:53
Ticks All Out	2	System	5/15/2017 17:53
Ticks YL XB Out YR XT In	8	System	5/15/2017 17:53
Times New Roman Font	1	System	5/15/2017 17:53

☑ Exclude increment lists

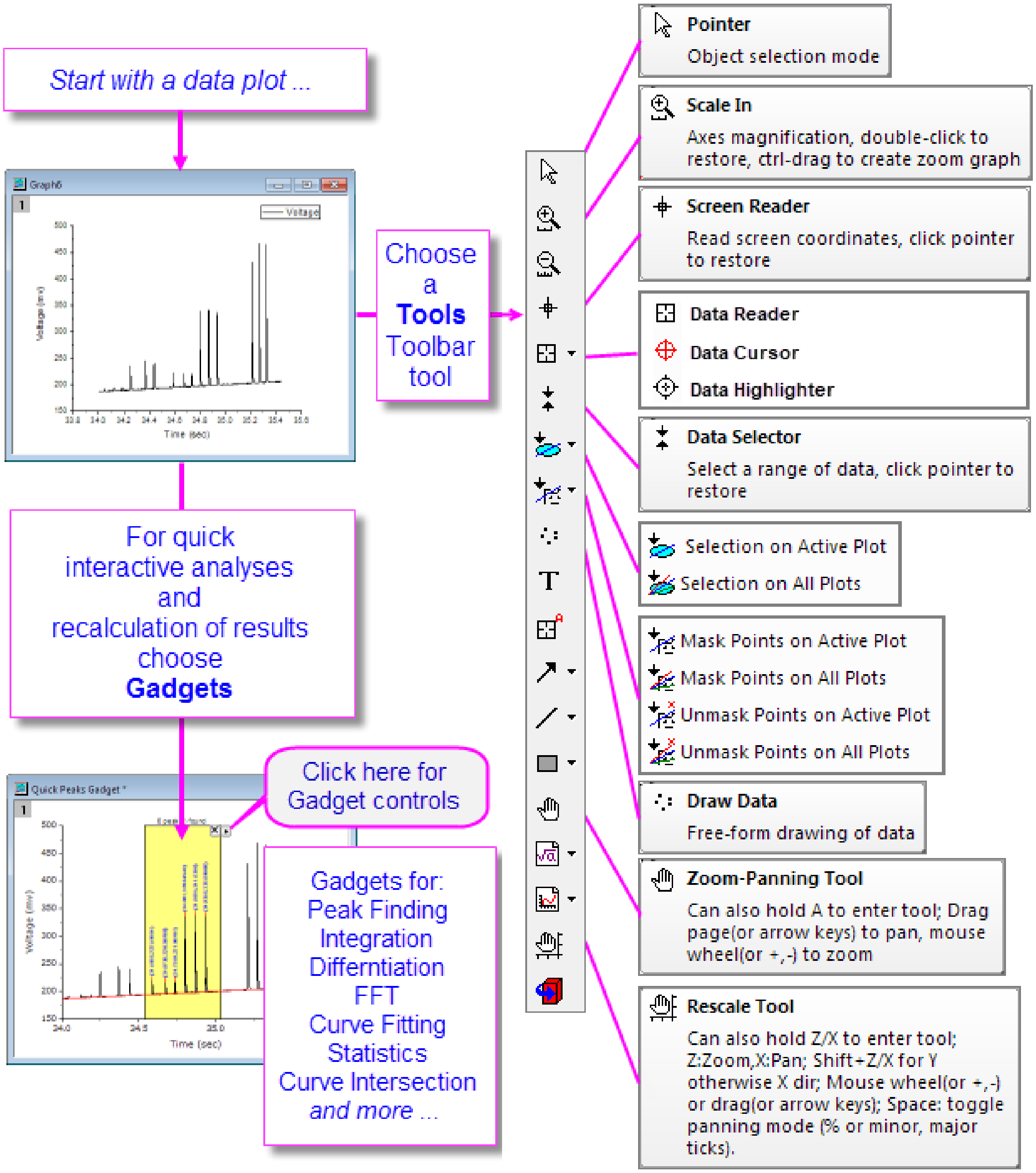
- If you right-click on a graph Theme and save it as your System Theme in the **Theme Organizer**, then each time you plot a new graph, the System Theme will be applied regardless of the settings that were saved with the graph template.
- If you don't want a System Theme to be applied automatically to the graph, choose **File: Save Template As** and make sure the **Apply System Theme to Override** check box is cleared.
- You can load a graph Theme in the **Export Graph** dialog and the Theme will be applied to the exported image file.

12.11 Topics for Further Reading

- Customizing Graph Page Elements
- Customizing Graph Layer Elements
- Customizing Plot Elements
- The Tools: Options: Axis tab Settings
- The Tools: Options: Graph tab Settings
- Graph Axes
- Controlling the Graph Axis Display Range

- Adding Text and Drawing Objects
- Hiding Labels, Data and Layers
- Creating Graphs from Graph Templates
- System Themes

13 Graphical Exploration of Data



Start with a data plot ...

Choose a **Tools** Toolbar tool

For quick interactive analyses and recalculation of results choose **Gadgets**

Click here for Gadget controls

Gadgets for:
Peak Finding
Integration
Differntiation
FFT
Curve Fitting
Statistics
Curve Intersection
and more ...

Pointer
Object selection mode

Scale In
Axes magnification, double-click to restore, ctrl-drag to create zoom graph

Screen Reader
Read screen coordinates, click pointer to restore

Data Reader
Data Cursor
Data Highlighter

Data Selector
Select a range of data, click pointer to restore

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
Free-form drawing of data

Zoom-Panning Tool
Can also hold A to enter tool; Drag page(or arrow keys) to pan, mouse wheel(or +,-) to zoom

Rescale Tool
Can also hold Z/X to enter tool; Z:Zoom,X:Pan; Shift+Z/X for Y otherwise X dir; Mouse wheel(or +,-) or drag(or arrow keys); Space: toggle panning mode (% or minor, major ticks).

Origin includes a number of tools for graphically exploring your data, including tools for magnifying and zooming, reading XY coordinate values, and drawing and deleting data points.

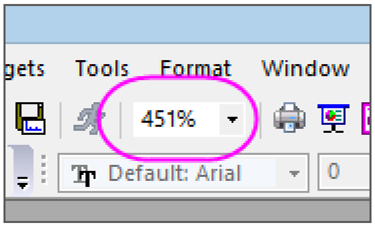
With Origin 2016, OriginLab began releasing add-on tools called **Apps**. Many exploratory and analysis-related tools have been added to OriginLab's **File Exchange** since that time. If you find you need some exploratory or analysis tool that is not a standard part of Origin, you might check to see if the tool exists as an App. If it does not, request it!.

13.1 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 panning treat the graph page as a whole. 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, while axis rescaling tools (such as and) change axis scales and *will* affect the printout and export of the graph.



- 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.

Action	Button	Shortcut Key	Menu	Notes
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 Page**	- Reset the view of the page after using the 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).

13.1.1 Axis Rescaling

Action	Button	Shortcut Key	Menu	Notes
Rescale: Rescale and pan the graph in both X and Y dimensions.	✋	--	--	- 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.

Action	Button	Shortcut Key	Menu	Notes
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.

Action	Button	Shortcut Key	Menu	Notes
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.
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).

You can use the **Scale In** button 🔍 to copy an enlarged portion of your 2D graph to a new window. 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). With a graph active, press Ctrl then click the **Scale In** button 🔍 (**Tools** toolbar) and drag out a rectangle on your 2D graph. Note that this **Enlarged** graph is dynamic. Move or resize the rectangle on your original graph and the **Enlarged** graph is updated.

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.

Origin 9.1 SR0 introduced the **@nrm** system variable to modify rescale behavior when using the **Rescale** tool or associated shortcut keys:

@nrm = 0: **From/To** values on the **Scale** tab of the **Axis** dialog box will change when **Rescale** is set to **Manual**. This is established behavior.

@nrm = 1: **From/To** values will not change when **Rescale** is set to **Manual**. This is new behavior.

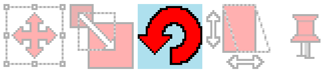
Modify the current behavior by opening the Script Window (**Window: Script Window**), typing **@nrm =** <*value*>, then pressing ENTER.

Note:

- Since Origin 2017, we have renamed **Manual** rescaling to **Fixed** rescaling. And several advanced selections, one-side fixed rescaling, have been available under this **Rescale** drop-down list.
- When using the older **Scale In** tool you are prompted to override Manual rescaling. However, when @nrm=1 you cannot override the Axis dialog box Rescale setting.

13.2 Rotation of 3D openGL Graphs

You can interactively rotate your 3D graphs for purposes of data exploration. When you click on an empty portion of a 3D graph, a floating toolbar displays. You can use the floating buttons to rotate the graph; or you can use your keyboard and mouse.

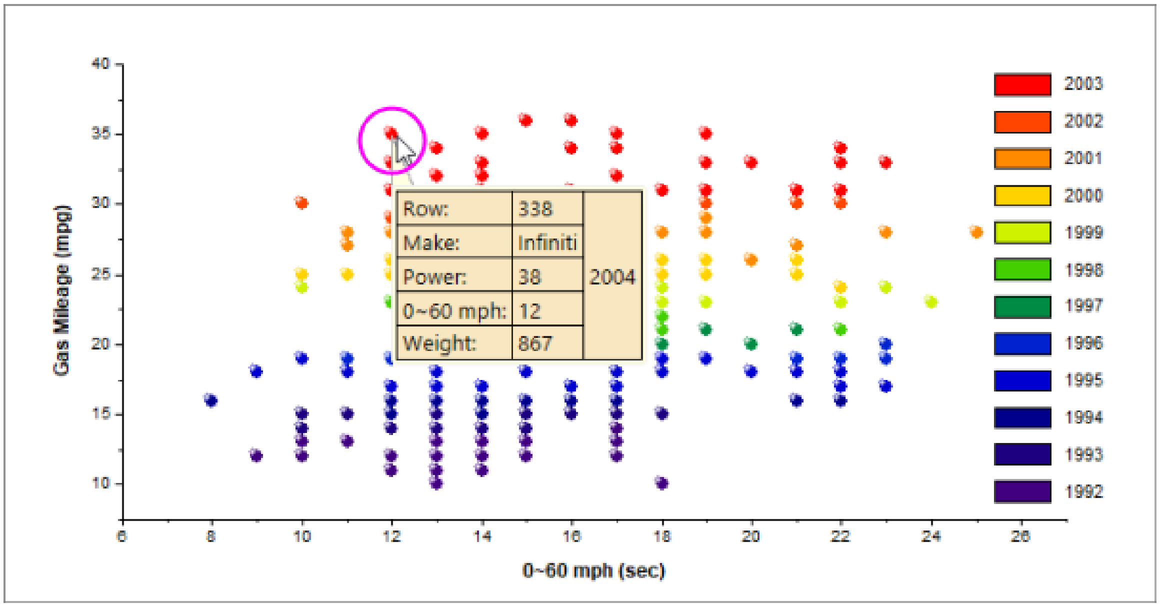
Hot Key	Menu/Action	Context
Rotate 3D graphs with the 3D floating buttons		
X + Arrow key	Rotate the 3D graph around the X axis.	With graph layer active and with **Rotate** button selected in the 3D floating button group. 
Y + Arrow key	Rotate the 3D graph around the Y axis.	
Z + Arrow key	Rotate the 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.	

13.3 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.

13.3.1 Data Point Tooltip

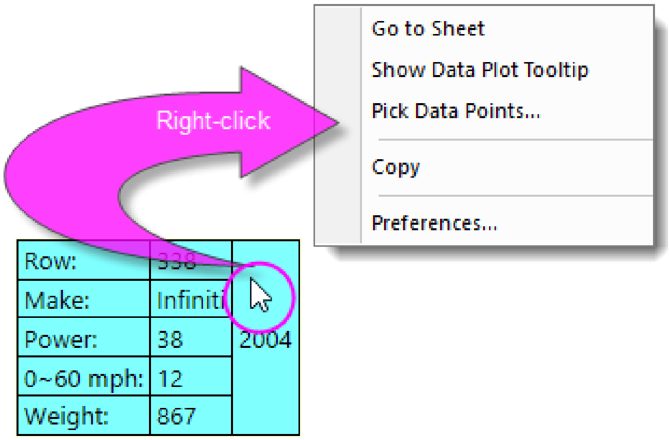
Origin 2019 adds a floating, customizable tooltip that reads data point values when you hover on a data point.



Row: 338
Make: Infiniti
Power: 38
0~60 mph: 12
Weight: 867
2004

Tooltip Shortcut Menu

For tooltip customiztion and other options, right-click directly on the data point tooltip.


Right-click
Go to Sheet
Show Data Plot Tooltip
Pick Data Points...
Copy
Preferences...

Row: 338
Make: Infiniti
Power: 38
0~60 mph: 12
Weight: 867
2004

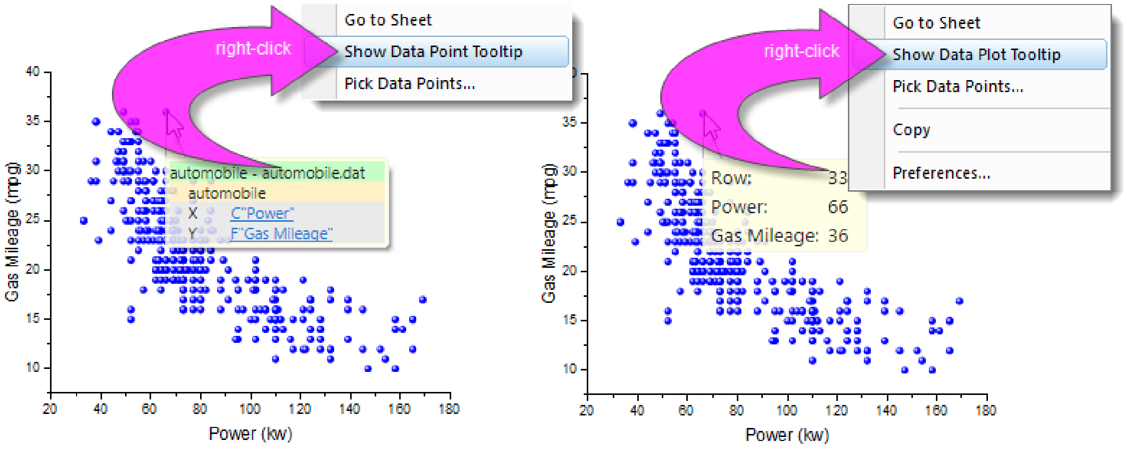
- **Go to Sheet** pops up the worksheet and highlights the row that contains the source data for the data point.
- **Show Data Plot Tooltip** toggles display of a non-customizable data plot tooltip in place of the customizable data point tooltip (see, below).
- **Pick Data Points** puts the cursor into 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 to the Clipboard.
- **Preferences** opens the **Data Point Tooltip** dialog allowing you to customize tooltip content and formatting (alternately, you can double-click on the tooltip to open this dialog).

The **Data Point Tooltip** dialog is virtually identical to 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.

13.3.2 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.


right-click
Go to Sheet
Show Data Point Tooltip
Pick Data Points...
automobile - automobile.dat
automobile
X C"Power"
Y F"Gas Mileage"
Gas Mileage (mpg)
Power (kw)
40
35
30
25
20
15
10
20
40
60
80
100
120
140
160
180
right-click
Go to Sheet
Show Data Plot Tooltip
Pick Data Points...
Copy
Preferences...
Row: 33
Power: 66
Gas Mileage: 36
Gas Mileage (mpg)
Power (kw)

Data *Plot* Tooltip **Data *Point* Tooltip**

Right-click on the Data Point Tooltip and you can choose to **Show Data Plot Tooltip**. Conversely, right-click on the Data Plot Tooltip and you can choose to **Show Data Point Tooltip**.

13.3.3 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 Tooltip**.

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.

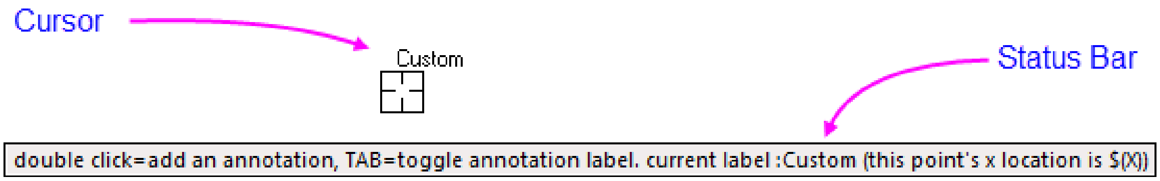
```
@PT=0; //Disable both data plot and data point tooltips

@PT=1; //Enable data plot tooltips for 2D graph (default)

@PT=2; //Enable data plot tooltips for 3D OpenGL graph

@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)
```

13.3.4 The Annotation Tool

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.



double click=add an annotation, TAB=toggle annotation label. current label :Custom (this point's x location is $(X))

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.

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 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.

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

- To *move* a label to another data point, click the **Pointer** tool, press the ALT key and drag the label.
- To *copy* a label to another data point, press CTRL + SHIFT and drag to a new data point.

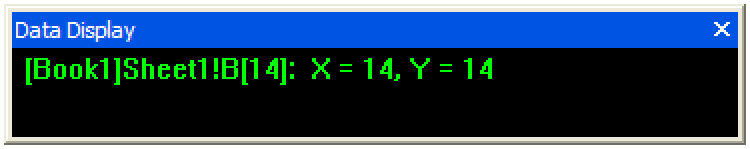
In both cases, the label is automatically updated to display info on the new data point.

Use the **Pointer** and drag to re-position overlapping labels. A leader line is automatically added.

13.3.5 The 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 Data Reader is not reading *data point coordinates*; rather it is reading *page coordinates* in relation 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).



[Book1]Sheet1!B[14]: X = 14, Y = 14

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.

13.3.6 The 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 visible 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.

To use the Data Reader tool:

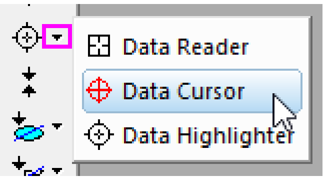
1. Click the **Data Reader** button on the **Tools** toolbar. This opens the **Data Info** window.
2. Click on a data point to read its X,Y (and Z, if they exist) coordinates. Coordinate values display in the Data Info window (and Data Display window).
3. To move the cross-hair to the next data point 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.

13.3.7 The Data Cursor Tool

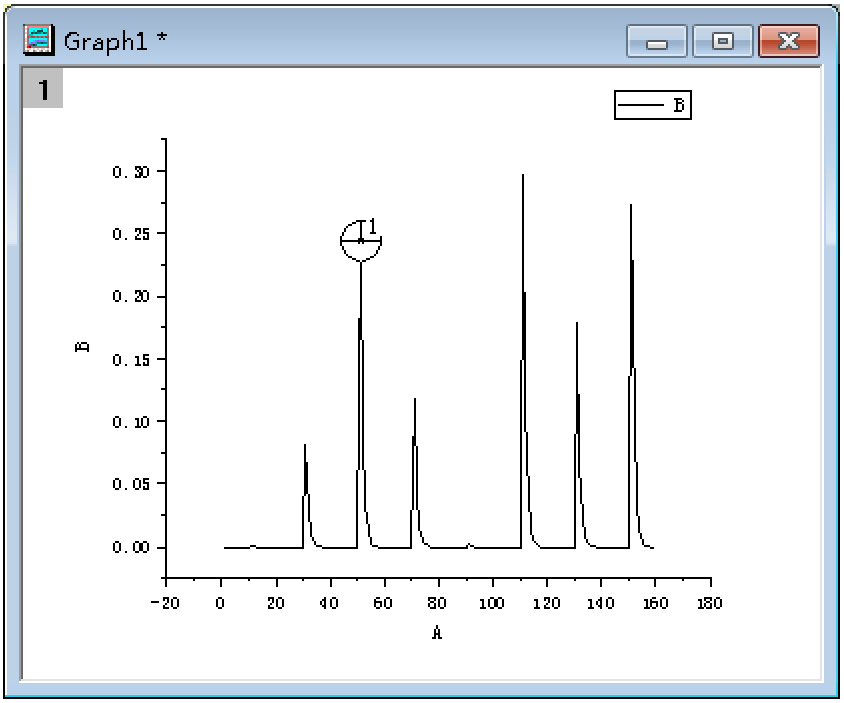
The **Data Cursor** tool -- grouped on the Tools toolbar with the **Data Reader** tool -- allows you to place one or more cursors on a data plot and (using the **Data Info** window) read the cursor coordinates or measure the X and Y distance between two cursors, or the distance between a cursor and a 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.

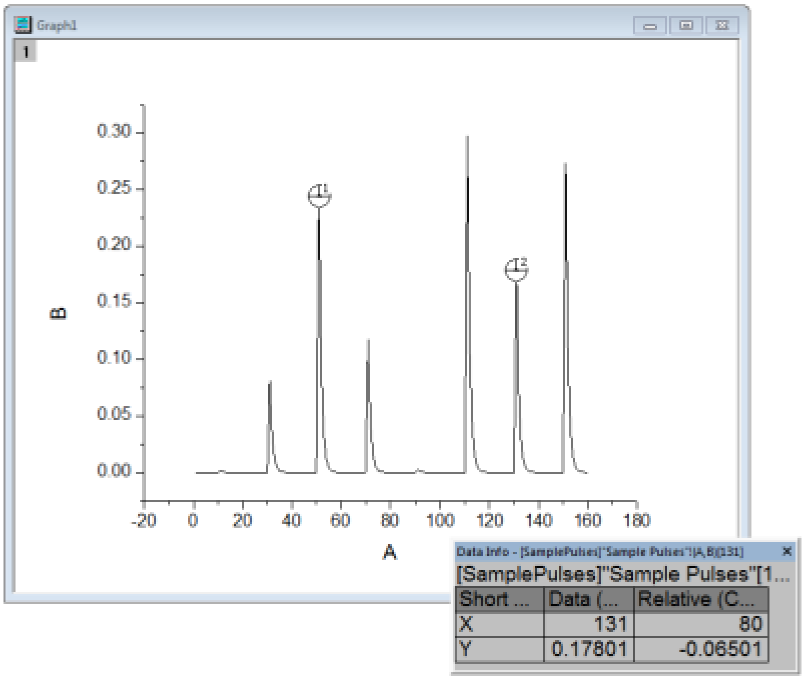

Data Reader
Data Cursor
Data Highlighter

3. Double-click on one of the peaks or click once on a data point and press ENTER, to add a cursor object.


Graph1 *
1
B
1
0.30
0.25
0.20
0.15
0.10
0.05
0.00
B
-20
0
20
40
60
80
100
120
140
160
180
A

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.


Graph1
1
B
A
0.30
0.25
0.20
0.15
0.10
0.05
0.00
-20
0
20
40
60
80
100
120
140
160
180
1
2

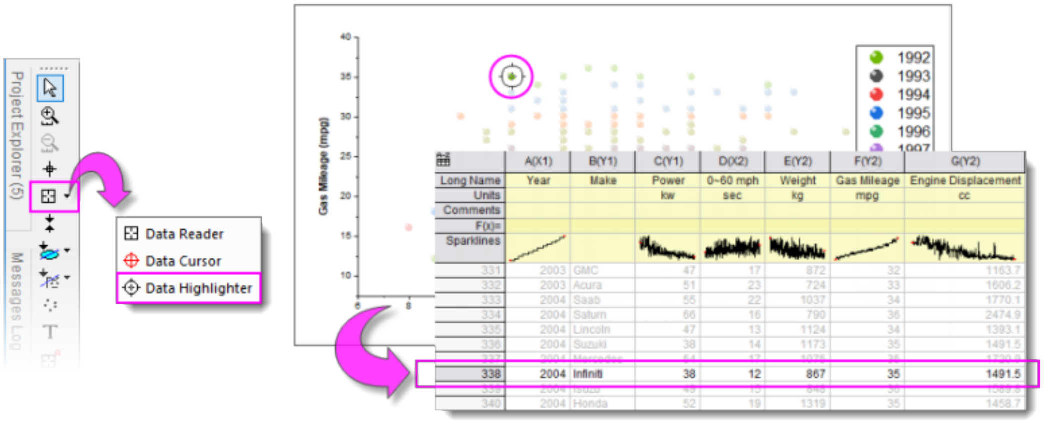
Data Info - [SamplePulses]"Sample Pulses"!A,B[131]

[SamplePulses]"Sample Pulses"[1...

Short ...	Data (...	Relative (C...
X	131	80
Y	0.17801	-0.06501

13.3.8 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.


Project Explorer (5)
Messages Log
Data Reader
Data Cursor
Data Highlighter
Gas Mileage (mpg)
40
35
30
25
20
15
10
6
8
1992
1993
1994
1995
1996
1997

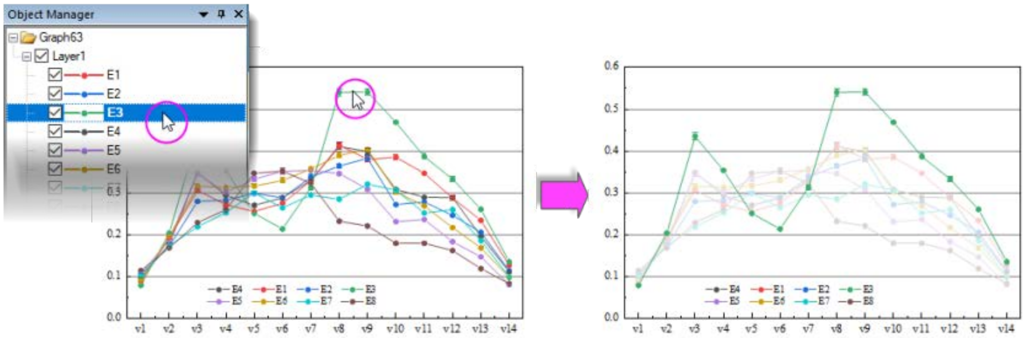
	A(X1)	B(Y1)	C(Y1)	D(X2)	E(Y2)	F(Y2)	G(Y2)
Long Name	Year	Make	Power	0~60 mph	Weight	Gas Mileage	Engine Displacement
Units			kw	sec	kg	mpg	cc
Comments							
F(x)=							
Sparklines							
331	2003	GMC	47	17	872	32	1163.7
332	2003	Acura	51	23	724	33	1606.2
333	2004	Saab	55	22	1037	34	1770.1
334	2004	Saturn	66	16	790	36	2474.9
335	2004	Lincoln	47	13	1124	34	1393.1
336	2004	Suzuki	38	14	1173	35	1491.5
337	2004	Mercedes	54	17	1076	35	1720.9
338	2004	Infiniti	38	12	867	35	1491.5
339	2004	Isuzu	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
340	2004	Honda	52	19	1319	35	1458.7

While in Data Highlighter mode ...

- CTRL+click to select multiple points in the graph.
- Drag out a rectangle on the graph to select multiple points.
- While in highlight mode, 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.

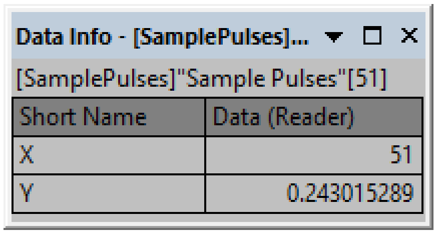
To highlight a single plot in the graph window and simultaneously dim all other plots:

- Click directly on the plot (once if ungrouped, twice if grouped) in the graph window.
- Alternately, click once on the plot in **Object Manager**.



13.3.9 The Data Info Window

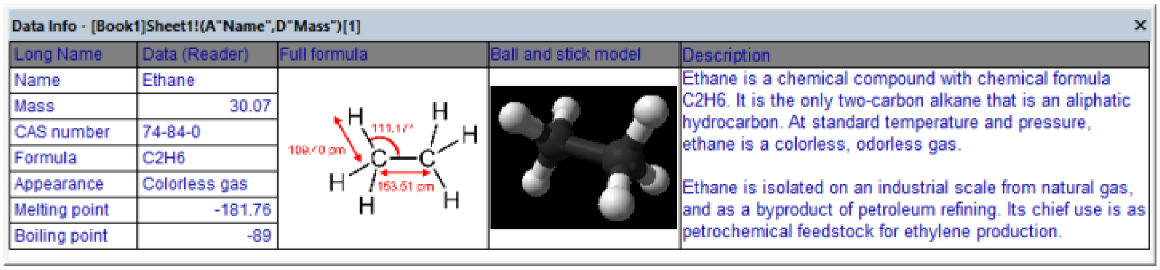
The **Data Info** window opens when you choose either the **Data Reader** , the **Annotation** or the **Data Cursor** tools . When you click on a plotted data point with one of these tools, the **Data Info** window displays information about this particular data point.


Data Info - [SamplePulses]...

[SamplePulses]"Sample Pulses"[51]

Short Name	Data (Reader)
X	51
Y	0.243015289

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.

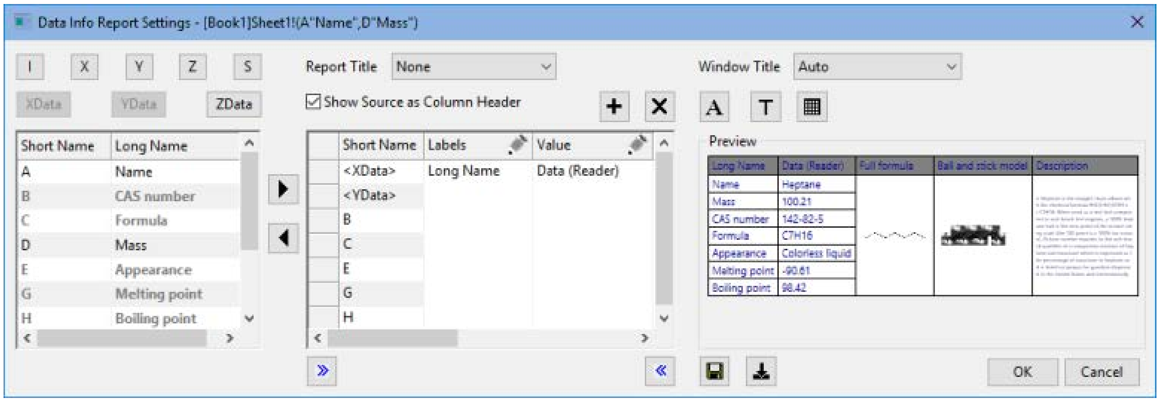


Data Info - [Book1]Sheet1!(A"Name",D"Mass")[1]

Long Name	Data (Reader)	Full formula	Ball and stick model	Description
Name	Ethane			Ethane is a chemical compound with chemical formula C2H6. It is the only two-carbon alkane that is an aliphatic hydrocarbon. At standard temperature and pressure, ethane is a colorless, odorless gas. Ethane is isolated on an industrial scale from natural gas, and as a byproduct of petroleum refining. Its chief use is as petrochemical feedstock for ethylene production.
Mass	30.07			
CAS number	74-84-0			
Formula	C2H6			
Appearance	Colorless gas			
Melting point	-181.76			
Boiling point	-89			

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:



Data Info Report Settings - [Book1]Sheet1!(A"Name",D"Mass")

Report Title: None

☑ Show Source as Column Header

Window Title: Auto

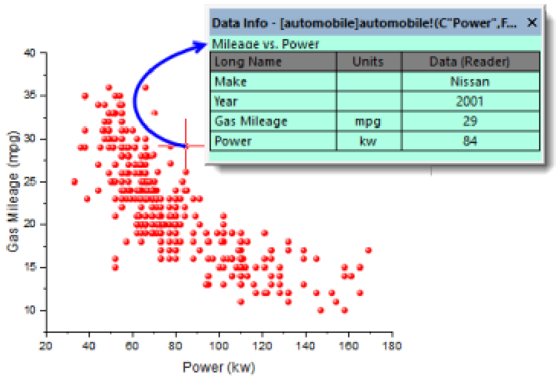
Short Name	Long Name
A	Name
B	CAS number
C	Formula
D	Mass
E	Appearance
G	Melting point
H	Boiling point

Short Name	Labels	Value
<XData>	Long Name	Data (Reader)
<YData>		
B		
C		
E		
G		
H		

Preview

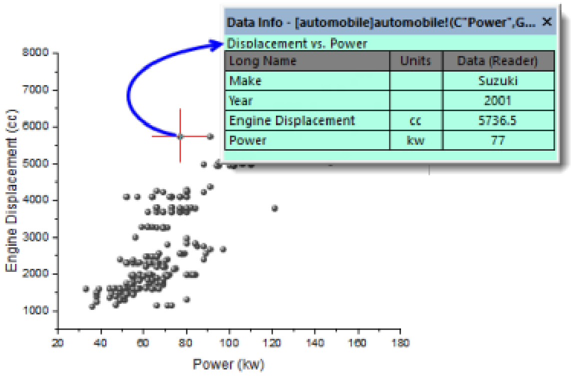
Long Name	Data (Reader)	Full formula	Ball and stick model	Description
Name	Heptane			
Mass	100.21			
CAS number	142-82-5			
Formula	C7H16			
Appearance	Colorless liquid			
Melting point	-90.61			
Boiling point	98.42			

- 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.



Mileage vs. Power

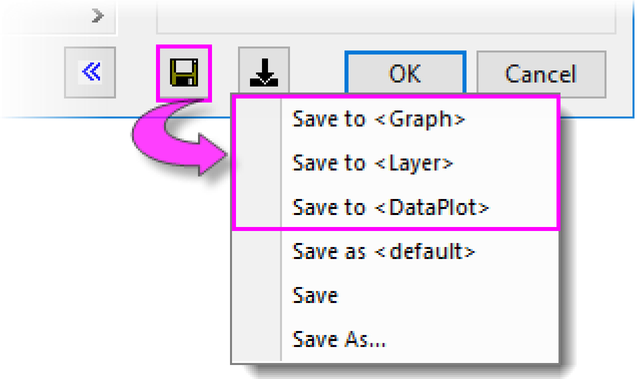
Long Name	Units	Data (Reader)
Make		Nissan
Year		2001
Gas Mileage	mpg	29
Power	kw	84



Displacement vs. Power

Long Name	Units	Data (Reader)
Make		Suzuki
Year		2001
Engine Displacement	cc	5736.5
Power	kw	77

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).

13.3.10 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:

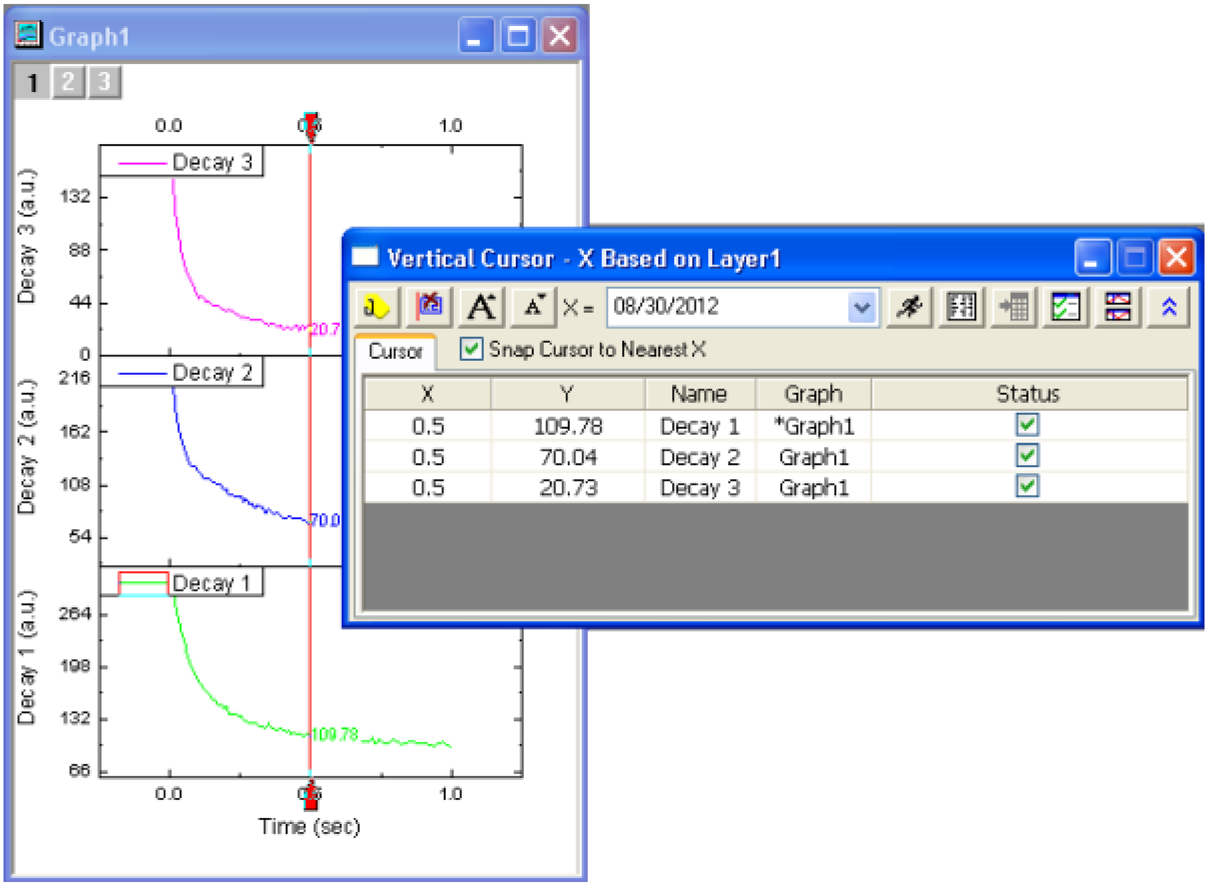
- **Vertical Cursor**
- **Statistics**
- **Cluster** (OriginPro)

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.


Graph1
1
2
3
0.0
0.5
1.0
Decay 3
Decay 3 (a.u.)
132
88
44
0
20.7
Decay 2
Decay 2 (a.u.)
216
162
108
54
70.0
Decay 1
Decay 1 (a.u.)
264
198
132
66
109.78
Time (sec)
Vertical Cursor - X Based on Layer1
Cursor

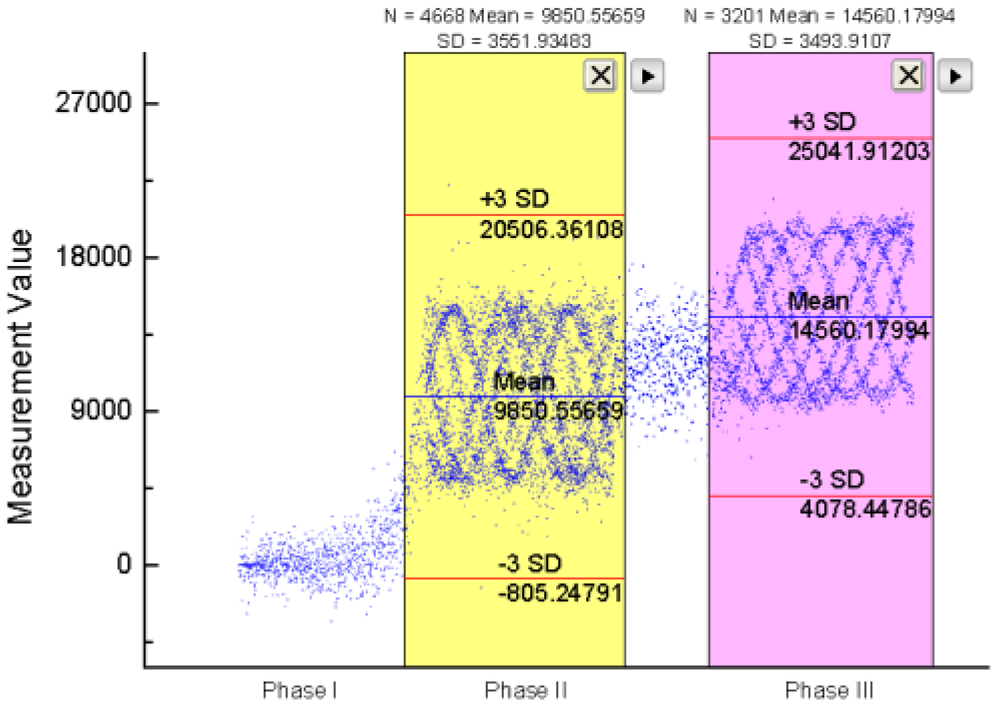
X = 08/30/2012

☑ Snap Cursor to Nearest X

X	Y	Name	Graph	Status
0.5	109.78	Decay 1	*Graph1	☑
0.5	70.04	Decay 2	Graph1	☑
0.5	20.73	Decay 3	Graph1	☑

The **Statistics** gadget returns basic statistics on data points falling inside a rectangular region-of-interest (ROI) on the graph.

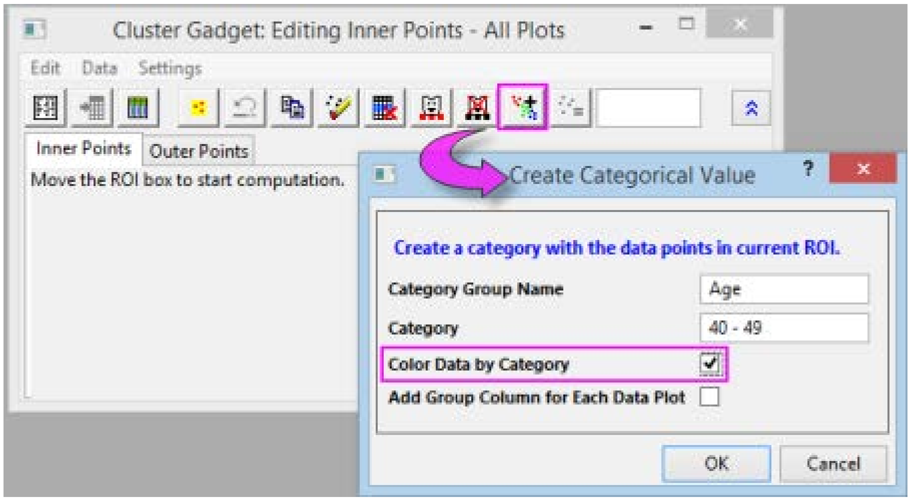
- Display basic statistics for data inside the ROI.
- Display mean and *n*th Standard Deviation lines inside the ROI.
- Update results dynamically as ROI is moved or resized.


N = 4668 Mean = 9850.55659
SD = 3551.93483
N = 3201 Mean = 14560.17994
SD = 3493.9107
27000
18000
9000
0
Measurement Value
+3 SD
20506.36108
Mean
9850.55659
-3 SD
-805.24791
+3 SD
25041.91203
Mean
14560.17994
-3 SD
4078.44786
Phase I
Phase II
Phase III

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.

Beginning with Origin 2018, 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.


Cluster Gadget: Editing Inner Points - All Plots
Edit
Data
Settings
Inner Points
Outer Points
Create Categorical Value
?
OK
Cancel

Move the ROI box to start computation.

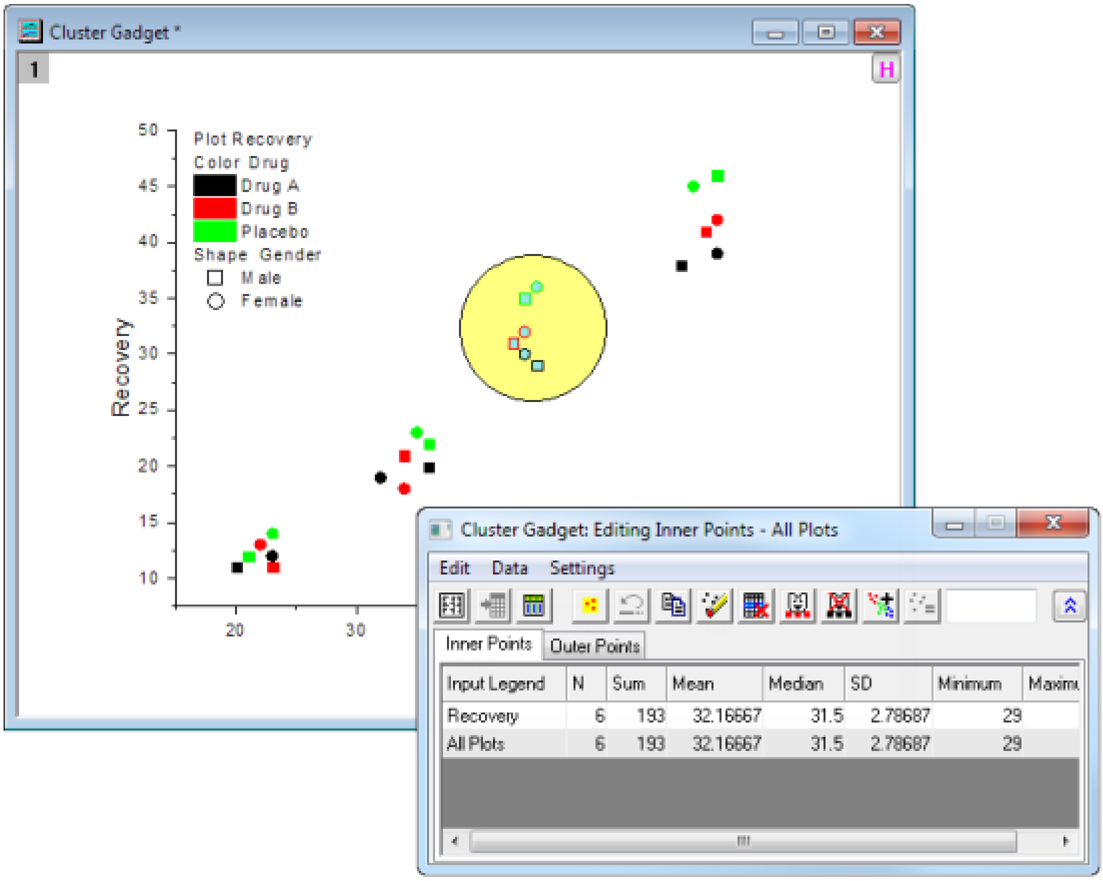
Create a category with the data points in current ROI.

Category Group Name: Age

Category: 40 - 49

Color Data by Category ☑

Add Group Column for Each Data Plot ☐


Cluster Gadget *
1
H
Recovery
50
45
40
35
30
25
20
15
10
20
30
Plot Recovery
Color Drug
Drug A
Drug B
Placebo
Shape Gender
Male
Female
Cluster Gadget: Editing Inner Points - All Plots
Edit
Data
Settings
Inner Points
Outer Points

Input Legend	N	Sum	Mean	Median	SD	Minimum	Maxim
Recovery	6	193	32.16667	31.5	2.78687	29	
All Plots	6	193	32.16667	31.5	2.78687	29	

Note: To learn more about these gadgets, see:

Help: Origin: Origin Help > **Gadgets**

13.4 Topics for Further Reading

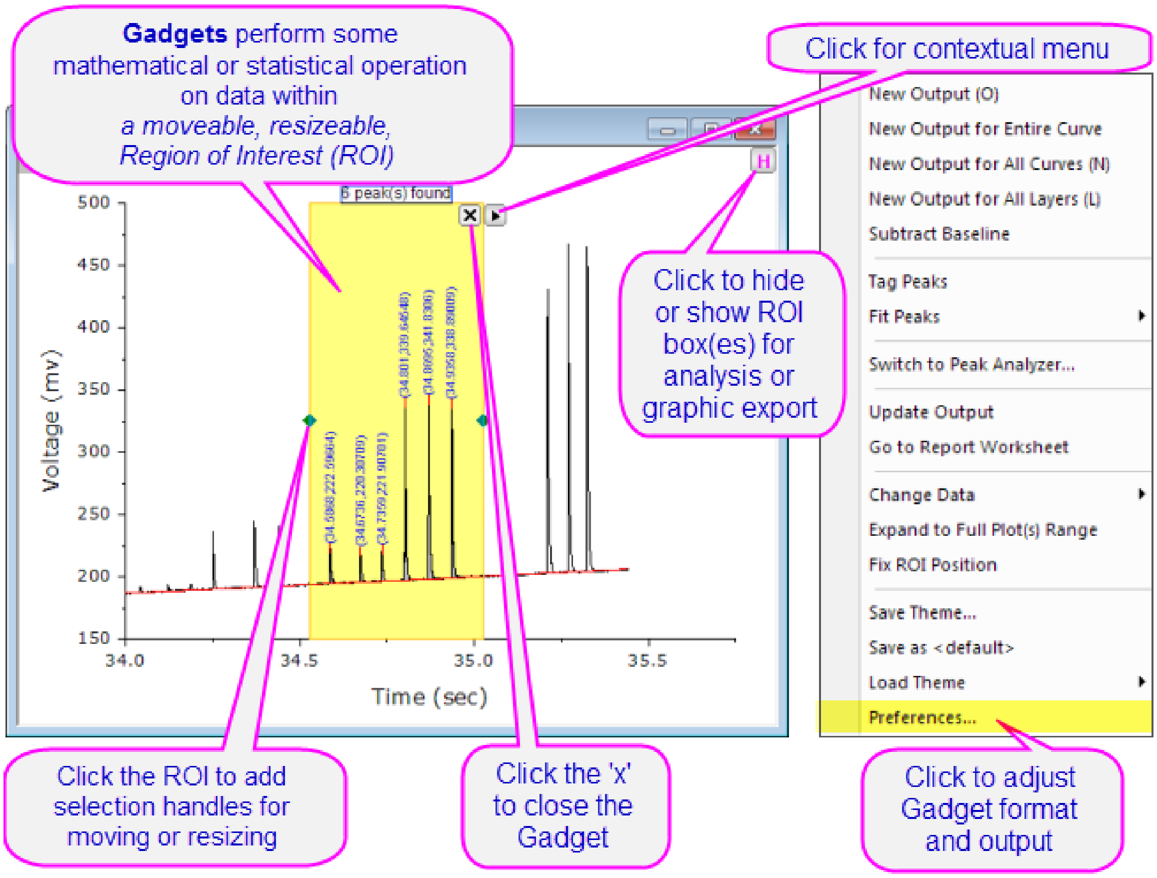
- Gadgets
- The Data Analysis chapter of this User Guide
- The Cluster Gadget (OriginPro)
- The Vertical Cursor Gadget
- The Digitizer
- The Statistics Gadget
- Masking Data
- Data Filtering
- Drawing or Deleting Data Points in the Graph
- List of Origin Built-in Toolbars and Buttons

14 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.


Gadgets perform some mathematical or statistical operation on data within *a moveable, resizeable, Region of Interest (ROI)*

Click for contextual menu

Click to hide or show ROI box(es) for analysis or graphic export

Click the ROI to add selection handles for moving or resizing

Click the 'x' to close the Gadget

Click to adjust Gadget format and output

6 peak(s) found
Voltage (mv)
500
450
400
350
300
250
200
150
34.0
34.5
35.0
35.5
Time (sec)
H
New Output (O)
New Output for Entire Curve
New Output for All Curves (N)
New Output for All Layers (L)
Subtract Baseline
Tag Peaks
Fit Peaks
Switch to Peak Analyzer...
Update Output
Go to Report Worksheet
Change Data
Expand to Full Plot(s) Range
Fix ROI Position
Save Theme...
Save as <default>
Load Theme
Preferences...

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.

14.1 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/outside a rectangular or elliptical ROI (OriginPro Only).
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 (OriginPro Only).
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 (OriginPro Only).
Statistics Gadget	Compute and display simple descriptive statistics of selected data on the graph.
Vertical Cursor Gadget	Read and tag X, Y coordinate values for data plots across multiple graphs 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:

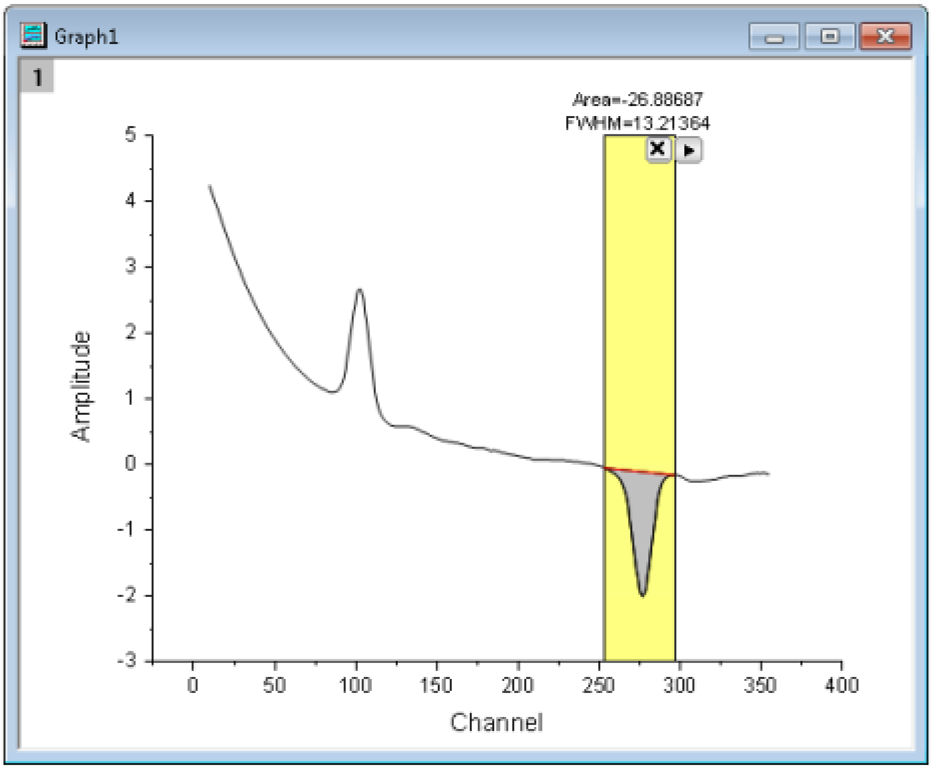
Help: Origin: Origin Help > **Gadgets**

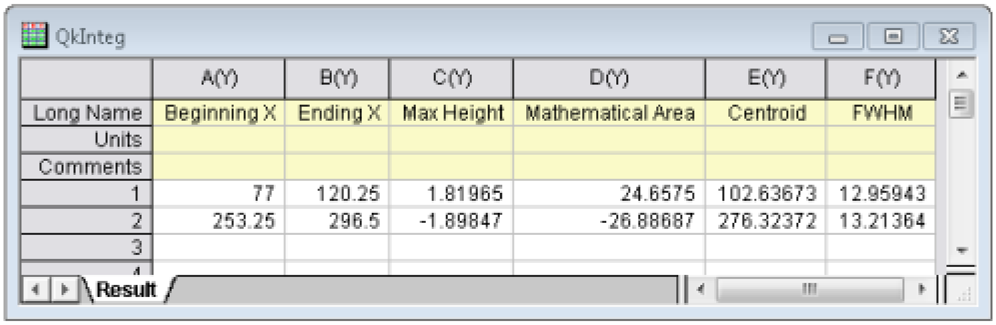
Help: Origin: Origin Help >Matrix Books Matrix Sheets and Matrix Objects > **Viewing and Profiling Matrix Data**

† For 2018, when you use the **Cluster** gadget to graphically define a category (within an ROI), you can apply a differentiating color to points within the ROI.

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**. 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.


Graph1
1
Area=-26.88687
FWHM=13.21364
Amplitude
5
4
3
2
1
0
-1
-2
-3
0
50
100
150
200
250
300
350
400
Channel


QkInteg
Result

	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						

Click the arrow button ▶ in the top right corner of the ROI and you can opt to output results for all curves in the current layer (**New Output for all Curves (N)**) or for all layers of the graph page (**New Output for All Layers (L)**) or press the corresponding **N** or **L** hotkey. This allows for batch analysis of multiple curves in a graph.

14.2 Topics for Further Reading

- Gadgets
- The Image/Contour Profile tool
- Tutorial: Using Multiple Gadgets
- Tutorials for Individual Gadgets
- Peak Analyzer
- Digitizer

15 Data Analysis

15.1 Introduction

Origin contains powerful tools for all of your analytic needs, including peak analysis, curve fitting, statistics, and signal processing. The output of one operation can be used as input for another, allowing for a chain of operations and their associated results to be updated. You can easily update results when input data or analysis parameters are changed and avoid the trouble of repeating the procedure from the beginning.

The following sections cover (1) identifying 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.

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.

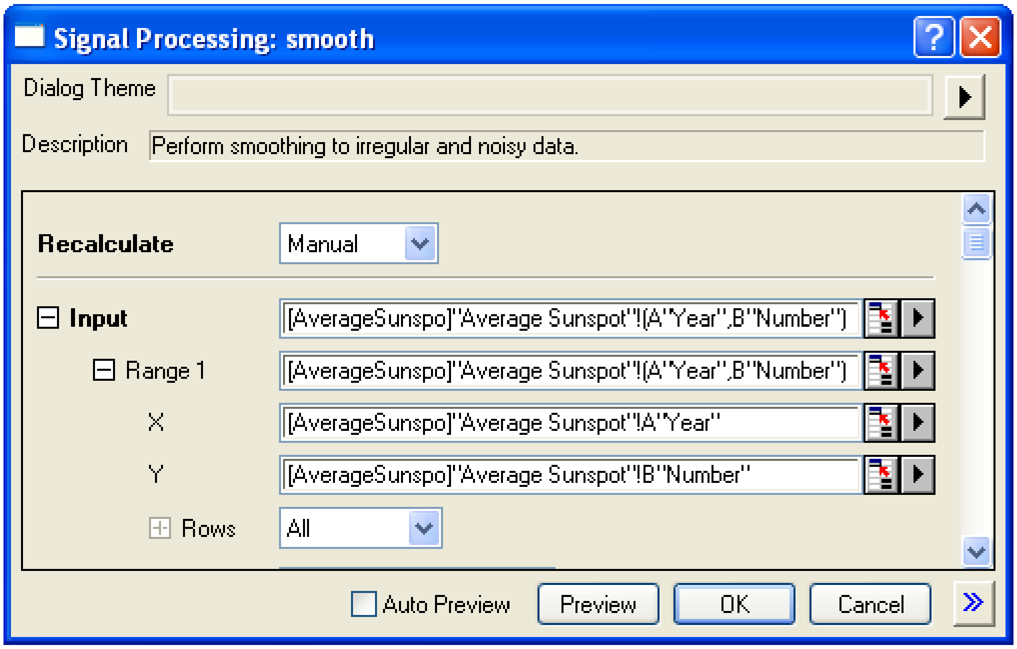
15.2 Selecting Data

Origin's analyses tools may act on workbook data or plotted (graph window) data. By default, analyses will be on done on highlighted data in worksheet or the active plot in graph. 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.

You can either do the data selection (with methods mentioned below) before opening an analysis dialog or after opening the dialog. Most of Origin's X-Function based analysis tools have a **Input Data** branch with standard range selection control that you'll want to become familiar with (we explain the control, below).

15.2.1 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 Data** 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.



Signal Processing: smooth

Description: Perform smoothing to irregular and noisy data.

Recalculate: Manual

Input: [AverageSunspo]"Average Sunspot"!(A"Year",B"Number")

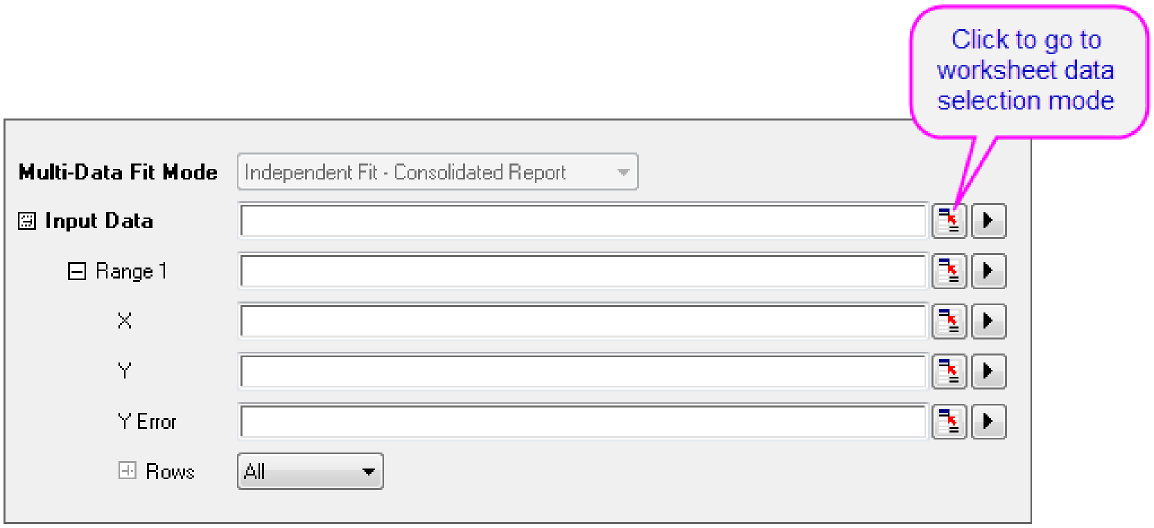
Range 1: [AverageSunspo]"Average Sunspot"!(A"Year",B"Number")

X: [AverageSunspo]"Average Sunspot"!A"Year"

Y: [AverageSunspo]"Average Sunspot"!B"Number"

Rows: All

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 Data** branch:



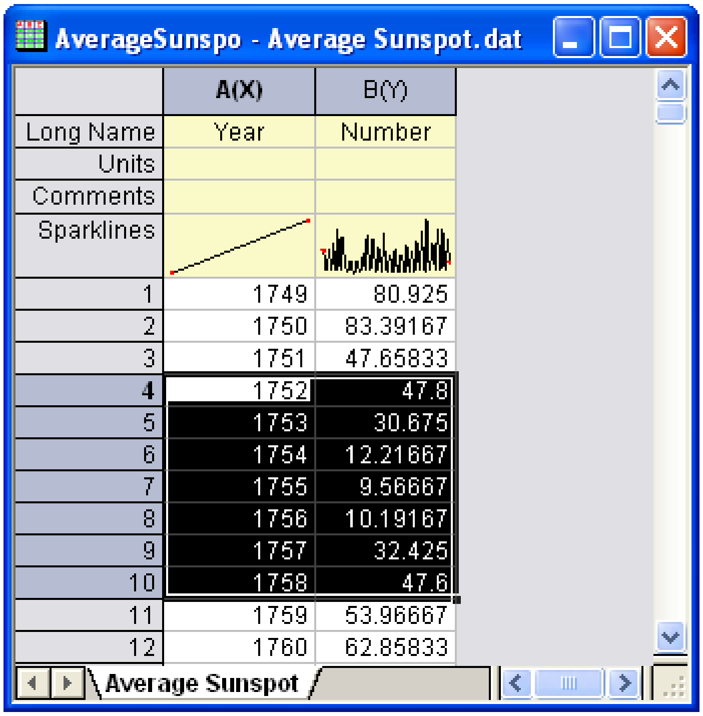
Click to go to worksheet data selection mode

Multi-Data Fit Mode: Independent Fit - Consolidated Report

Rows: All

1. Click the range selection control next to **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 Data** branch will now show the selected range.

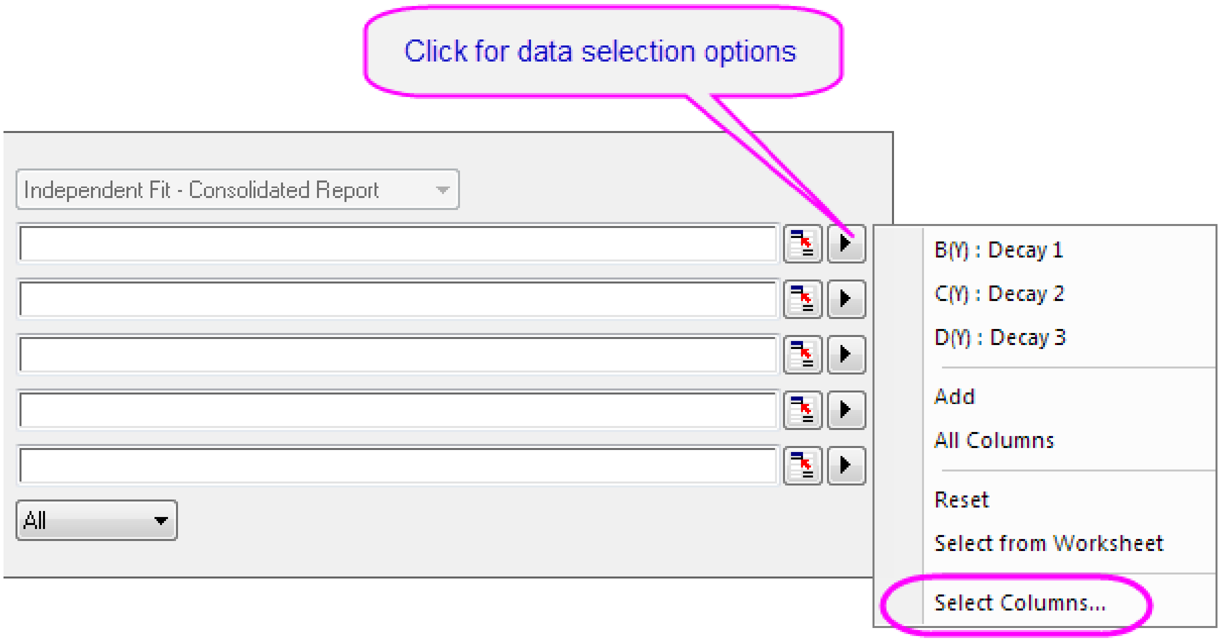
Note that you do not have to select entire datasets (columns). You can select a portion of your worksheet data and analyses will be confined to that selected subset of your data. Also if the analysis supports multiple datasets, you could support multiple ranges such as multiple Y columns or Y ranges. 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.



	A(X)	B(Y)
Long Name	Year	Number
Units		
Comments		
Sparklines		
1	1749	80.925
2	1750	83.39167
3	1751	47.65833
4	1752	47.8
5	1753	30.675
6	1754	12.21667
7	1755	9.56667
8	1756	10.19167
9	1757	32.425
10	1758	47.6
11	1759	53.96667
12	1760	62.85833

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.

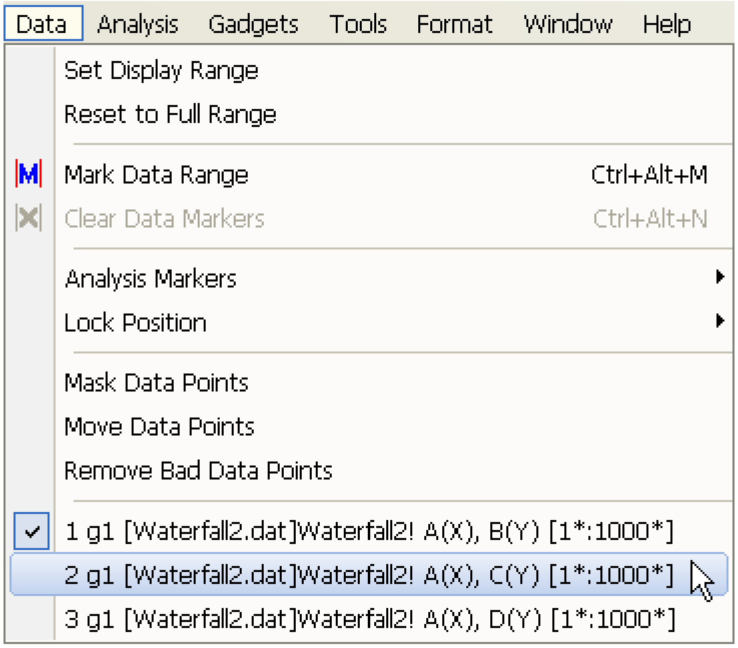

Click for data selection options
Independent Fit - Consolidated Report
All
B(Y) : Decay 1
C(Y) : Decay 2
D(Y) : Decay 3
Add
All Columns
Reset
Select from Worksheet
Select Columns...

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.

15.2.2 Selecting 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.).

The active dataset is the one that shows in the data list (bottom of the **Data** menu) with a check mark next to it. Note that this analysis dialog box behavior applies even to plot groups. You can force an **Analysis** dialog box to register a particular data range by clicking on another of the data plots listed at the bottom of the **Data** menu.


Data
Analysis
Gadgets
Tools
Format
Window
Help
Set Display Range
Reset to Full Range
Mark Data Range Ctrl+Alt+M
Clear Data Markers Ctrl+Alt+N
Analysis Markers
Lock Position
Mask Data Points
Move Data Points
Remove Bad Data Points
1 g1 [Waterfall2.dat]Waterfall2! A(X), B(Y) [1*:1000*]
2 g1 [Waterfall2.dat]Waterfall2! A(X), C(Y) [1*:1000*]
3 g1 [Waterfall2.dat]Waterfall2! A(X), D(Y) [1*:1000*]

Alternately, you can graphically set the range for your analysis by selecting one or more plots in the graph window:

- If your data plots are not part of a plot group, you can click once on the intended plot before opening an Analysis dialog box and this will set the **Input Data** range to the selected plot.
- If your data plots *are* part of a plot group, click once on any of the plots in the group to set **Input Range** to *all* plots in the group; or click a second time on any plot to restrict analysis to the *selected* plot (note that this does not switch the active dataset). Alternately, you can pre-select multiple plots using the **Regional Data Selector** (see below).

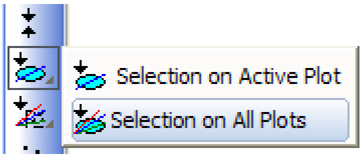
You can indicate the active dataset by placing a red rectangle around the plot's legend entry. To turn this feature on or off:

- Click on your graph window, select **Format: Page Properties...**, click on the **Legends/Titles** tab and enable or clear the **Indicate Active Dataset** box.
- Right-click on the graph and choose **Legend**, then select/deselect **Indicate Active Dataset**.
- Right-click on the graph and choose **Legend: Update Legend** and enable or clear the **Indicate Active Dataset** box.

15.2.3 Selecting a Subset of Your Data Graphically

You can graphically select a range of data using the **Regional Data Selector** tool:

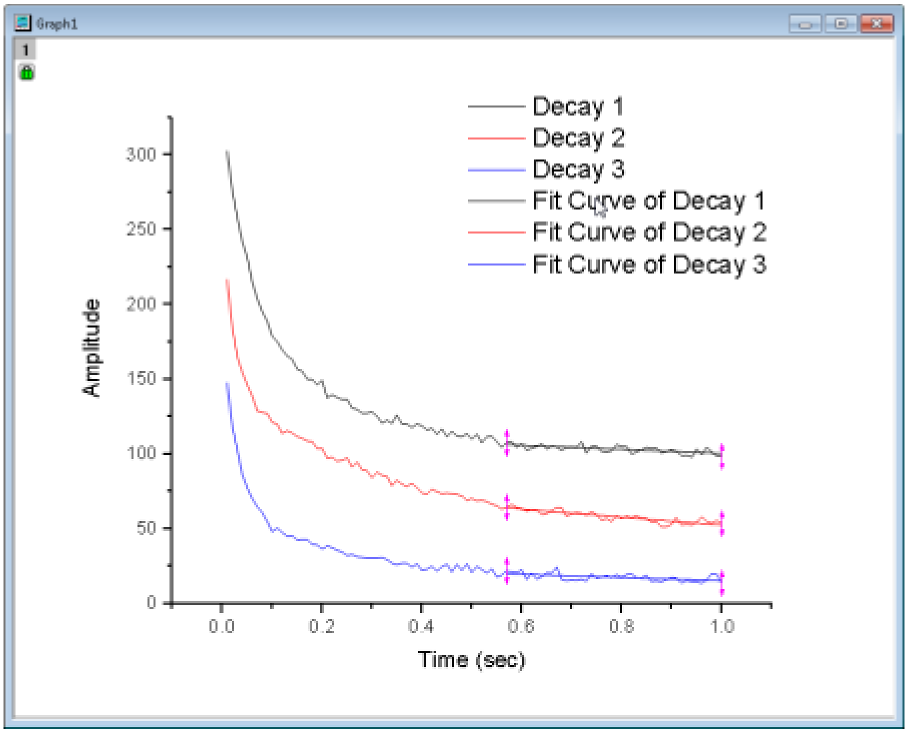
1. With a graph window active, click and hold the **Regional Data Selector** button on the **Tools** toolbar, and then choose **Selection on Active Plot** or **Selection on All Plots**.
2. Drag out a rectangle or freehand object to select an area of the plot(s). Press **Space** to toggle between rectangle and freehand modes .



When you make your selection, data markers appear on the graph, delineating the selected range(s). You can work with graphically selected data using Origin's analysis tools (e.g., Linear Fit), 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.

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.

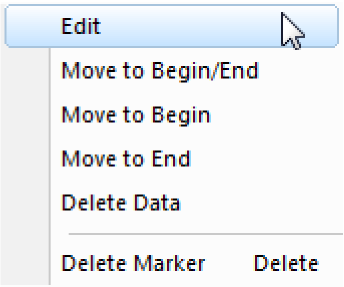


- In addition to the **data selection** and **data masking** methods discussed in this section, Origin includes **data filtering** and **data reduction** tools. Please visit the linked pages for details.

15.2.4 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 ...

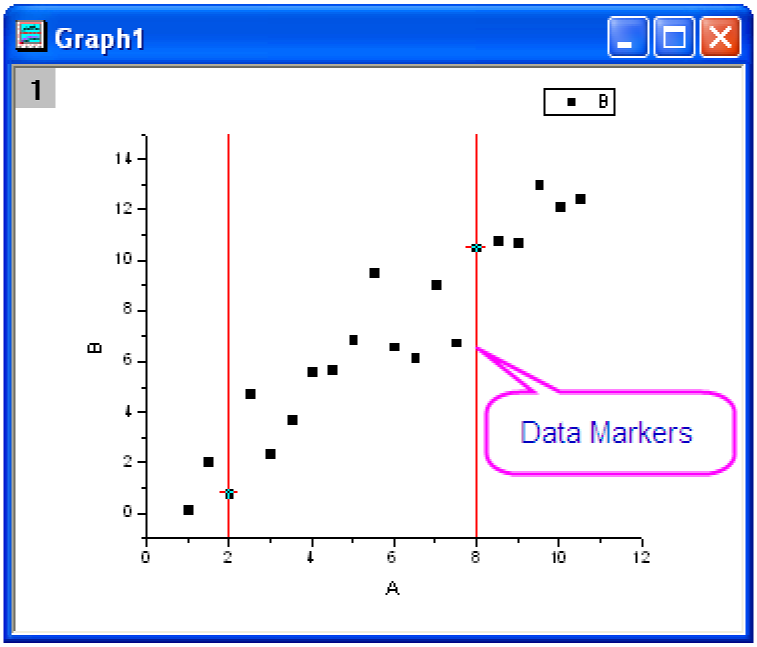
Hot Key	Action
s	Select the first pair of data markers on the graph (those marked with "1").
Tab	Select the next pair of data markers (not in edit mode) or the other data marker of the pair (in marker edit mode).
Home	Return to the first data marker.
End	Go to the last data marker.

2. ... then activate and edit the data marker using these key combinations:

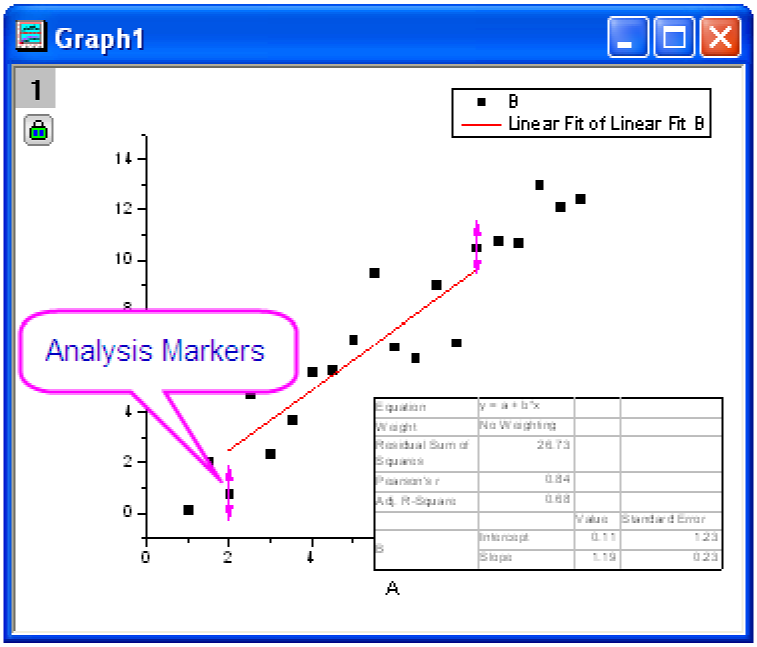
Hot Key	Action
Enter	Activate the selected data marker for editing. (Press **Enter** again to exit data selection mode.)
Arrow	Move the active data marker exactly one data point.
Ctrl/Shift + Arrow	Move the active data marker multiple data points.
Delete	Delete the the active data marker.

15.2.5 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.


Graph1
1
■ B
14
12
10
8
6
4
2
0
B
0
2
4
6
8
10
12
A
Data Markers

- 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.


Graph1
1
■ B
Linear Fit of Linear Fit B
14
12
10
8
4
2
0
0
2
4
A
Analysis Markers

Equation	y = a + b*x		
Weight	No Weighting		
Residual Sum of Squares	26.73		
Pearson's r	0.84		
Adj. R-Square	0.68		
		Value	Standard Error
B	Intercept	0.11	1.23
	Slope	1.19	0.23

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 Data: Analysis Marker menu and context menus when right click on analysis marker, green lock, in graph layer to control analysis markers.

15.3 Data Masking

Masking is another tool 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. Mask or unmask will trigger recalculation.

You can mask data points in either your worksheet or your graph. When data exist in both the worksheet and the graph, masking data in one will mask the corresponding data in the other.

Note that there are two toolbars with masking buttons: the **Tools** toolbar and the **Mask** toolbar. The masking tools on the **Tools** toolbar work only with graphs. The tools on the **Mask** toolbar work with worksheets or graphs.

15.3.1 Masking Data in Worksheets

Masking of worksheet data excludes masked data from analysis operations. When plotted, masked data points display in the mask color.

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".
Change mask color		**Mask: Change Color**	Change the mask color of the masked data range.
Disable masking		**Mask: Disable Masking**	Toggle the mask on or off for all masked data in the worksheet.

15.3.2 Masking Data in Graphs

With your graph window active:

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. This activates the **Regional Mask Tool**.
2. To mask a single point, double click on the point.
3. To mask a region of points, similar to **Regional Data Selector**, press the **space** bar to toggle among masking by row index, rectangular region or by freehand region. then draw a rectangle or freehand region to mask data in that region.

Note that the cursor changes as you:

- Press **space** bar to toggle masking data points by row index number, rectangular region or freehand region.
- Choose the **Mask Points on the Active Plot** tool vs. the **Mask Points on All Plots of Active Layer** tool (**Tools** toolbar).

Mask Points on Active Plot	Mask Points on All Plots of Active Layer	Purpose
		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.
		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.

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.

Some useful buttons on the **Mask** toolbar:

- **Change mask color** to avoid using the same mask color as your data plot color.
- **Hide/Show masked points** to hide masked points on the screen, printout and exported graph.
- **Disable/Enable Masking** button to quickly toggle the mask on or off without removing the masked points.

15.4 Drawing or Moving, or Deleting Data Points in the Graph

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.

1. Activate the graph window.
2. Click on the **Draw Data Tool** .
3. Make sure that the correct graph layer is active and place the cursor on the graph.
4. Double-click to create data points. The **Data Display** tool opens (if not already open) and displays the **X** and **Y** values for each created data point.
5. When you have finished adding data points, click on another tool (on the **Tools** toolbar) to exit drawing mode.

When you use the **Draw Data** tool, you simultaneously create a hidden worksheet named **Draw*n*** (worksheets are automatically enumerated, with ***n*** = 1, 2, 3, 4, etc.).

15.4.1 Opening the hidden Draw*n* Worksheet

Right-click on the data plot and select **Go to Draw*n*** from the shortcut menu or in Plot Details dialog, with data plot selected on left panel, click the **Workbook** button.

A **Draw*n*** workbook will appear with A(X) and B(Y) columns with coordinate values of your drawn data plot.

15.4.2 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.

15.4.3 Moving a Data Point

You can move individual data points in the graph. Understand that when you do this, you are changing the plot and the underlying data:

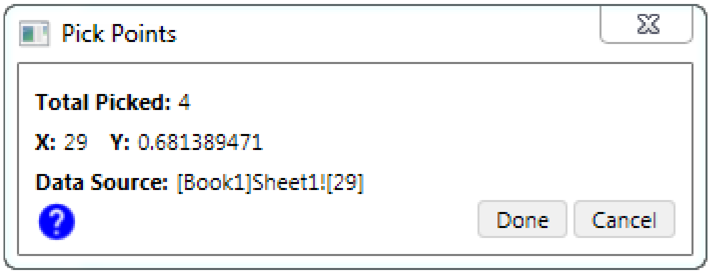
1. Select **Data: Move Data Points** (you'll be warned that you are about to change your data).
2. Click on the point you want to move (change X and Y coordinates). Place crosshairs on the point and drag; or use the arrow keys.
3. Click the **Pointer** button on the **Tools** toolbar or press **ESC** 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.

15.4.4 Picking Data Points

Since Origin 2018b, you can pick the data points in the graph using the **Pick Data Points** tool.

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 info). 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.



Total Picked: 4

X: 29 **Y:** 0.681389471

Data Source: [Book1]Sheet1![29]

3. Once you finished the picking, click the **Done** button to generate the results in a new workbook.

15.5 Mathematics

Origin provides a number of mathematics tools to perform basic calculations, interpolation, and area or volume calculations.

15.5.1 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)
• 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)
• Vertical Translate • Horizontal Translate	• Use a Gadget to graphically translate curve(s) in vertical or horizontal.	**Analysis:Data Manipulation** (graph)
• 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)

Tool Name	Description	Menu Entry
- 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)

15.5.2 Interpolation

Tool Name	Description	Menu Entry
- Interpolate Gadget	- Perform interpolation over a region of interest	**Gadgets:Interpolate...** (graph)
- 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)

Tool Name	Description	Menu Entry
• 2D Interpolate/Extrapolate	• Perform 2D interpolation/extrapolation for a matrix	**Analysis:Mathematics** (matrix, graph from matrix)

15.5.3 Area/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 Only)	• 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 Only)	• 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 Only) • Matrix Surface Area (Pro Only)	• 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)

15.6 Curve Fitting

15.6.1 Linear and Polynomial Fit

Linear and polynomial fitting can be performed on worksheet data or data plots in a graph. The menu entries of these tools are listed in the table below. All are available for both workbook or plotted data.

Tool Name	Menu Entry
- Linear Fit	**Analysis:Fitting:Linear Fit** *or* **Gadgets:Quick Fit** (graph)
- Fit Linear with X Error (Pro Only)	**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)

15.6.2 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)

Tool Name	Features	Menu Entry
• 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 Only) • Fit with replicas • Advanced options including bounds, constraints, fit control	**Analysis:Fitting:Nonlinear Curve Fit** (workbook, graph)
• Implicit Curve Fitting (Pro Only)	• Fit with implicit functions • Orthogonal Distance Regression (ODR) algorithm	**Analysis:Fitting:Nonlinear Implicit Curve Fit** (workbook, graph)
• Surface Fit (Pro Only)	• 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**
• Simulate	• Simulate a curve from a given function • Simulate a surface from a given function (Pro Only)	**Analysis:Fitting:Simulate Curve** *or* **Analysis:Fitting:Simulate Surface**

Tool Name	Features	Menu Entry
- Fit Comparison (Pro Only)	- 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 Only)	- Compare fit results of two or more functions for a single dataset	**Analysis:Fitting:Rank Models** (workbook, graph)

15.7 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.

The table below summarizes various tools available for peak analysis:

Tool Name	Features	Menu Entry
- Quick Peaks Gadget	- Perform peak analysis over a region of interest - Create baseline - Subtract baseline - Find peaks - Integrate peaks - Fit peaks	**Gadget:Quick Peaks** (graph)
- Multiple Peak Fit	- Pick multiple peaks - Fit peaks	**Analysis:Peaks and Baseline:Multiple Peak Fit** (graph, workbook)

Tool Name	Features	Menu Entry
- Peak Analyzer	- Create baseline - Subtract baseline - Find peaks - Integrate peaks - Fit multi-peak datasets (Pro Only) - Fit baseline (Pro Only) - Find hidden peaks - Compute many peak characteristics (Pro Only)	**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)

15.8 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.

15.8.1 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 Only) - 2D IFFT (Pro Only)	**Analysis:Signal Processing:FFT** (matrix)

Tools	Menu Entry
• Short-time Fourier Transform (STFT) (Pro Only)	**Analysis:Signal Processing:STFT** (workbook)
• Hilbert Transform (Pro Only)	**Analysis:Signal Processing:Hilbert Transform** (workbook, graph)
• Image Profiling	**Plot>2D:Profile:Image Profile**(matrix, worksheet, XYZ data)

15.8.2 Filtering

Tools	Menu Entry
• FFT Filter	**Analysis:Signal Processing:FFT Filters** (workbook, graph)
• 2D FFT Filter (Pro Only)	**Analysis:Signal Processing:2D FFT Filters** (matrix)
• IIR Filter Design (Pro Only)	**Analysis:Signal Processing:IIR Filter** (workbook, graph)

15.8.3 Smoothing

Tools	Menu Entry
• Smooth	**Analysis:Signal Processing:Smooth** (workbook, graph, matrix)

15.8.4 Correlation

Tools	Menu Entry
- Correlation	**Analysis:Signal Processing:Correlation** (workbook, graph)
- 2D Correlation (Pro Only)	**Analysis:Signal Processing:2D Correlation** (matrix)

15.8.5 Convolution

Tools	Menu Entry
- Convolution	**Analysis:Signal Processing:Convolution** (workbook, graph)

15.8.6 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 - 2D Wavelet Reconstruction	**Analysis:Signal Processing:Wavelet Analysis** (matrix)

15.8.7 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)

15.9 Image Processing

Origin provides a collection of tools for basic image processing. These tools are accessible from the **Image** menu when a matrix book is active. The tools are organized in the following sub-menus:

- **Image:Adjustments**
- **Image:Arithmetic Transforms**
- **Image:Conversion**
- **Image:Geometric Transforms**
- **Image:Spatial Filters**

15.10 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

16 Statistics

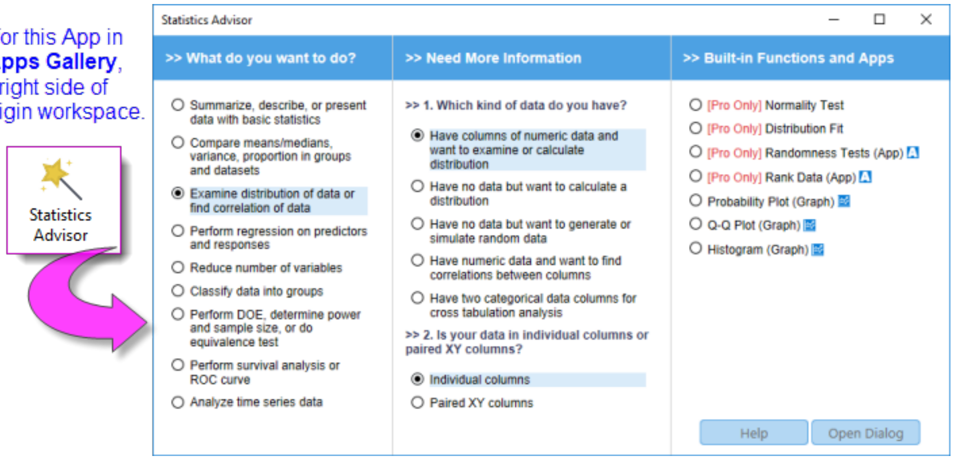
16.1.1 Apps for Statistics

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 but note that as of the summer of 2018, all Apps are available at no extra cost and they are easily downloaded and added to Origin. Point to the **Add Apps** button in the "Apps Gallery" to the right-side of your workspace and double-click. In the **App Center** dialog that opens, you will find **New** and **Popular** Apps. Using this dialog, you can download new Apps or update existing Apps.

Origin 2019 includes a pre-installed App called **Statistics Advisor** that will be of particular interest to those doing statistical analyses in Origin. This App uses an interactive "wizard" interface to help you choose appropriate tests and tell you where you will find them in Origin, or on **the OriginLab File Exchange**.

Look for this App in your **Apps Gallery**, to the right side of the Origin workspace.



Statistics Advisor

>> What do you want to do?	>> Need More Information	>> Built-in Functions and Apps
○ Summarize, describe, or present data with basic statistics	>> 1. Which kind of data do you have?	○ [Pro Only] Normality Test
○ Compare means/medians, variance, proportion in groups and datasets	● Have columns of numeric data and want to examine or calculate distribution	○ [Pro Only] Distribution Fit
● Examine distribution of data or find correlation of data	○ Have no data but want to calculate a distribution	○ [Pro Only] Randomness Tests (App)
○ Perform regression on predictors and responses	○ Have no data but want to generate or simulate random data	○ [Pro Only] Rank Data (App)
○ Reduce number of variables	○ Have numeric data and want to find correlations between columns	○ Probability Plot (Graph)
○ Classify data into groups	○ Have two categorical data columns for cross tabulation analysis	○ Q-Q Plot (Graph)
○ Perform DOE, determine power and sample size, or do equivalence test	>> 2. Is your data in individual columns or paired XY columns?	○ Histogram (Graph)
○ Perform survival analysis or ROC curve	● Individual columns	
○ Analyze time series data	○ Paired XY columns	

16.2 Basic Statistics

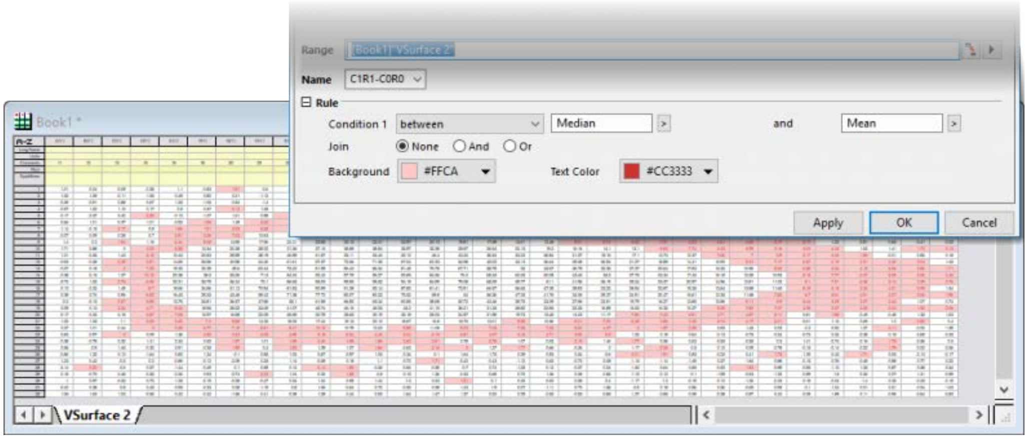
Origin provides several tools and methods to compute basic statistics on data from either the worksheet or from a graph.

16.2.1 Basic Statistics on Worksheet

Descriptive Statistics	Menu entry with worksheet active
• Statistics on Columns • Statistics on Rows	**Statistics:Descriptive Statistics**
• Cross Tabulation and Chi-Square (Pro Only)	**Statistics:Descriptive Statistics**

Frequencies/Counts	
Frequency Counts 2D Frequency Counts/Binning Discrete Frequency	**Statistics:Descriptive Statistics**
Distribution	
Normality Test Distribution Fit (Pro Only)	**Statistics:Descriptive Statistics**
Relationship	
Correlation Coefficient (Pro Only) Partial Correlation Coefficient (Pro Only)	**Statistics:Descriptive Statistics**
Detecting Outliers	
Grubbs Test Dixon's Q-test	**Statistics:Descriptive Statistics**

Origin 2019 supports **Conditional Formatting** of worksheet cells, with which you can apply color to worksheet cells based, among other things, on worksheet statistics. For more information see **Conditional Formatting**.



Range [Book1]"VSurface 2"

Name C1R1-C0R0

Rule

Condition 1 between Median and Mean

Join ● None ○ And ○ Or

Background #FFCA

Text Color #CC3333

16.2.2 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 Only)	**Gadgets:Cluster...**
• Statistics Gadget	**Gadgets:Statistics...**

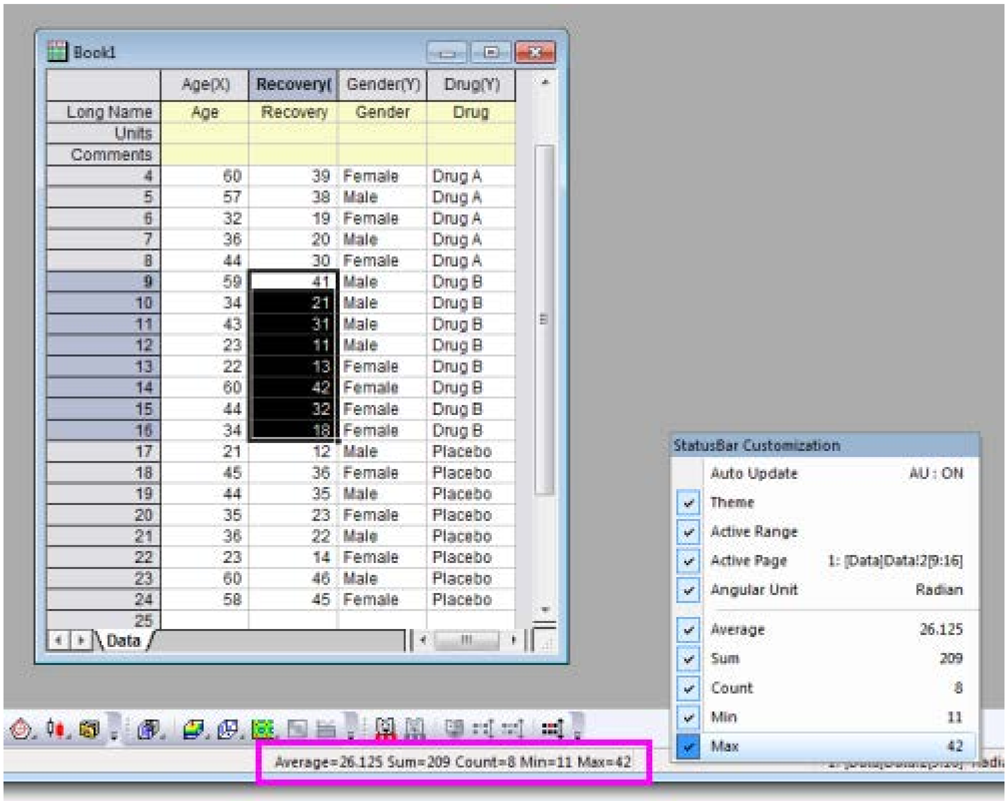
16.2.3 Statistics on Selected Range

Origin provides some quick ways to obtain basic statistics on a selected range of worksheet cells, or data plot(s) in a graph.

16.2.3.1 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.



	Age(X)	Recovery(	Gender(Y)	Drug(Y)
Long Name	Age	Recovery	Gender	Drug
Units				
Comments				
4	60	39	Female	Drug A
5	57	38	Male	Drug A
6	32	19	Female	Drug A
7	36	20	Male	Drug A
8	44	30	Female	Drug A
9	59	41	Male	Drug B
10	34	21	Male	Drug B
11	43	31	Male	Drug B
12	23	11	Male	Drug B
13	22	13	Female	Drug B
14	60	42	Female	Drug B
15	44	32	Female	Drug B
16	34	18	Female	Drug B
17	21	12	Male	Placebo
18	45	36	Female	Placebo
19	44	35	Male	Placebo
20	35	23	Female	Placebo
21	36	22	Male	Placebo
22	23	14	Female	Placebo
23	60	46	Male	Placebo
24	58	45	Female	Placebo
25				

StatusBar Customization

	Auto Update	AU : ON
☑	Theme	
☑	Active Range	
☑	Active Page	1: [Data]Data!2[9:16]
☑	Angular Unit	Radian
☑	Average	26.125
☑	Sum	209
☑	Count	8
☑	Min	11
☑	Max	42

Average=26.125 Sum=209 Count=8 Min=11 Max=42

16.2.3.2 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

16.3 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	Menu Entry
Box Charts: Box, Interval Plot, Marginal Box Charts, Bar Charts, Box Overlap, Box Normal, Half Box, Bar Overlap, Bar Normal, Scatter Interval, Double-Y Box.	**Plot > 2D: Box**
Box Charts, Grouped: Grouped Box Charts - Indexed Data, Grouped Box Charts - Raw Data.	**Plot > 2D: Group Box**
NEW **Violin Plots**: Violin Plot, Violin with Box, Violin with Point, Violin with Quartile, Violin with Stick, Split Violin, Half Violin.	**Plot > 2D: Violin Plot**
Histograms: Histogram, Histogram + Probabilities, Multi-Panel Histogram, Marginal Histograms, Histogram + Distribution, Histogram + Label, Stacked Histograms. NEW Stacked Histograms	**Plot > 2D: Histogram**
2D Kernel Density	**Plot > 2D: 2D Kernel Density**

Graph Type	Menu Entry
Heatmap: Heatmap, Heatmap with Labels NEW Heatmap with Labels	**Plot > 2D: Heatmap**
NEW Contour - Categorical Z	**Plot > 2D: Contour**
NEW Cluster Plots	**Plot > 2D: Multi-Panel**
Probability: Probability Plot, Q-Q Plot.	**Plot > 2D: Probability**
Pareto and QC Chart: Pareto Chart - Binned Data, Pareto Chart - Raw Data, QC (X-bar R) Chart.	**Plot > 2D: Pareto and QC Chart**
Scatter Matrix	**Plot > 2D: Scatter Matrix**
Trellis Plot: Trellis Plot, Double-Y Trellis Plot NEW Double-Y Trellis Plot	**Plot > 2D: Trellis**
NEW **Parallel Plot:** Parallel Plot, Parallel Sets, Parallel Index.	**Plot > 2D: Parallel Plot**

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 Only)
- Survival Curve - One Minus Survival Curve - Hazard Curve - Log Survival Curve	**Statistics: Survival Analysis: Kaplan-Meier Estimator** (Pro Only)
- Scree Plot - Component Plot	**Statistics: Multivariate Analysis: Principal Component Analysis** (Pro Only)
- Dendrogram	**Statistics: Multivariate Analysis: Hierarchical Cluster Analysis** (Pro Only)
- Classification Summary Plot - Classification Fit Plot - Canonical Score Plot	**Statistics: Multivariate Analysis: Discriminant Analysis** (Pro Only)
- ROC Curve	**Statistics: ROC Curve** (Pro Only)

16.4 Comparing One, Two or More Groups

Origin provides parametric and non-parametric tests to compare one, two, three or more groups.

16.4.1 Parametric Hypothesis Tests

Feature	Menu Entry
One-Sample t-Test Two-Sample t-Test Pair-Sample t-Test One-Sample Test for Variance (Pro Only) Two-Sample Test for Variance (Pro Only)	**Statistics: Hypothesis Testing**
One-Sample Proportion Test (Pro Only) Two-Sample Proportion Test (Pro Only)	**Statistics: Hypothesis Testing**
Two-Sample t-Test on Rows (Pro Only) Pair-Sample t-Test on Rows (Pro Only)	**Statistics: Hypothesis Testing**

16.4.2 ANOVA

Feature	Menu Entry
One-Way ANOVA Two-Way ANOVA Three-Way ANOVA One-Way Repeated-Measures ANOVA (Pro Only) Two-Way Repeated-Measures ANOVA (Pro Only) (Supports both Balanced and Unbalanced data)	**Statistics: ANOVA**

16.4.3 Non-parametric Tests (Pro Only)

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

16.5 Advanced Statistics

Several additional tools are available in **OriginPro**.

16.5.1 Multivariate Analysis (Pro Only)

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.

16.5.2 Survival Analysis (Pro Only)

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.

16.5.3 Power and Sample Size (Pro Only)

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 One-Sample t-Test Two-Sample t-Test Paired-Sample t-Test One-Variance Test Two-Variance Test One-Way ANOVA	**Statistics: Power and Sample Size**

16.5.4 ROC Curve (Pro Only)

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**

16.6 Topics for Further Reading

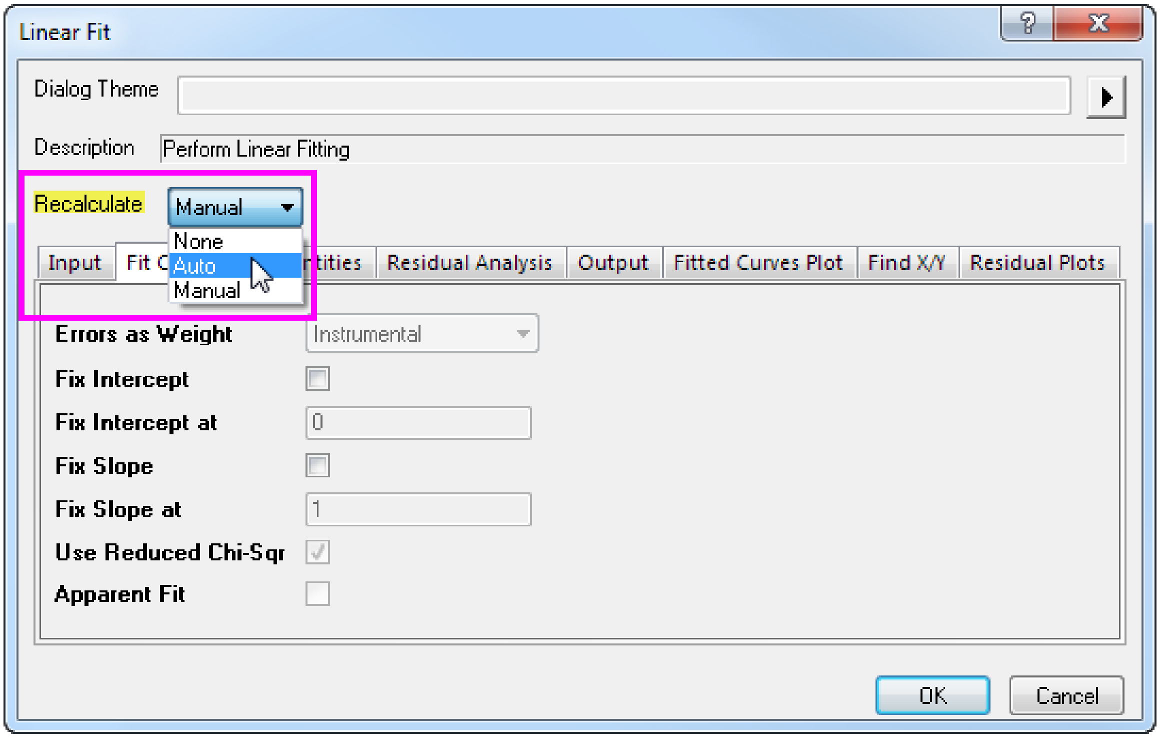
- Statistics on Worksheet Columns
- Statistics on Worksheet Rows
- Descriptive Statistics
- Statistics Charts, General
- Appendix 2 - Origin Graph Types
- Appendix: Statistical Graph Types by Template
- Normality Testing
- Distribution Fit

- Parametric Hypothesis Testing
- ANOVA
- Nonparametric Tests
- Multivariate Analysis
- Survival Analysis
- ROC Curves
- Power and Sample Size Tests
- LabTalk Supported X-Functions: Statistics

17 How to Handle Repetitive Tasks

17.1 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.



Linear Fit

Dialog Theme

Description: Perform Linear Fitting

Recalculate: Manual

Errors as Weight: Instrumental

Fix Intercept ☐

Fix Intercept at: 0

Fix Slope ☐

Fix Slope at: 1

Use Reduced Chi-Sqr ☑

Apparent Fit ☐

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 🔒 is displayed in the output columns and graphs that contain plots of the output data. • 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. • 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.

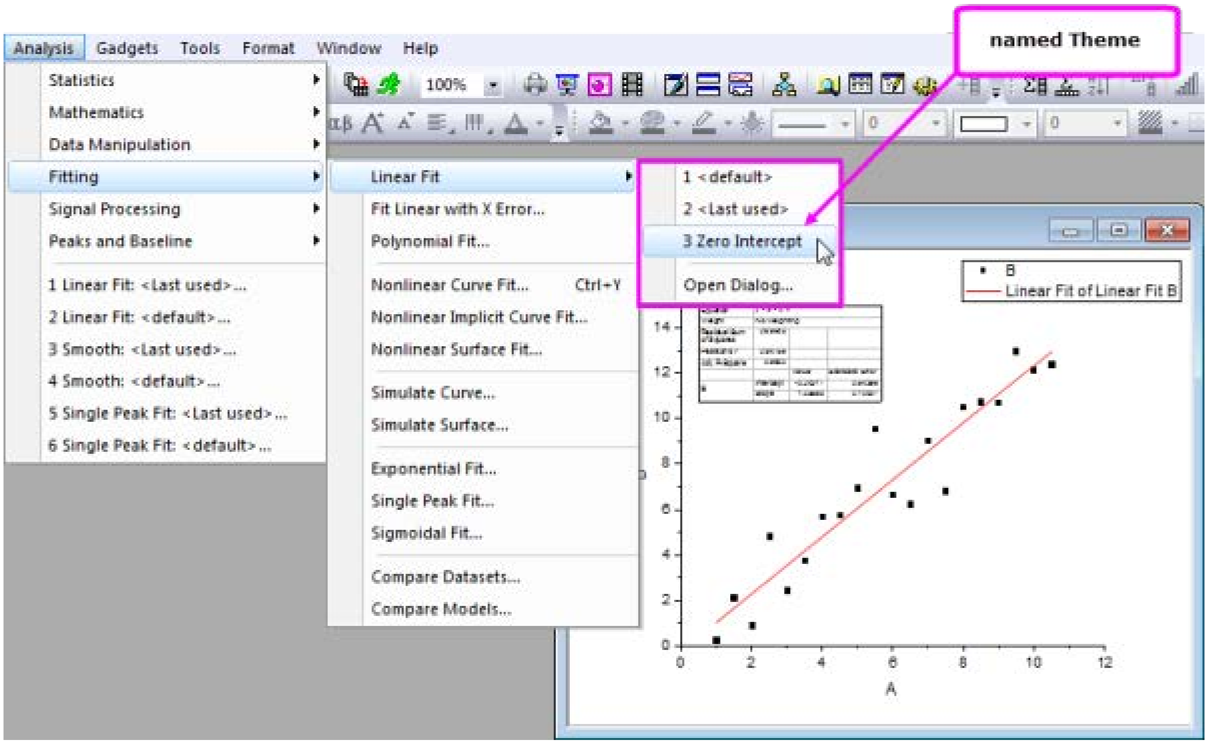
Block Recalculation: Having many recalculation operations in your project file can slow down your work. Starting with Origin 2019, you can block recalculation -- both **Manual** and **Auto** recalculation -- by clicking on a lock icon and choosing **Block Recalculation** from the popup menu. Placing 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).

Hide Locks: Starting with 2019, 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.

17.2 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 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.


named Theme
Analysis
Gadgets
Tools
Format
Window
Help
100%
Statistics
Mathematics
Data Manipulation
Fitting
Signal Processing
Peaks and Baseline
1 Linear Fit: <Last used>...
2 Linear Fit: <default>...
3 Smooth: <Last used>...
4 Smooth: <default>...
5 Single Peak Fit: <Last used>...
6 Single Peak Fit: <default>...
Linear Fit
Fit Linear with X Error...
Polynomial Fit...
Nonlinear Curve Fit... Ctrl+Y
Nonlinear Implicit Curve Fit...
Nonlinear Surface Fit...
Simulate Curve...
Simulate Surface...
Exponential Fit...
Single Peak Fit...
Sigmoidal Fit...
Compare Datasets...
Compare Models...
1 <default>
2 <Last used>
3 Zero Intercept
Open Dialog...
B
Linear Fit of Linear Fit B
A
0
2
4
6
8
10
12
14

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.

- 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.

17.3 Project and Workbook Templates

17.3.1 The Project as Template

The Origin project file can be used as a template for carrying out repetitive graphing and analysis tasks. Create the desired graphs and/or analysis results from data in your workbook(s) and save the project. You then simply replace the workbook data, to automatically update graphs and results. When saving the project, you have the following options:

1. Use the **File: Save Project without Data** menu item. This will clear all data before saving the project.
2. Use the **File: Duplicate Project without Data** menu item. This will create a copy of the existing project where all the data will be cleared before saving.

You can, of course, save the current project with data but the above two options may prove useful when working with very large datasets as they will reduce project file size.

17.3.2 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.

Workbook templates of all types can now be opened and managed using the **New Workbook** dialog box, that opens by default, when you start Origin 2019.

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 contain custom report sheets and a summary sheet. Thus, you can create an individual report for each file. The advantage of saving the workbook as an Analysis Template is that the **Batch Processing** tool can use the template to process multiple files or datasets and create a final summary report for all files that are processed as part of the batch analysis. View the **Batch Plotting** and **Batch Analysis** sections of this chapter for examples of using the workbook as a template for handling repetitive tasks.

17.4 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.

17.4.1 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.

17.4.2 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 **File: Import 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.

17.5 Batch Analysis

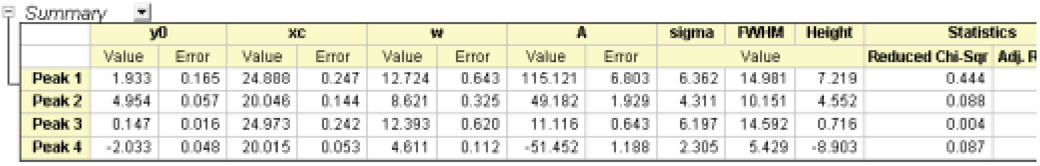
Origin provides several ways to perform batch analysis of multiple files, data columns, or data plots.

17.5.1 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

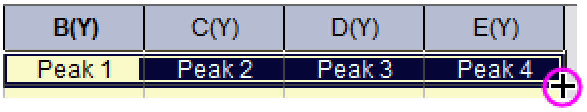
1. Open a new workbook and import the file **Samples\Curve Fitting\Multiple Gaussians.dat** from the Origin installation folder.
2. Set the Long Names of the four Y columns as **Peak 1**, **Peak 2**, **Peak 3** and **Peak 4**.
3. Select all four Y columns, and use the **Analysis: Fitting: Nonlinear Curve 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
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	
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	
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	
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	

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.



B(Y)	C(Y)	D(Y)	E(Y)
Peak 1	Peak 2	Peak 3	Peak 4

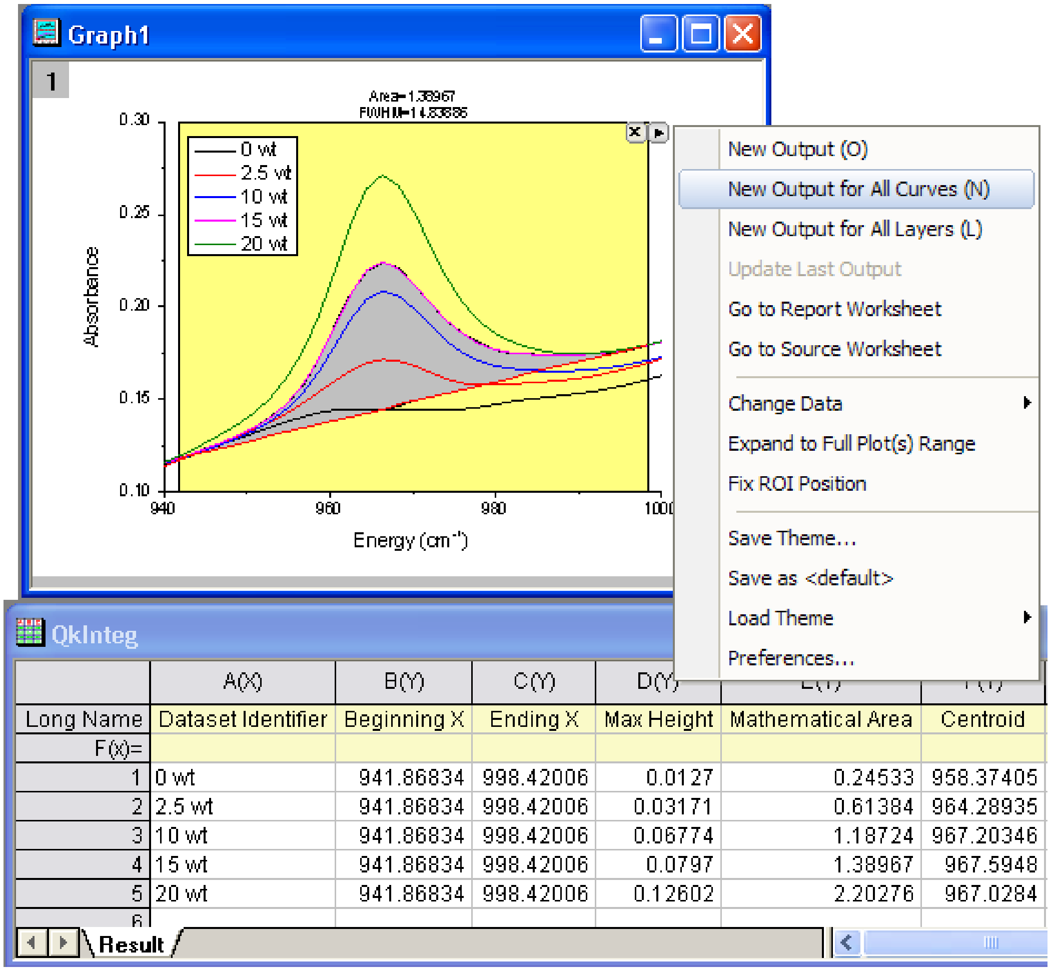
17.5.2 Using Gadgets for Analyzing Multiple Curves

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.


Graph1
1
Area=1.38967
FWHM=14.83886
0 wt
2.5 wt
10 wt
15 wt
20 wt
Absorbance
0.30
0.25
0.20
0.15
0.10
940
960
980
1000
Energy (cm⁻¹)
New Output (O)
New Output for All Curves (N)
New Output for All Layers (L)
Update Last Output
Go to Report Worksheet
Go to Source Worksheet
Change Data
Expand to Full Plot(s) Range
Fix ROI Position
Save Theme...
Save as <default>
Load Theme
Preferences...
QkInteg
Result

	A(X)	B(Y)	C(Y)	D(Y)	E(Y)	F(Y)
Long Name	Dataset Identifier	Beginning X	Ending X	Max Height	Mathematical Area	Centroid
F(x)=						
1	0 wt	941.86834	998.42006	0.0127	0.24533	958.37405
2	2.5 wt	941.86834	998.42006	0.03171	0.61384	964.28935
3	10 wt	941.86834	998.42006	0.06774	1.18724	967.20346
4	15 wt	941.86834	998.42006	0.0797	1.38967	967.5948
5	20 wt	941.86834	998.42006	0.12602	2.20276	967.0284
6						

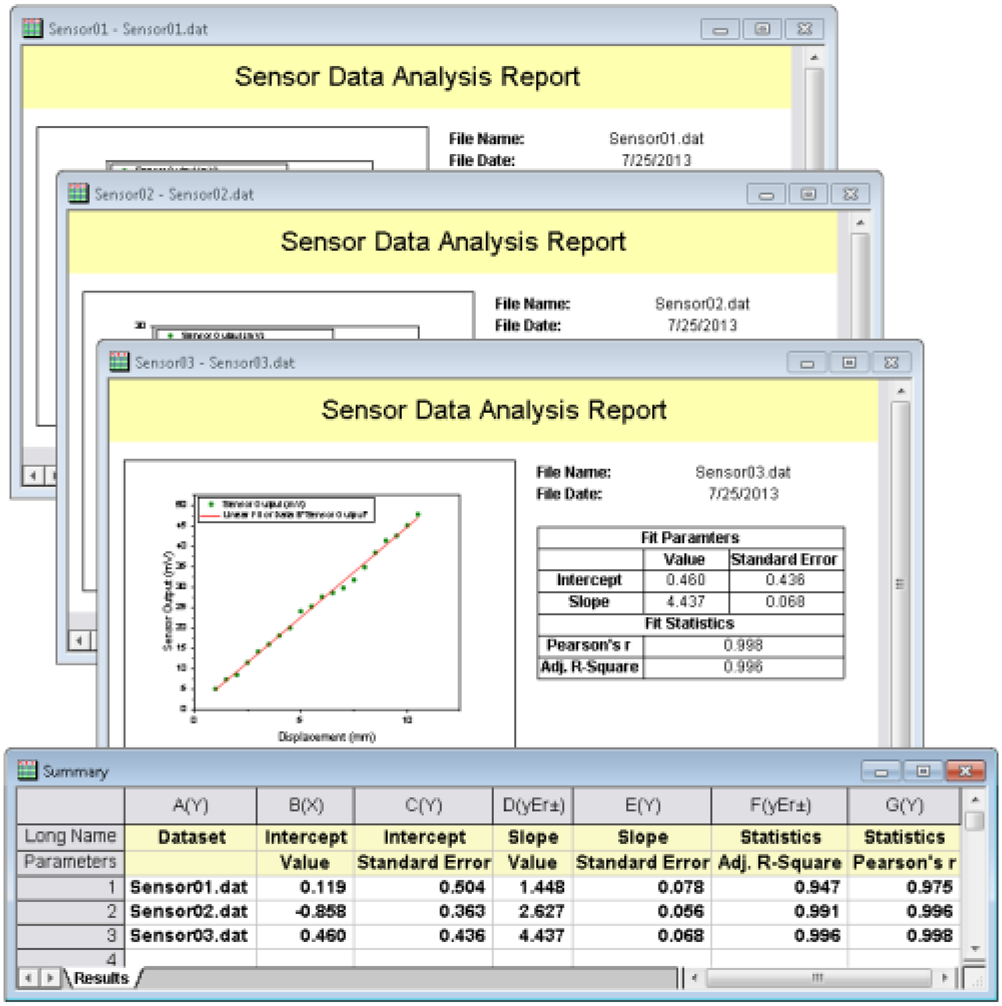
17.5.3 Batch Analysis Using an Analysis Template

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 select the file **Sensor Analysis.OGW** located in the **Samples\Batch Processing** subfolder under your Origin installation folder. This Analysis Template contains multiple sheets set up for linear regression analysis, reporting, and summary tables.

4. Set **Data Source** to **Import From Files**, then click the browse button … to the right of the **File List** and from the **Samples\Curve Fitting** subfolder under your Origin installation folder, select files **Sensor01.dat**, **Sensor02.dat** and **Sensor03.dat** .
5. Set **Dataset Identifier** to **File Name**, **Data Sheet** to **Data**, and **Result Sheet** to **Result**, thus selecting the appropriate sheets in the 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.



Sensor Data Analysis Report

File Name: Sensor01.dat
File Date: 7/25/2013

Sensor Data Analysis Report

File Name: Sensor02.dat
File Date: 7/25/2013

Sensor Data Analysis Report

File Name: Sensor03.dat
File Date: 7/25/2013

Fit Paramters		
	Value	Standard Error
Intercept	0.460	0.436
Slope	4.437	0.068
Fit Statistics		
Pearson's r	0.998	
Adj. R-Square	0.996	

	A(Y)	B(X)	C(Y)	D(yEr±)	E(Y)	F(yEr±)	G(Y)
Long Name	Dataset	Intercept	Intercept	Slope	Slope	Statistics	Statistics
Parameters		Value	Standard Error	Value	Standard Error	Adj. R-Square	Pearson's r
1	Sensor01.dat	0.119	0.504	1.448	0.078	0.947	0.975
2	Sensor02.dat	-0.858	0.363	2.627	0.056	0.991	0.996
3	Sensor03.dat	0.460	0.436	4.437	0.068	0.996	0.998
4							

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** file for each report. For more information, see this tutorial.

17.6 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.

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.

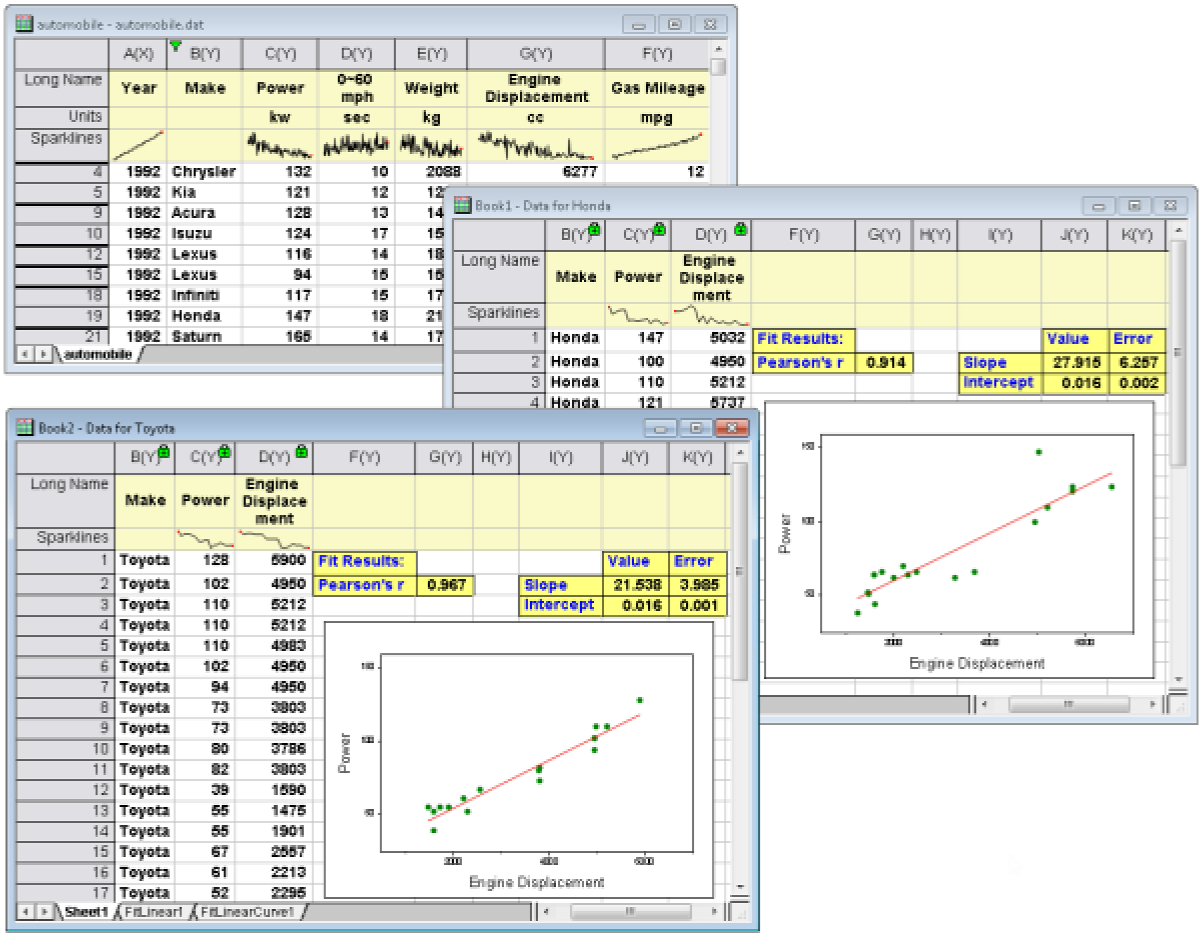
17.7 Repeating Analysis Using Data Filters

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.



automobile - automobile.dat

	A(X)	B(Y)	C(Y)	D(Y)	E(Y)	G(Y)	F(Y)
Long Name	Year	Make	Power	0~60 mph	Weight	Engine Displacement	Gas Mileage
Units			kw	sec	kg	cc	mpg
Sparklines							
4	1992	Chrysler	132	10	2088	6277	12
5	1992	Kia	121	12	12		
9	1992	Acura	128	13	14		
10	1992	Isuzu	124	17	15		
12	1992	Lexus	116	14	18		
15	1992	Lexus	94	16	16		
18	1992	Infiniti	117	15	17		
19	1992	Honda	147	18	21		
21	1992	Saturn	165	14	17		

Book1 - Data for Honda

	B(Y)	C(Y)	D(Y)	F(Y)	G(Y)	H(Y)	I(Y)	J(Y)	K(Y)
Long Name	Make	Power	Engine Displacement						
Sparklines									
1	Honda	147	5032	Fit Results:				Value	Error
2	Honda	100	4950	Pearson's r	0.914		Slope	27.916	6.257
3	Honda	110	5212				Intercept	0.016	0.002
4	Honda	121	5737						

Book2 - Data for Toyota

	B(Y)	C(Y)	D(Y)	F(Y)	G(Y)	H(Y)	I(Y)	J(Y)	K(Y)
Long Name	Make	Power	Engine Displacement						
Sparklines									
1	Toyota	128	5900	Fit Results:				Value	Error
2	Toyota	102	4950	Pearson's r	0.967		Slope	21.538	3.985
3	Toyota	110	5212				Intercept	0.016	0.001
4	Toyota	110	5212						
5	Toyota	110	4983						
6	Toyota	102	4950						
7	Toyota	94	4950						
8	Toyota	73	3803						
9	Toyota	73	3803						
10	Toyota	80	3786						
11	Toyota	82	3803						
12	Toyota	39	1590						
13	Toyota	55	1475						
14	Toyota	55	1901						
15	Toyota	67	2557						
16	Toyota	61	2213						
17	Toyota	52	2295						

Tutorial: Locking a Filter Condition on Copied Columns

1. Import the file **Samples\Statistics\Automobile.dat**
2. Click on the **Make** column, then right-click and select **Filter: Add or Remove Filter** context menu.
3. Click on the filter icon that was added to the column, and uncheck all makes but Honda (Choose **Select All** to clear all and then select Honda). Click **OK**.
4. Hold down the CTRL key and click and select the **Make**, **Power** and **Engine Displacement** columns. Next, right-click and select the **Copy Columns to...** context menu.
5. Accept defaults in the dialog that opens, and click **Ok** to copy the columns. A new worksheet will be added to the workbook.
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 and modify the filter condition to Toyota and 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.
12. Compare the fitting results for the two automobile makes.

17.8 Automating Tasks Using Programming

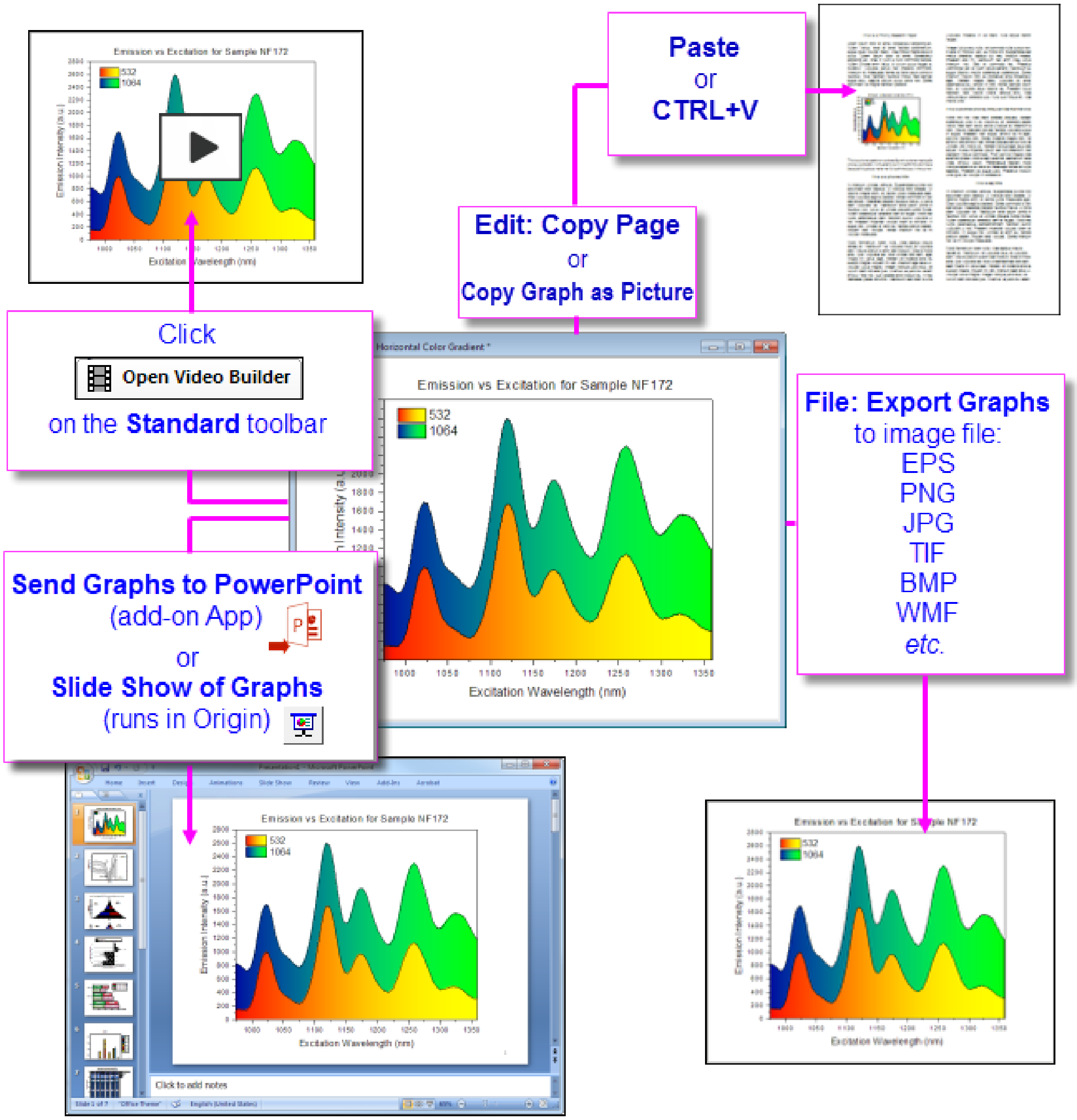
In addition to the above mentioned methods for automating tasks using the interface, graphing and analysis features can also be accessed programmatically from either the **LabTalk** scripting language or from **Origin C**. Access to Graph Themes and templates, and Analysis Templates can be programmed. You can set up some of the procedure manually by first creating the templates 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.

17.9 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

18 Publishing and Export



Emission vs Excitation for Sample NF172
532
1064
Emission Intensity (a.u.)
Excitation Wavelength (nm)
Horizontal Color Gradient *
Click to add notes

Paste
or
CTRL+V

Edit: Copy Page
or
Copy Graph as Picture

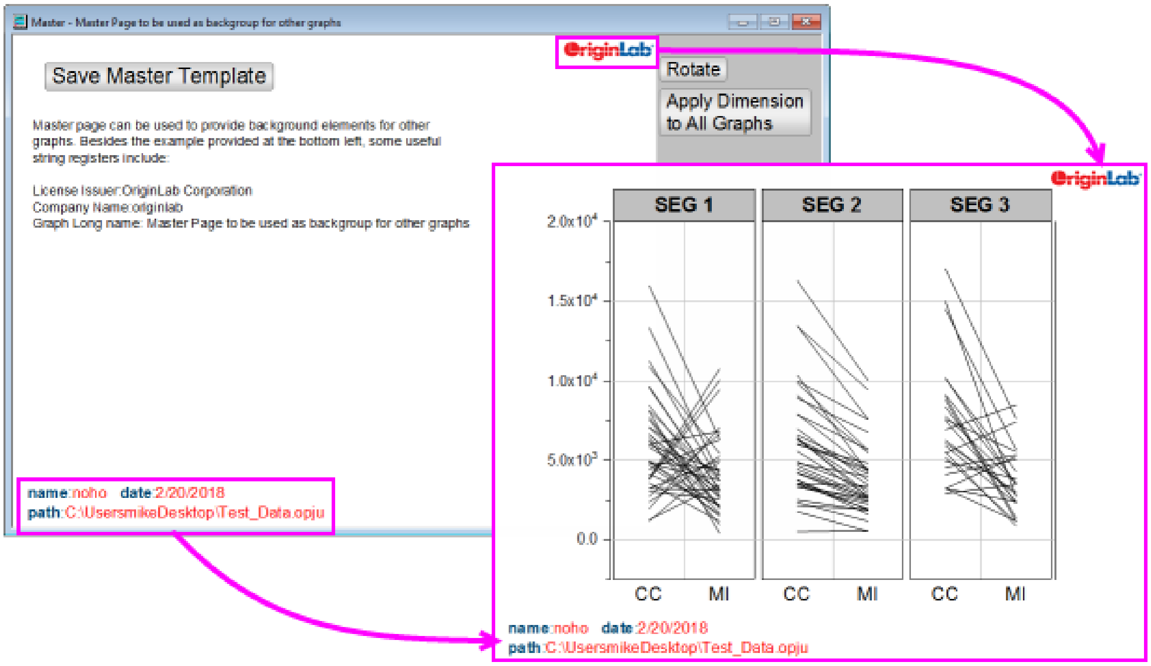
Click
Open Video Builder
on the **Standard** toolbar

Send Graphs to PowerPoint
(add-on App)
or
Slide Show of Graphs
(runs in Origin)

File: Export Graphs
to image file:
EPS
PNG
JPG
TIF
BMP
WMF
etc.

18.1 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.



Master page can be used to provide background elements for other graphs. Besides the example provided at the bottom left, some useful string registers include:

License Issuer:OriginLab Corporation
Company Name:originlab
Graph Long name: Master Page to be used as backgroup for other graphs

name:noho date:2/20/2018
path:C:\UsersmikeDesktop\Test_Data.opju

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*.
- **Edit: Copy Page** normally copies an Origin graph object to the Clipboard. When the object is pasted into an MS Word document and the user subsequently double-clicks on the graph object, the graph opens in

an OLE instance of Origin, where it can be edited. When Master Items are present on the graph, **Edit: Copy Page** places an image object (EMF) on the Clipboard, not the usual graph object.

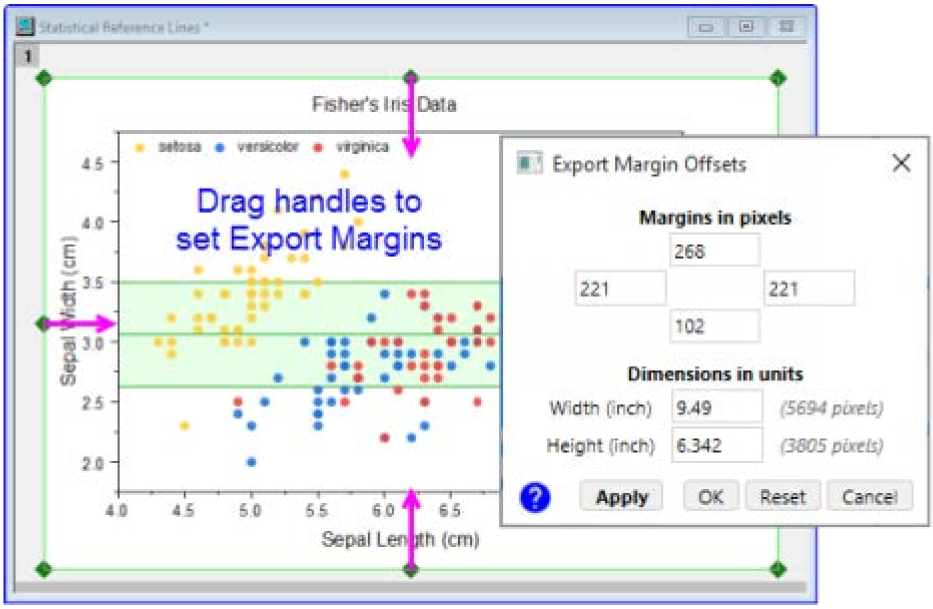
- **Send Graphs to PowerPoint** *does not* support **Insert Graphs as Embedded Object** if the graph contains Master Items (see previous bullet). **Insert Graphs as Picture** does support Master Items.
- There is a mechanism for selectively excluding Master Items in your exported or printed page. *Any 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 Properties**, **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

18.2 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 **Tools: Options** (Copy actions) or the **Export Settings** branch of **Export Graphs** (Export actions). Beginning with Origin 2018, you can interactively modify the default margins using the **Export Margin Offsets Dialog Box**.


Statistical Reference Lines *
1
Fisher's Iris Data
setosa
versicolor
virginica
Drag handles to
set Export Margins
Sepal Width (cm)
Sepal Length (cm)
4.5
4.0
3.5
3.0
2.5
2.0
4.0
4.5
5.0
5.5
6.0
6.5
Apply
OK
Reset
Cancel

Export Margin Offsets

Margins in pixels

268

221 221

102

Dimensions in units

Width (inch) 9.49 (5694 pixels)

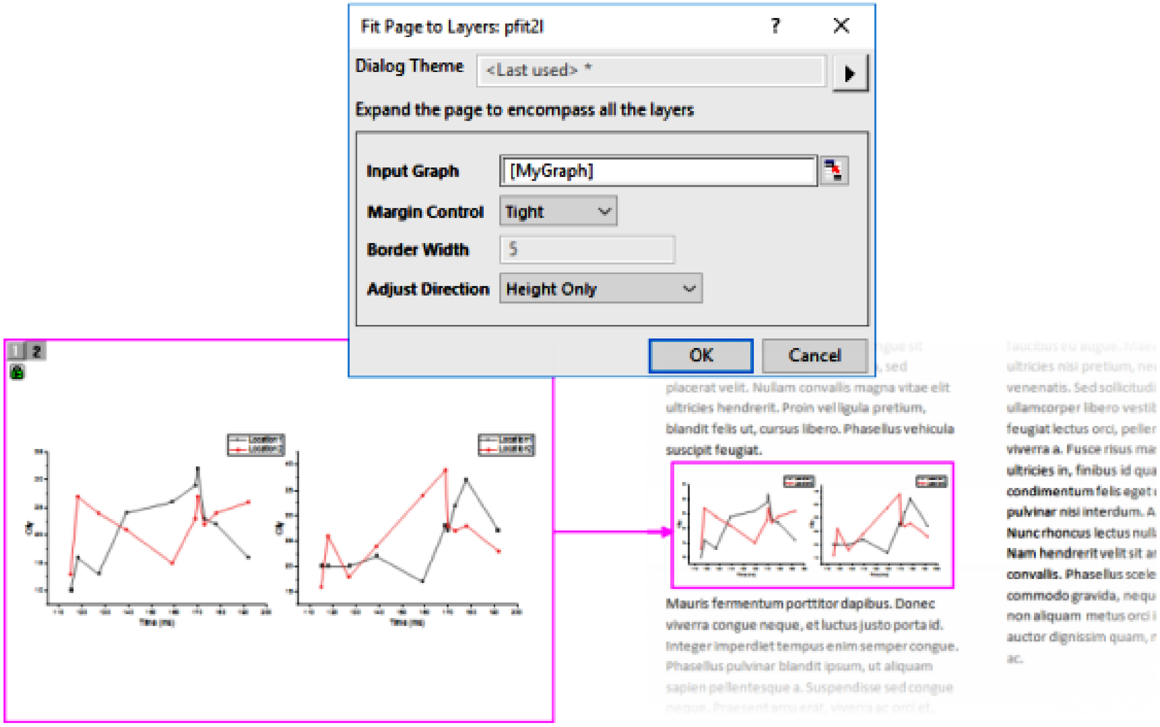
Height (inch) 6.342 (3805 pixels)

1. Click on the graph window (to activate) and choose **Edit: Export Margin Offsets**. This opens the **Export Margin Offsets** dialog.
2. Drag the green selection handles that appear at the page margins; or enter values into the dialog edit boxes and click **Apply**.

18.3 Fit Page to Layer and Layer to Page

There are two small dialog boxes -- one new, one that has been part of Origin for some time -- 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.



Fit Page to Layers: pfit2l

Dialog Theme: <Last used> *

Expand the page to encompass all the layers

Input Graph: [MyGraph]

Margin Control: Tight

Border Width: 5

Adjust Direction: Height Only

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 (**Fit Layers to Page**); if not, either tool should do the job.

18.4 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): as a **Picture**, or as an **Origin Graph Object**.

1. Click on your Origin graph to activate it, then ...
    - To copy the graph as a picture, choose **Edit: Copy Graph as Picture**.
    - To copy the graph as an editable Origin graph object, choose **Edit: Copy Page.**
2. In your target application choose **Paste** or press CTRL+V.

When you paste as a picture, the graph is inserted as an image. In MS Word, for instance, double-clicking on the image launches Word's picture-editing tools, but this method does not allow for further graph edits in your Origin software.

When you paste as a graph object, you can later double-click on the object in the target 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.

There are several settings in the **Options** dialog (**Tools: Options, Page** tab) that determine how the graph page is copied. These settings work with the newer **Export Margin Offset** dialog, to determine such things as graph copied size and page margins. Please review the **Copy Page Settings** and the **Export Margin Offset** dialog box.

Note: For more information, please refer to the:

Help: Origin: Origin Help > Exporting and Publishing Graphs > Pasting or Embedding Graphs in Other Applications

18.5 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.

18.6 Exporting Graphs and Layout Pages to an Image File

To export a graph or a layout page as an image file, select the menu **File:Export Graphs**. This will open the **expGraph** dialog box. The **expGraph** dialog offers options for customizing the output size by scaling the height or width of the page, various settings that are specific to the chosen file format, options for naming the output file, and options to perform batch exporting of multiple pages.

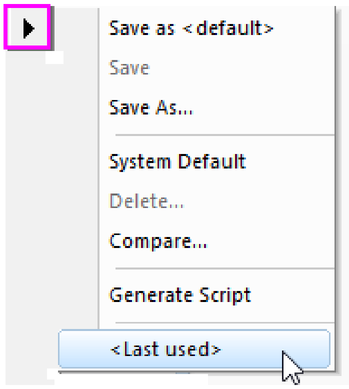
Origin supports 14 export file formats:

Raster Formats	BMP, GIF, JPG, PCX, PNG, TGA, PSD, TIF;
Vector Formats	CGM, DXF, EPS, EMF, PDF, WMF

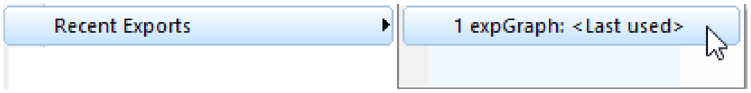
As is the case with most Origin dialog boxes, you can save your custom settings to a Theme file for repeat use. Once you have customized your settings:

- Click the arrow 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 **expGraph** dialog box or from the **File: Recent Exports** menu item.

exPGraph dialog box


Save as <default>
Save
Save As...
System Default
Delete...
Compare...
Generate Script
<Last used>

File: Recent Exports menu

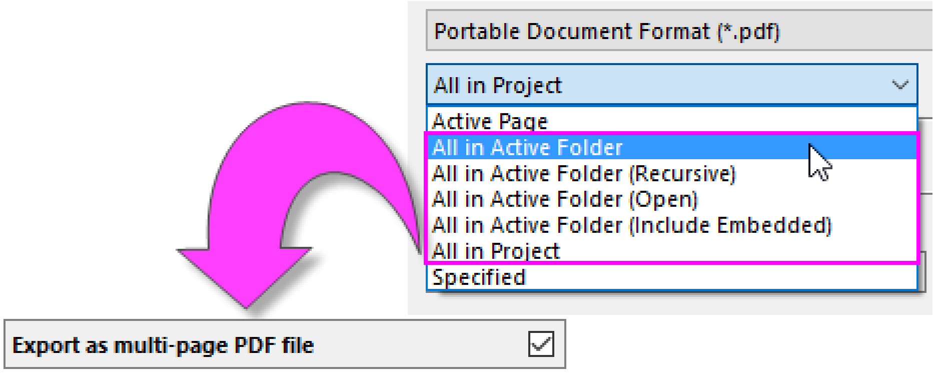

Recent Exports
1 expGraph: <Last used>

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]**

Exporting to raster formats such as TIFF and specifying a high resolution (e.g. 600 DPI or above) can produce a very large output file size, depending on the page size. To reduce the file size, consider reducing the size of the page before export. Consult with your publisher to determine the actual width of a print column in your journal.

Starting with Origin 2018b, 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**.


Portable Document Format (*.pdf)
All in Project
Active Page
All in Active Folder
All in Active Folder (Recursive)
All in Active Folder (Open)
All in Active Folder (Include Embedded)
All in Project
Specified
Export as multi-page PDF file ☑

18.7 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 an embedded objects can be edited, as needed, in your Origin software. Double-click on the graph in PowerPoint to open the graph in an OLE instance of Origin.

There are two **Send Graphs to PowerPoint** tools in Origin -- the older, built-in tool and a newer **Send Graphs to PowerPoint App** that is installed with more recent versions of the Origin software. As most users favor the App, it will be discussed here. Documentation of the older, built-in tool, is found here and here.

To launch the App, 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.

Tutorial: Send Graphs to PowerPoint

1. Run Origin and open the sample file *<Origin EXE Folder>*\Samples\Graphing\Column and Bar.opju.
2. Click on the **Send Graphs to PowerPoint** App icon to run the App.
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 available free-of-charge from the OriginLab File Exchange. This App is particularly useful for batch export of graphs to a book-marked MS Word document.

18.8 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.

18.9 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.

18.10 Exporting Worksheets and Matrices

18.10.1 Exporting Worksheets

With a worksheet active, the **File: Export** menu item provides the following options:

- **ASCII**, **NI TDM (TDM, TDMS)**, and **Sound (WAV)**

  This option is available only for sheets containing data columns, and is not available when report sheets such as those created by the Nonlinear Fitting tool are active. The exported file will contain only data from the worksheet columns. Floating or embedded graphs placed in the worksheet will be ignored.

- **As Multipage PDF File**

  This option is available only on sheets with data columns, and not for 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.

- **As Image File**

  This option is available on both data and report sheets. In the dialog that opens, you can select whether to export the entire sheet, visible area, or selection. Image file formats including PDF are supported. Floating or embedded graphs placed in the worksheet will be included in the exported image.

- **As PDF File**†

  This option is available for both data and 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.

† The PDF export option was previously included with the **As Image File** menu option but was not obvious to users so starting with version 2018, it is now a separate Export menu entry.

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.

18.10.2 Exporting a Matrix

Origin matrix data can be exported in these two formats:

- **ASCII**

  This will create an ASCII file of the data contained in the active matrix object.

- **Image**

  This option will export the image view of the active matrix object, as a raster file.

Note: For more information, please refer to the:

Help: Origin: Origin Help > Importing and Exporting Data > Exporting Worksheets and Matrices

18.11 Topics for Further Reading

- The **Tools: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

19 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.

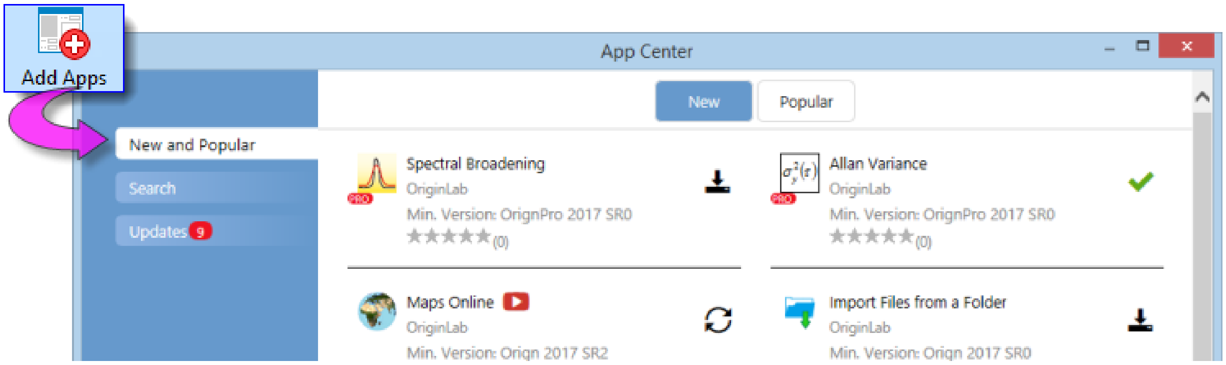
As of the fall of 2019, most Apps can be downloaded for free. Note that some Apps require OriginPro; this will be denoted in the App description by the PRO symbol.

19.1 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.


Add Apps
App Center
New
Popular
New and Popular
Search
Updates 9
Spectral Broadening
PRO
OriginLab
Min. Version: OrignPro 2017 SR0
(0)
Allan Variance
PRO
OriginLab
Min. Version: OrignPro 2017 SR0
(0)
Maps Online
OriginLab
Min. Version: Orign 2017 SR2
Import Files from a Folder
OriginLab
Min. Version: Orign 2017 SR0

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.

19.2 How Do I Install Apps?

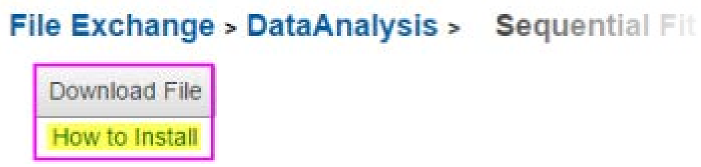
If you install your Apps using the **Download and Install** button in the **App Center** dialog, you don't need to do anything else. The App is automatically downloaded and installed. When App updates become available, you can use the **Update** button to update an installed App.

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 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.



19.3 How Do I Run an App?

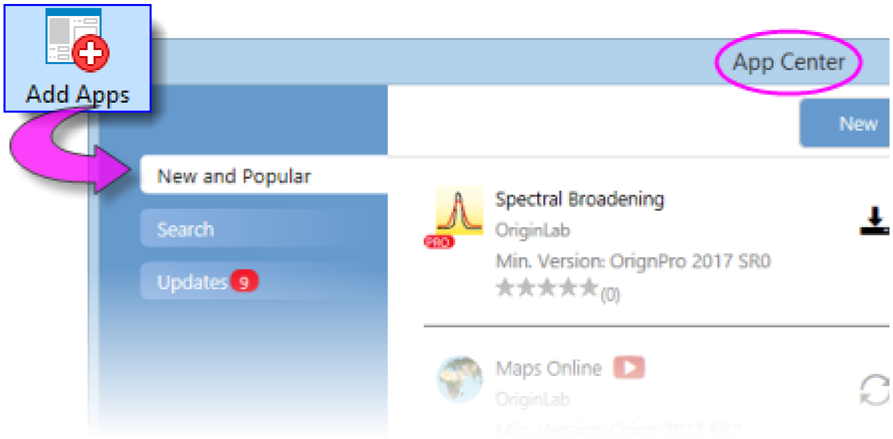
- Upon installation, an App icon is placed in the **Apps Gallery**, docked to the right side of the Origin workspace.
- App operations may be window-specific. If the App is dimmed (grayed out), the active window cannot be operated on by the App. Check the required window type (hover on the dimmed App 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.

19.4 Managing Your Apps

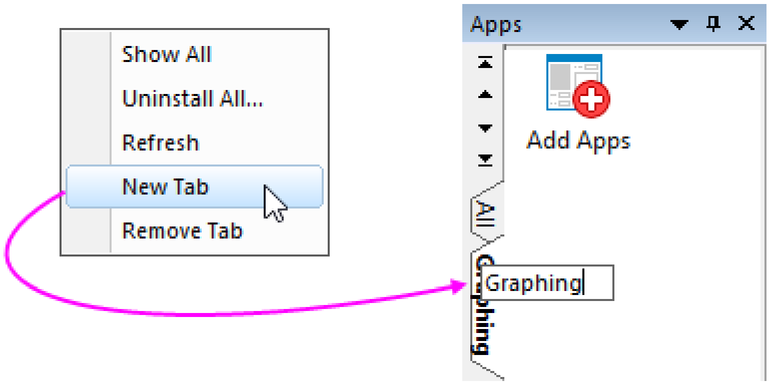
You can use the **App Center** in combination with the **Apps Gallery**, to manage your Apps:

- Use the **App Center** (discussed above) to add and update Apps, search for Apps, request an App or submit a review of an App.

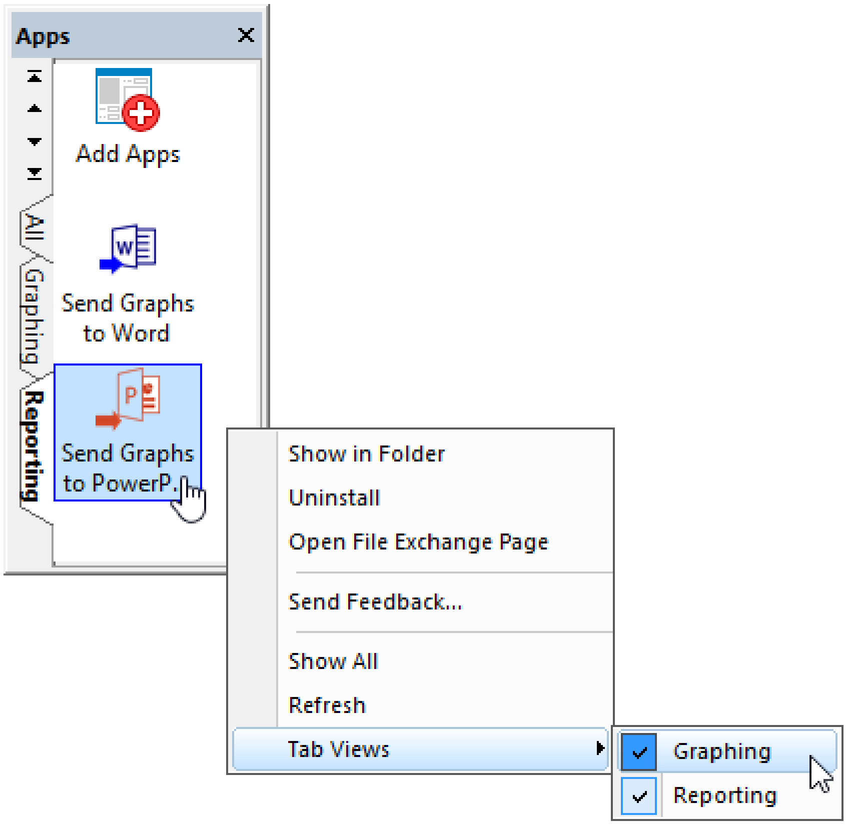
. To launch the App Center, click the **Add Apps** button in the Apps Gallery.


Add Apps
App Center
New
New and Popular
Search
Updates 9
Spectral Broadening
OriginLab
PRO
Min. Version: OrignPro 2017 SR0
(0)
Maps Online
OriginLab

- 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.


Show All
Uninstall All...
Refresh
New Tab
Remove Tab
Apps
Add Apps
All
Graphing
Graphing

- 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.

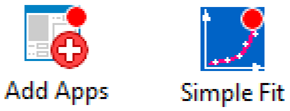

Apps
Add Apps
Send Graphs to Word
Send Graphs to PowerP...
All
Graphing
Reporting
Show in Folder
Uninstall
Open File Exchange Page
Send Feedback...
Show All
Refresh
Tab Views
Graphing
Reporting

- **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.

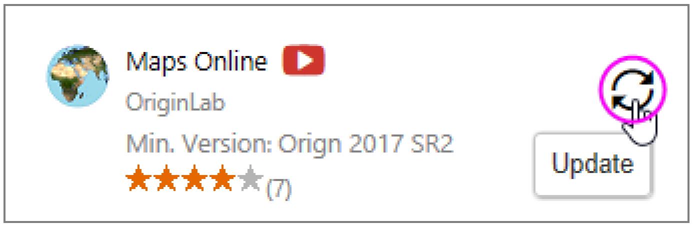
19.5 Will I be Notified When Updates are Available?

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.

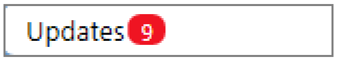

Maps Online

OriginLab

Min. Version: Orign 2017 SR2

★★★★☆ (7)

- 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.



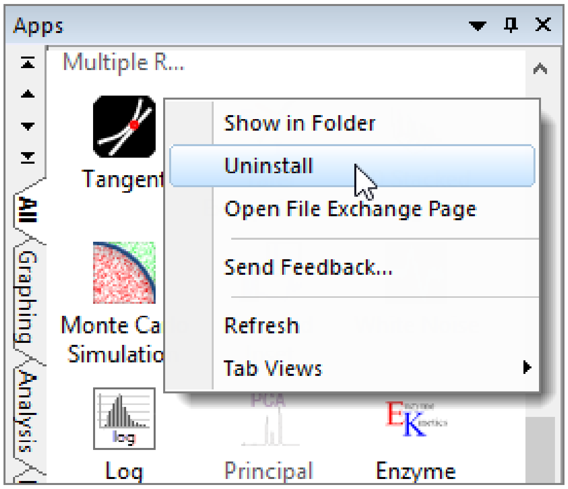
To update an App:

- 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.

You can verify the version of an installed App by hovering on the App in your Apps Gallery.

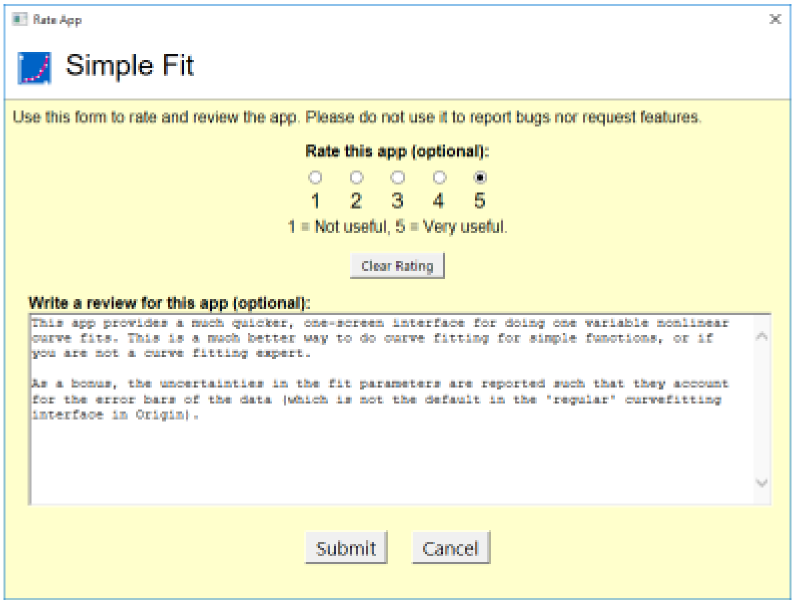
19.6 How Do I Uninstall an App?

Uninstalling an App is easy. Right-click on the App icon in the Apps Gallery and choose **Uninstall** from the shortcut menu.


Apps
Multiple R...
Tangent
Monte Ca
Simulatio
Log
Principal
Enzyme
All
Graphing
Analysis
Show in Folder
Uninstall
Open File Exchange Page
Send Feedback...
Refresh
Tab Views

19.7 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!


Rate App
Simple Fit

Use this form to rate and review the app. Please do not use it to report bugs nor request features.

Rate this app (optional):

○ 1 ○ 2 ○ 3 ○ 4 ● 5

1 = Not useful, 5 = Very useful.

Clear Rating

Write a review for this app (optional):

This app provides a much quicker, one-screen interface for doing one variable nonlinear curve fits. This is a much better way to do curve fitting for simple functions, or if you are not a curve fitting expert.

As a bonus, the uncertainties in the fit parameters are reported such that they account for the error bars of the data (which is not the default in the "regular" curvefitting interface in Origin).

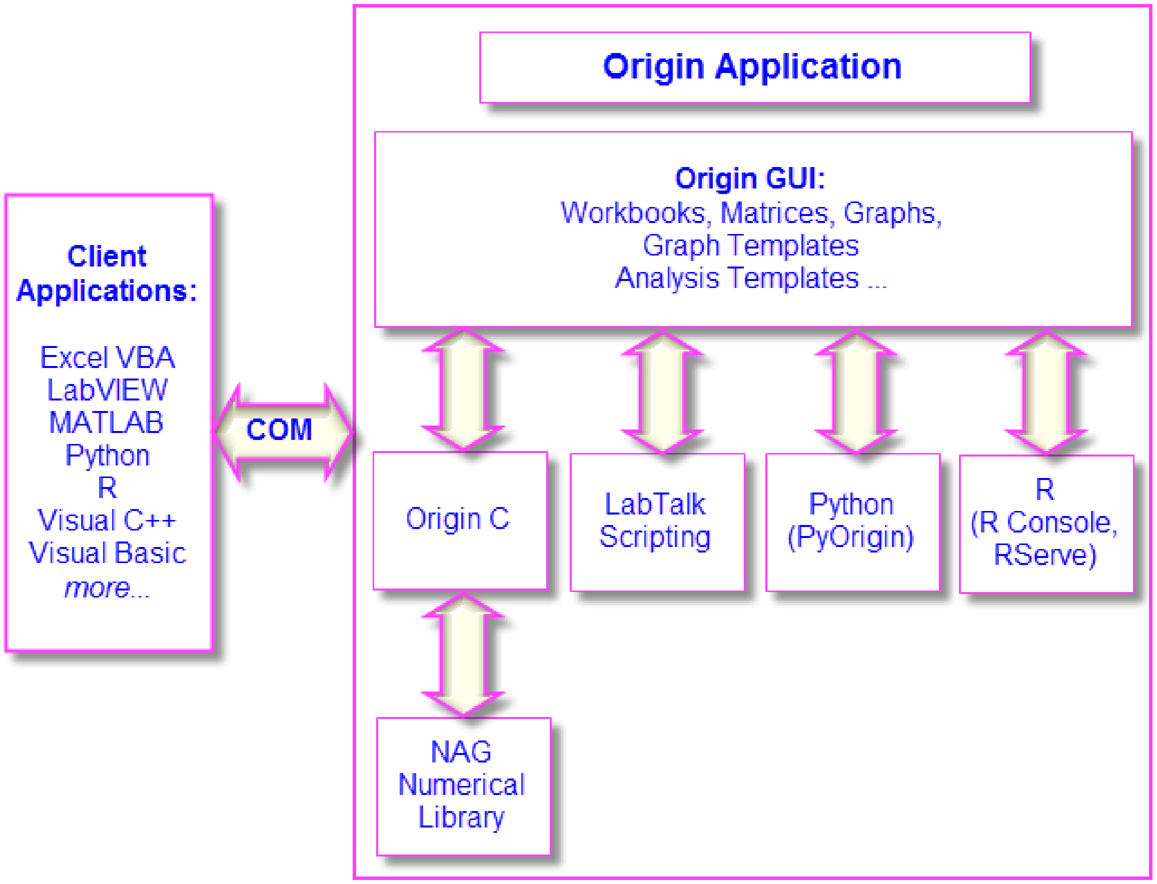
Submit
Cancel

19.8 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.

20 Programming in Origin


Origin Application
Origin GUI:
Workbooks, Matrices, Graphs,
Graph Templates
Analysis Templates ...
Client Applications:
Excel VBA
LabVIEW
MATLAB
Python
R
Visual C++
Visual Basic
more...
COM
Origin C
LabTalk Scripting
Python (PyOrigin)
R (R Console, RServe)
NAG Numerical Library

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.

20.1 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 results to the worksheet.

1. Run Origin and start a new project by clicking the **New Project** button on the **Standard** toolbar.
2. Click **File: Import: 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.
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:

```
wks.userParam1 = 1;
wks.userParam1$ = "Mean";
for (int ii = 2; ii <= wks.ncols; ii++)
{
        range rr = $(ii);
        Col($(ii))[D1]$ = $(mean(rr),.2*);
}
```

6. Click **OK** to apply settings and close the **Text Object** dialog box. Note that your text object now looks like a button.
7. 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.

20.2 Python

Origin provides an embedded Python environment so that you can run Python in Origin. Origin supports command line execution from the Script Window, or the running of .py files. To access Origin from Python, you can use the supplied **PyOrigin** module.

The current embedded Python in Origin is version 3.5.2 and version 2.7.12.

> **Note:** For more information on integrated usage of Origin and Python, refer to the LabTalk Scripting Guide: **Help: Programming: LabTalk > LabTalk Scripting Guide > Working with Python**. Sample files can be found in the \Samples\Python folder of your Origin software.

Starting with Origin 2018b, there is an API for calling Origin from Python. See note under **Automation Server**, below.

20.3 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.

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.

NEW

Origin 2019 supports **R** version **3.5.0**.

20.4 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.

> **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.

20.5 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.

20.6 Automation Server

Origin can be used as an **Automation Server**. Client applications such as National Instruments™ **LabVIEW™**, Microsoft **Excel**, 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.

NEW

Origin 2019 includes Automation Server support for **Python 3.6**

20.7 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.

20.8 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 both 64-bit and 32-bit systems. To find out more about Orglab and to download the Orglab module, go to the **Products > Orglab** page of **www.originlab.com**.

21 Customizing Origin

21.1 Customizing Default Settings

21.1.1 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 **Tools: Options** (any Origin window is active)
- If you are working with Excel in 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 tick labels when using scientific notation, units display in axis titles
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 Speed mode reminder watermark

	Controls For
Miscellaneous Tab	- Proxy server configuration - Default templates for ASCII import - Custom date/time formats - Enable collapsible menus - Use of dataset names in the Origin workspace
Numeric Format Tab	- Thresholds for displaying numbers in scientific notation - Defaults for displayed digits in data and report sheets - Radians, degrees or gradians - Separators for decimal places
Open/Close Tab	- Default window closing behaviors - Project startup, backup and autosave options - Options dialog save options
Page Tab	- Defaults for page size of copy/paste or exported graphs
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
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)

21.1.2 System 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 (**Tools: 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.

21.1.3 3D 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 **Tools: 3D Open GL Settings...**. Look under **OpenGL Info** for information on graphics hardware and the supported version of OpenGL.

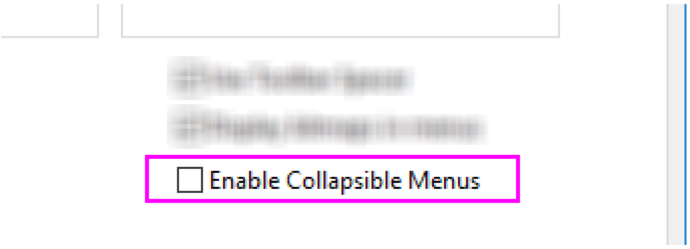
If your graphics hardware is older, you may experience compatibility issues with things such as transparency settings and anti-aliasing. The controls under the **Settings** node in this dialog allow you do such things as disabling transparency. The dialog box also provides information on disabling OpenGL.

For more information on OpenGL in Origin, see the links under "Topics for Further Reading" at the end of this chapter.

21.2 Customizing Menus

21.2.1 Collapsible 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 **Tools: Options**, click the **Miscellaneous** tab and clear the **Enable Collapsible Menus** check box.



☐ Enable Collapsible Menus

21.2.2 Custom 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 **Tools: 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 **Format: 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 also be shared with colleagues.

21.2.3 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 **Tools: 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.

21.3 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.

21.3.1 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.

21.3.2 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

21.3.3 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.

21.3.4 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

21.3.5 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

21.4 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.

21.5 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, 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 **Reinitialize** produces an attention message asking if you want to restore the workspace settings from your previous version or apply the new version defaults.

21.6 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)

21.6.1 Templates

The Origin template concept applies to graphs, workbooks, matrix books, and Analysis Templates™. Templates allow you to choose a set of properties or operations and save those for repeat use.

21.6.1.1 Workbook Templates and Analysis Templates

You can save workbook or matrix book 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.

Starting with Origin 2019, you can use the **New Workbook** dialog box for managing your workbook templates, both built-in (**System Templates**) and custom (**User Templates**). The dialog allows you to save a custom template with a description as well as a preview image, making it easier to keep your various workbook templates organized and ready for use.

You can use the same **New Workbook** dialog to organize and open 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:

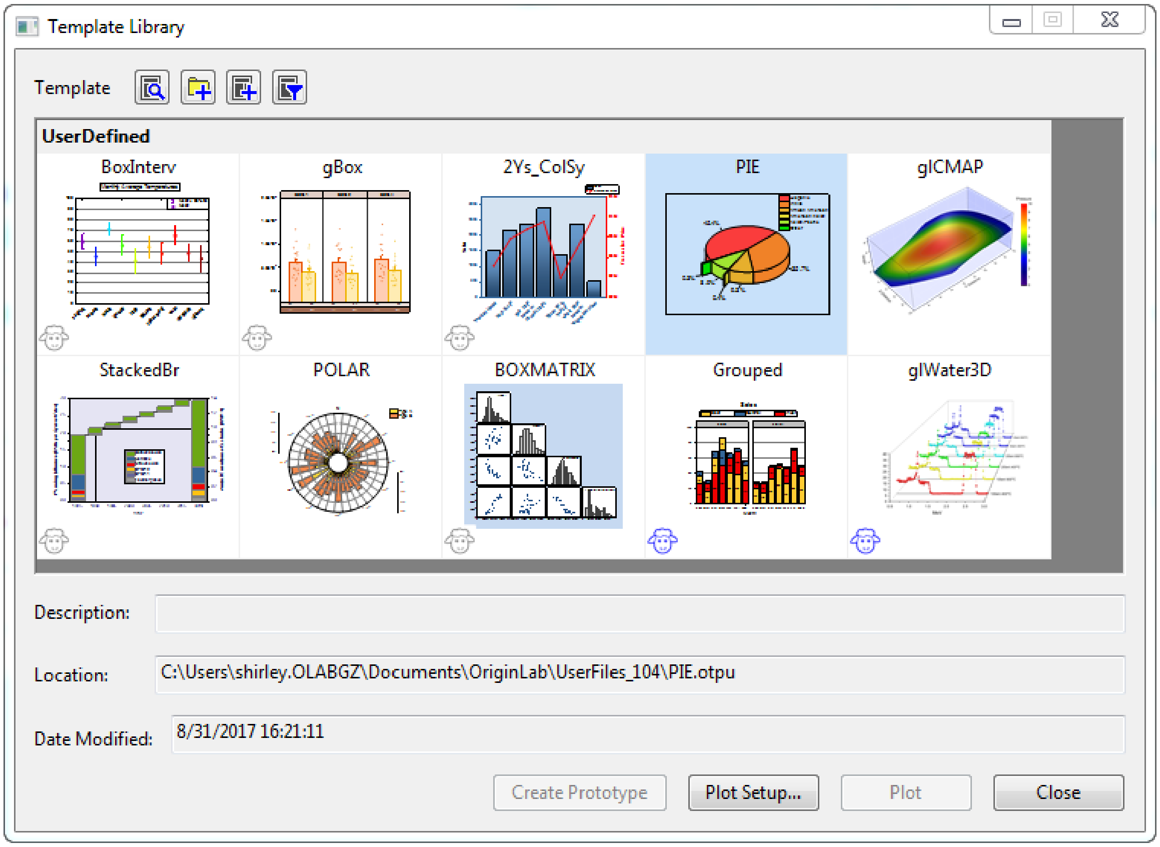
- Analysis Templates.
- Creating and Using Analysis Templates (tutorial).
- Batch Processing with Word Template for Reporting (tutorial).

21.6.1.2 Graph Templates

Origin ships with over 100 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...**.

As with built-in workbook and matrix templates, you cannot overwrite built-in (system) graph templates. If you customize a built-in graph template then choose **File: Save Template As**, the file will be saved, by default, to your **User Files Folder** (UFF). This UFF copy then takes the place of the built-in template and it is this customized template that will be used when clicking the corresponding menu command or toolbar button (e.g. **Scatter** plot). To reconnect a built-in template with these menu commands or toolbar buttons, delete (or remove) the customized template from your UFF.

An 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 preview image. When the sheep icon is blue, a cloneable template is compatible with the current active workbook/matrix; when gray, the cloneable template is not compatible with the current active workbook/matrix. For more information, see the section on cloneable templates in **Graph Template Basics** in your Origin Help file.



Description:

Location: C:\Users\shirley.OLABGZ\Documents\OriginLab\UserFiles_104\PIE.otpu

Date Modified: 8/31/2017 16:21:11

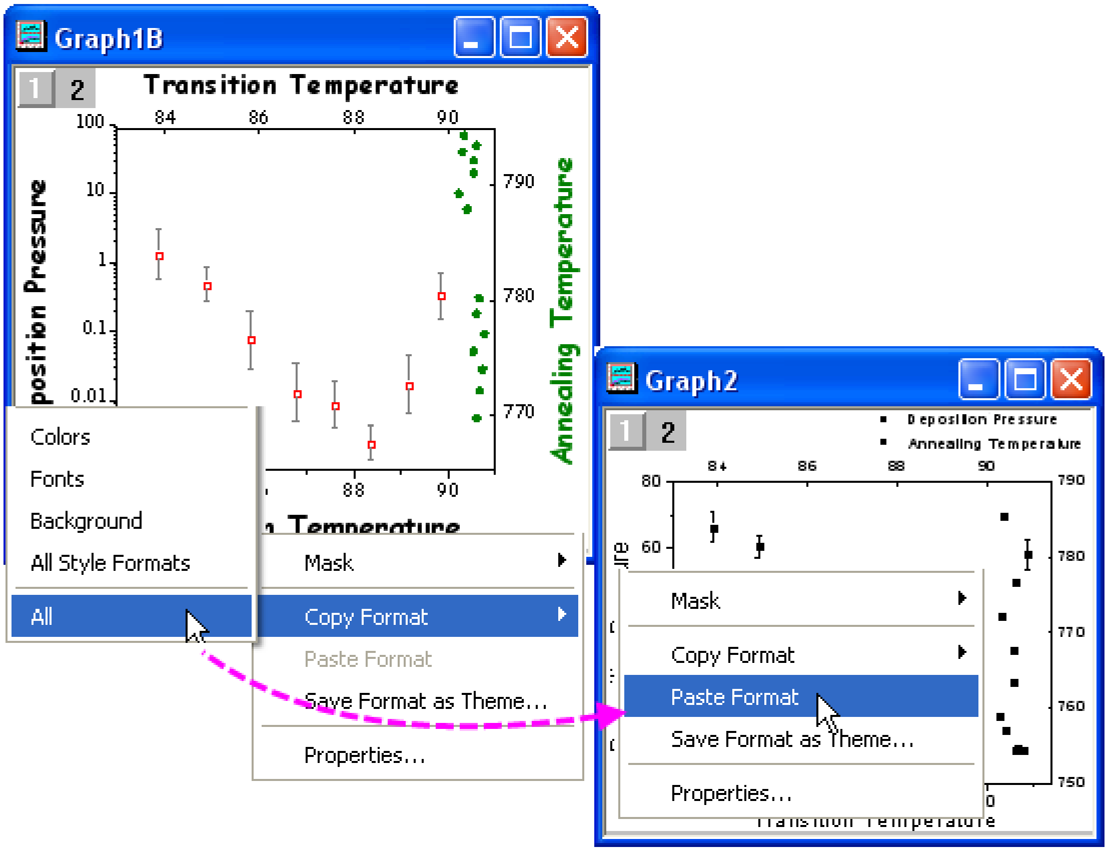
21.6.2 Themes

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.

A Graph Theme could be as simple as an axis tick mark direction setting, or as extensive as a collection of multiple graph object properties.

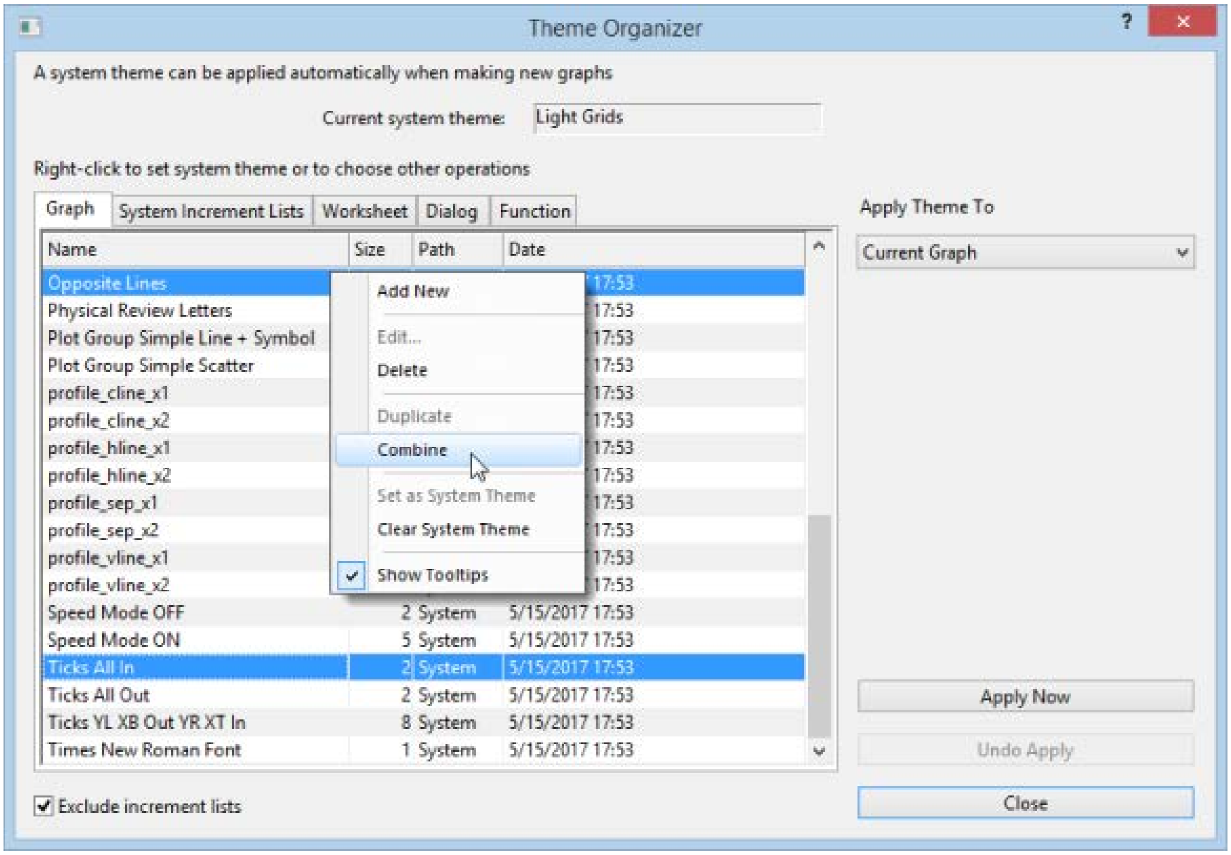
Themes allow you to quickly apply a new set of properties to an object, such as a graph. For example, you might apply a black-and-white Theme to a color graph in order to prepare it for publication. Or you might take the object properties of one graph and apply them to all the other graphs in the same 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.


Graph1B
1
2
Transition Temperature
Deposition Pressure
Annealing Temperature
Colors
Fonts
Background
All Style Formats
All
Mask
Copy Format
Paste Format
Save Format as Theme...
Properties...
Graph2
Deposition Pressure
Annealing Temperature
Mask
Copy Format
Paste Format
Save Format as Theme...
Properties...

The **Theme Organizer** dialog box is available from the **Tools** menu. Use this dialog to organize 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. Set a theme as system theme will apply it to future newly created graphs automatically if the graph template allows system theme to override.



Theme Organizer
Graph
System Increment Lists
Worksheet
Dialog
Function
Add New
Edit...
Delete
Duplicate
Combine
Set as System Theme
Clear System Theme
Show Tooltips
Apply Now
Undo Apply
Close

A system theme can be applied automatically when making new graphs

Current system theme: Light Grids

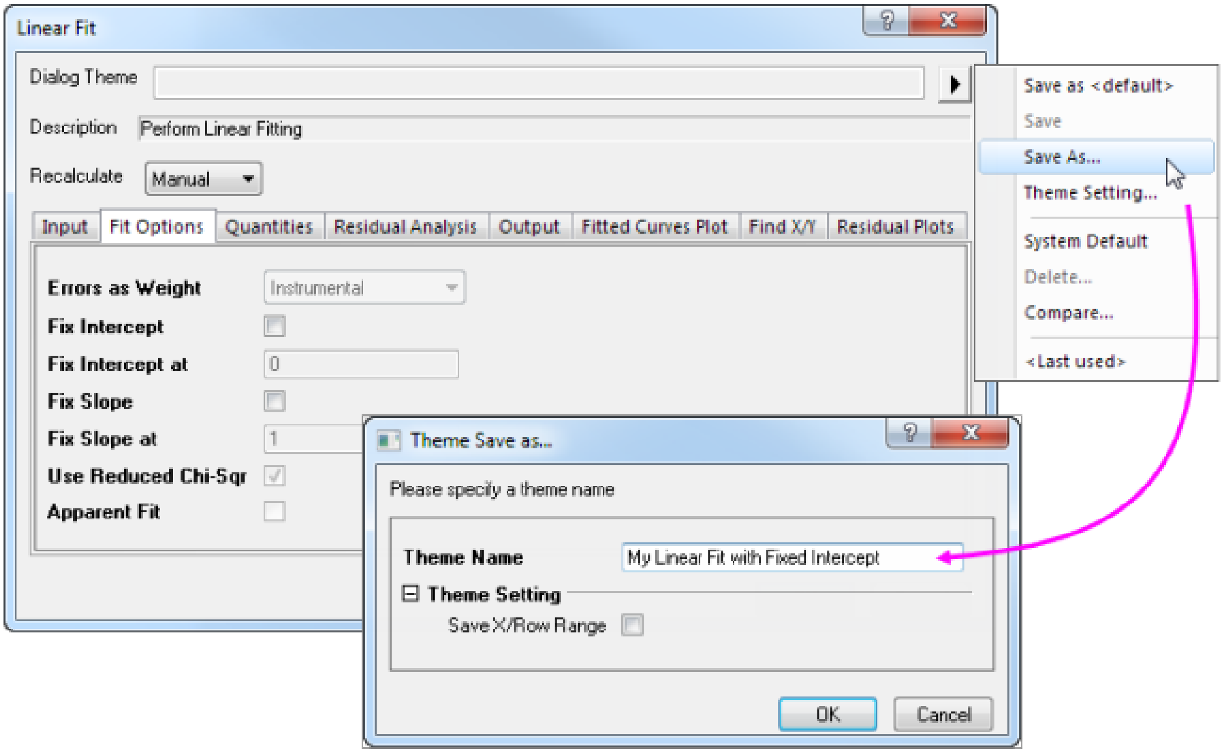
Right-click to set system theme or to choose other operations

Apply Theme To: Current Graph

Name	Size	Path	Date
Opposite Lines			17:53
Physical Review Letters			17:53
Plot Group Simple Line + Symbol			17:53
Plot Group Simple Scatter			17:53
profile_cline_x1			17:53
profile_cline_x2			17:53
profile_hline_x1			17:53
profile_hline_x2			17:53
profile_sep_x1			17:53
profile_sep_x2			17:53
profile_vline_x1			17:53
profile_vline_x2			17:53
Speed Mode OFF	2	System	5/15/2017 17:53
Speed Mode ON	5	System	5/15/2017 17:53
Ticks All In	2	System	5/15/2017 17:53
Ticks All Out	2	System	5/15/2017 17:53
Ticks YL XB Out YR XT In	8	System	5/15/2017 17:53
Times New Roman Font	1	System	5/15/2017 17:53

☑ Exclude increment lists

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 recall them from the dialog, as needed. 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.


Linear Fit
Input
Fit Options
Quantities
Residual Analysis
Output
Fitted Curves Plot
Find X/Y
Residual Plots
Save as <default>
Save
Save As...
Theme Setting...
System Default
Delete...
Compare...
<Last used>
Theme Save as...
OK
Cancel

Dialog Theme

Description: Perform Linear Fitting

Recalculate: Manual

Errors as Weight: Instrumental

Fix Intercept ☐

Fix Intercept at: 0

Fix Slope ☐

Fix Slope at: 1

Use Reduced Chi-Sqr ☑

Apparent Fit ☐

Please specify a theme name

Theme Name: My Linear Fit with Fixed Intercept

Theme Setting

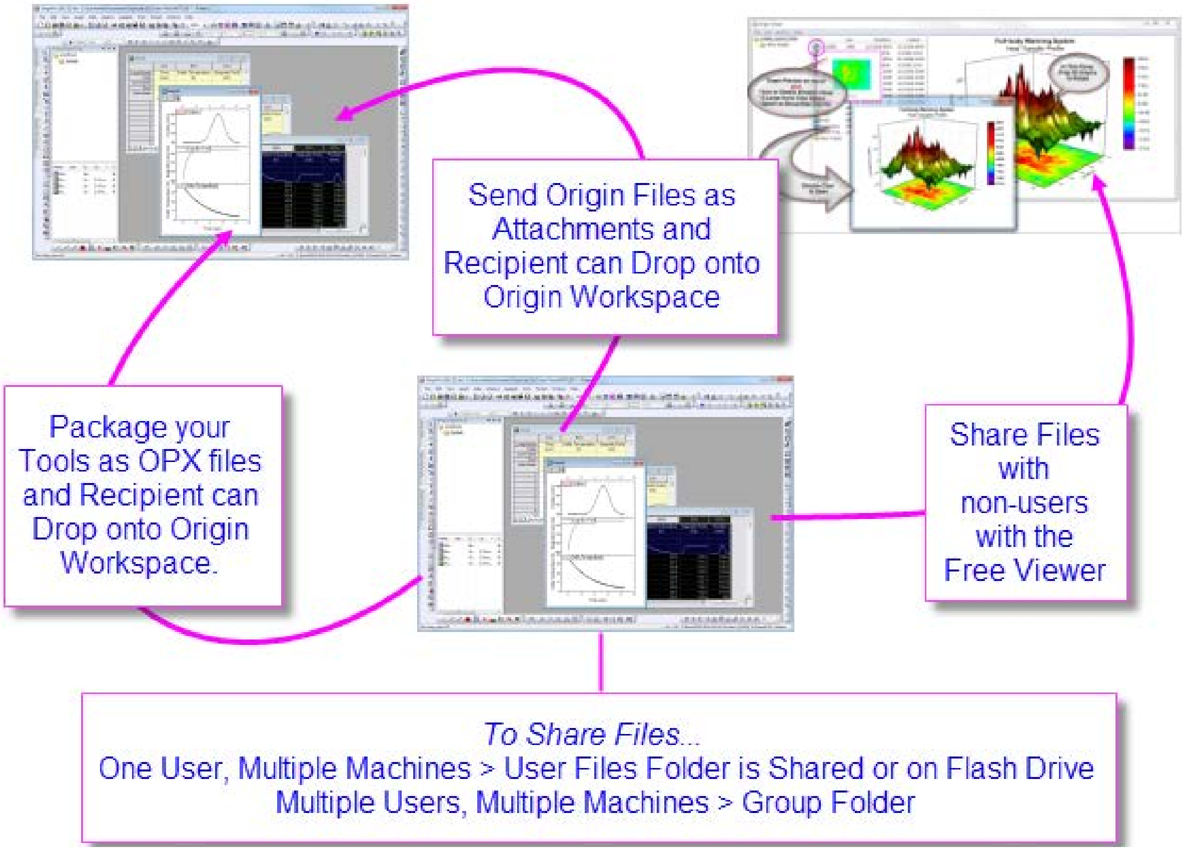
Save X/Row Range ☐

Dialog themes are explained in more detail in the **How to Handle Repetitive Tasks** chapter of this guide.

21.7 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

22 Sharing Origin Files


Send Origin Files as Attachments and Recipient can Drop onto Origin Workspace
Package your Tools as OPX files and Recipient can Drop onto Origin Workspace.
Share Files with non-users with the Free Viewer
To Share Files...
One User, Multiple Machines > User Files Folder is Shared or on Flash Drive
Multiple Users, Multiple Machines > Group Folder

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.

22.1 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.

22.2 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**

22.3 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 group member launches Origin, the published files will be copied to their Origin automatically and ready to use.

Note: For information on group folders, see:

Help: Origin: Origin Help > Sharing Your Origin Files with Others > Sharing Files with Multiple Clients > Group Folder Manager

22.4 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 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

22.5 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.
- Project Explorer-like folder view with graph previews on hover, icon or details windows 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.
- Available in 32- and 64-bit versions.

Origin 2018 introduced a new Unicode-compliant project file type (OPJU). The free Origin Viewer **9.5.5** allows anyone to save the new 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 EXE.

22.6 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

23 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 (e.g. **Open Excel**), because it is duplicated on another toolbar, or simply because it is a lesser-used button.

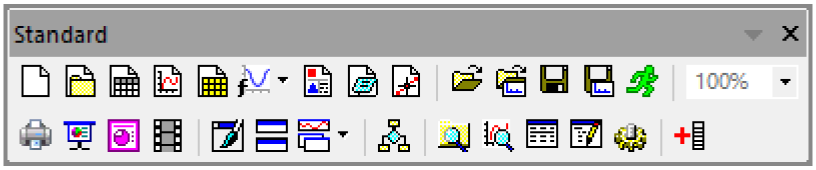
To add or remove buttons from a toolbar:

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.

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.

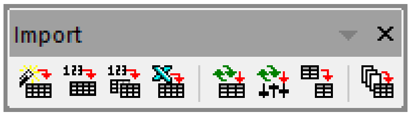
23.1 Standard



Button	Description	Hotkey	Button	Description	Hotkey
	New Project			New Folder	
	New Workbook			New Excel	
	New Graph			New Matrix	
	New Function			New 2D (Function) Plot	
	New 2D Parametric (Function) Plot			New 3D (Function) Plot	
	New 3D Parametric (Function) Plot			New Layout	

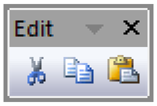
Button	Description	Hotkey	Button	Description	Hotkey
	New Notes			Digitize Image	
	Open	Ctrl+O		Open Template	
	Open Excel			Import Excel	Ctrl+E
	Save Project	Ctrl+S		Save Template	
	Recalculate Auto			Recalculate Manual	
	Import Wizard	Ctrl+3		Import Single ASCII	Ctrl+K
	Import Multiple ASCII			Batch Processing	
100%	Zoom In and Out by Percentage			Print	
	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
	Code Builder	Alt + 4		Add New Columns	

23.2 Import



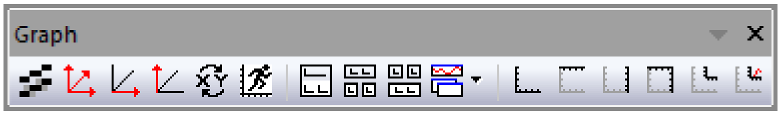
Button	Description	Hotkey	Button	Description	Hotkey
	Import Wizard			Import Single ASCII	
	Import Multiple ASCII			Import Excel	
	Re-import no Dialog	CTRL + 4		Re-import with Dialog	
	Clone Import			Batch Processing	

23.3 Edit



Button	Description	Hotkey	Button	Description	Hotkey
✂	Cut	Ctrl+X		Copy	Ctrl+C
📋	Paste	Ctrl+V	↶	Undo	Ctrl+Z

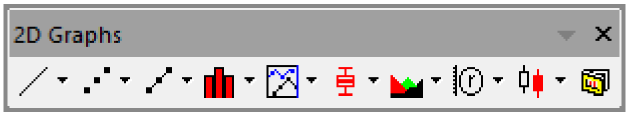
23.4 Graph



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				

23.5 2D Graphs

Note that a few plot types do not have a toolbar button. The most complete list of Origin plot types is found on the **Plot** menu.



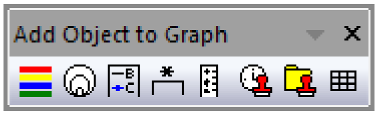
Button	Description	Button	Description
	Line		Horizontal Step
	Vertical Step		Spline Connected
	Scatter		Scatter Central
	Column Scatter		Y Error
	X Y Error		Vertical Drop Line
	Bubble		Color Mapped
	Bubble + Color Mapped		Line + Symbol
	Line Series		2 Point Segment
	3 Point Segment		Row-wise
	Column		Column + Label
	Grouped Column-Indexed Data		Bar

Button	Description	Button	Description
	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		Waterfall
	Waterfall Y: Color Mapping		Waterfall Z: Color Mapping
	3D Waterfall		3D Waterfall Y: Color Mapping
	3D Waterfall Z: Color Mapping		Vertical 2 Panel
	Horizontal 2 Panel		4 Panel
	9 Panel		Stack
	Multiple Panels by Label		Trellis Plot

Button	Description	Button	Description
	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		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

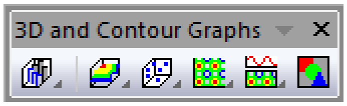
Button	Description	Button	Description
	Piper		Smith Chart
	Radar		Vector XYAM
	Vector XYXY		High-Low-Close
	Japanese Candlestick		OHLC Bar Chart
	OHLC-Volume		Line (Stock)
	Bridge Chart		Template Library

23.6 Add Object to Graph



Button	Description	Hotkey	Button	Description	Hotkey
	Add Color Scale			Reconstruct Legend	Ctrl+L
	Add Asterisk Bracket			Add XY Scale	
	Date & Time			Project Path	
	New Link Table			Add Bubble Scale	

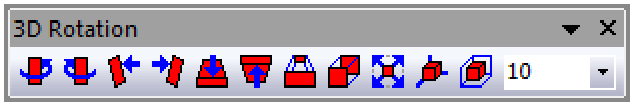
23.7 3D and Contour Graph



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		3D Waterfall Y: Color Mapping
	3D Waterfall Z: Color Mapping		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

Button	Description	Button	Description
	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

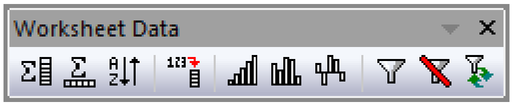
23.8 3D Rotation



Button	Description	Button	Description
	Rotate counterclockwise		Rotate clockwise
	Tilt left		Tilt right
	Tilt down		Tilt up
	Increase perspective		Decrease perspective

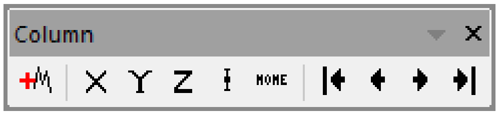
Button	Description	Button	Description
	Fit frame to layer		Reset Rotation
	Reset		Rotate on any direction
10 ▾	Rotation Angle		

23.9 Worksheet Data



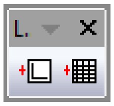
Button	Description	Hotkey	Button	Description	Hotkey
Σ	Statistics on Column(s)		Σ	Statistics on Row(s)	
A↓Z	Sort		123	Set Column Values	Ctrl+Q
123	Set All Column Values	Ctrl+F5		Row number	
	Uniform random numbers			Normal random numbers	
▽	Add/Remove Data Filter			Enable/Disable Data Filter	
	Reapply Data Filter				

23.10 Column



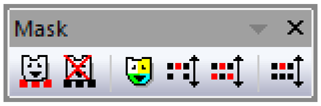
Button	Description	Button	Description
X	Set as X	Y	Set as Y
Z	Set as Z	I	Set as Y Error Bars
abc	Set as Labels	NONE	Set as Disregard
G	Set as Grouping	S	Set as Subject
|◀	Move to First	◀	Move Left
▶	Move Right	▶|	Move to Last
⇄	Swap Columns	+	Add Sparkline

23.11 Layout



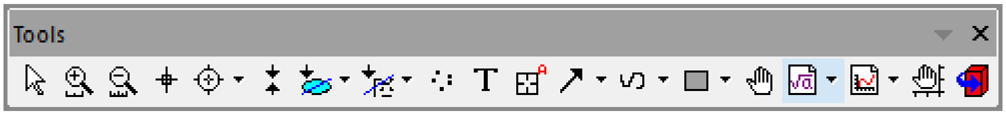
Button	Description	Button	Description
+☐	Add Graph	+▦	Add Worksheet

23.12 Mask



Button	Description	Button	Description
	Mask Range		Unmask Range
	Change mask color		Hide/Show masked points
	Swap mask		Disable/Enable masking

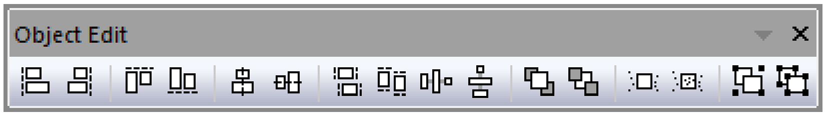
23.13 Tools



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	

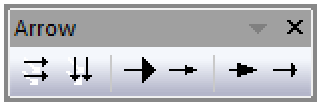
Button	Description	Hotkey	Button	Description	Hotkey
	Unmask Points on Active Plot			Unmask Points on All Plots	
⁘	Draw Data		T	Text Tool	
	Annotation		↗	Arrow Tool	
↷	Curved Arrow Tool		╱	Line Tool	
	Polyline Tool			Freehand Draw Tool	
▭	Rectangle Tool		⬭	Circle Tool	
	Polygon Tool			Region Tool	
✋	Zoom-Panning Tool	Hold "A"	√α	Insert Equation	
W	Insert Word Object		X	Insert Excel Object	
	Insert Object			Insert Graph	
▦	Insert Worksheet			Rescale Tool	Hold "Z": Zoom; Hold "X": Pan
	Rotate Tool	Hold "R"			

23.14 Object Edit



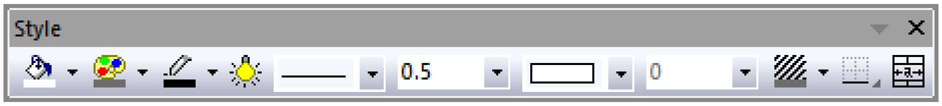
Button	Description	Button	Description
	Left		Right
	Top		Bottom
	Vertical		Horizontal
	Uniform Width		Uniform Height
	Group		Ungroup
	Distribute Selected Layers/Graphic Objects Evenly in Vertical Dimension		Distribute Selected Layers/Graphic Objects Evenly in Horizontal Dimension
	Front		Back
	Forward		Backward
	Front(data)		Back(data)

23.15 Arrow



Button	Description	Button	Description
⇉	Horizontal Alignment	⇊	Vertical Alignment
➔	Widen Head	→	Narrow Head
➔	Lengthen Head	→	Shorten Head

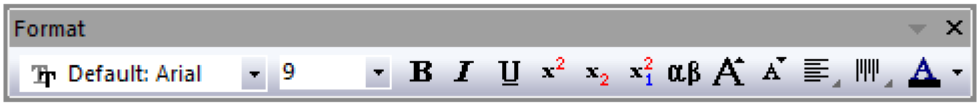
23.16 Style



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	

Button	Description	Hotkey	Button	Description	Hotkey
□	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

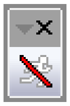
23.17 Format



Button	Description	Hotkey	Button	Description	Hotkey
Default: Arial	Font		22	Font size	
B	Bold	Ctrl+"B"	I	Italic	Ctrl+"I"
U	Underline	Ctrl+"U"	x^2	Superscript	Ctrl+"+"
x_2	Subscript	Ctrl+"="	x^2_1	SuperSubscript	Ctrl+"-"
A	Increase Font	Ctrl+">" Ctrl+Shift+"."	A	Decrease Font	Ctrl+"<" Ctrl+Shift+","
αβ	Greek	Ctrl+"G"	≡	Left	
≡	Center Horizontal		≡	Right	

Button	Description	Hotkey	Button	Description	Hotkey
	Top			Center Vertical	
	Bottom		A	Font Color	

23.18 Auto Update



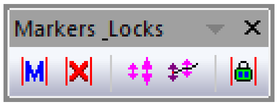
Button	Description
	Block Auto Update

23.19 Database Access

Database Access

Button	Description	Button	Description
	Open SQL Editor		Open Query Builder
	Load ODQ File		Preview Import
	Import data		Remove SQL

23.20 Markers & Locks



Button	Description	Hotkey	Button	Description	Hotkey
M	Add Data Markers	Ctrl+Alt+M	✕	Clear Data Markers	Ctrl+Alt+N
⇕	Marker Size		⇕	Marker Hide Show	
🔒	Lock Positions				

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