Aegis Analytical

Discoverant®

User's Guide

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Contents

1 • Introduction

In this chapter you'll learn about some of the general features, functions, conventions and navigation of Discoverant's user interface. You'll also find ways other than this manual to learn more about Discoverant and how to use it.

Windows™ Conventions

Discoverant's user interface is much like the interface in most other Microsoft® Windows programs (except that there are no menus at the tops of the windows). Many of the same conventions in other Windows programs also work in Discoverant.

The Mouse

All of the functions and options in Discoverant are available by clicking (with the left button) or right-clicking (with the right button) on them with the mouse. To use the large icons on Discoverant's opening window, click them once.

Toolbars

At the top of most windows are a row of tools you can use in that window. Sometimes one or more of the tools will appear grey and will not do anything when you click it. This means that the tool will not function with your current selections in the window.

For more information on the tools available in the various Discoverant functions and their explanations and uses, see Chapter 5, *Functional Modules*.

Tool Tips

If you hold the cursor over a tool in Discoverant, a "tool tip" will appear after a moment, giving you the name of the tool or the function it performs.

User Interface

Discoverant's user interface is very similar to the interface in most other Window's programs. In this manual and other Discoverant documentation, the individual user interfaces are called windows or dialog boxes.

Selecting Data or Parameters

In most Discoverant windows and functions, you must select data from external databases or parameters from Analysis Groups (explained later). Simply click on the data or parameter, then click a "move" button (see table below).

Buttons	Function
	Add a Parameter
	Remove a Parameter
	Remove all selected Parameters
	Move a Parameter up in the selected list
	Move a Parameter down in the selected list

"Move" buttons in Discoverant

Choosing Analysis Options

In the analysis windows, the analysis options are on the lower left side of the window, below the area where you select the parameters. Most of the options are selectable by clicking the radio button  or by choosing an option from drop-down lists.

Displaying Results

After you've chosen your analysis options, click **Display**. The resulting plot or graph will appear on the right side of the window. You may also choose to have the results displayed in a separate window by selecting **Use New Window for each Plot**.

Using the Preferences 

Click the preferences icon to change display properties such as labels, fonts and colors.

Guidance and Help

Aegis Analytical provides you with a number of resources to help you use the Discoverant software.

User Guide (this manual)

This User Guide explains how the Discoverant software works and illustrates the major functions it provides you. It also explains terms and concepts Discoverant uses that may be unfamiliar to you but are used to facilitate and simplify data analysis.

Online Reference Manual

The online Reference Manual gives you specific help for the major windows in the software. In any window, click the Help tool for help and information specific to that window.

Results Paths

This icon on the opening window of the Discoverant software gives you access to six tutorials to guide you through the major functions in the software.

Customer support

You may contact Aegis Analytical Corp. for customer support either by e-mail or phone:

support@aegiscorp.com

(303) 926-0317

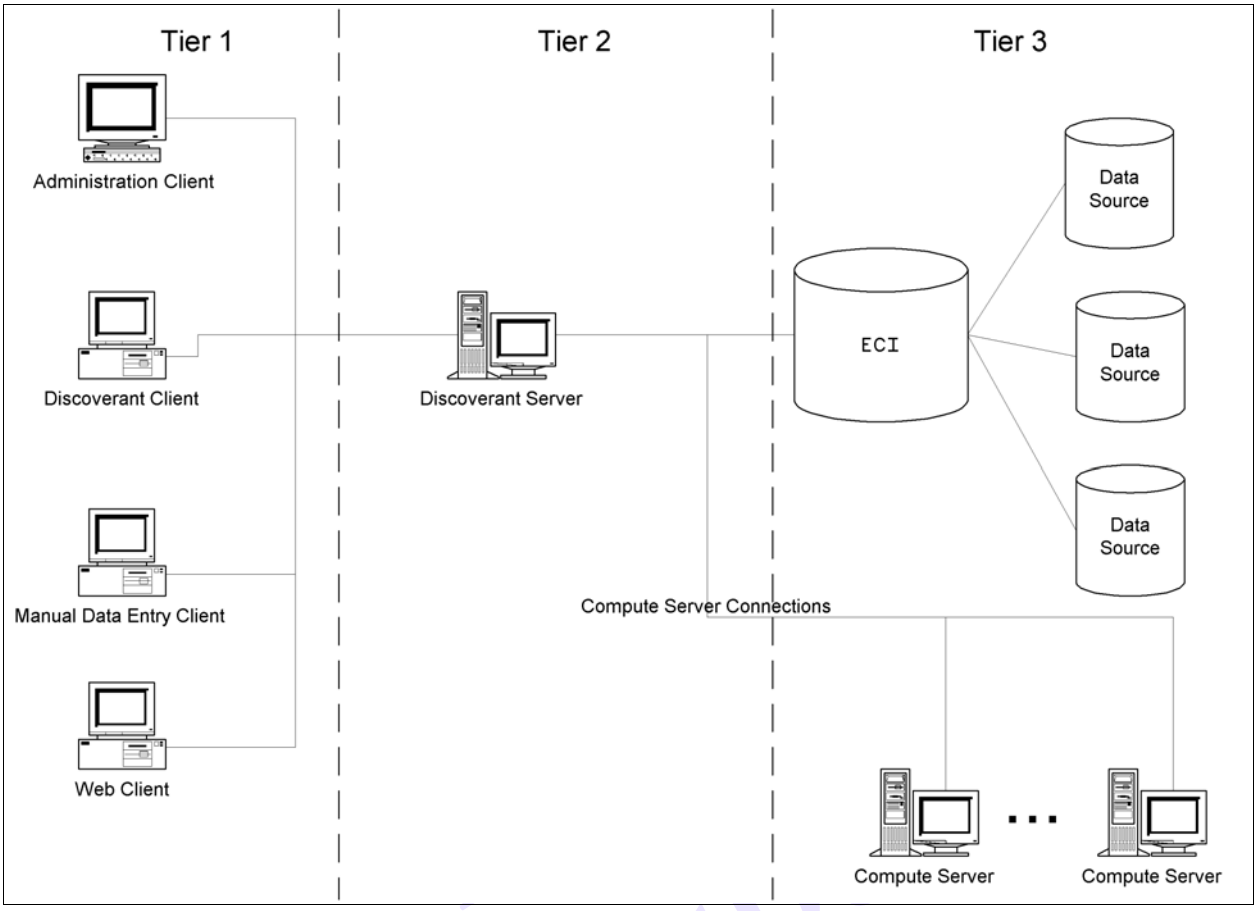
2 • Overview of the Discoverant Software

Aegis Analytical's Discoverant software solves a number of problems with analyzing the data associated with your manufacturing process and communicating your results. First, it directly connects to your source data giving you seamless access to different, physically remote databases. Your view of the databases is grouped however your system administrator sets it up—by product or raw material, for example—and the data is further identified by batch number. Discoverant then lets you extract only the data you need for a single analysis. This data is combined into an Analysis Group, which simplifies and focuses your analysis even further.

Discoverant provides you a variety of ways to view, analyze and compare your data, with charts and graphs, using both traditional and proprietary analysis methods. These visual results are easily shared with others.

System Architecture

The Discoverant software and its required hardware form a 3-tiered structure. Most of this is invisible to you, the user, but it may help you to understand how Discoverant connects to the data sources and how it handles the data.



Discoverant's Three-Tiered Architecture

Tier 1 contains the end-user application. In this illustration, the application is broken down into four parts, but all are combined in the Discoverant software.

Tier 2 contains the application and business logic server. This provides session and logging services, caches the Analysis Group(s) in use, and connects the user to the compute server(s) and data server(s).

Tier 3 contains the JWave compute server(s) and ECI data server(s). The compute server performs both analytical processing and generates graphic results for the user. The data server connects the various data sources to the rest of the system and creates a single, comprehensive view of the data sources.

Basic Theory of Operation

Aegis Analytical's Discoverant is integrated information discovery software for batch process data review, statistical analysis, pattern recognition and data visualization. Discoverant helps you examine your existing manufacturing data to troubleshoot manufacturing problems and improve productivity and quality.

Discoverant helps you extract, analyze, display and report data associated with a specific manufactured material. It lets you:

- locate and extract data stored in various databases,
- perform functions or analyses on this data without altering the original data,
- analyze the data using a variety of statistical methods, and
- produce graphic representations of trends and correlations.

The data Discoverant uses can be from raw and intermediate materials records, testing information, production process data, yield information and most other continuous, discrete, and replicate data associated with your manufacturing process.

Begin by grouping related data into an Analysis Group, then use Discoverant's Functional Modules to compare and analyze the data. Afterwards, you can export or print your results so that others can see them.

The Analysis Group Central Window

Analysis Group Central is the opening window of the Discoverant software and is the gateway to all of Discoverant's major functions or modules.

Opening window of the Discoverant software

Analysis Group Central 

Analysis Groups are the beginning and most basic tool in the Discoverant software. Analysis Groups let you organize and simplify the vast amount of data available to you so that, at any time, you work with only the data you want to analyze and no more. For example, if you're interested in analyzing all 3rd Quarter processes in which the yield was 75% percent of the ideal yield, you would create an Analysis Group that included only the relevant data from those processes, restricted to only the timeframe you want to analyze.

On the left side of the window—under Analysis Group Central—are users' folders containing Analysis Groups (see *Analysis Groups* on page 3-1). Within your personal folder you can structure the contents to best suit your needs.

Within Analysis Group Central, you can create Analysis Groups (see *Creating an Analysis Group* on page 3-6), and perform functions on Analysis Groups (see *Analysis Groups in Analysis Group Central* on page 3-2). Right-click on any folder or Analysis Group to see what functions you can perform.

Folders

Each user has their own folder in which they keep their own Analysis Groups. This is an important feature in Discoverant; it helps keep individual users' data separate. You can only work with Analysis Groups you "own" (those in your folder) and not with anyone else's.

You will only see your own folder and the folders of others who have shared Analysis Groups available for you to copy. Within the folders of others, you will see only the Analysis Groups they have made shared, though you cannot work with these Analysis Groups until you have copied them to your own folder.

Right-click on the folders or Analysis Groups to see the options you have for them. You will have different options available depending on the status of the folder or group and your permissions. For more detailed information, see *Folder and Analysis Group Options* on page 3-2.

Functional Modules

The icons on the right side of the Analysis Group Central window allow you to access Discoverant's Functional Modules. After you've created or selected an Analysis Group, click these functions once to perform statistical analyses and comparisons on the data in your Analysis Group, prepare plots of the data or use the Results Paths to work your way through analyses.

For more complete descriptions of these Functional Modules, see Chapter 5, *Functional Modules*.

Table View

In Table View, you can view your parameters and the data contained therein. You can also delete parameters from an Analysis Group, create categories for data, edit data, condition parameters, and derive new data based on your parameters.

Plotting

In Plotting, you can view your data in a number of ways. The following types of plots are available:

- Line
- Scatter
- Ribbon
- Bar
- Histogram
- Pie
- Surface
- Contour

Statistics

The Statistics area lets you create and compare data using statistics to describe the data. Four kinds of statistics are available:

- Summary Statistics
- Regression
- Multivariate Analysis
- Comparisons

Results Paths

The Results Paths are mini-tutorials for the most common functions available in Discoverant:

- Creating an Analysis Group
- Displaying summary statistics
- Statistically comparing groups of data
- Analyzing groups of data by plotting
- Finding correlations in groups of data
- Creating and using Visual Process Signatures

Visual Process Signature™ (VPS)

A VPS is a "snapshot" of the relationship between key parameters in a process. While the calculations behind the VPS are complex, the resulting surface plot and animation give you an intuitive, visual way to compare processes.

Quality Monitor

The Quality Monitor provides a number of standard Statistical Process Control (SPC) tools—including Control Charts and CuSum and Pareto graphs—that help you graphically view and analyze your processes. These are common, standard methods to analyze your processes, easily understood and created using Discoverant.

Curve Metrics

Curve Metrics helps you work with time-series data measured on different time scales. By smoothing curves, aligning curves, fitting equations to curves and extracting other features of digital strip charts, Curve Metrics helps you compare similar processes that took different lengths of time to run.

Manual Data Entry (MDE)

Manual Data Entry allows you to input data that is not available in the databases Discoverant can access, such as manually collected data, data collected especially for statistical comparison, or data collected by instruments that don't save data to usable databases.

MDE also allows you to import spreadsheet data. For a more complete description of MDE, see Chapter 6, *Manual Data Entry*.

3 • Analysis Groups

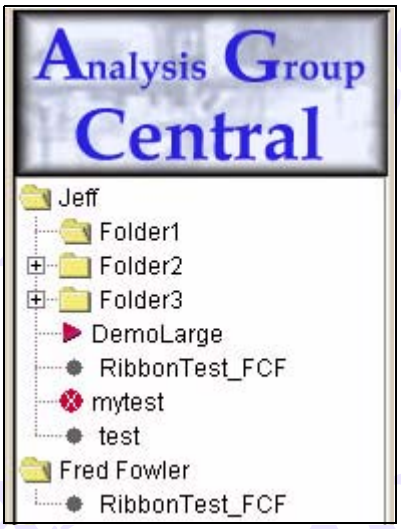
In this chapter you will learn more about Analysis Groups, how to work with them, and how to create and edit them.

Analysis Groups are the "center" of the Discoverant world. All functions in the Discoverant software require an Analysis Group. They are nothing more than a defined set of data (parameters) you create, and generally only include related parameters you want to analyze or compare.

Analysis Groups are the most basic tool in the software. They let you organize and simplify the vast amount of data available to you so that, at any time, you work with only the data you want to analyze. For example, if you're interested in analyzing all 3rd Quarter processes in which the yield was 75% percent of the ideal yield, you would create an Analysis Group that included only the data you were interested in from those processes, restricted to the timeframe you want to analyze.

Analysis Groups in Analysis Group Central

Analysis Groups appear under Analysis Group Central on the left side of Discoverant's opening window. The Analysis Groups are arranged within users' folders; you *own* the Analysis Groups in your folder but not the Analysis Groups in anyone else's folders. You can create your own Analysis Groups within your folder, copy Analysis Groups to your folder, and work only on Analysis Groups that appear within your folder and, therefore, you own.



Analysis Group Central with folders

Folder and Analysis Group Options

The symbols beside the Analysis Groups and the way the names of the Analysis Groups appear give you certain information about them:

Symbol/Name	Meaning
Analysis Group 1	If this Analysis Group is in your own folder, it means it has not been modified or it has already been *committed*. If this Analysis Group is in someone else's folder, it means it is *shared* and therefore available for you to *copy*.
Analysis Group 1	If the name of the Analysis Group is in blue, the Analysis Group is in use.
Analysis Group 1	If the name of the Analysis Group is in grey, the Analysis Group is being created.
Analysis Group 1	This Analysis Group (in your folder) has been modified and not yet *committed* or *rolled back*.
Analysis Group 1	If the name of an Analysis Group you own is bold, you have marked it *shared* and made it available to others to *copy*.

Symbol/Name	Meaning
Analysis Group 1	This symbol in front of the name means there was a problem creating the Analysis Group, such as because of the absence of data during the data range you specify. You cannot use this group until you correct the problem.

Right-click your own folder to access the following options:

- Create AG lets you to create a new Analysis Group
- Create Folder lets you to create a new folder
- Delete lets you delete the folder (except top-level folders)
- Workspaces lets you save, restore, rename and delete workspaces (for more information, see *Workspaces* on page 3-4).

You have no right-click options on top-level folders for which you have no permissions.

Once you own or create an Analysis Group, you can perform certain functions on the Analysis Group within Analysis Group Central.

If you *own* an Analysis Group, right-click it to access the following options for that Analysis Group (for more information, see the explanations of these options beginning on page 3-4):

- Commit
- Rollback
- Delete
- Shared
- Rename
- Copy
- Move
- Refresh
- Use As Template
- Properties

You have the following right-click options for others' Analysis Groups they have *shared*:

- Copy
- Properties

To protect your data and the data of others, Discoverant will not allow you to work with others' Analysis Groups or someone else to work with yours. You can only work on Analysis Groups that you own, which appear in your folder under Analysis Group Central. You can either create new Analysis Groups in your folder (see *Creating an Analysis Group* on page 3-6) or *copy* someone else's Analysis Group into your folder.

Sharing and *copying* Analysis Groups are critical options in Analysis Group Central. You may want to work with an Analysis Group that another user has created, but Discoverant won't allow you to. It will, however, allow that user to make their Analysis Group(s) available to other users by *sharing* them, after which you can *copy* to you own folders. For more information, see *Shared* on page 3-4 and *Copy* on page 3-4.

Workspaces

If you need to quit working in Discoverant and come back to it later, select **Workspaces** to save the details of your current work session, including all the Discoverant windows you have open and their placement on the computer screen, data you're working with, and all plots and results you've generated and have open. When you restore your workspace, all the windows will be reopened as they were. All plots and results will be regenerated based on the state of the Analysis Groups *when you restore your workspace.*

If you are already working in Discoverant and wish to save your current workspace and open a workspace you've previously saved, you may do this too. When you open another workspace, your current workspace will be closed.

Commit

If you've made modifications to data in an Analysis Group and want to make those modifications permanent, select **Commit** to save those modifications. These modifications might include creating derived data, conditioning data, creating categories, and editing data.

Once you've committed an Analysis Group, you can't undo those modifications. If you log off Discoverant before committing your modifications, you will not lose your modifications: when you log on again, your Analysis Groups will be in the same state as when you logged off.

Rollback

Rollback is similar to "Undo" in many other programs, except that Rollback undoes *all* of the modifications you've made to data in an Analysis Group since it was last committed.

Delete

Select **Delete** to delete an Analysis Group you own from Analysis Group Central.

Shared

Select **Shared** to share or un-share an Analysis Group that you own. *Shared* makes your Analysis Group available for others to *copy*.

Rename

Select **Rename** to change the name of an Analysis Group you own.

Copy

Select **Copy** to copy someone else's Analysis Group to your own folder. You can also copy one of your own Analysis Groups to create a new one.

Move

Select **Move** to move the Analysis Group to another folder. The Analysis Group will retain its name. You can only move Analysis Groups you *own* and you can only move them among your own folders.

Refresh

Select **Refresh** to change global restrictions and re-query the databases to recreate the Analysis Group. You might want to do this to change the global date range of your Analysis Group, for instance, but still use the same parameters. Refresh will also recalculate *all* new parameters (categories or derived data) you have created. (For more information, see *Recalculating New Parameters* on page 5-4.) The original data conditioning and derivations you have applied to parameters will be preserved.

Use As Template

Use As Template is a great way to add parameters to your Analysis Group. Select **Use As Template** to create another Analysis Group based on the selected Analysis Group.

The Analysis Group Creation window will appear with the same restrictions and parameters as the original Analysis Group. Here you can name the new Analysis Group and change the restrictions and parameters as needed.

Properties

Select **Properties** to display the properties of the Analysis Group.

Creating an Analysis Group

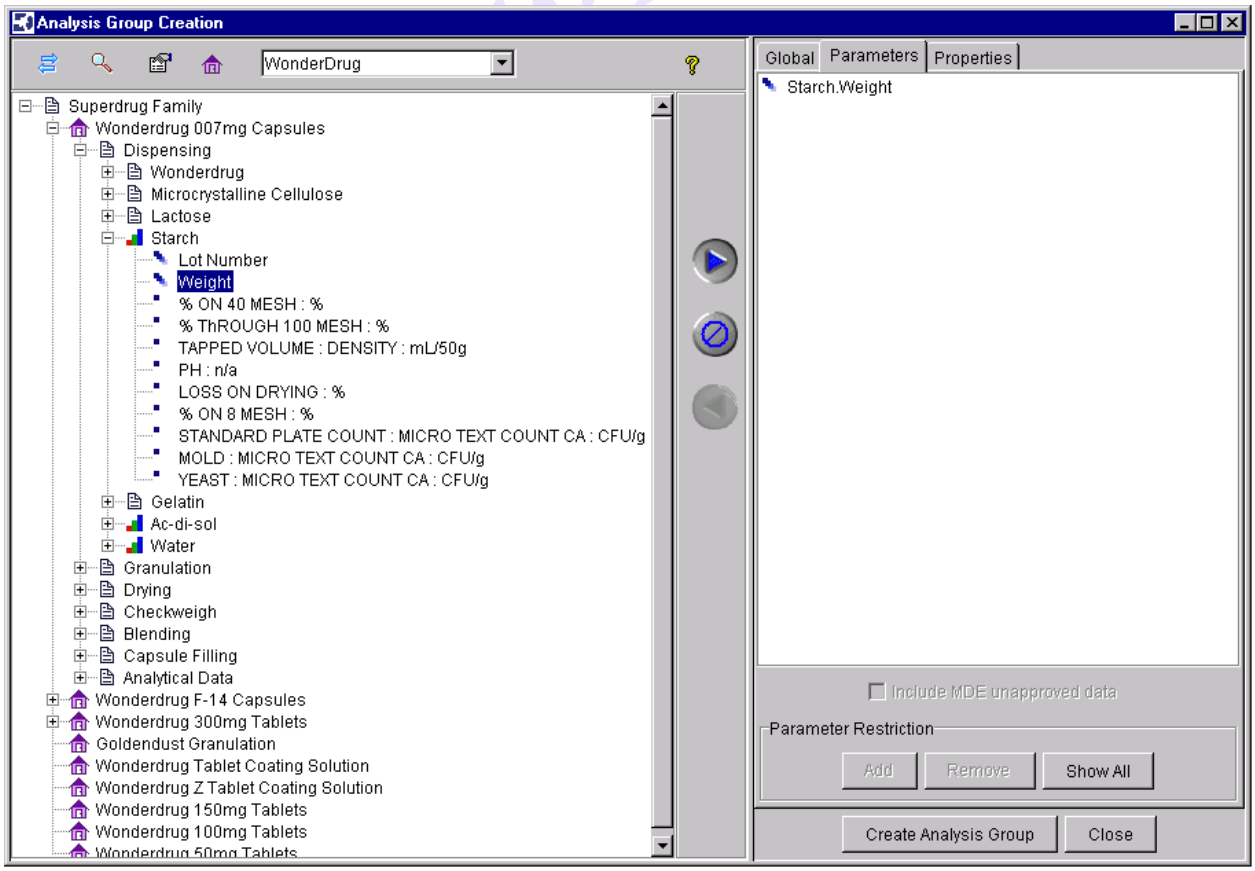
To create an Analysis Group, you must select leafs in the hierarchy and add them to the Analysis Group, then name the Analysis Group.

To begin:

1. Start on Discoverant's opening window.
2. On the left, under Analysis Group Central, right-click a folder for which you have permissions.
3. Select **Create AG** from the popup list.

The Analysis Group Creation window appears.

The Analysis Group Creation window



Sample Analysis Group Creation window

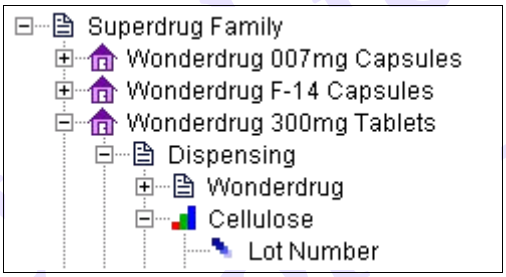
On the left side of the window is the current Data Hierarchy. This is simply a navigational "window" to the data available through the Discoverant software. The organization and content of the data in the hierarchy is determined by your system administrator and cannot be changed by the user.

The Data Hierarchy

The data hierarchy is the "tree" on the left side of the Analysis Group Creation window. This tree displays the data available to you through the Discoverant software; when you create Analysis Groups, you include whatever data you want to view, compare or analyze in the Discoverant software. The hierarchy or hierarchies are determined by your system administrator.

Discoverant can support multiple hierarchies. For instance, one hierarchy may organize data by plant, one may organize data by product and one may organize data by raw material. These hierarchies are set up by your system administrator.

The parts of the hierarchy are identified by different symbols on the window. Each of these symbols represents a "node" in the hierarchy, and the different symbols tell you something about the hierarchy structure and its data.



Sample Data Hierarchy in Analysis Group Creation

The following table describes the symbols and their significance:

Symbol	Meaning
	This is an organizational node, a purely arbitrary way to separate data according to the organization's needs.
	This indicates a Data Universe. Data universe's are critical to the data hierarchy; all parameters within an Analysis Group must come from the same data universe. The data universe symbol indicates data associated with the actual product.
	This indicates a conditional node in the hierarchy. Every other node and "leaf" organized underneath this conditional node carries the same database restrictions. Examples of this are conditional nodes restricted to raw materials, products, processes, machine IDs, etc.

Names of non-validated parameters are displayed in red, italic text (if your system administrator has set this option).

The following symbols are called "leafs" and indicate specific sets of data which can become parameters in an Analysis Group.

Symbol	Meaning
	Discrete data
	Continuous data
	Discrete replicate data
	Continuous replicate data
	The M next to an icon indicates that the data was entered using Manual Data Entry (see Chapter 6, *Manual Data Entry*). In this instance, this icon indicates discrete data created with Manual Data Entry.
	This data isn't valid in the current hierarchy.

Analysis Group Creation Tools

The following table describes the tools available to you in Analysis Group Creation.

Tool	Name	Function
	Help	Displays help for the window in which you're working.
	Toggle to Names –or— Toggle to Descriptions	Toggles the text in the hierarchy between descriptions and names. The default is names.
	Search Hierarchy Tree	Displays the Find & Replace dialog box, where you can search for strings or values in different objects within Discoverant. Depending on the functional area from which you search, different options will be available to you. You can also use the Find & Replace dialog box to replace certain object names.
	Preferences	Allows you to customize your display by setting the date format and designating a default hierarchy.
	View Parameter Set Description	Displays the Parameter Set Name and Date descriptions associated with a particular Universe in the current hierarchy. The user must select a Universe or a node in order to see a description.

The Analysis Group Creation tabs

On the right side of the window are tabs that allow you to define the Analysis Group:

- Global tab
- Parameters tab
- Properties tab

Once you've created an Analysis Group, you can only delete parameters or create new ones in the Table View (see *Table View* on page 5-1). To add new parameters from the data hierarchy, see *Use As Template* on page 3-5.

Using the Global Tab

Use the Global tab to enter general information about the Analysis Group you're creating, including the name of the Analysis Group, a description (if you want one), and any global restrictions. You can restrict the Analysis Group by dates and by parameter set names.

To restrict the whole Analysis Group by a date range, select Date Range Only from the Global Restriction drop-down box and enter the start and end dates.

To restrict the whole Analysis Group by parameter set names:

1. Select the parameters for the Analysis Group.
2. Select **Parameter Set Names** from the Global Restriction drop-down box.
3. Enter the start and end dates.
4. Click **Retrieve List**.
5. When the Parameter Set Names appear, select as many or as few as you want.

Using the Parameters Tab

Use the Parameters tab to add parameters to and remove them from the Analysis Group you're creating. To select parameters to add or remove, click them then click the "move" buttons in the center of the window to move the parameters to or from the list on the Parameter tab.

Use the Parameter Restriction area to add restrictions to or remove them from individual parameters. Select a parameter from the list on the Parameters tab, then click **Add** or **Remove** in the Parameter Restriction area below to add or remove restrictions that apply to that parameter.

Click **Show All** to see a list of each parameter and the restrictions applied to it. You can't edit restrictions in this list.

You can also right-click a parameter under the parameters tab to add restrictions, change its name, or Synchronize with Tree. Select **Synchronize with Tree** to make the Data Hierarchy show you the parameter and its relative position within the hierarchy.

Using the Properties Tab

Select a parameter or node and click the Properties tab to see the properties associated with that parameter or node.

Important Terms to Know

Discoverant uses some terms that you may or may not be familiar with. These terms are used to simplify concepts you probably already know well.

Parameters

A parameter is simply a set of data, usually

- a single measurement on a material or process (discrete data),
- a set of measurements, taken over time, on the same material or process (continuous data), or
- multiple measurements of the same type taken on a material or process (replicate data).

Parameters are usually numeric data, but they may also be dates, time stamps or string values (called Categories—for more information, see *Creating Categories* on page 3-12 and *Categories* on page 5-3). For more information, see *Data Classes* on page 4-1.

Continuous data parameters can be viewed as columns of data in Table View (page 5-1).

Parameter Sets

Parameter sets apply to both discrete and continuous data. Discoverant collects and organizes parameters into parameter sets; each set typically represents a single manufacturing batch. Such parameter sets are typically defined by the batch I.D.; in other words, a parameter set would contain all the parameter data for a specific batch.

Replicate Groups

Replicate groups contain a replicate parameter and the ID values associated with the data. Replicate groups can be viewed in the Discrete Replicate tab of Table View; they also appear as folders in the Discrete tab.

Offset Groups

Offset groups only apply to continuous data. Offset groups are the time stamp by which all the continuous data is grouped.

Summary Parameters

Summary parameters appear at the end of the parameters list in the Discrete tab of Table View. Discoverant automatically creates these parameters for your convenience. Each represents a summary value calculated from the corresponding continuous or replicate parameter in the Analysis Group. These parameters have the following names:

Parameter names	Meaning
[parameter name] ->max	The maximum value of the named parameter
[parameter name] ->min	The minimum value of the named parameter
[parameter name] ->mean	The mean value of the named parameter
[parameter name] ->median	The median value of the named parameter
[parameter name] ->stdev	The standard deviation of the named parameter
[parameter name] ->rsd	The relative standard deviation of the named parameter

Modifying Analysis Groups

Analysis Groups can be modified in a number of ways. You can change the description and global restrictions, add and delete parameters, create new parameters, condition parameters, and edit data.

Changing the Description

You can change an Analysis Group's description in Analysis Group Central. Right-click the Analysis Group and select **Properties** from the options. In the Description tab of the Properties dialog box, edit the description and click **Set Description**.

Adding Parameters

To add parameters to an Analysis Group, you must actually create a new Analysis Group. In Analysis Group Central, right-click the Analysis Group to which you want to add parameters and select **Use as Template** from the options. The Analysis Group Creation window will appear. Change the Analysis Group Name, make any other changes you want to make, then click Create Analysis Group.

To add data and parameters to the hierarchy manually, so that you can add them to an Analysis Group, you must use Manual Data Entry. For more information, see Chapter 6, *Manual Data Entry*.

Removing Parameters, Parameter Sets or Replicate Groups

You can remove parameters, parameter sets, or replicate groups from an Analysis Group in Table View.

To remove a discrete parameter:

On the Discrete tab, select the parameter then click the **Remove Parameter from AG** tool.

To remove a continuous parameter:

On the Continuous tab, select the parameter then click the **Remove Parameter from AG** tool.

To remove a replicate group:

On the Discrete Replicate tab, double-click the parameter to display it on the right side of the window, then click the **Remove Parameter from AG** tool.

To remove a parameter set:

On either the Discrete or Continuous tab, double-click the parameter to display it on the right side of the window, select a parameter set (a row), then click the **Remove Parameter Set from AG** tool.

Creating New Parameters

New parameters can be created two ways:

- by using categories to group data (such as labeling a value "high," "medium," or "low" within a range), or
- by using numerical formulas to derive new data mathematically from an existing data.

Creating Categories

Categories are simply string values (words) used to group a discrete parameter based on its values. A typical set of categories might include "high," "medium," and "low." When you create categories, you actually create a new parameter based on the parameter you want to group.

To create categories:

1. Select an Analysis Group then click the **Table View** icon.
2. Choose a parameter to group, decide what categories you want to assign to what values, then click the **New** tool.

   The Create a New Discrete Parameter dialog box appears.
3. Type a name for the new parameter, select the Create Parameter Values by Category option, then click **OK**.

   The Category Create dialog box appears.
4. Use the options and fields on this dialog box to select the parameter on which you want to base your categories and the definitions of the categories you want to create.

5. Click **Apply** to create each individual category, then click **OK** when you're done.

A column of categorical data has these symbols  at the top.

Creating Derived Data

Derived data is created by applying a mathematical formula to an existing parameter (or parameters) to create a new parameter.

To create derived data:

1. Select an Analysis Group then click the **Table View** icon.

   Choose a parameter (or parameters) from which to create a new parameter, decide how you want to create the new parameter (mathematically), then click the **New** tool.

   The Create a New [Discrete or Continuous] Parameter dialog box appears.
2. Type a name for the new parameter, select the Create Parameter Values by Numeric Formula option, then click **OK**.

   The Category Create dialog box appears.
3. Use the fields on this dialog box to create the mathematical formula you want to use.
4. Click **Apply** to create each new parameter, then click **OK** when you're done.

A column of derived data has these symbols  at the top.

Conditioning Data

Many times, existing data in a parameter is missing data points or contains outlier data that isn't useful. You can condition this data in Table View to replace these missing data points (null data) with useful data or to replace outlier data with more useful data.

To condition data, select an Analysis Group then click the **Table View** icon. Choose a parameter you want to condition, then click the **Condition** tool.

Cells containing conditioned data have a light green background.

Editing Data

Sometimes parameters contain incorrect data or the data points are not meaningful or useful. In Table View, you can edit the data as needed by double-clicking on the data cell.

Edited data is displayed in **bold**.

4 • Data Operations

In this chapter you'll learn how Discoverant helps you meet FDA guidelines. We'll also discuss the different data classes Discoverant handles, how you can import and export data, and how you can save or print your results.

Compliant Operations

Discoverant never modifies your source data or databases. Instead, it extracts the data from the original databases and places it into an Analysis Group, then tracks modifications you make to the data. In the Table View, you can clearly see which data you have edited, conditioned or derived from original data.

Discoverant never allows you to modify someone else's Analysis Groups.

All these make certain that Discoverant's management and protection of your data falls within approved FDA guidelines.

Data Classes

Discoverant can use, analyze and compare different types of data, including continuous data, discrete data and replicate data.

Continuous

Continuous data is typically collected at regular intervals over a certain period of time for a particular measurement of a process. Continuous data—also known as time-series data—always has a time stamp associated with each reading or measurement. Examples of continuous data include regular temperature or moisture content readings taken by sensors on a PLC.

Discrete

Discrete data represents single readings or measurements made during a manufacturing process. It is typically not time-dependent, though time stamps may be recorded as discrete data. Examples of discrete data include laboratory test readings or amounts of raw material added during a process step.

Replicate

Replicate (discrete replicate) data represents multiple readings or measurements of the same type made during the manufacturing process. For example, you may need to repeat a specific test three times, generating three replicate measurements.

Importing and Exporting Data

Discoverant can both import and export your data. Using Manual Data Entry, you can also enter data that isn't stored in an electronic database.

Manual Data Entry (MDE) and Importing Data

Using the Manual Data Entry function, you can both import data from a spreadsheet and enter data not stored electronically. Spreadsheet data must be in a comma-separated (CSV) format, and must be either all continuous or all discrete, and all replicates or non-replicates. You can't update previously imported data by reimporting it; each time you import data, it is saved as a new, separate Manual Data Group.

Manual Data Entry is explained in more detail in see Chapter 6, *Manual Data Entry*.

Exporting Data

Discoverant will export or save three kinds of information:

- Plots and graphical results (in .wmf, .jpg and .gif formats)
- Numerical results, such as PCA and regression analysis (in .htm format)
- Values displayed in Table View (in .csv and .htm formats)

To export or save files, click the **Save** tool at the top of the window you're in.

Discoverant exports files in Table View to a standard .csv (comma-separated value) format, which can be read by most leading database software packages.

Printing and Exporting Results for Publishing

To print data or files, click the **Print** tool at the top of the window you're in.

5 • Functional Modules

The icons on the right side of the Analysis Group Central window (see *The Analysis Group Central Window* on page 2-4) allow you to access Discoverant's Functional Modules. After you've created or selected an Analysis Group, use these functions to perform a variety of statistical analyses and comparisons on the data in your Analysis Group, prepare plots of the data, or use the Results Paths to work your way through analyses.

Table View

You can perform four major functions in Table View:

- View data
- Condition data
- Create new data
- Export data

In the Table View, you can view the individual data and parameters in any Analysis Group you own. You can edit that data, condition the data, or create new data derived from a parameter, and export any data displayed. You can also change the number of decimal places displayed and select a unit of measure for numeric parameters, if your system administrator has made these options available.

Each column has one or more symbols at the top. The following table tells you what these symbols mean.

Symbol	Meaning
	All parameters displayed are sorted in ascending order based on this column.
	All parameters displayed are sorted in descending order based on this column.
	This column contains only original, unmodified parameter data.
	This column contains at least some edited data. The edited data is displayed in bold type. (Bold type is the default; this can be changed in the Customizer.)
	This column contains conditioned data. The conditioned data is displayed in cells with a light green background. (Light green is the default; this can be changed in the Customizer.)

Symbol	Meaning
	This is a new parameter of *categorical* data.
	This is a new parameter of *numerical* data.
	This is an *unapproved* parameter created with Manual Data Entry.
	This is an *approved* parameter created with Manual Data Entry.

The Discrete Tab

The first two columns in the Discrete tab are always the Parameter Set Name and Parameter Set Date. These cannot be edited or changed in any way. The parameters you select to view in Table View make up the rest of the columns; you can easily see the raw data in each parameter.

Each row of the display represents data for an individual batch or process. Replicate groups appear as folders.

The Continuous Tab

In the Continuous tab, the Parameter Set can be selected from the drop-down box above the columns; the first column is always the Offset Group.

Each row of the display represents data for an individual batch or process.

The Discrete Replicate Tab

Only one Replicate Group at a time can be displayed in the Discrete Replicate tab. The Discrete Replicate tab is the only place to view the ID values associated with the replicate data.

Working With Data in Table View

Table View allows you to work with your Analysis Group parameters in many useful ways, including

- changing the decimal places displayed,
- adding a unit of measure,
- editing and conditioning data,
- creating new parameters, and
- recalculating parameters.

The results of these operations are reflected in your statistical analyses or comparisons in Discoverant's other functional modules.

Decimal Places and Units of Measure

If your system administrator makes these options available, you may change these for numerical parameters. Changes will appear in all the functional modules.

Either right-click a parameter on the left side of the window or right-click a column heading. Select **Properties**, make the changes, and click **OK**.

Modifying Data

Table View is the only place in Discoverant where you can edit or condition data for analysis.

Editing Data

In Table View, you can edit individual data cells. You may want to do this when conditioning the entire parameter is too broad an operation.

To edit individual data cells, double-click them or select them and click the **Edit** tool. Edited data will be displayed in bold type. (Bold type is the default; you can change this in the Customizer.)

Derived data or categories can be edited after they are created. Select the column of derived data or categories, then click the **Edit** tool.

Conditioning Data

Conditioning data involves choosing and applying rules to modify specific data in the parameter. You could, for example, replace all the null values in the parameter with a mean. You could also define "outlier" data and replace it with a specific value.

To condition data, select a column, then click the **Condition** tool.

Cells containing conditioned data will have a light green background. (Light green is the default; you can change this in the Customizer.)

Creating New Parameters

Two kinds of new parameters can be created in Table View: derived data and categories. (For more information on either of these, see *Creating Derived Data* on page 3-13 or *Creating Categories* on page 3-12.) Create new parameters from Discrete Replicate data in the Discrete tab.

To create a new parameter, click the **New** tool.

Derived Data

Derived data is a new parameter created from applying a mathematical formula to existing parameters.

Categories

Categories are textual labels describing an existing parameter.

Recalculating New Parameters

If you change the data in a parameter, Discoverant doesn't automatically update any categories or derived data based on that parameter. To recalculate a derived or category parameter, select the parameter then click the **Recalculate** tool. This will recreate the derived or category parameter based on the modified data in the original parameter(s).

Deleting Parameters

To delete a single parameter (column) from an Analysis Group, select the parameter in the hierarchy on the left side of the window, then click the **Remove Parameter from AG** tool.

To delete a parameter set (row) or replicate group from an Analysis Group, select a row (Parameter Set or batch ID) on the right side of the window, then click the **Remove Parameter Set from AG** tool.

Table View Tools

The following table describes the tools available to you in Table View. Some of these are also available to you by right-clicking on the parameters, rows, columns and individual cells.

Tool	Name	Function
	Help	Displays help for the window in which you're working.
	New	Displays the Create New Parameter dialog box, where you can create new parameters (categories or derived data).
	Save	Saves all parameter data displayed in Table View. Data is saved in a .csv or .htm file.
	Edit	Allows you to edit individual cells of original parameter data or edit the definitions of derived or categorical parameters.
	Recalculate	Recreates a derived or categorical parameter by going back to the original parameters from which it was created and re-applying the definitions of the derived or categorical parameter. This is particularly useful when the original parameter or parameters have been edited or conditioned.
	Print	Generates a .htm file of the data displayed in Table View.
	Properties	Allows you to change the number of decimals displayed and add a unit of measure.
	Condition	Allows you to select a parameter then condition the data to remove nulls and outliers.
	Remove Parameter from AG	Allows you to select a parameter and remove that parameter from the Analysis Group.

Tool	Name	Function
	Remove Parameter Set from AG	Discrete tab only - Allows you to select a parameter set in the Discrete tab and remove that parameter from the Analysis Group.
	Sort Ascending	Allows you to select a column and sort it in ascending order. All other data displayed in Table View is sorted accordingly, based on matching parameter sets or offset groups.
	Sort Descending	Allows you to select a column and sort it in descending order. All other data displayed in Table View is sorted accordingly, based on matching parameter sets or offset groups.
	Preferences	Allows you customize how Table View displays your data, including how the numbers are displayed and how conditioned and edited data is displayed.

Plotting

The Plotting module lets you view and compare your data with the following graphical representations:

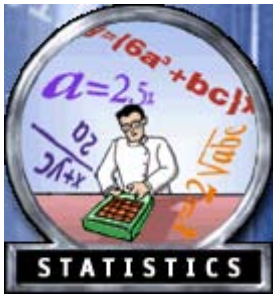
- Line plots
- Scatter plots
- Ribbon plots
- Bar plots
- Histograms
- Pie charts
- Surface plots
- Contour plots

Plotting Tools

The following table describes the tools available to you in Plotting.

Tool	Name	Function
	Help	Displays help for the window in which you're working.
	Save	Saves the displayed plot to a .gif, .jpg or .wmf format.
	Print	Prints the displayed plot.
	Preferences	Allows you customize how Plotting displays your data, including how the plots are labeled, how the axis are displayed and what color the lines, bars or contours are.
	ID Points	Displays exact values of data points. Click **ID Points**, then click a data point (or data points) on the plot, then click **ID Points** again to see the exact value associated with that point (or points).

Tool	Name	Function
	Remove Outliers	Removes data points from the plot. Click **Remove Outliers**, then click a data point (or data points) on the plot, then click **Remove Outliers** to remove that point (or points) from the plot. (This does not change the data in the Analysis Group.)
	Restore Original Data	Restores data points removed from the plot with **Remove Outliers**.



Statistics

The Statistics module lets you perform the following statistical analyses and comparisons on your data:

- Summary Statistics, including:
  - N
  - Mean
  - Standard deviation
  - % relative standard deviation
  - Median
  - Minimum
  - Maximum

  The summary statistics can be displayed as a summary table or a box plot.
- Regression, including:
  - Standard error
  - T-statistic
  - P-value
  - Analyses of Variance
  - Linear and polynomial regression
  - Multiple and stepwise regression

  The regression results can be displayed as a summary table, a fitted model, or an observed vs. predicted plot.
- Multivariate Analysis (Principal Component Analysis/Principal Component Regression), including:
  - Eigenvalue
  - % of variance
  - Cumulative %
  - K-Means

  The multivariate analysis results can be displayed as a summary table or score and loading plots.

- Comparisons
  - ANOVA (Tukey method, Bonferroni method, Dunn-Sidak method, Scheffe method)
  - MANOVA (Wilk's lambda, Hotelling's trace, Roy's maximum root, Pillai's trace)
  - Two sample t-test
  - Variance tests (Levene's test, using means or medians; Bartlett's test)
  - Correlation (Pearson, Spearman)
  - Covariance

  The comparison results can be displayed as a summary table or a pairwise plot.

Statistics Tools

The following table describes the tools available to you in Statistics.

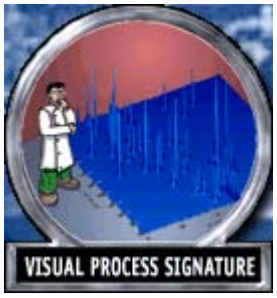
Tool	Name	Function
	Help	Displays help for the window in which you're working.
	Save	Saves displayed statistical data to a .htm file.
	Print	Prints the displayed statistical data.
	Preferences	Allows you to customize how Statistics displays your results by choosing how many significant digits to display, which labels are displayed, how axes are displayed, line colors, etc.

Results Paths

The Results Paths are much like "wizards" that guide you through some of the most common tasks in Discoverant. Each explains the tasks, then tells you how to navigate through the software or gives you a shortcut to the final window or dialog box you need. Each gives you enough information to make choices about what data to use and which tests to perform, then explains the results to you.

The following Results Paths are available:

- Creating an Analysis Group
- Displaying summary statistics
- Statistically comparing groups of data
- Analyzing groups of data by plotting
- Finding correlations in groups of data
- Creating and using Visual Process Signatures



Visual Process Signature (VPS)

Visual Process Signatures provide you a unique, visual way to compare processes. VPS's, in effect, are a 3D "snapshot" of a manufacturing process.

Using parameters you choose and performing a complex set of calculations, VPS creates a surface plot, which can be animated, that you can compare with similar plot from other manufacturing processes or batches. These plots display the relationship between many parameters and create a "big picture" that is visually easier to grasp than large tables of data.

One use of VPSs would be to visually compare one batch process to another. Another use might be to create a VPS of a good or ideal batch process and compare other batches to this one.

Visual Process Signature Tools

The following table describes the tools available to you in Visual Process Signatures.

Tool	Name	Function
	Help	Displays help for the window in which you're working.
	Save	Saves the displayed VPS to a .gif, .jpg or .wmf format.
	Print	Prints the displayed VPS.
	Preferences	Allows you customize how VPS displays your data, including how the results are labeled, how the axis are displayed and what color the contours are.

Quality Monitor

The Quality Monitor offers you a number of standard Statistical Process Control (SPC) tools, including Control Charts and CuSum and Pareto graphs, by which to view your processes.

The CuSum and Pareto graphs are simple, straight-forward tools.

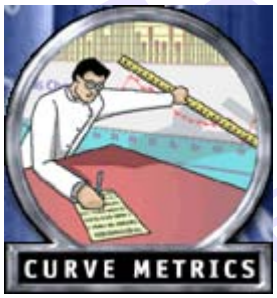
You can also choose from a number of different Control Charts:

- X-bar
- Moving average
- Individuals
- Range
- Moving range
- Standard deviation
- Exponentially weighted moving average (EWMA)

Quality Monitor Tools

The following table describes the tools available to you in Quality Monitor.

Tool	Name	Function
	Help	Displays help for the window in which you're working.
	Save	Saves the displayed results to a .gif, .jpg or .wmf format.
	Print	Prints the displayed results.
	Preferences	Allows you customize how Quality Monitor displays your data, including how the plots are labeled, how the axis are displayed and what color the lines or bars are.
	ID Points	Displays exact values of data points. On the Control Charts tab only, click **ID Points**, then click a data point (or data points) on the plot, then click **ID Points** again to see the exact value associated with that point (or points).



Curve Metrics

The Curve Metrics functions works with continuous data measured on different time scales. Curve Metrics stretches or compresses data so they have the same relative time scale, using curve fitting or rolling average. This is a good way to compare similar processes that took different lengths of time to run.

Curve Metrics Tools

The following table describes the tools available to you in Curve Metrics.

Tool	Name	Function
	Help	Displays help for the window in which you're working.
	Save	Saves the displayed results to a .gif, .jpg or .wmf format.
	Print	Prints the displayed results.
	Preferences	Allows you customize how Curve Metrics displays your data, including how the plots are labeled, how the axis are displayed and what color the lines are.

Tool	Name	Function
	ID Points	Displays exact values of data points. Click **ID Points**, then click a data point (or data points) on the plot, then click **ID Points** again to see the exact value associated with that point (or points).
	Remove Outliers	Removes data points from the plot. Click **Remove Outliers**, then click a data point (or data points) on the plot, then click **Remove Outliers** to remove that point (or points) from the plot. (This does not change the data in the Analysis Group.)
	Restore Original Data	Restores data points removed from the plot with **Remove Outliers**.

Manual Data Entry

Manual Data Entry (MDE) is a way for you to input data that is not available in the databases Discoverant can access, such as manually collected data, data collected especially for statistical comparison, or data collected by instruments that don't save data to usable databases. For a more complete description of MDE, see see Chapter 6, *Manual Data Entry*.

6 • Manual Data Entry

Manual Data Entry (MDE) is a way for you to input data that is not available in the databases Discoverant can access, such as manually collected data, data collected especially for statistical comparison, or data collected by instruments that don't save data to usable databases.

MDE builds a new data source and creates new entries in your data hierarchies. For more information on hierarchies and their symbols, see *The Data Hierarchy* on page 3-7.

Manual Data Entry Tools

The following table describes the tools available to you in Manual Data Entry.

Tool	Name	Function
	Help	Displays help for the window in which you're working.
	Toggle to Names *–or–* Toggle to Descriptions	Toggles the text in the hierarchy between descriptions and names. The default is names.
	Search Hierarchy Tree	Displays the Find & Replace dialog box, where you can search for strings or values in different objects within Discoverant. Depending on the functional area from which you search, different options will be available to you. You can also use the Find & Replace dialog box to replace certain object names.
	View Parameter Set Description	Displays the Parameter Set Name and Date descriptions associated with a particular Universe in the current hierarchy. The user must select a Universe or a node in order to see a description.
	Preferences	Displays the MDE Preferences dialog box, in which you can set date and number formats and the display characteristics of edited data.
	Open	In the Hierarchy tab, this opens the MDE parameters you select in the hierarchy and displays them on the right side of the window. In the Manual Data Group tab, this opens the MDE parameter you select in the Search Results area and displays it on the right side of the window.

Tool	Name	Function
	Find Lost Parameters	Displays the Add Lost Parameters dialog box, which shows MDE parameters stored in the database but not displayed in the current hierarchy. Parameters may be missing for two reasons: (1) someone deleted an MDE parameter, or (2) the hierarchy was overwritten by a spreadsheet-generated hierarchy.
	Import	Displays the Import MDE dialog box. For more information, see *Importing Data* on page 6-5.
	Template Export	Lets you export a .csv file template, making importing data easier. For more information, see *Exporting a Template for Data* on page 6-6.
	Open a Draft	Lets you open previously saved drafts of manually entered or imported data.
	Save a Draft	Lets you save a draft of MDE data you're entering without committing the data to the database.
	Add a Replicate Column	This tool appears only in the Hierarchy tab. It lets you add a column of discrete replicate data. You must first select a Parameter column.
	Edit	This tool appears only in the Manual Data Group tab. Click it to edit data cells.
	Approve	This tool appears only in the Manual Data Group tab. Click it to mark a Manual Data Group *approved*.

Important Terms to Know

Manual Data Entry uses some terms that you may or may not be familiar with. These terms are used to simplify concepts you probably already know well.

Approved/Unapproved

Your organization may require manually entered or imported data to pass an approval process. Manual Data Entry lets you mark your data approved or unapproved as necessary. The two types are displayed with different symbols in Table View. Unless data is approved, MDE saves data as unapproved. Analysis Group parameters consisting of both approved and unapproved data will be marked unapproved.

CSV files

Data to be imported must be in comma-separated value files, a format common to most spreadsheet software.

Draft

At some point, you may want to save data you're entering without committing it to the database, either because you need to continue entering data at some other time or because you need to verify some of the data before continuing. Manual Data Entry lets you save a draft  of your data without committing it to the database, and later retrieve it  at your convenience and continue entering data. This also helps you save your entered data in one Manual Data Group instead of many MDG's.

MDE Parameter

An MDE parameter is simply a placeholder for a set of data or a parameter within the hierarchy. For more information, see *The Data Hierarchy* on page 3-7.

Manual Data Group

A Manual Data Group contains all the data entered in a single data entry session. Once data is committed, a manual data group is formed. Groups may contain one or more related parameters (such as all the quality tests associated with a single batch process). A parameter may contain many Manual Data Groups.

Timestamp Group Name

The timestamp group name is simply a way to group related data with the same set of timestamps. The name will become the offset group name when the parameter is added to an Analysis Group.

Preparing to Enter or Import Data

Before you enter or import any data, you must add nodes or MDE parameters in a hierarchy where you want the data to reside. You can add them one at a time as you enter or import data, or you can add them for all your data at once. This second approach may save you time later.

1. Start on the **Hierarchy** tab.
2. From the drop-down box in the toolbar, select the hierarchy to which you want to add your data.
3. Click **Edit** at the bottom of the hierarchy tree (on the left side of the window) to "lock" other users out of the hierarchy so you can add your data.
4. In the hierarchy tree, navigate to where you want to add your data.

   You must, at some point, add an MDE Parameter. This is where the data you enter or import will be placed in the hierarchy; an MDE parameter is necessary to enter or import data.

To add an MDE parameter:

a. Right-click on any node to add an MDE parameter (which is the placeholder for the actual data you're about to enter or import).

b. Select **Add MDE Parameter…** to insert a parameter below the selected node.

c. In the **Add MDE Parameter** dialog box, enter a description and alias for the MDE parameter.

d. Indicate whether the data will be discrete or continuous.

e. Indicate whether the data will consist of numeric, string or date values.

f. If you want, enter the number of decimals to display for the parameter and select a unit of measure label for the parameter.

g. Enter a **Default Replicate Number**.

If the data will not be replicate data, enter 1.

If the data will be replicate data, enter the minimum number of replicates in the data. It is easy to add replicates later.

h. If the data will be continuous data, enter a **Timestamp Group Name**. (For more information, see *Timestamp Group Name* on page 6-3.)

i. Click **OK**.

5. When you're finished creating all the MDE parameters you need for the data you're about to enter or import, click **Commit**.

This finishes adding the new MDE parameters to the hierarchy and unlocks the hierarchy for others to use again.

Manually Entering Discrete Data

Only discrete data can be manually entered. Parameter Set Names in the MDE parameter must match Parameter Set Names in data you enter.

If, at any time, you wish to save your work and come back to it later without committing it to the database (and ending up with multiple Manual Data Groups), click **Save a Draft**  . Retrieve the data later by clicking **Open a Draft**  .

1. In the hierarchy, select the MDE parameter that will contain the discrete data. More than one MDE parameter can be selected at once.

2. Click the **Open**  tool.

3. Enter a start and end date, and click **OK**.

MDE queries the database for available parameter sets from that date range and displays them with the empty parameters (designated by the word "null") on the right side of the dialog box. The Parameter Set Name and Parameter Set Date columns are already filled and cannot be edited.

4. At the top of the right side of the dialog box, enter a Manual Data Group name and description.
5. Double-click the data cells to enter data, and use the tab and arrow keys as in most spreadsheet programs to move among cells.
6. Once you're finished entering the data, click **Commit**.

A small dialog box will appear with the Manual Data Group name and ID#. The group can be viewed and edited in the Manual Data Group tab, but can no longer be edited in the Hierarchy tab.

Importing Data

In MDE, you can import both discrete and continuous data from a spreadsheet. Spreadsheet data must be in a comma-separated value (CSV) format, and must be either all continuous or all discrete. You can't update previously imported data by reimporting it; each time you import data, it is saved as a new, separate Manual Data Group.

To import data, you must first choose one or more MDE parameters to match to the data to be imported. Parameter Set Names in the spreadsheet data to be imported must match Parameter Set Names in the MDE parameter.

To import comma-separated spreadsheet data:

1. In the hierarchy, select the MDE parameter that will contain the data. More than one parameter can be selected at once.
2. Click the **Import**  button.
3. In the Import MDE dialog box, select the import file from the Filename drop-down box at the top of the dialog box.
4. Click **Open** just below the Filename drop-down box to read the column titles of your spreadsheet data into the Import MDE dialog box so you can match them.
5. Enter a Manual Data Group name and description.
6. Set the date format and separator *as it appears in your spreadsheet data.*

   The field names displayed in the Data section represent column headings from your spreadsheet data. The fields displayed in the Fields section represent the column headings present in your selected parameter.
7. If the spreadsheet data file contains a header row, make sure **Skip First Header Row** is selected. If the file does not contain a header row, make sure the option is not selected.
8. Click a Data field name, then a Field name, then click **Add>>**. The resulting match will appear in the Associated Fields section.

   Repeat Step 8 for each Field name.
9. When you have matched all the fields you need, click **Import**.

The data is automatically committed to the database, and a small dialog box appears with the Manual Data Group name and ID#. The group can be viewed and edited in the Manual Data Group tab.

Exporting a Template for Data

Export templates help you create files for importing data. The export template contains the Parameter Set IDs, replicate numbers and time stamps to match with data you want to import.

To create an export template:

1. In the hierarchy, select the MDE parameter that will eventually contain the data.
2. Click the **Template Export** button.
3. Enter the start and end dates for the template.
4. Enter the Filename for the template. Use the Browse button to navigate to where you want to save the file.
5. Click **OK**.

You can now open the saved .csv file in a spreadsheet program and enter the data as necessary.

Editing Data

In the Manual Data Group tab…

1. Find the group you want to edit by the MDG ID (assigned when you created the MDG) or by the name of its creator and its approved or unapproved status.
2. Select the Manual Data Group in the Search Results list, then click **Open** at the bottom of the list.

   The data will appear on the right side of the dialog box.
3. On the right side of the dialog box, click the **Edit** tool.
4. You can edit any of the data except the Parameter Set name and date.
5. When you're finished editing the data, select a Change Reason from the drop-down box at the bottom of the dialog box.
6. Click **Commit**.

Approving Data

Your organization may make a distinction between approved and unapproved data. Use the Manual Data Group tab to find, view and approve data if necessary. If you're allowed to use unapproved data in your Analysis Groups, you must select the **Include MDE unapproved data** option in the Analysis Group Creation window.

7 • Administration

The "Administration" mode or domain is one of two Discoverant modes system administrators will use to maintain the software. In the Administration mode, you can:

- Manage users
- Manage Discoverant system settings while Discoverant is running
- Reload or refresh various types of pools while Discoverant is running
- Generate logging or auditing reports

The "Hierarchy Admin" mode or domain is the second Discoverant mode administrators will use to maintain the software. In the Hierarchy Administration mode, you can:

- Create and edit hierarchies
- Add and edit nodes within hierarchies
- Add and edit views within hierarchies
- Add and edit parameters within hierarchies

Both these domains require special permission to use and should be used only by trained Discoverant system administrators. For detailed information on each, see the *Discoverant Administrator's Guide*.

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