CRITERION ™ Vantage 3
Admin
Training Manual

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1.   INTRODUCTION

1.1 PURPOSE OF THIS MANUAL

This manual covers the functionality of the Admin application as relates to interfacing with ASC International's solder paste inspection systems.   It is recommended for those responsible for configuring or maintaining a project or database.

1.2 ROLE OF AN ADMINISTRATOR

In every installation of CRITERION, there will be one or more users who are charged with the task of administrating the system. In large installations, these will be managers who tailor the system for use by other operators. In smaller installations, administration, shop floor data collection, and analysis may be performed by the same person or group of people. In either case, certain administrative tasks need to be performed when the system is installed, and on a continuing basis as the system is used.

1.3 UNDERSTANDING SPC

SPC (Statistical Process Control) is a set of quality control techniques that involves the collection and analysis of production data for the purpose of process improvement. **The main goal of SPC is to minimize variation and thus maximize quality and improve profits**. By definition, a process with a large degree of variation cannot be precisely controlled. The application of SPC techniques makes it possible to reduce variation in such processes so that they are easier to control. A computer-based system helps automate SPC techniques by collecting data, and interpreting it statistically in order to point out trends that can affect product quality.

1.4 UNDERSTANDING THE DATABASE

A complete database actually consists of two database files. One file maintains all of the configuration information created in the Admin application regarding products, data collection procedures (DCPs), etc. (CRITERION.MDB). The other file (CRITERIONDAT.MDB) is the historical database and contains actual data.

The database contains organizational information, data collection and analysis parameters, and actual product/process data. The product tree provides product-specific categorization, while the process tree allows process-specific categorization. For the purpose of this manual, we will focus on the Product Tree. The diagram below shows how the product tree is used to categorize and group data. Each of these structures is described in the following paragraphs.

Characteristic 1   Characteristic 2

Historical Data
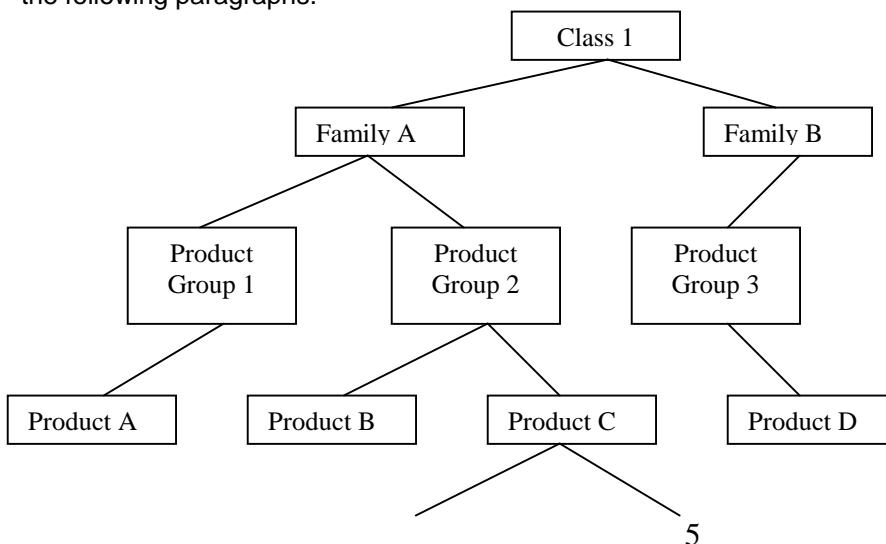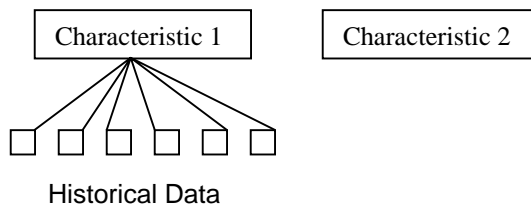
1.5. The Product Tree

Product oriented grouping allows for the definition and organization of actual products and associated characteristics. Classes and families are used to create high-level categories that correspond to areas or functions of a business. In a large company, **classes are used to identify factories in different locations,** and **families are used to denote different types of manufacturing within each factory**. More specific product grouping structures, defined below, are grouped in the same manner within individual families. **A product record in the database corresponds to a unique product**. Several product records may be combined into a single product group record. Several product groups may then be combined into a single family (described above).

Each product record may contain one or more characteristic records (i.e. Height, Volume) that define measurable quantities (variables) of the product. Variables characteristic records should be maintained for all measurements that are vital to the overall quality of the product. Among other things, this information includes names, descriptions, specifications and instructions for data collection and analysis.
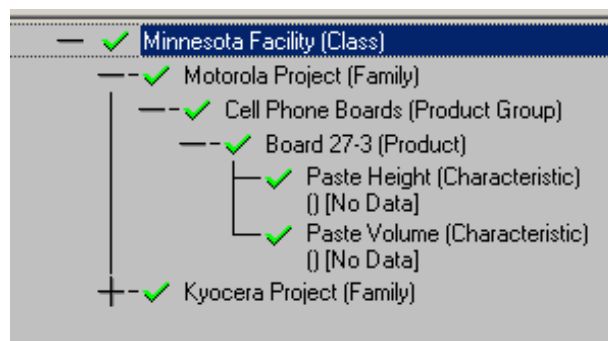
The product tree is an organizational hierarchy that is used to model the output of manufacturing processes. The product tree has five levels. From most general to most specific, they are: **Class, Family, Product Group, Product, and Characteristic**. Classes, families, and product groups are general grouping structures that can be used in a variety of ways to categorize more specific product structures. Products and characteristics are product oriented grouping structures that allow for the definition and organization of actual manufactured products and their properties. A partially developed product tree is shown above.

2. RUNNING ADMIN

2.1 STARTING ADMIN
Like most Windows applications, Admin can be run from the start menu. If a password is required to gain access to the current database, a login window will appear before Admin completely loads. (See Below)

2.2 LOGGING IN TO ADMIN
If passwords have been configured for the current database, you must log in to gain access to Admin. By logging in, you identify yourself so that the program can grant the correct user privileges.
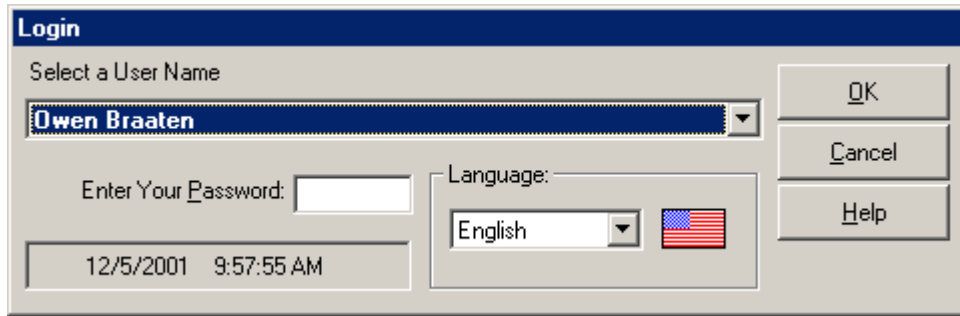
To log in, you must know the User Name and Password that is assigned to you. If the Login window is not already on the screen, you can open this window by selecting the Login/Logout option from the User menu.

To log in
1. Select your name from the list of users.
2. Type your assigned password in the box. Any combination of capital and lower-case letters are accepted.
3. Select OK or press ENTER.
4. If you enter your password incorrectly, a message warns you. You must re-enter the password.

2.3 LOGGING OUT OF ADMIN

To log out
Logging out of Admin halts the application until a user with access to the application logs in. To log out without exiting the application, press F2 or select Login/Logout in the User menu. To log out and exit the application, select Exit from the File menu.

3. UNDERSTANDING THE ADMIN DISPLAY

The two main tools in the Admin application are the System Viewer and the List Viewer. The System Viewer lets you view and access the organization of data records that have been created. The List Viewer can be used to create, select and edit various types of information that facilitate the management of detailed information about various items including tags lists, corrective action lists, warning lists and collection procedures. A sample display is shown below.
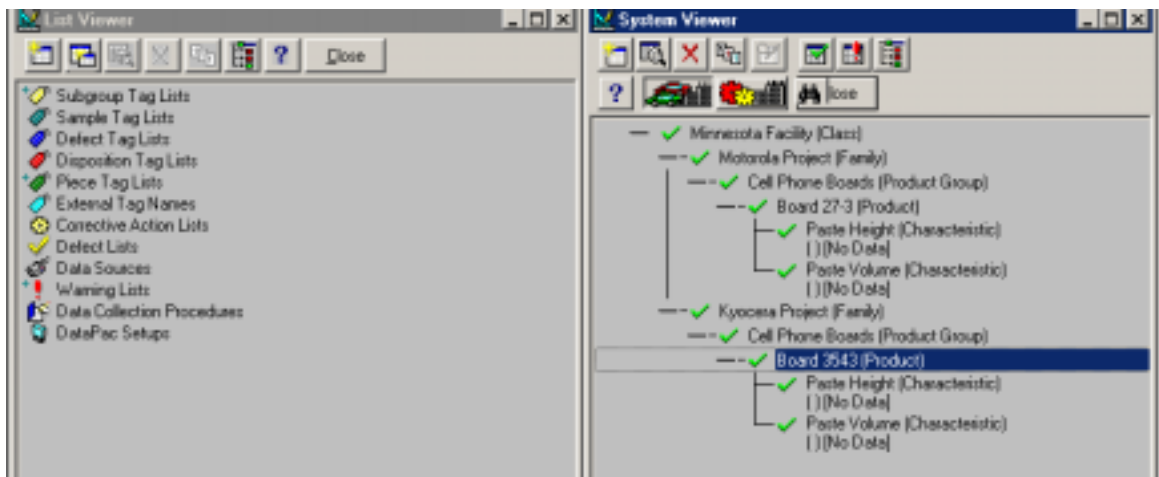
Both the System Viewer and the List Viewer can be opened and closed by selecting or deselecting them in the Setup Menu. The viewer windows can be resized and tiled so that they can be viewed at the same time.

Note: Many of the components found in the List Viewer are only used with specific applications. Components that are used only with specific applications will be noted.

3.1 MENUS

Several menus in Admin (like File, Window, and Help) are standard to most Windows software (see the diagram above). The remaining menus are designed for functionality specific to Admin. Specific menu choices are described in the sections listed below.

3.1.1 The File Menu

Preferences - Opens the Preferences window, which allows the selection of options for the Admin application.

Reports - This menu opens the Report Setup window, from which any setup created in Admin may be printed.

Exit - This option terminates the Admin application.

3.1.2 The Setup Menu

System Viewer... - Choosing this menu item opens (or closes) the System Viewer window.

List Viewer… - Choosing this menu item opens (or closes) the List Viewer window.

3.1.3 The User Menu

Login/Logout - If a user is already logged in, selecting this item logs the user out of Admin. If no user is logged in, selecting this menu item opens the Login window.

User Accounts... - This menu item opens the User Manager window, from which administrators may create and configure records for users and user groups.

3.1.4 The Window Menu

Cascade - This option causes all open windows to be resized and moved such that all title bars are visible. Each subsequent window is placed slightly lower and to right of the previous one, so that each window is visible, and each may be selected by touching on the title bar.

Tile Horizontally – This option centers the first window at the top of the application workspace. Each subsequent window is then placed directly beneath the previous one. This scheme gives equal screen space to all windows.

Tile Vertically - This option centers the first window to the left of the application workspace. Each subsequent window is then placed directly to the right of the previous one. This scheme gives equal screen space to all windows.

Arrange Icons - This menu item is not currently used.

(open windows) - Any currently open windows are listed here.

3.1.5 The Help Menu

**Contents -** Choosing this option causes the Contents window of Admin help to be displayed.

Search for Help on… - This menu option opens Admin help with the Search window displayed.

Technical Support - When selected, a window appears giving telephone and fax numbers for technical support.

About Admin... - This option causes a window to appear displaying version, copyright information and specifics about system resources.

3.2 THE SYSTEM VIEWER

The System Viewer, shown below, allows an administrative user to view and access the entire organization of data records that have been created in the database. Data records are stored in one of two hierarchically organized structures called the product tree and the process tree. Any level in this hierarchy can be created or edited from within the System Viewer. The elements or branches within the tree (at any level) may be referred to as "setups" or "records". An example of a product tree is shown below.
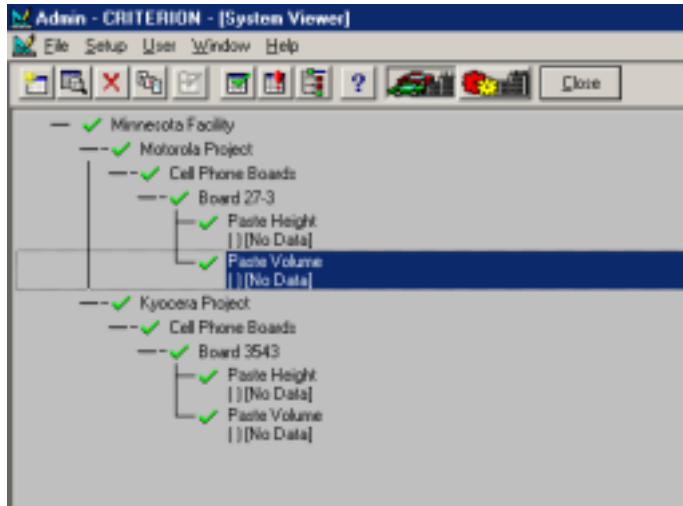
The System Viewer can be opened or closed by selecting or deselecting it in the Setup menu. Any element that is displayed in the System Viewer can be selected by highlighting that element.

When it is first opened, the System Viewer displays only the most general level of the tree (i.e. classes). Whenever an element in the tree has subsidiary or child levels below it that are not displayed, it has a **(+)** next to its name. Any parent level in the tree can be expanded to show the next lower level by selecting the **(+)** or by pressing Enter while the parent level is highlighted. Similarly, when a level in the tree is expanded to show the elements at the next lower level, it has a **(-)** next to it. Elements in the tree may be collapsed to hide all lower levels by selecting the **(-)** or by pressing Enter while the parent element is highlighted. Elements that do not have any subsidiary levels are not marked with either a plus or a minus.

The System Viewer also shows the status of warnings that may have been generated when data was collected for a characteristic. If a warning has been generated and has not yet been acknowledged by an administrator, a red exclamation point **!** is shown next to that characteristic and next to each level of either tree that is associated with that characteristic. If no warnings have been generated for a characteristic since an administrator last acknowledged warnings, then a green check mark ✔ is displayed next to it. A check mark beside any element of the hierarchy indicates that all characteristics that are subsidiary or linked to that element have no unacknowledged warnings.

When the database contains data for a characteristic in the product tree, a symbol is shown to the left of the characteristic name. Double-clicking on the symbol, or selecting the desired characteristic and then clicking on the Data Edit button in the toolbar, calls the Subgroup Selection window from which subgroups can be edited or deleted. An option can be turned on in the Applications Preferences window to allow the System Viewer to display an additional line of information below each characteristic name. This line lists the code for the most recent warning generated for that characteristic and specifies the date and time range of the available data.

System Viewer Buttons

New Button - The New button creates a new record from the System Viewer.

Edit Button - The Edit button allows the user to edit the selected record.

Delete Button - The Delete button can be used to delete the selected record, any children under this record, and, in the case of the product tree, any data under this record. (under this branch of the tree).

Clone button - The Clone button can be used to clone the selected record and any children under this record.

Edit Data button - The Edit Data button allows the user to edit subgroups of previously collected data.

Clear Warnings button - The Clear Warnings button clears warnings associated with the selected record and any children under this record.

Reset Warnings button - Indicates all warnings that have not been acknowledged by an administrator.

Rebuild Tree button - The Rebuild Tree button updates the System Viewer to reflect any changes in the system.

Help button - The Help button can be used to access context sensitive help.

Show Product Button - The Show Product button displays the product tree.

Show Process Button - The Show Process button displays the process tree.

Close button - The Close button can be used to close the System Viewer window.

The Shortcut menu - Many commands performed by the toolbar buttons of (for example, creating or deleting a record or a list) may be performed using a shortcut menu. Each viewer has its own shortcut menu.

To access the shortcut menu for either viewer do one of the following:
KEYBOARD   Use the arrow keys to highlight the desired item in the viewer and then press the space bar. Press Esc to close the shortcut menu.
MOUSE   Click the right mouse button on any item displayed in the viewer. When the menu appears, select a command. The menu will close when the right mouse button is released.

3.3 THE LIST VIEWER

The List Viewer is used to create and edit various types of items, including tag lists, data sources, corrective action lists, and warning lists. The use of lists and categories such as these makes it easier to record information about characteristics, data and data collection methods. Also, most of these lists and categories can be shared by more than one characteristic thus simplifying the process of defining information for multiple characteristics. The List Viewer can be opened or closed by selecting or deselecting it in the Setup menu.
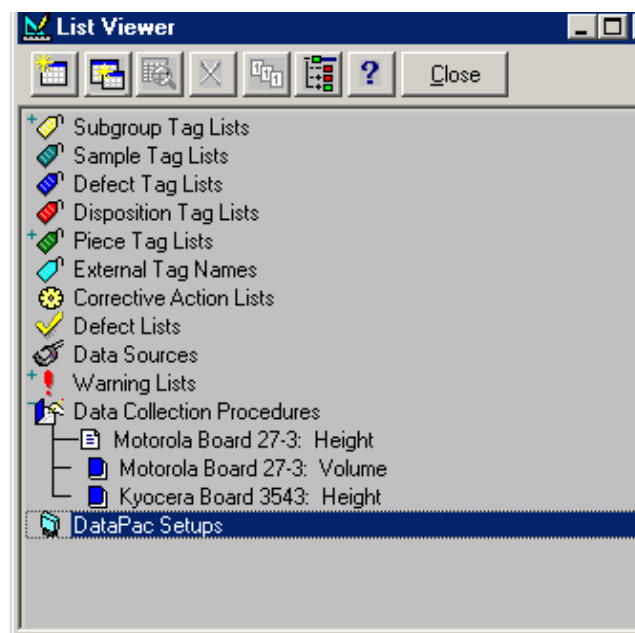
In order to display the items available for any particular category, expand the category by double-clicking on the icon next to the category name or highlight the category and press enter. If one or more items are available for that category, the item names will be displayed beneath the category name. Similarly, in order to display the items in a particular list, simply expand the list by double-clicking on the icon next to the list name or highlight the list name and then press enter. Any of the List Viewer categories and individual lists can be collapsed by double-clicking on the associated icon or highlighting the name of the list or category to be closed and pressing return.

List Viewer Buttons

New Button - The New button is used to create a new list or new item within an existing list, depending on what item in the List Viewer is currently highlighted.
Add Child Button - The Add Child button allows you to add items to a list.

Edit Button - The Edit button allows you to edit a list or an item in that list.

Delete Button - Deletes the selected list or item in a list.

Clone Button - Clones the selected item or list (including any individual items the selected list may contain).

Rebuild Tree Button - Refreshes the List Viewer to incorporate new information since it was last opened.

List Viewer Help Button - The List Viewer Help button accesses context sensitive on-line help.

Close Button - The Close button closes the List Viewer.

The Shortcut menu - Many commands performed by the toolbar buttons of the System Viewer and the List Viewer (for example, creating or deleting a record or a list) may be performed using a shortcut menu. Each viewer has its own shortcut menu.

To access the shortcut menu for either viewer do one of the following:
KEYBOARD   Use the arrow keys to highlight the desired item in the viewer and then press the space bar. Press Esc to close the shortcut menu.
MOUSE   Click the right mouse button on any item displayed in the viewer. When the menu appears, select a command. The menu will close when the right mouse button is released.

4. USING THE SYSTEM VIEWER

The System Viewer allows an administrative user to view and access the entire organization of data records that have been created. Data records are stored in two hierarchical structures: the product tree and the process tree. When a new database is created for use in Acquire, Admin is the tool used to create it. The System Viewer is used to set up the product and process trees. Edits and updates are made to this database using Admin.

4.1 PRODUCT INFORMATION

In Admin, a single product record is typically maintained for each product with a unique part number or model number. Variables characteristics are then associated with the product to define measurements or observations that are used to assess the quality of the product. Any number of Product records may be created and stored in the database.

4.1.1 Creating & Editing Classes

Classes are the most general structures in the product tree. A class record, for example, may contain all families of products produced in one manufacturing facility. The Class Setup window, shown below, is called from the System Viewer by highlighting an existing class and pressing ENTER or by selecting the Edit button or the New button. From the Class Setup window, existing class records are viewed and edited, and new classes are created. Additionally, if families exist below the selected class, they are listed in a grid at the bottom of the window.
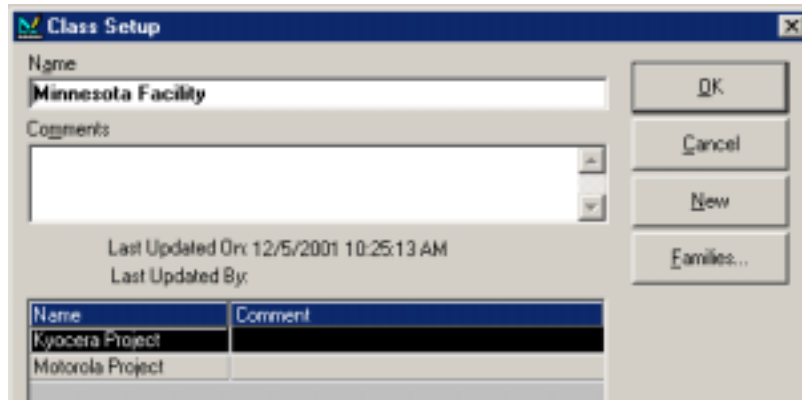
To Create or Edit a Class
1. Display the Class Setup window for a new or existing class as described above.
2. Enter or edit the class Name. This is the name that will be visible in the tree.
3. Enter Comments (optional).
4. Dismiss the class record in one of the following ways. You will be prompted to save changes.
   - Select the OK or Cancel buttons to return to the System Viewer window. If you select OK, changes are automatically saved. Otherwise, you will be prompted to save the changes.
   - Create a new class by selecting the New button. Repeat the steps above.
   - Create a new family inside of this class by clicking the Families... button, or edit an existing Family by double-clicking the name of an existing family in the grid.

4.1.2 Creating & Editing Families

Families are the second-highest level in the product tree. They are used to categorize product groups. For example, a family may be used to categorize all product groups in a given type of production or all product groups associated to a specific customer. The Family Setup window, shown below, is called from the System Viewer by highlighting an existing family and pressing ENTER or by selecting the Edit button or the New button. From the Family Setup window, existing family records are viewed and edited, and new families are created. Additionally, if product groups exist for the selected family, they are listed at the bottom of the window.
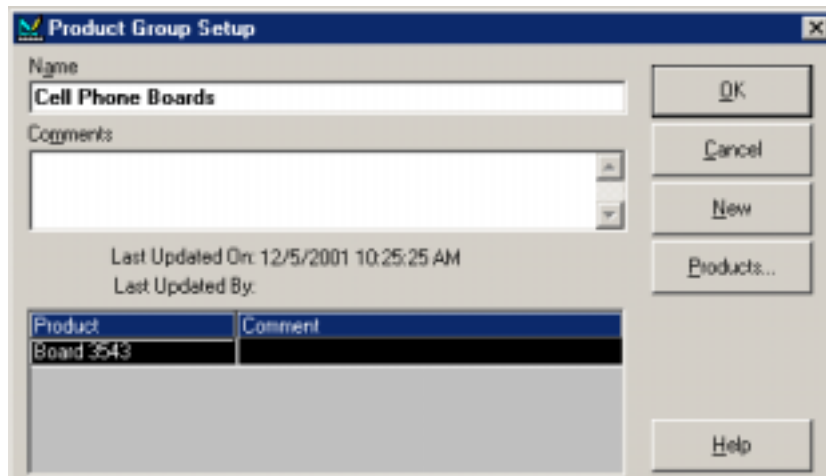
To Create or Edit a Family
1. Display the Family Setup window for a new or existing family as described above.
2. Enter or edit the family Name. This is the name that will be visible in the tree.
3. Enter Comments (optional).
4. Dismiss the family record in one of the following ways. You will be prompted to save changes.
   - Select the OK or Cancel buttons to return to the System Viewer window. If you select OK, changes are automatically saved.
   - Create a new family by selecting the New button. Repeat the steps above.

- Create a new product group inside of this family by clicking the Prod Groups... button, or edit an existing product group by double-clicking the name of an existing product group in the grid.

4.1.3 Creating & Editing Product Groups

Product groups are the third most general structures in the product tree. A product group, for example, may be created to classify all products that are combined into a larger assembly or all products that have similar functions. The Product Group Setup window, shown below, is called from the System Viewer by highlighting an existing product group and pressing ENTER or by selecting the Edit button or the New button. From the Product Group Setup window, existing group records are viewed and edited, and new groups are created. Additionally, if products exist below the selected product group, they are listed at the bottom of the window.
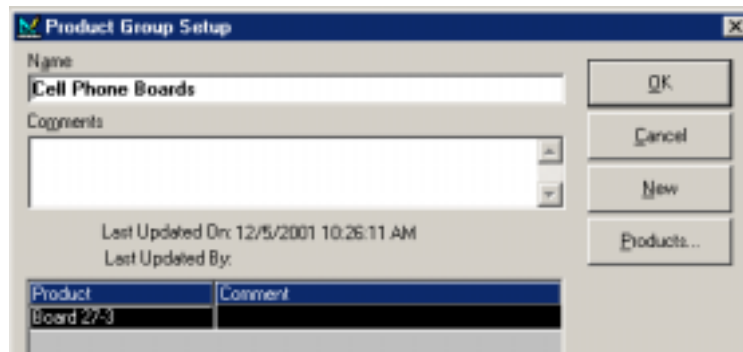

To Create or Edit a Product Group
1. Display the Product Group Setup window for a new or existing product group as described above.
2. Enter or edit the product group Name.
3. Enter Comments (optional).
4. Dismiss the product group record in one of the following ways:
   - Select the OK or Cancel buttons to return to the System Viewer window.
   - Create a new product group by selecting the New button. Repeat the steps above.
   - Create a product inside of this product group by clicking the Products... button, or edit an existing product by double-clicking the name of an existing product in the grid.

4.1.4 Creating & Editing Products

Products are another level in the product tree. Products typically represent specific part numbers. The Product Setup window is called from the System Viewer by selecting the name of an existing product record and pressing ENTER, or by selecting the New button or the Edit button. The Product Setup window is also called by selecting the Products... button in the setup window of a parent product group record. From the Product Setup window, existing product records are viewed and edited, and new product records are created. If variable characteristic records exist below the product, they are listed in the grid at the bottom of the window.

Note: The Product Setup window contains two additional buttons: Parameters and Piece Tags. When creating configurations for Acquire, these buttons may be ignored.
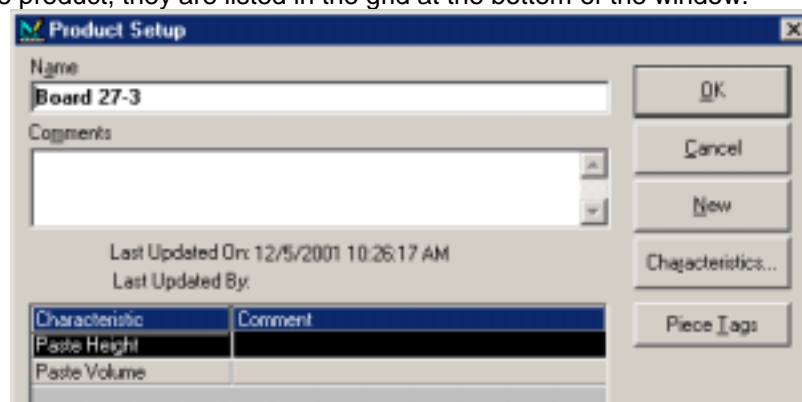
To Create or Edit a Product
1. Display the Product Setup window for a new or existing product as described above.
2. Enter or edit the product Name.
3. Enter Comments (optional).
4. Dismiss the product record in one of the following ways. You will be prompted to save changes.
- Select the OK or Cancel buttons to return to the System Viewer window. If you select OK, changes are automatically saved.
- Create a new product by selecting the New button. Repeat the steps above.
- Create a new characteristic inside of this product by clicking the Characteristics... button, or edit an existing characteristic by double-clicking the name of the characteristic in the grid. When prompted, select the type of characteristic to create, attributes or variables (Note: Stats does not use attributes). Then follow the instructions in Creating & Editing Characteristics.

4.1.5 Creating & Editing Characteristics

A characteristic represents a quantity or property that contributes to the overall quality of the final product. Variables characteristics represent measurable quantities such as paste height, volume, etc. Attribute characteristics, on the other hand, represent data that is assessed qualitatively rather than with a measured value and can be counted for recording and analysis. Variables characteristics are assigned to product records because they represent dimensions or qualities of a manufactured product.

The Variables Characteristic Setup window may be called from the System Viewer by selecting the name of an existing characteristic record and selecting the New button or the Edit button. The Characteristic Setup window may also be called by selecting the Characteristics button in the setup window of a parent product record. When new characteristic records are created, you are prompted to decide which type of characteristic record to create (choose from the variables option only). From the Characteristic Setup window, you can view and edit existing characteristic records and create new characteristic records.

To Create or Edit a Characteristic Record
Fill in the necessary fields in the characteristic setup window. See Section 5, Variables Characteristic Setup Window, or Section 6, Attributes Characteristic Setup Window.

4.2 GENERAL MAINTENANCE PROCEDURES

4.2.1 Deleting a Setup

Note: Deleting a branch from the product tree **will also delete all data** collected for characteristics contained in that branch.

1. Select the level of the product hierarchy that defines the branch to be deleted. For example, if a particular product group is selected, this product group and all of the products and characteristics under that group will be deleted. Any level of the product tree can be selected for deletion.

2. Select on the Delete button to delete the selected element in the product tree as well as any children below this element, or press the right mouse button and select Delete from the menu. For example, if a class is deleted, all families, product groups, products and characteristics under this class will also be deleted. *Since this is a very powerful option, be sure to carefully read any confirmation dialog boxes that may appear before the deletion actually takes place.*

Tip: It is not necessary to delete the actual product hierarchy or setups in order to delete all of the data under a particular branch of the tree. The data can be deleted while leaving the setups intact.

4.2.2 Creating a Subsidiary Record

To create a subsidiary record to an existing record, highlight the existing record and click the Edit button. This displays the setup window that displays the current information for the highlighted level. From there, click the button with the subsidiary level to create a new child. For example, to create a new product group under an existing family, first display the setup window for the parent family by highlighting it and clicking the Edit button. Then display a new Product Group Setup window by clicking the Groups button.

4.2.3 Editing a Setup

To edit the record displayed in the tree, highlight the record and click the Edit button. This displays the setup window for that record, where configuration information for that record may be viewed and edited.

4.2.4 Updating the System Viewer

The System Viewer may be updated to reflect any changes that may have occurred in the system. To rebuild the viewer, click the Rebuild Viewer button. Both the product and the process tree will be rebuilt.

4.2.5 Cloning Records

Cloning may be performed on any level of the product or process tree. When a record is cloned, the new record becomes a child to the same parent. For example, if a product that belongs to the "Cell Phone" product group is cloned, the clone will also belong to the "Cell Phone" product group. In addition, if the original record is parent to other levels, all subsidiary levels are cloned.

To clone a record in the List Viewer
1. Highlight the original record and click the Clone button. The dialog will request a name for the new record.

2. Enter the new name for the cloned record and click the OK button.

To clone a record in the System Viewer
1. Select the record you wish to clone.

2. Press the Clone button at the top of the System Viewer window. This will open the Edit Cloned Items window. The record to be cloned and all its children records will appear in tree form at the top of the window.

3. To change the name of any record in the tree, click on the item. It will appear in the Edit Current Product Information field. Change the name and press the Update button. Note the name of the topmost item **must** be changed; two records at the same level can not have the same name. If you wish to return to the original name instead, press the Restore button. Note the Restore button will not function once the Update button has been selected.

4. Any links these records have between the Product and Process Trees may be cloned along with the records. To maintain all links between the two trees, select the Clone All button from the Characteristic Operation Association field. To avoid cloning any links between the Product and Process Trees, select the Clone None button from this field. To manually select which characteristics will maintain their links, highlight each characteristic one at a time in the tree and select or de-select the checkbox titled Clone Characteristic Operation Associations.

5. Once all information has been set for the new cloned record, press the OK button. To terminate the clone function without cloning, press the Cancel button.
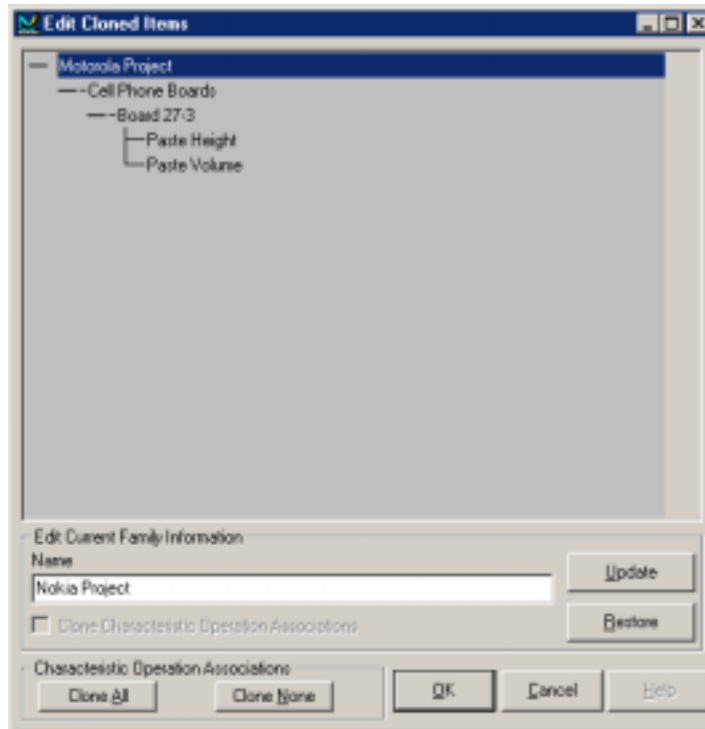
4.2.6 Clearing Warnings

A ! next to an item of the System Viewer indicates that warning(s) were issued for characteristic(s). After examining the situation under which warnings were issued, you will likely want to clear that warning to indicate that the warnings have been acknowledged. Clearing a warning simply changes the picture from a red ! indicator to a green indicator √; it does not remove the record of that warning from the database.

To clear warnings for a record of the product tree, simply highlight the element and click the Clear Warnings button. Warnings may be cleared on any level of the product tree. Clearing warnings for a record clears the warnings of all subsidiary records.

4.2.7 Refreshing the Display

4.2.7.1 Rebuild Tree

The System Viewer Tree may be rebuilt to show any changes that have been made since the last rebuild of the tree. Rebuilding the tree will also reset the warnings, as described in the next subsection. To rebuild the tree, click the Rebuild Tree button.

4.2.7.2 Resetting Warnings

The System Viewer may be updated to indicate any warnings that have not yet been acknowledged by an administrator. To reset warnings, click the Reset Warnings button.

4.3 HANDLING DATA FROM WITHIN THE SYSTEM VIEWER

Occasionally, after data has been entered, errors are found which affect subsequent analysis and warning generation. Data entered with Acquire is committed to the database in complete subgroups. Until a subgroup is completed, the Acquire user may "back up" through collected samples, tags, and defects to edit the information. Once data has been committed, however, it cannot be edited by users with Acquire. Facilities for editing completed subgroups are only included in Admin and Analysis.

Previously collected data may be edited or deleted by users who have the appropriate privileges in Admin. Individual subgroups (and their samples) may be viewed and edited from within the System Viewer. In addition, all

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of the data associated with a particular branch of the product tree (e.g., all of the data which has been collected for a particular product or family) can be deleted at once.

To edit individual subgroups or samples of data
1. Select (highlight) the characteristic to which the subgroup or sample of data belongs.

2. Click the Edit Data button to open the subgroup selection window for that characteristic.

3. Enter starting and ending dates in the Date Range frame.

4. In the Show frame, select the All subgroups option button to show all subgroups in the specified range, or select one of the other options to show only those subgroups which have or have not been excluded.

5. For attributes characteristics, select the collection Mode (Batch or Sample/Express).

6. Click the Show Selection button to display a list of subgroups collected in the specified date range. Information about individual subgroups is provided.

7. Select one or more subgroups. Individual subgroups may be selected and de-selected by clicking on the left margin of the appropriate row in the grid. The Select All button may be used to select all of the subgroups listed in the grid, and the Clear Selection button may be used to de-select all of the subgroups listed in the grid.

8. To edit the data, after the desired subgroup or subgroups have been selected, click on the Edit button to open up the Data Edit window for these subgroups. The Data Edit window varies depending on the type of data that has been selected for editing. Click on the Help button in this window to find specific information regarding editing the type of data you have selected. To delete the selected data click the Delete button.

To delete all data associated with a particular branch of the product tree
1. Select the grouping structure in the product tree that contains the data you want to delete. For example, if you want to delete all of the data that has been collected for a particular characteristic, select that characteristic. A grouping structure may be selected at any level of the product hierarchy (including Class, Family, Product Group, Product, or Characteristic).

2. Click the Delete button to delete all data under this level of the product tree. **This is a very powerful option**, so be sure to carefully read any confirmation dialog boxes that appear.

Tip: Any users who also have privileges to Edit Structures and Lists in the Admin application will be asked whether they wish to delete setups as well as data. If setups are deleted, **the grouping structure selected and all levels of the product hierarchy below this level will also be deleted.** For example, if a family is selected for deletion and setups are deleted as well as data, that family and any product groups, products, or characteristics

under that family will be removed from the product hierarchy. **To delete the data only**, answer "No" to this question.

4.3.1 Editing Variable Data
All information collected for a variables subgroup is edited in the Variables Data Edit window.
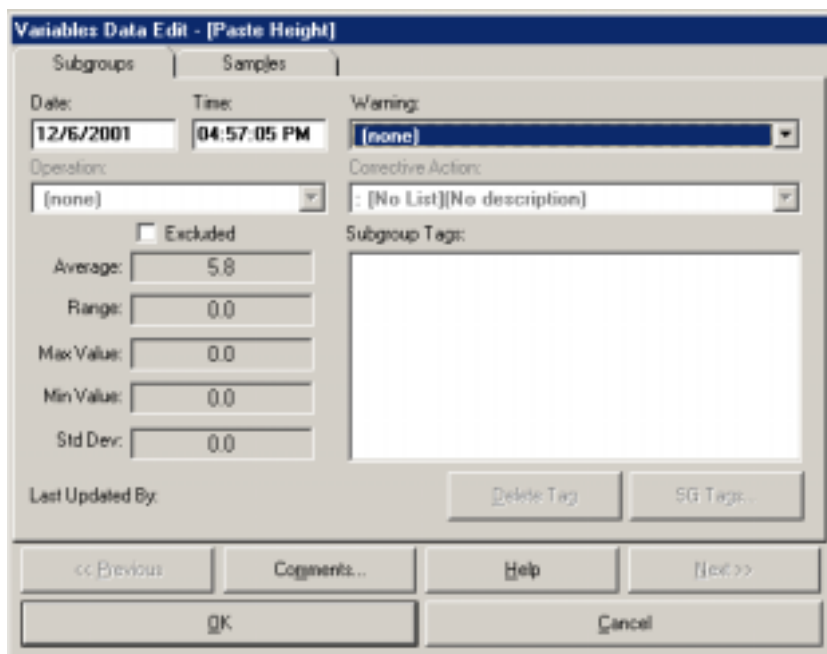
4.3.1.1 Variables Subgroup Information

Information that pertains to a selected subgroup is edited in the Subgroups tab of the Variables Data Edit window.

Date, Time - When creating analysis charts, data is selected chronologically. If date or time is incorrect a subgroup may be plotted out of order or completely eliminated from analysis.

Warning - If a warning was generated at time of data collection, the warning code and description are displayed. This field may be edited by selecting a different warning from the list.

Operation - If an operation was assigned to the subgroup at time of data collection, its name is displayed. Any operation assigned to the current characteristic may be selected.

Corrective Action - If a corrective action was entered at time of data collection, the corrective action code and description are displayed in this field.

Average, Range, Maximum, Minimum, Std Dev - The subgroup average, minimum, maximum, and standard deviation are listed on left side of the window. These items are calculated from subgroup data, and may not be directly changed by the user.

Excluded - Sometimes, due to special causes or inaccurate measurements, a collected subgroup of data contains one or more samples that are not representative of the actual process output. Subgroups such as these can greatly influence statistical analysis. To make statistical estimations more representative of actual process parameters, non-representative subgroups may be "masked" (excluded). When a subgroup is masked, it is not deleted from the database, but simply marked and omitted from further analysis. The current subgroup may be masked by selecting the Excluded check-box or unmasked by deselecting the check-box.

4.3.1.2 Variables Sample Values

Incorrect sample values can be the result of improper measurement technique, typing errors, or a number of other causes. Sample values may be edited from the Samples tab of the Variables Data Edit window.

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To change recorded sample values
1. Double-click on the incorrect sample value in the list of samples.

2. Edit the value in the Sample Value: field.

3. Click the OK button directly to the right of the Sample Value: field.

4.3.1.3 Variables Subgroup Tags

Users who have the privilege to Edit Collected Data may edit or delete subgroup tags using the Subgroups tab of the Variables data edit window.

To add or edit subgroup tags
1. From the data edit window for the desired subgroup, click on the SG Tags... button. This will open the Edit Tags window for this subgroup.

2. Highlight a tag label in the grid.

3. Enter or change the tag value in the right column of the grid.

4. Click OK to save changes and close the Edit Tags window.

To delete a subgroup tag
1. From the Data Edit window for the desired subgroup, highlight the tag to be deleted in the Subgroup Tags field.

2. Click on the Delete Tag button.

3. Click OK to save changes and close the Edit Tags window.
4.3.1.4 Variables Subgroup Comments

A subgroup comment may be saved with every subgroup of information in the database. Subgroup comments are used to give explanations of special causes, describe process adjustments, etc.

To edit or append the subgroup comments
1. Click the Comments… button at the bottom of the Variables Data Edit window.

2. Enter or append the subgroup comment.

3. Click OK to save changes and return Variables Data Edit window.

4.3.1.5 Variables Sample Tags

Sample tag values may be edited from the Samples tab of the Variables Data Edit window. To delete a sample tag, highlight the tag in the Sample Tags grid and click the Delete Tag button.

To add or edit sample tags
1. Highlight a tag in the grid and click the Sample Tags… button.

2. Enter a tag value in the right column of the grid in the Edit Tags window.

3. Click OK to save changes and return to the Variables Data Edit window.

5. VARIABLES CHARACTERISTIC SETUP WINDOW
Variables characteristic records contain specific information regarding data collection and analysis options. This information is organized into six categories (tabs) to make the creation and maintenance of variables records easy. A tab for each of the categories is displayed near the top of the setup window. Selecting a tab brings it to the front and displays the fields that relate to that category. The categories are:
- General

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- Control Charts
- Tags
- Instructions
- Warnings
- Math Line

5.1 GENERAL TAB

The fields on the General tab, shown below, hold a variety of descriptive information for the characteristic.

Variable Characteristic Name - Describes the measurement that the record represents (e.g., "Paste Height").

Subgroup Size - The number of samples (measurements) stored in each subgroup for the characteristic. Subgroup sizes for variables characteristics may range from 1 to 50.

Parameter Name – Not Used.

Classification Code – Not Used.

Comments - If desired, a more detailed description of the characteristic can be entered in the Comments field. This information will only be visible in this window.

LSL, Target, and USL - These fields represent, respectively, the lower specification limit, the target value, and the upper specification limit. Specification limits, determined by design engineers, define the upper and lower acceptable measurements of a characteristic. The target value is the ideal measurement for the characteristic. In most cases, the target is halfway between the specification limits, but this is not always the case. A target value must always be entered in the Target field. In addition upper or lower specification limits, or both upper and lower specification limits must be entered.

Units - This field provides a label to identify the type of values being measured. Select a label from the list or enter another label directly into the text field. **Note**: This field is not used in conjunction with Stats. The units of these characteristics can be set using either *4-mation* configuration software or View. Refer to the user's manuals for these software packages for further information.

Spec Limits - This field is used to specify whether this characteristic has both upper and lower specification limits defined or only one or the other (upper or lower) defined.

Resolution - This field determines how many significant digits to the right of the decimal point will be maintained for measurements and calculation results.

Data Source - Data sources are used to instruct the Acquire application where and how to obtain measurements for the characteristic. Select Manual if the data for the characteristic will be entered manually. If data are to be collected using an instrument, you must assign the specific data source and create a mathline.

Corrective Action List - This field allows the user to tie the current characteristic to a corrective action list. A corrective action list contains potential adjustments that might be made to a process or machine. To select a corrective action list for the characteristic, choose one from those listed in the combo-box. Note that a corrective action list must first be created in the List Viewer.

5.2 CONTROL CHART TAB

Fields on this tab are used to specify options that correspond to control methods for the characteristic.

Control Chart for Warning Generation - This field specifies the type of control chart that will be used to generate warnings for this characteristic. In addition, the control chart type selected in this field is used as the default when a control chart is requested for this characteristic from within the Analysis application. Choose one from those listed in the combo-box. See Appendix A Selecting a Variables Control Chart for guidelines on selecting a control chart type.

To monitor the extent to which a process is in control, data are checked against control limits (based on the specific type of control chart used) as each subgroup is added to the database. If unnatural trends are found in the data, the user is issued a warning before data for the next subgroup is requested.

Number of Subgroups for Statistical Calculation - The value in this text field determines the number of subgroups that will be used for trend checking and warning tests.

Number of Samples per Part - This field is only important when a disposition tag list is assigned to the characteristic. It defines the number of samples which are required before disposition is assessed. During data collection, the tags in the disposition tag list are requested after the number of samples specified in this field have been collected.

Control Chart Limits - The fields and controls in this frame specify what type of control limits will be used for the characteristic. Vantage has the capability to use control limits that are calculated automatically or fixed by the user. Select a calculation option on the left side of the frame then enter control limits on the right if necessary. The calculation options are described below.

- **Calculated X And R (or MR or S)** - control limits for both the mean and variation charts will be calculated from actual data values.

Tip: For characteristics that have **unilateral tolerances (only an upper or lower specification limit)**, fixed control charts are always used until the required number of subgroups for statistical calculations have been

acquired. Be sure to enter valid upper and lower control chart limits for X and R (or MR or S) even if the characteristic is configured to use calculated control chart limits.

- **Fix X And R (or MR or S)** - fixed limits are applied to both the mean and the variation charts.

- **Fix X, Calculate R (or MR or S)** - control limits for the mean chart are fixed and control limits for the variation chart will be calculated from actual data. See warning below.)

- **Calculate X, Fix R (or MR or S)** - control limits for the mean chart will be calculated from actual data and control limits for the variation chart are fixed. (See warning below.)

WARNING: Calculated control limits for the X-bar Chart are derived from the same data values as those of the variation chart (R, MR, or S Chart). Therefore, fixing one set of control limits and calculating the other is poor statistical practice. Although this practice is discouraged, any combination of fixed and calculated limits is allowed to afford maximum flexibility.

Short Run - This frame contains three text fields that are used to normalize data during short run analysis. It is not necessary to enter data for these fields unless the characteristic will be controlled with a short-run chart.

Reasonable Limits - Reasonable limits are used to reduce entry of erroneous data by screening out values that cannot realistically be considered possible measurement results. Reasonable limits can be defined by entering the maximum and minimum numerical values to be accepted as measurements for this characteristic in the Upper RL and Lower RL boxes respectively. The Enforce Reasonable Limits box must be checked in order for the application to apply these limits at the time of data collection. When this box is checked, it specifies that measurements outside of these limits should not be accepted during data collection.

Tip: The Upper and Lower RL % boxes describe the reasonable limits in terms of the percentage of the difference between the target and the relevant specification limit. For example, if the target is 10, the Upper Specification limit is 20, and the Upper Reasonable limit is 30 - the Upper RL % will be 200 % (i.e., the Upper RL is twice as far from the target as the Upper Specification limit is). The specific numerical values of the upper and lower reasonable limits can be specified by entering the desired percentage in the Upper and Lower RL % boxes; the Upper and Lower RL boxes will update accordingly.

5.3 TAGS TAB

Data tags allow individual subgroups or samples of data to be associated with supplemental information (e.g., conditions at the time of data collection). This information can assist in post-collection identification, tracking, and interpretation of the data. Variables data may be associated with subgroup, sample and disposition tags. If data tags are to be used for a characteristic during data collection, a tag list for each type of tag to be used must be assigned to the characteristic using the Tags tab of the Variables Characteristic Setup window. The tag lists are created and modified in the List Viewer. If data tags are not going to be used, it is not necessary to assign any tag list to a characteristic. Up to three tag lists can be assigned to each Variables Characteristic   (one for each type of tag).
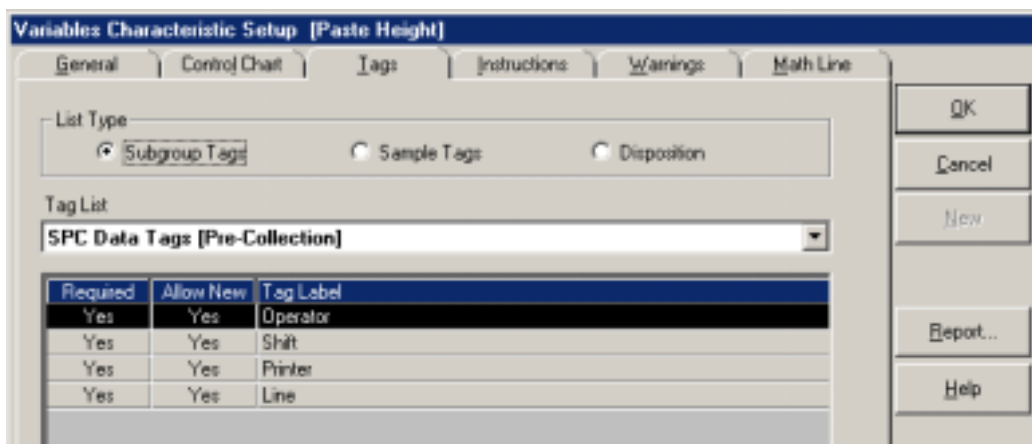
Assigning a tag list to a characteristic
1. Select the type of tag list you wish to assign to the characteristic (Subgroup, Sample, or Disposition Tags).

2. Click on the right end of the Tag List list box to display tag lists of the type selected. Select the desired list.

3. Once a specific tag list has been selected, any individual tags that may be included on that list will be displayed in the grid at the bottom of the window. The grid shows whether the entry of a value for each tag will be required or optional during data collection, whether the operator can enter new values for the tag or must select only from a value list, and the name of the tag. These tag characteristics are defined in the Edit Tag window and cannot be modified from the Variables Characteristic Setup window.

5.4 INSTRUCTIONS TAB

The Acquire application is capable of displaying multi-media or text instructions for the operator collecting data. Also, a CAD (Computer-Aided Design) graphic may be viewed at any time while collecting data for the characteristic.
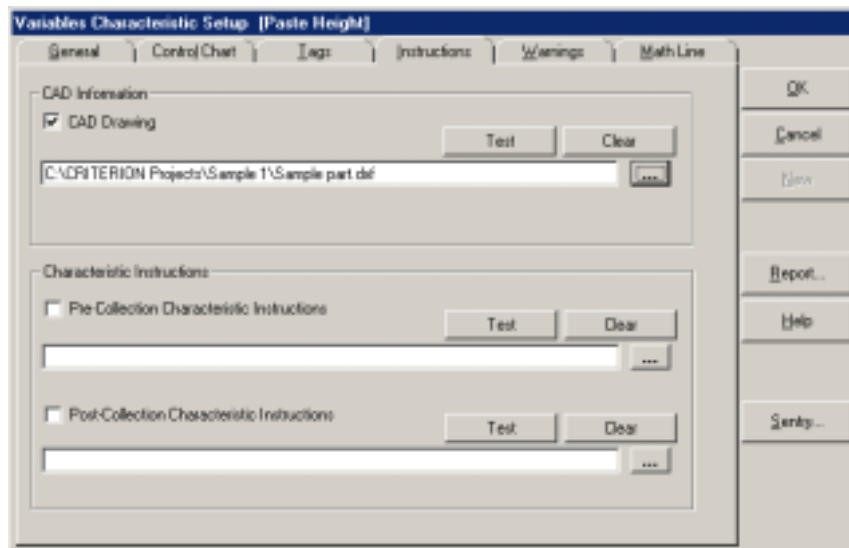
CAD Drawing
CAD drawing files used in Vantage must have a .dxf, .eps, or .wmf file extension.

To select a CAD drawing for the characteristic
1. Check the CAD Drawing box to enable the display of a CAD file during data collection.
2. Click the button to the right of the CAD Drawing check box.
3. In the Select CAD Drawing File window, specify the CAD file to be displayed.
4. Click OK to return to the Instructions tab.
5. To view the CAD drawing, click the Test button.
- To maximize the drawing window, click the button. Clicking this button again returns the window to original size.
- To zoom in on an area of the drawing, drag the mouse across the desired area. Double-click on the picture to zoom out.
- To exit the drawing window, click the button.

Characteristic Instructions
Instructions can be text, sound, video, or even program files. There are two times when instructions are played for an individual characteristic--immediately before collecting data for a characteristic and immediately after. Pre-collection instructions are displayed before and post-collection instructions after a subgroup of data is collected for the characteristic.

To select instructions for the characteristic
1. Check the Pre-Collection (and/or Post-Collection) Characteristic Instructions box to enable the use of the file during data collection.
2. Click the button to the right of the check box.

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3. In the Select Operator Instruction File window, specify the file to be displayed.
4. Click OK to return to the Instructions tab.
5. To play the instruction file, click the Test button.

5.5 WARNINGS TAB

Fields and controls on the Warnings tab are used to specify and customize sets of control warnings that are applied at the time of data collection. With the Warning List combo-box, a pre-defined set of warning criteria may be assigned to the characteristic. Several warning sets are provided. If it is not necessary to apply warning criteria to the characteristic, choose (None) from the list.

Once a warning set has been chosen, the individual warnings in the set are listed in the grid at the bottom of the window. Any warning may be turned off or turned on for the characteristic by double-clicking on the corresponding row in the grid. Additionally, an instruction file can be specified for any warning in the list by highlighting the warning and clicking the small builder button next to the Warning List field. In the Select Operator Instruction File window, specify the instruction file to be executed. Acceptable instruction files are those with .txt, .doc, .wav, .avi, .exe, .pdf, .com, .pif, or .bat filename extensions. Once an instruction file is specified, the Test button may be used to execute the operator instruction.

5.6 MATH LINE TAB

The instruments used for variables data collection do not always provide values that are ready to be used as SPC samples. Often, manipulation or mathematical combinations of instrument readings are required. For such situations, Vantage provides a math expression feature that allows incoming data from a variety of instruments to be manipulated and combined during data collection. Math expressions are built by the administrator as part of a variables characteristic. The Math Line tab of the Variable Characteristic Setup window allows the user to create and edit math expressions.
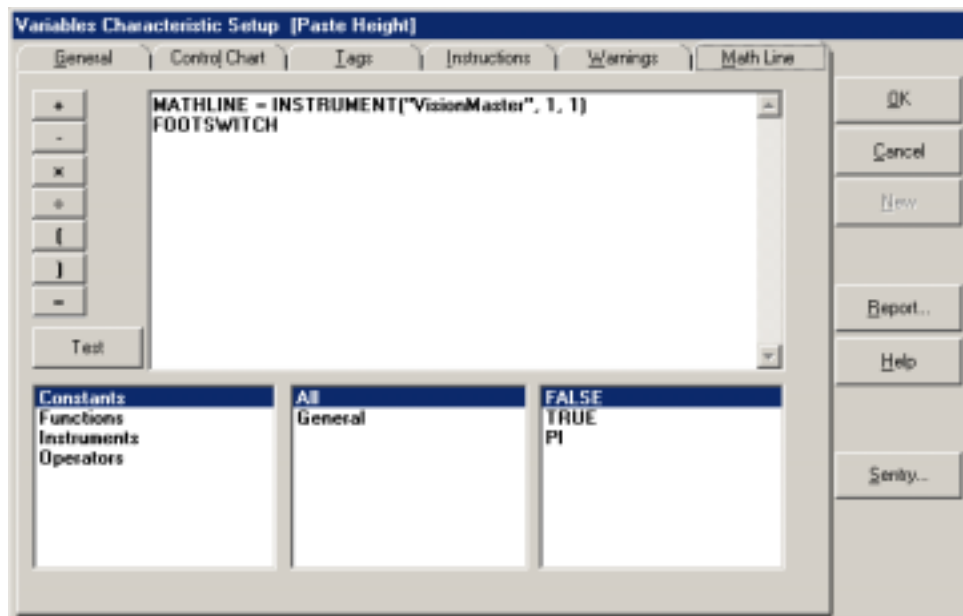
5.7 CREATING REPORTS

Reports are created to summarize setup information entered in the Admin application. Reports may be generated for products, characteristics, users and user groups. All reports are displayed on the screen in a preview window before they are printed.

Report Setup

Report Item:

Variables Characteristics

Available Items:

Paste Height
Paste Height
Paste Volume
Paste Volume

Preview

Close

Select All

De-Select All

Help
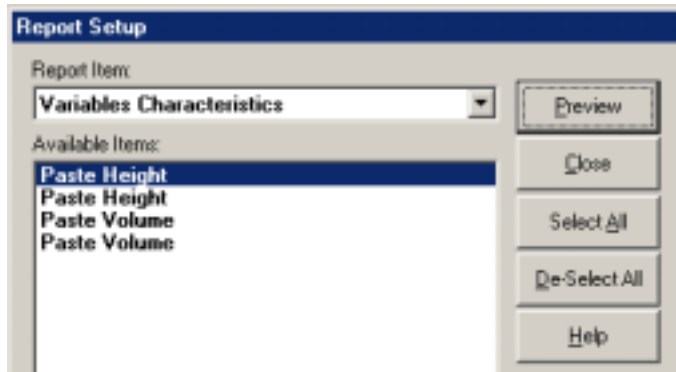
To create a report

1. Select Reports… from the File menu to call the Report Setup window.

2. From the Report Item field, choose the type of report that you wish to create.

3. From the list of Available Items, highlight those that should be included in the report. A single item may be highlighted by clicking on it. Multiple contiguous items may be selected by dragging with the mouse or by clicking with the SHIFT key depressed. Multiple items that are not contiguous may be selected by clicking with the CTRL key depressed. In addition, the Select All and De-Select All buttons may be used to select all or none of the items.

4. If desired, click the Printer Options button to set options specific to your printer.

5. Select the Preview button to display the report, as it will be printed, or click the Close button to dismiss the Report Setup window without producing the report.

6. From the Print window, follow the instructions listed below.

To	Do this
* Reduce or enlarge the preview	* Resize the Print Window by dragging any of the corners, or by clicking the maximize button to fill the screen.
* Preview other pages in the report	* Use the horizontal scroll bar at the bottom of the Print window. Scrolling to the right display subsequent page, while scrolling to the left displays previous pages.
* Set printer-specific options	* Click the Setup button.
* Print the report as it is shown in the preview	* Click the Print button.
* Dismiss the Print window without printing the report	* Click the Cancel button,

6. USING THE LIST VIEWER

Nine different types of lists can be viewed, created and edited with the List Viewer. They are: Subgroup Tag Lists, Sample Tag Lists, Defect Tag Lists, Data Gage Lists, Disposition Tag Lists, Corrective Action Lists, Defect Lists, Warning Lists, and Program Lists. In addition, four other categories of items can be viewed with the List Viewer; they are: External Tag Names, Data Sources, Data Collection Procedures (DCPs), and DataPac Setups.

Displaying categories and lists

In order to display the items available for any particular category, expand the category by double-clicking on the icon next to the category name or highlight the category and press enter. If one or more items are available for that category, the item names will be displayed beneath the category name. Similarly, in order to display the items in a particular list, simply expand the list by double-clicking on the icon next to the list name or highlight the list name and then press enter.

Collapsing categories and lists
Any of the List Viewer categories and individual lists can be collapsed by again double-clicking on the associated icon or highlighting the name of the list or category to be closed and pressing return.

Narrowing the display to one type of list
If you wish to have only one type of category or list displayed on the List Viewer at a particular time, select the one to be viewed from the Show box on the List Viewer tool bar.

Creating and editing lists within the List Viewer
All lists except Warning Lists can be created and edited from within the List Viewer. (Warning lists can be viewed but not modified by the user). See the topics listed below for more information about handling lists and their items in the List Viewer.
- For most practical purposes, Data Sources and the instruments they contain can be handled just like lists and their items.
- External Tag Names, Control Equations, Data Collection Procedures and DataPac Setups can generally be handled as if the general category (e.g., Data Collection Procedures) is a single list and its children are items on that list.

Tip: In general, special care must be taken when modifying a list or item that may be used by more than one existing characteristic. If the modification would not be appropriate for all characteristics that use the list, it may be better to make a separate list instead of modifying the existing list. However, the name of any list in the List Viewer can be modified without in any way disrupting its connections with characteristics that reference it.

6.1 LIST ADMINISTRATION

There are several types of generic lists stored in the database. These include defect lists, corrective action lists, tag lists, and warning lists. Admin provides tools that facilitate the creation and maintenance of such lists (note however, that Warning Lists can only be viewed in the List Viewer; they can not be created, edited, or deleted). Once defined, lists are referenced (or pointed to) by characteristics. This allows several characteristics to share the same corrective action list, for example, making it more convenient in situations where many similar characteristics exist. Accordingly, care must be taken when modifying or deleting lists that may be used by existing characteristics.

6.2 SELECTING LIST VIEWER ITEMS

List Viewer items can be selected (highlighted) by clicking on them with the mouse or by using the arrow keys.

6.3 EDITING A LIST

To edit a list, either double-click on the list's name to display its setup window, or highlight the list and click on the Edit button to display the setup window for that list. Configuration information for the list may be viewed and edited using the Setup window.

Tip: While warning lists can be viewed in the List Viewer, they cannot be created or edited by the user.

Tip: Special care must be taken when modifying a list or item that may be used by more than one existing characteristic. If the modification would not be appropriate for all characteristics that use the list, make a separate list instead of modifying the existing list.

6.4 MOVING A LIST ITEM

A list item (such as a tag, a corrective action, or a data collection procedure) can be easily moved to another list of the same type by dragging it and dropping it under another parent list.
1. Click on the icon next to the list name until the cursor turns to a symbol.

2. Drag the mouse to the name of the list to which the item should be moved. The viewer tells which lists are possible parents for this item by changing the cursor to a symbol as you pass over the list names. You can only move a list item to other lists of the same type (for example, a subgroup tag item cannot be moved to a sample tag list).

6.5 COPYING A LIST ITEM

A list item (such as a tag, corrective action, data collection procedure) can be copied to another list of the same type by holding down CNTRL while dragging and dropping it under the parent list that should receive the copy.
1. Press and hold CTRL.

2. Click on the icon next to the list name until the cursor turns to a symbol.

3. Drag the mouse to the name of the list to which the item should be copied. The viewer tells which lists are possible parents for this item by changing the cursor to a symbol as you pass over the list names. You can only copy a list item to other lists of the same type (eg., a subgroup tag item cannot be copied to a sample tag list).

Tip: An item can be copied to its own list, thus making a second copy of the item under the same parent as the original item. This has the same effect as cloning an item.

6.6 CLONING A LIST OR LIST ITEM

Cloning a list or a list item has the effect of making a copy of that list or list item under the same parent as the original. To clone a list or list item, highlight the item and then click the Clone Button or select Clone from the shortcut menu.

Tip: When a list is cloned, any items that may be part of that list are included in the cloned copy.

6.7 UPDATING THE LIST VIEWER

There are times when it may be necessary or helpful to update the List Viewer to reflect changes in the system. For example, if the database in use is changed in preferences while the List Viewer is open, the List Viewer will need to be rebuilt in order for it to display lists from the now current database. Simply click on the Rebuild Viewer button or select Refresh from the shortcut menu.

In addition, the Rebuild Viewer button or the Refresh Option from the shortcut menu can be used to collapse all open lists and list categories at once so that only category names (as selected in the Show Box) will be displayed.

6.8 DELETING A LIST OR LIST ITEM

To delete a list or list item, highlight the list or item and either click the Delete button or select Delete from the shortcut menu.

Warning: If a list is deleted, any items contained on that list are also deleted. Special care must be taken when deleting a list or an item on a list that may be used by more than one existing characteristic.

6.9 TAGS AND TAG LISTS

Through the use of data tags, Vantage allows individual subgroups or samples of data to be associated with supplemental information. This information can assist in post-collection identification, tracking, and interpretation of the data. Supplemental information can be associated with subgroups of data (e.g., the shift during which the parts were produced) or with individual data samples (e.g., the serial number of the part measured). Vantage supports four types of data tags: Subgroup tags, Sample tags, Disposition tags, and Defect tags.

Subgroup tags can be associated with subgroups of either variables or attributes data. Two types of subgroup tags are available: Manual and External. Manual tag values are entered or accepted by the operator during data collection.

External tags are subgroup tags whose values can be automatically generated by an external program that runs along with a data collection procedure.

Sample tags can also be associated with either variables or attributes data. As the name implies, sample tags are associated with individual data samples. Sample tags can be used with attributes data collected in sample or express mode. (However, Sample tags cannot be used with attributes data that is collected in batch mode, because in batch mode, no information is saved regarding individual samples.)

Disposition tags are special tags that can be associated only with variables data samples. Disposition tags indicate the disposition (e.g., the acceptance or rejection) of the part (or piece) to which a sample belongs.

Defect tags can be attached to individual defects collected for attributes data. In painting processes, for example, defect tags (e.g., indicating the location of the defect), could be associated with SPC data on specific painting defects (such as scratches or runs). Defect tags are used only for attributes data (any mode of collection). When attributes data is collected in batch mode, each defect record may stand for several occurrences of the same type of defect in the subgroup; therefore, defect tags in batch subgroups pertain to all occurrences of the same type of defect in the subgroup.

6.9.1 Using Data Tags

In order to use any of the data tag types, it is necessary to specify in advance what information is required, and when it should be requested. This is done in the Admin application by creating appropriate tag lists and referencing them as necessary in each characteristic record. Only users with administrative privileges may do this. Each time data collection begins for a characteristic, the Acquire application checks to see which tag lists (if any) are associated with the characteristic. Separate lists are maintained for subgroup, sample, disposition, and defect tags. Thus, variables characteristics may reference three tag lists (one for subgroup tags, one for sample tags, and one for disposition). If a list of subgroup tags is referenced by the characteristic, each required tags in the list must be entered before a subgroup may be completed. Similarly, if a list of sample tags is referenced by the characteristic, each required tag in the list must be entered before moving on to the next sample. Disposition tags are requested after enough samples have been collected to comprise a part. The number of samples that comprise a part is entered on the Control Chart tab of the Characteristic Setup window.

All four types of tag lists are created and maintained from within the List Viewer. The sections listed below detail the steps required for creating and maintaining tag lists.

Tip: Special care must be taken when modifying a tag list that may be used by more than one existing characteristic. If the modification would not be appropriate for all characteristics that use the list, make a separate list instead of modifying the existing list.

6.9.2 Creating a Tag List

To create a new tag list, first open the tag list setup window. There are two ways to do this, listed below.

A tag list setup window can always be opened by selecting the type of tag list desired from the List Viewer and then clicking on the Add Child button.

-or-

When one or more tag lists of the desired type already exist, the New button can be used to open the tag list setup window. Simply select one instance of the desired tag list type (e.g., to create a new subgroup tag list, select an existing subgroup tag list) and then click on the new button or select New from the shortcut menu.

Using the tag list setup window
1. Enter a name for the new tag list in the Name field.

2. Optionally, enter comments that apply to the tag list in the Comments field.

3. For subgroup and sample tag lists, use the option buttons to specify whether the tags in the list will be requested before or after collection of each subgroup or sample. Defect tags and disposition tags are always requested after collection.

4. For subgroup tag lists, the window will contain a frame labeled: External Tag Information. If you do not want this subgroup tag list to contain any external subgroup tags, simply leave the External Tag List box unchecked and go on to step 5.

To allow this subgroup tag list to contain one or more External subgroup tags:
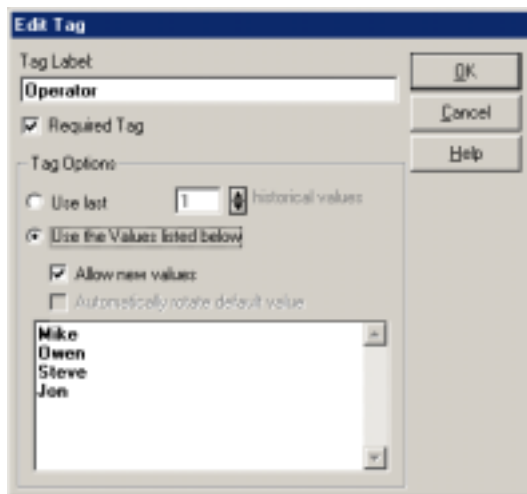- Check the External Tag List box.
- In the Executable File field, enter the *name* of the executable file that will be run during data collection to gather external tag data. This name may be a maximum of eight characters followed by a three-character extension. Do not enter a file path in this field. In the User Prompt field, enter the prompt to be displayed to a data collection operator when it is time to enter the value for the key external data tag. The prompt may be up to 50 characters in length.

5. When all the tag list information has been entered, click OK to save this new tag list. Click cancel to close the tag list setup window without creating a new list (or without saving any changes made to an existing list).

6.9.3 Adding a Tag to a List

To add a tag to a list, first open a blank Edit Tag window. There are two ways to do this, listed below. A blank Edit Tag window can always be opened by highlighting the name of the list to which the tag should be added and then clicking on the Add Child button.

-or-

When a tag list already has at least one tag, the New button can be used to open a blank Edit Tag window for that list. Simply select a tag already on that list and then click on the new button or select New from the shortcut menu.

Using the Edit Tag window
Note: The Edit Tag window appears quite similar for most tags. The one exception is when this window is opened for a subgroup tag list that allows external subgroup tags. In this case, an extra frame (External Tag Options) appears in the bottom part of the window.

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1. Enter a name for the new tag in the Name field. The tag name should provide enough information that the data collection operator can easily understand what is being requested (e.g., "serial number", "shift", or "customer").

Note: If the tag being created is an External subgroup tag, do not manually enter the tag name into the name field. The external tag name must be selected later from the External Tag Options frame.

2. If you want to require the operator to enter a value for the tag, check the Required box. If the tag is not always necessary or valid, do not check the Required box.

3. For subgroup tags, sample tags, or defect tags, select one of the two options in the Tag Options frame. (Disposition tags always use a Value List.)

6.9.4 Changing a Tag List Name or Definition

First open the tag list setup window for that list. There are two ways to do this. Either double-click on the list name or highlight the list name and click on the Edit button to display the tag list setup window. The tag list setup window will display the current information for that tag list. Simply make any needed changes right in this window.

6.9.5 Deleting a Tag List

Users with the required privilege may delete tag lists from the List Viewer. To delete a tag list, highlight the tag list name and either click the Delete button or select Delete from the shortcut menu.

Warning: If a list is deleted, any tags that are contained on that list are also deleted. When deleting a tag list, remember that more than one characteristic can reference the same list. Removing the list will affect all characteristics that may have used this tag list.

6.9.6 Deleting a Tag from a List

Users with the required privilege may delete tags from existing tag lists. To delete a tag from a list, highlight the tag and either click the Delete button or select Delete from the shortcut menu.

Tip: When deleting a tag from a list, remember that more than one characteristic can reference the same tag list. Removing the tag from the list will prevent all characteristics that use the list from using this tag.
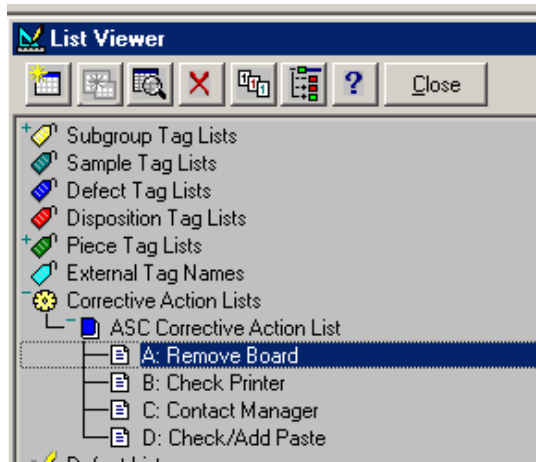
6.10 CORRECTIVE ACTION LIST

Manufacturing involves many complex processes that must be continually regulated and adjusted in order to ensure that production is as efficient and accurate as possible. All types of quality improvement methods   require some form of process manipulation to cope with problems or to aid in continuous improvement efforts. Vantage software refers to this type of manipulation as corrective action. When a corrective action is made the action should be documented so that it may be correlated with trends in subsequent data.

Applications in Vantage have the ability to store corrective action information with each subgroup of data. In Acquire and Stats, the operator is automatically invited to enter information regarding a corrective action whenever a warning is generated for a subgroup. In addition, the operator can attach corrective action information to any subgroup, even when no warning has been generated, by selecting the appropriate menu item from the data collection screen. In either case, it is left to the operator to make the corrective action record clear enough to be understood by another person at a later date. The reporting of corrective actions can be made easier and more consistent by making use of Corrective Action Lists that present operators with codes for one or more valid corrective actions for a particular characteristic. The lists are used to group together corrective actions that are valid for a particular type of manufacturing process. Therefore, a single Corrective Action List might be used by several different characteristics that are created by similar processes.

Each individual corrective action on a Corrective Action List has a code, a description, and an assigned weight. Administrative users can create, modify, and delete corrective action lists from within the List Viewer.

Corrective actions can be created and edited within the List Viewer. A sample program list is shown below.

6.10.1 Adding or Editing a Corrective Action List

To edit or add to the Corrective Action List:
1. Click on the Corrective Action List and click the New Corrective Action List button at the top of the window. The Corrective Action List window will appear, as shown below.
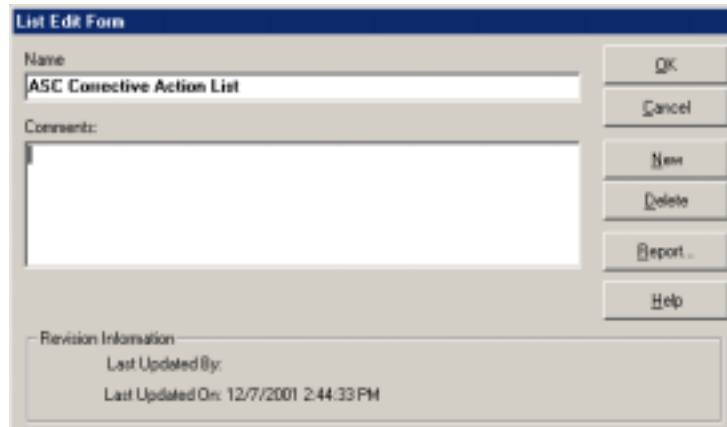
2. An administrator can enter or edit a name for the Corrective Action List in the Name field. (Optionally, comments that apply to this list can be entered in the Comments field.)

3. When the Corrective Action List information has been entered, select OK to save the list. Select Cancel to close the setup window without creating a new list or without saving any changes made to an existing list.

The Edit Corrective Action window can be used to create a new Corrective Action or edit an already existing Corrective Action. When this window is opened with the New button or the Add Child button, information for a new Corrective Action can be entered. When an existing Corrective Action is being edited, the current name for that Corrective Action is displayed in the window and any needed changes can be made right in the window.

6.10.2 Adding or Editing a Corrective Action

To add a corrective action to a list, open the New Corrective Action setup window. There are two ways to do this.

A New Corrective Action setup window can always be opened in the List Viewer by highlighting the name of the corrective action list which the item should be added to and then clicking the Add Child button.

-or-

When a corrective action list already has at least one corrective action, the New button can be used to open a New Corrective Action setup window for that list. Simply select a corrective action already on that list and then click on the new button or select New from the shortcut menu.

Using the corrective action setup window
1. Enter a corrective action code in the Code field. Corrective action codes may be any combination of six or fewer alphanumeric characters, but should (for clarity) be unique within a given list. In general, corrective action codes are abbreviations for corrective action descriptions, and should be understood by those working closely with the manufacturing process.

2. In the Description field, enter a textual identifier for the corrective action. For example, "changed bit", "re-calibrated machine", and "increased oil flow" are typical descriptions for adjustments in milling operations. Corrective action descriptions should generally contain enough information such that a person with limited knowledge of the manufacturing process may understand them.

3. In the Weight field, enter a value that describes the relative cost or weight of the corrective action. This value is used when producing weighted corrective action Pareto charts.

4. When the information for the new corrective action has been entered, click OK to save it. Click cancel to close the New Corrective Action setup window without creating a new corrective action (or without saving any changes made to an existing corrective action).

6.10.3 Deleting a Corrective Action

To delete a corrective action list, highlight the list name and either click the Delete button or select Delete from the shortcut menu.

Warning: If a list is deleted, any items, which are contained on that list, are also deleted. When deleting a corrective action list, remember that more than one characteristic can reference the same list. Removing the list will affect all characteristics that may have used this list.

6.12 DATA SOURCE

A data source (data source record) is used to define how to obtain measurements for variables data. Data sources can contain one or more instruments; each instrument represents a particular way of obtaining a specific data value (measurement).

By creating a data source record, the administrative user may define which, where, and how instruments are interfaced to the data collection workstation. Each variables characteristic points to a pre-established data source that defines how measurements will be acquired during data collection.

Administrative users can create, modify, and delete data sources and instruments from within the List Viewer.

Tip: When setting up a data source, it is helpful to keep in mind that all of the characteristics included in any particular DCP must make use of the same data source. For example, a single DCP should not contain some characteristics that use one data source and some that use another.

Warning: If a data source is deleted, any instruments that are contained in that data source are also deleted. In addition, characteristics may be left unusable by deleting data sources which they make reference to. Special care must be taken when modifying a data source that may be used by more than one existing characteristic.

6.12.1.1 Creating a Data Source

To create a new data source, first open the Data Source setup window. There are two ways to do this.

A data source setup window can always be opened by selecting Data Sources from the List Viewer and then clicking on the Add Child button.

-or-

When one or more data sources already exist, the New button can be used to open the data source setup window. Simply select any data source and then click on the new button or select New from the shortcut menu.

Using the Data Source setup window
1. Enter a name for the new data source in the Name field.

2. If desired, enter comments that apply to this data source record in the Comments field.

3. When all the data source information has been entered click OK to save the data source. Click cancel to close the Data Source setup window without creating a new data source (or without saving any changes made to an existing data source).

6.12.1.2 Editing a Data Source Name or Comment

First open the Data Source setup window for that data source. There are two ways to do this. Either double-click on the data source name or highlight the data source name and click on the Edit button.

Using the Data Source setup window
The Data Source setup window will display the current information for that data source. Simply make any needed changes right in this window.

6.12.2 Deleting a Data Source

To delete a data source, highlight the data source name and either click the Delete button or select Delete from the shortcut menu. The system will prompt for confirmation before performing the deletion.

Warning: If a data source is deleted, any instruments that are contained in that data source are also deleted. In addition, characteristics may be left unusable by deleting a data source which they make reference to.

6.12.3 Editing an Instrument in a Data Source
First, open the Instrument Setup window for that data source. There are two ways to do this. Either double-click on the instrument name, or highlight the instrument name and click on the Edit button.

Using the Instrument Setup window
The Instrument Setup window will display the current definition for the instrument. Simply make any needed changes right in this window.

To add an instrument to a data source, first open the Instrument Setup window. There are two ways to do this.

The Instrument Setup window can always be opened by highlighting the name of the data source to which the instrument should be added and then clicking on the Add Child button.

-or-

When a data source already has at least one instrument, the New button can be used to open the Instrument Setup window. Simply select an instrument already in that data source and then click on the new button or select New from the shortcut menu.

Using the Instrument Setup window
1. In the Name field, enter a textual label for the instrument. The name is used to refer to the instrument in mathline expressions.

2. Select the ASCII File Import option.

- **ASCII File Import Options** - Instruments may also be configured to obtain values from ASCII text files. Such text files should consist of a single number per line. The only option required of such instruments is the path and name of the text file. In the mathline, be sure to issue a FOOTSWITCH command after every call to an ASCII file instrument.

3. When all the instrument information has been entered, click OK to save the instrument. Click cancel to close the Instrument Setup window without creating a new instrument (or without saving any changes made to an existing instrument).

Tip: When adding instruments to data sources, it is helpful to keep in mind that all of the characteristics included in any particular Data Collection Procedure or job must make use of the same data source. For example, a single DCP should not contain some characteristics that use one data source and some that use another.

6.12.4 Deleting an Instrument from a Data Source

To delete an instrument from a data source, highlight the instrument and either click the Delete button or select Delete from the shortcut menu. The system will prompt for confirmation before deleting the instrument from the data source.

6.13 WARNING LISTS

Warning lists cannot be created or edited by the user. They can, however, be viewed in the List Viewer.

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7. USERS ACCOUNTS

The configuration of user accounts takes place from the User Manager window. View this window by selecting User Accounts... from the User menu. The User Manager window displays information about existing users in the database. From this window, new users may be added, and existing users may be edited or removed. The User Manager window contains two tabs: one for Users and one for Groups.

Note: We will only be dealing with User Accounts, NOT Groups.
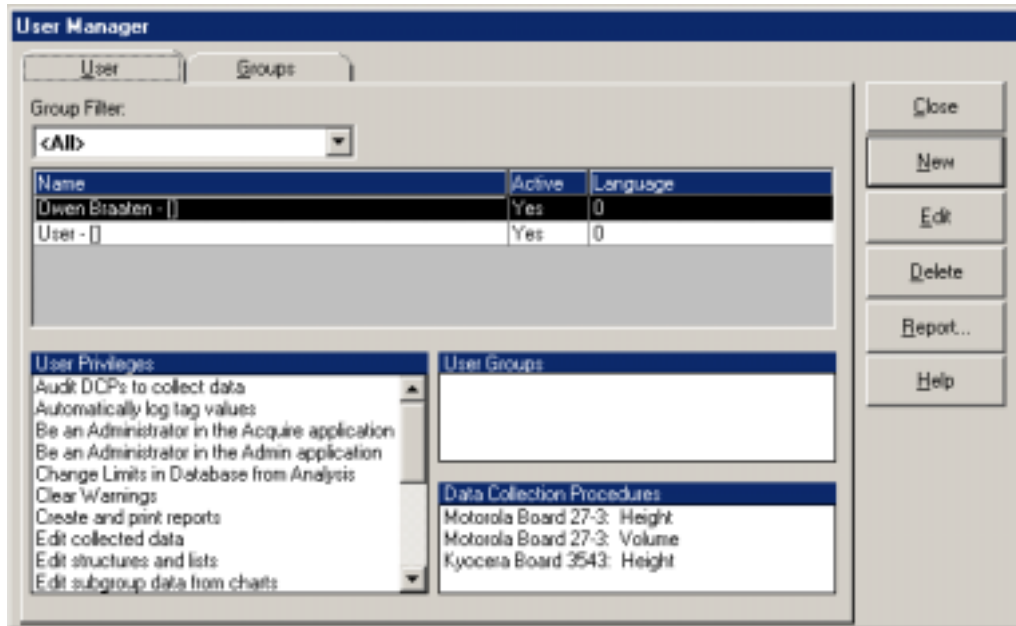
The three boxes below the grid (labeled Privileges, User Groups, and DCPs) display additional information about the user that is highlighted in the grid.

Most Vantage installations employ more than one individual who will use the software. For this reason, the database has the capacity to store information about each user, including login name, actual name, password, language, privileges and assigned DCPs. Together, these pieces of information constitute a user account. Likewise, in order to have access to a specific DCP, access must be granted to the user's account.

The user management facilities included in Admin may be utilized in a number of ways, depending on the general manufacturing environment in which the system is installed. If there are a small number of users, and traceability is not an issue, a single user account with full privileges may be sufficient. Larger installations with more users may require a separate account for each person. This configuration allows privileges to be granted based on a user's responsibilities.

7.1 CREATE AT LEAST ONE ADMINISTRATIVE USER FIRST

When Admin is first installed, it is not necessary to log in with a user name and password. This is because no user accounts have been created yet. When even a single user is created, built-in security features are activated for the application. After the first user is created, in order to reenter the Admin application, it will be necessary to log in with one of the user accounts that have already been set up. After logging in, the only privileges that will be available are those that have been assigned to the current user. If none of the existing users have administrative privileges, then it will not be possible to log in as an administrator, and it will not be possible to access administrative privileges (including the ability to create new users or add new privileges to existing user accounts). To avoid this problem, simply make sure to assign all privileges for the Admin application to the first user account that is created.

7.2 ADDING A USER ACCOUNT

To add a new user account to the database, select User Accounts from the User menu. This opens the User Manager window. Select the Users tab and follow the instructions below.
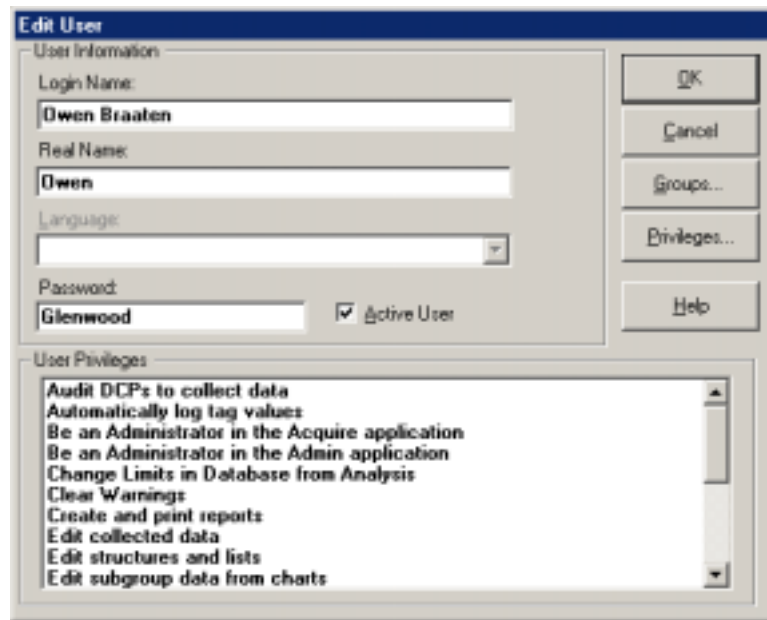
Warning: Remember, it is very important that at least one user has administrative privileges in the Admin application. If there is not already an administrative user for the Admin application, create one first (before creating any users with more limited privileges).

1. Select the New button. This calls the New User window. The Edit User window, shown above, is similar and filled in the same way.

2. Enter a user name for the user in the Login Name field. This is the name that the user will enter or select from a list when logging in to Admin. It should be short and easy to remember.

3. Enter the full name of the user in the Actual Name field.

4. The Language box is not currently available. Leave this field blank. A default language option for Admin is available in Preferences under the File menu.

5. In the Password field, enter the password that the user will enter when logging in to gain access to Admin.

6. Activate the user account by selecting the Active check-box. Inactive user accounts still exist in the database, but may not be used to gain access to Admin.

7. To define privileges for the user account, select the Set Privileges... button.

8. Dismiss the New User window by selecting the OK button. The information for the new user account is then automatically inserted into the grid on the User tab of the User Manager window.

7.3 ASSIGNING PRIVILEGES TO A USER

Warning: Remember, it is very important that at least one user has administrative privileges in the Admin application. If there is not already an administrative user for the Admin application, create one. To ensure integrity of information in the databases and prevent unauthorized access to that information, Admin provides multiple levels of security. Only authorized users may access specific privileges. Only users with administrative privileges may edit setups in the database.
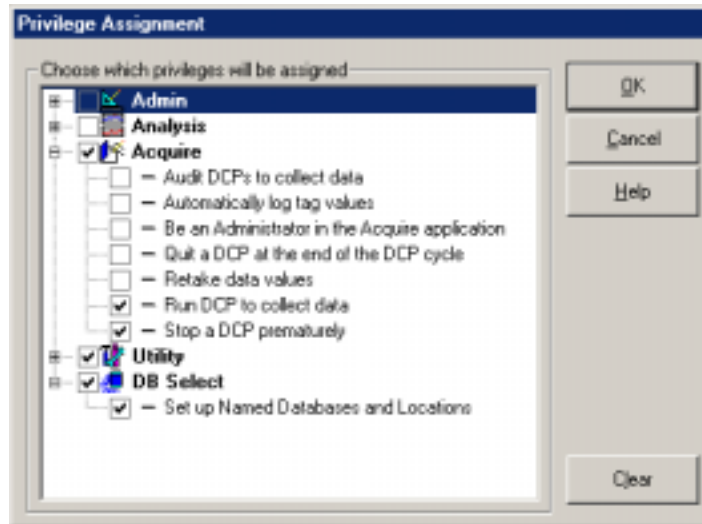
Specific privileges are granted to individual users, using the window shown above.

At least two levels of user privileges are available. Granting any privilege for a given application grants the user or group access to the application. However, the type of privileges granted determines what a user has access to in the application.

To Assign Privileges to a User
1. Select the Set Privileges… button of the New/Edit User window to call the Privilege Assignment window.

2. To add privileges to the record, select a privilege from the list of Available Privileges and select the Add button. Privileges are viewed by selecting the next to the application name.

3. To remove privileges from the list of those assigned to the DCP, select the privilege from the Selected Users pane and select the Remove button. The Clear button is used to quickly remove all privileges from the list of those assigned to the record.

4. Press OK to save the privilege list (or Cancel if you do not wish to save changes).

7.4 PRIVILEGES

As stated earlier, Admin is a software tool used in conjunction with many software packages. Privileges required for each of these packages are available in Admin.

7.4.1 Admin Privileges

These privileges each grant different levels of access to items in Admin only.

Be an Administrator in Admin
This privilege grants full access to the Admin application to:
- view and edit any setups
- view and edit user accounts and user groups
- set Preferences

This privilege takes the place of all the remaining privileges found in the Admin list.

Warning: When creating or modifying user accounts, it is very important to always have at least one user who is an Administrator in the Admin application.

Clear Warnings - This privilege allows the user to clear warnings in the System Viewer.

Clone Structures and Lists - This privilege allows the users to clone sections of the product tree in the System Viewer or lists from the List Viewer.

Create and print reports - This privilege allows the user to create and print all reports.

Edit collected data -This privilege allows the user to edit subgroup data in the database.

Edit Parameter Fields and Spec. Limits - This privilege allows the user to edit parameter fields at the product and characteristic level. It also allows the user to edit specification limits.

Edit structures and lists - This privilege grants access to Admin and allows the user to create, edit or delete setups of the product tree, lists and data collection procedures. **Note**: When an element is removed from the product tree, its children (any levels of the product tree below that element) are also deleted.

Edit users and groups - This privilege grants access to Admin and allows the user to create and edit user accounts and user groups. **Note:** This privilege allows the user to view and edit all users' passwords.

View collected data - This privilege allows the user to view (but not edit) subgroup data in the database.

View structures and lists - This privilege grants access to Admin and allows the user to view (but not edit) setups of the product tree, lists and data collection procedures.

7.4.2 Analysis Privileges

Change Limits in Database from Analysis - This privilege allows the user to change limits in the database.

Edit subgroup data from charts - This privilege allows the user to open charts and edit subgroup data from those charts.

Use Analysis - This privilege grants access to Analysis and allows the user to create or open charts and workspaces, view subgroup data from a chart, and set preferences.

7.4.3 Acquire
.
Audit DCPs to collect data - This privilege allows the user to audit DCPs and collect data. When a user audits a DCP, he or she need not follow a specific collection script. Instead, the user chooses the order in which characteristics in the DCP are collected.

Automatically log tag values - Allows Acquire to automatically enter sample tags or subgroup tags under certain conditions where these values remain the same for more than one consecutive sample value.

Be an Administrator in Acquire - This privilege grants full access to all features in Acquire.

Quit a DCP at the end of the DCP cycle - This privilege allows the user to quite a DCP at the end of the DCP cycle. If a user who does not have this privilege runs a DCP, an administrative user must give permission to allow the user to stop collecting data for the DCP.

Retake data values in Acquire - This privilege allows the user to retake (re-enter) the most recent data value collected during the data collection procedure. The originally value will be replaced with the new value.

Run DCPs to collect data - This privilege allows the user to run DCPs. The user may only run DCPs to which he or she has been assigned. When the DCP is run, the program requires that the data be collected in a particular sequence.

Stop a DCP prematurely - This privilege allows the user to stop collecting data before the DCP sequence or subgroup has completed. **Note**: If a DCP is stopped before a subgroup is completed, data from incomplete subgroups will be lost.

7.4.4 Utility Privileges

Use the Utility program
This privilege grants access to the Utility program.

7.4.5 DB Select Privileges

Set up Named Databases and Locations

This privilege grants access to DB Select and allows the user to setup a named database and location.

7.5 DELETING USER ACCOUNTS

Delete a user account from the database by selecting a row in the Users tab and selecting the Delete button.

Warning: When making modifications to user accounts, remember that it is very important that at least one user have administrative privileges in the Admin application.

8. DATA COLLECTION PROCEDURES

A Data Collection Procedure (DCP) defines what data will be collected, who will collect it, and how it will be collected. The primary component of a data collection procedure or "job" record is an ordered list of characteristics. When an operator runs a DCP with the Acquire application, data is requested for each of the characteristics listed in the DCP. A list of valid users assigned to a DCP grants access to the DCP. Operator instructions (like those for characteristic records) may also be assigned to the beginning and end of a DCP. When used effectively, the features listed above give administrators flexibility to configure a simple, efficient sequence for shop-floor operators to follow.

DCP records may be designed to suit any manufacturing environment. In a production environment where the same tasks are repeated, a DCP record might be created for each workstation where data is collected. In this case, the DCP represents the task(s) performed at a workstation. However, in environments where production schemes change more often, a DCP record might be created for each purchase order.

There are two different ways of executing a DCP in the Acquire application: running a DCP and auditing a DCP. When an operator runs a DCP, the order of data collection is as specified in the DCP record. If an operator or supervisor audits a DCP, the DCP record simply provides a list of characteristics for collection. The order specified by the DCP record is ignored since the person collecting data specifies which characteristics in the list are collected.

Administrative users can create and modify DCPs by using the Data Collection Procedure Setup window. To create a new DCP, a blank Data Collection Procedure Setup window should be opened. This can be done by selecting Data Collection Procedures in the List Viewer and then clicking on the Add Child button, or by selecting any existing data collection procedure and then clicking on the New button. To edit an existing data collection procedure, select the procedure to be edited and then click on the Edit button. This will open the Data Collection Procedure setup window with information on the selected DCP already displayed; any needed changes can be made right in this window.

To create or edit a DCP
1. Enter general information.

2. Define a collection script.

3. Design an interface or specify the instrument access table information.

4. Assign users to the DCP.

5. Click OK in the Data Collection Procedure Setup window to save a new DCP or changes made to an existing DCP. Click Cancel to close the Data Collection Procedure Setup window without saving a new DCP or any changes to an existing DCP.

8.1 ENTERING GENERAL INFORMATION

The fields on the General tab hold miscellaneous descriptive information for the data collection procedure.

1. Enter or edit a name for the DCP in the Name field. Since data collection operators identify the DCP by this name, make this name descriptive (e.g. a part number or a work order number).

2. If desired, a more detailed description of the DCP can be entered or edited in the Comments field.

3. The Prompt to continue DCP box is an optional field. After each subgroup of data is collected on a DCP, the Acquire application displays a prompt for the operator so they can indicate whether they will be continuing data collection at that time. If the Prompt to continue DCP box is left empty, after each DCP is completed, the Acquire application will display the default prompt specified in the Acquire application preferences. If a customized prompt for this DCP is desired instead, the prompt can be entered here. One caution should be kept in mind when entering a customized prompt. In order to reduce the risk of operator confusion or error, it is recommended that customized prompts always be worded such that a Yes response indicates a request to continue data collection.

4. Check the Active DCP (data collection procedure) box to activate the DCP. If the DCP is not activated, the DCP record exists but is unavailable to the Acquire application.

5. Select the Import Options drop-down box if this DCP will be used to import files using IFF or UFF file formats.

6. Check the Show Process Capability box that allows data collection operators to view either Sample Disposition Charts or Process Capability during data collection. Access the drop-down box to signify the type of information you would like to view. This display can be further defined (i.e., Cp/Cpk,Cm/Cmk,Pp/Ppk) within Preferences in the Acquire application.

7. The default Audit Preference is set so that a DCP can be either run or audited from within the Acquire application. However, the preference can be changed to limit a DCP to run only or audit DCP only.

8. If desired, enable and specify operator instructions. Operator instructions for DCPs are configured just like those for characteristics.

Activating a DCP makes that DCP available to the assigned users. In other words, when a DCP is active, any operator assigned to that DCP may execute it to collect data. It is possible to de-activate old DCPs so that the DCP list in the Acquire application remains short and simple. Note that de-activating a DCP setup does not delete it from the database.

8.2 THE DATA COLLECTION SCRIPT

The data collection script defines which characteristics are collected in what order as a DCP is run. Before defining a data collection script, consider how data will be sampled and measured for the characteristics in the script. If the DCP will always be "Auditing a DCP" during data collection, you need not worry about defining a specific collection order. If the DCP will be "Running a DCP" the order of collection of characteristics is defined by their order in the script. The collection sequence is further defined by the "grouping" of those characteristics. By grouping or ungrouping characteristics, you customize the DCP to suit different sampling and collection methods.

Grouped and Ungrouped Characteristics
When characteristics are ungrouped, a full subgroup of data is collected on each characteristic before collecting data for the next characteristic. For example, suppose a script contains two ungrouped characteristics, "length" and "diameter" each with a subgroup size of five. When the DCP runs, the operator is prompted to collect five "length" samples. Then the operator is prompted to collect five "diameter" samples.

If two or more characteristics are grouped, data is collected for each, until one sample has been collected for each characteristic in the group. Samples are collected in this manner until a subgroup is collected for each characteristic in the group. After one group is collected, the characteristics in the next group are collected. For example, suppose two characteristics of subgroup size five, "length" and "diameter", are grouped in a script. The operator is prompted to measure one "length" then one "diameter" sample. This sequence of one "length" and one "diameter" is repeated four more times to complete a subgroup for each characteristic.

There are certain cases when characteristics should not be grouped.
- Characteristics with different subgroup sizes should never be grouped.
- Attributes characteristics collected by sample or batch modes should never be grouped.

Making use of operations
While creating a data collection script, consider whether the desired characteristics are associated with multiple operations. If this is the case, the construction of the script will affect how the data is collected. Basically, the method by which characteristics are assigned to a script defines whether the user will select operations implicitly or explicitly. For characteristics that are assigned to a DCP from the process tree, the act of running the DCP implicitly specifies an operation. Building scripts in this manner requires a separate DCP to be created for each operation that the characteristic is attached to. On the other hand, when a characteristic is assigned to a DCP from the product tree, no specific operation is chosen until after the DCP is run. If the characteristic is linked to multiple operations, the data collection operator will be prompted to select one explicitly before collecting subgroup data. Accordingly, DCPs built in this manner may be used for several different operations, but involve an extra step during data collection.

Creating or Editing a Data Collection Script
The DCP collection script is configured using the Script tab of the Data Collection Procedure Setup window, as described below.
1. Click the Script tab.

2. Format the script as follows:

To Do this	**Do this**
• Design collection of characteristic(s) in a process-oriented manner	• Click the Process option in the middle left. Select a process or characteristic and click Add
• Design collection of characteristic(s) in a product-oriented manner	• Click the Product option in the middle left. Select a product or characteristic and click Add.
• Remove a characteristic from the list of select characteristics	• Highlight the characteristic in the script and click the Remove button.
• Remove all characteristics from the script	• Click the Clear Button.
• Change the order of characteristics in the script	• Highlight characteristic(s) and click Move Up or Move Down.
• Group Characteristics	• Double-click the characteristics (the test will turn blue) and click the Group button.
• Ungroup Characteristics	• Double-click the characteristics and click the Ungroup button.
• Use Data being collected simultaneously at other workstations for warning and control limit calculations	• Highlight the characteristic in the script and clear the Use Local Cache box.

8.3 DESIGNING THE COLLECTION INTERFACE

The settings on the Interface tab of the Data Collection Procedure Setup window affect the appearance and functionality of the data collection procedure. Administrators design the data collection window so that it displays only information that is useful to operators. The picture in the lower, right corner of the window previews the options you select. The settings are completely optional.

1. Click the Interface tab.

2. Highlight a characteristic in the DCP script, which appears in the upper left corner.

3. Select display options as described below. Note that some features are not optional for some modes of collection.

To Do this	Do This
• Display chart of measurements (variables) and defects (attributes) as they are entered.	• Check Live Data Indicator
• Display sample values plotted against specification lines (variables only)	• Check Sample/Disposition Chart
• Simultaneously display charts showing individual sample values, as well as subgroup X-Bar and sigma values	• Check X-Bar/Sigma Indicator
• Display characteristic information, control limit values, specification limits, DCP comments.	• Check DCP and Characteristic Info.
• Display all data collected for the current subgroup and allow that data to be edited.	• Check Data Edit/Review

4. Enable the display of up to two charts by checking Show Single/Chart1 and Show Chart2. To select a characteristic to be charted, click the button, and then select a characteristic from the viewer that appears. Select a Chart Type from the list. If the "default" chat type is chosen, the software will use the chart type defined for the specific operation or characteristic. If the Show maximized after SG option is selected, a full-size chart will be displayed after collecting each subgroup.

8.4 ASSIGNING USERS TO A DCP

In order for a DCP to be accessible from the Acquire application, it must have at least one user assigned to it. By assigning different users to different DCP's, the administrator may limit the number of DCPs listed in any one operator's DCP list.

To modify the list of users assigned to a DCP
1. Click the Users... button to call the DCP Assignment window.

2. Do the following. Note that users are listed on the Users tab.

To Do this	Do This
• Assign individual users to the DCP.	• Select a user from the list of Available Users and click Add.
• Remove user(s) from the list of Selected Users.	• Highlight the name(s) in the bottom grid of the Users tab and click Remove. Click Clear to remove all.

3. Press OK to save the user list (or Cancel to not save changes) and return to the DCP Setup window.

9. PREFERENCES

Preferences include defining the database the application points to, default values for variables characteristics, and defining the appearance of the application. Any user with administrative privileges in the Admin application may set preferences.

The Preferences window can be opened by selecting Preferences from the File menu. This window contains three tabs that can be used to specify general preferences for the application, default values for variables characteristic setups, and default values for attributes characteristic setups.

The Databases... button is used to open the Database Selector which can be used to change the current database (i.e., to change the database which Admin at this work station is pointing to).

9.1 GENERAL PREFERENCES
General preferences are selected from the General Tab of the Preferences window, shown below.
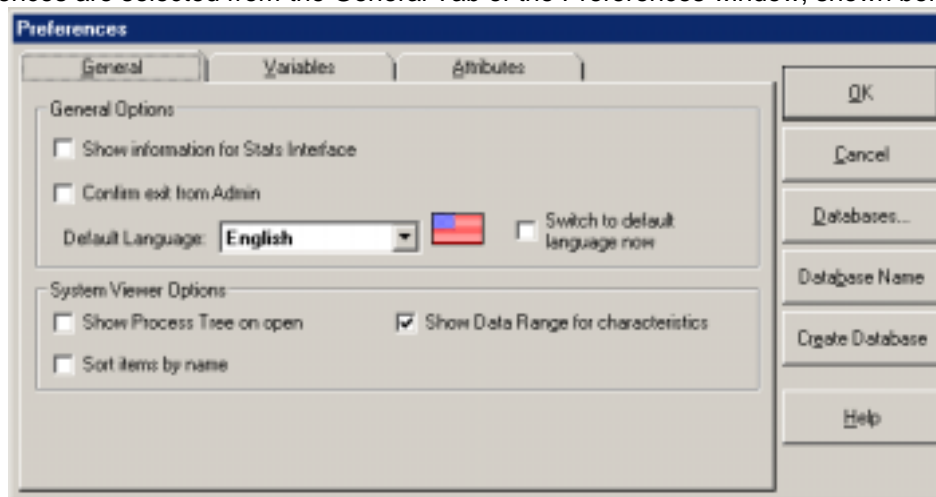
Show information for Stats Interface – Do not use

Confirm exit from Admin - If this check-box is selected, a message will appear on the screen when Exit is selected to confirm that the user wishes to exit Admin.

Default Language - Choose the desired language from this drop-down list field.

Show Process Tree on open – DO NOT CHECK

Sort items by name - This determines how the items in the System Viewer are sorted. If it is selected, they will be sorted alphabetically by. Otherwise, they will be sorted based on the order in which they were created.

Show Data Range for characteristics - If this check-box is selected, the System Viewer will display an additional line below each characteristic name. The additional line will list the most recent warning code, along with the chronological range of the data contained in the characteristic.

9.2 VARIABLES PREFERENCES
Default settings for variables characteristics are defined from the Variables Tab of the Preferences window, shown below.
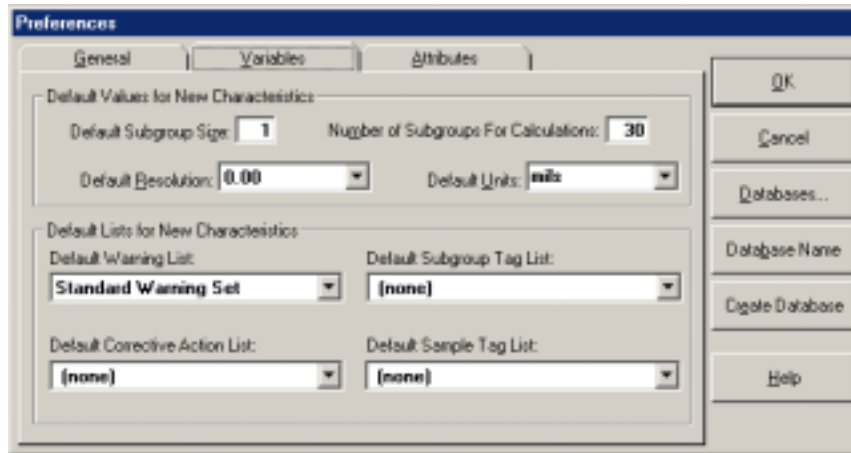
Default Values for New Characteristics - Upon creation, each new variables characteristic assumes the subgroup size, number of subgroups for warnings calculations, resolution, and units defined in these fields (This, of course, is not true for characteristics created by cloning). See Section 5 Variables Characteristic Setup Window for details about these values.

Default Lists for New Characteristics - A default warning list, corrective action list, subgroup tag list, and sample tag list may be assigned. These default lists will be assigned to each new variables characteristic.

Tip: Corrective action lists and tag lists must be created using the List Viewer before they can be assigned as a default list for new variables characteristics. Warning lists are not created by the user, but a default warning list may be chosen from those available.

9.3 SPECIFYING DATABASE LOCATION

To map to a database through the network on Criterion version 3.0.1, go to
<Start><Programs><Criterion><Project Manager>, and the following window will appear:
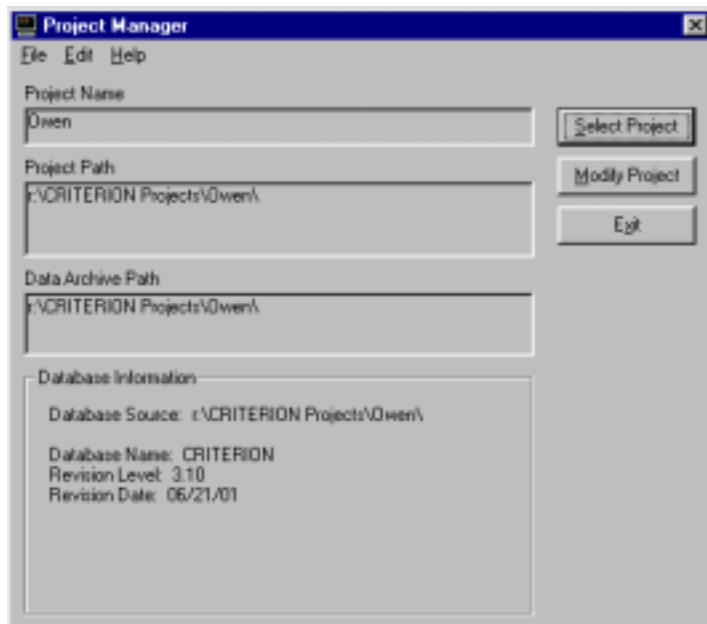
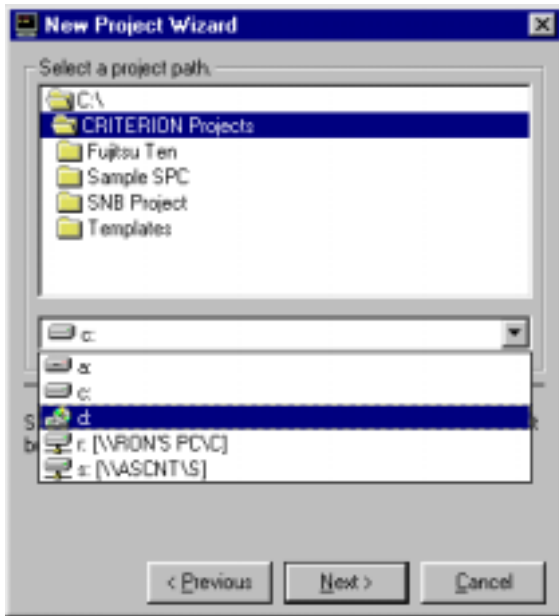Select <File><New Project>, and the following window will appear:
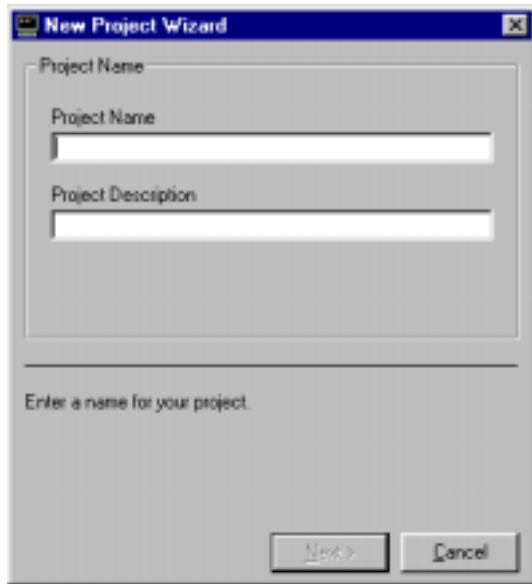
Next, enter a project name and description:
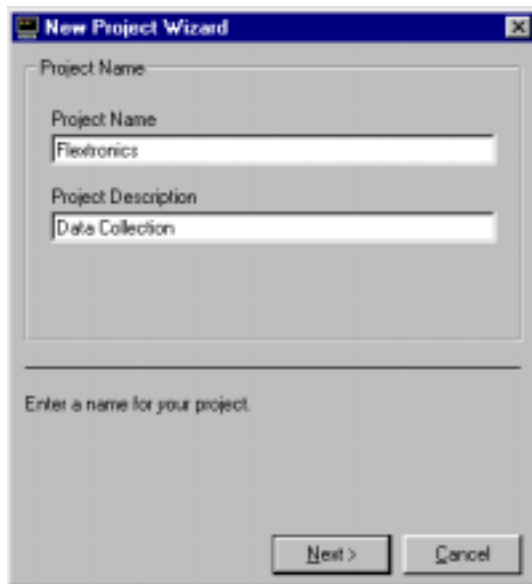
Click <Next>. Now, to map through a network, select the drive letter that you wish to use. (This drive will need to have been mapped through Windows Explorer prior to performing this operation. If you have not done this yet, please do so or contact your IT person to help you do so.)

After going to that drive, select the drive on which you wish to make your database.
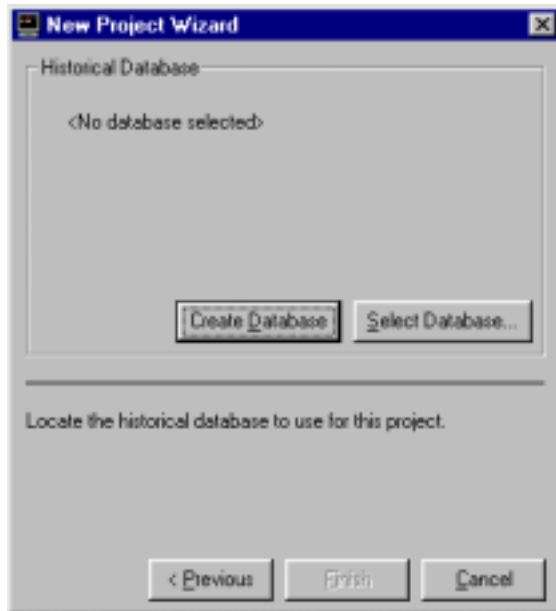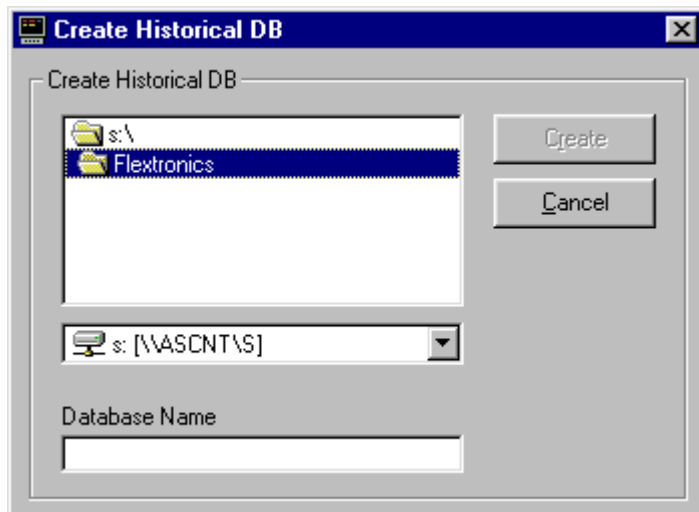
Click on <Next>, and the following window will appear:

Click <Next>, and the following window will appear:

Now you may make a new folder to put your database in, or leave it in the selected folder. Click <Next> when done, and the following window will appear:

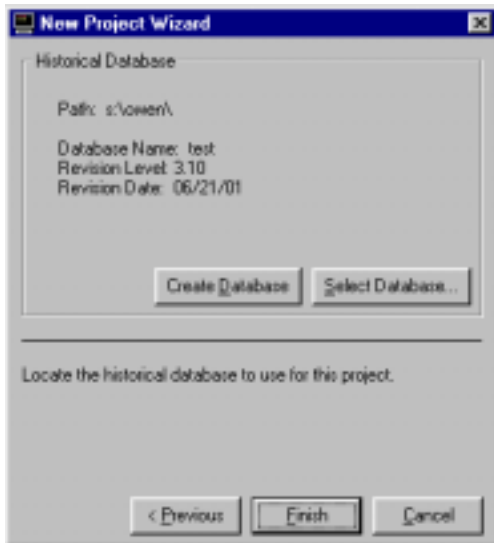Click on <Create Database> and the following window will appear:

Type in a database name, and then click on <Create>.
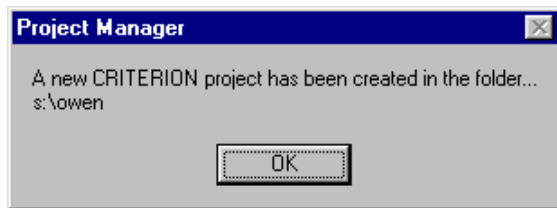
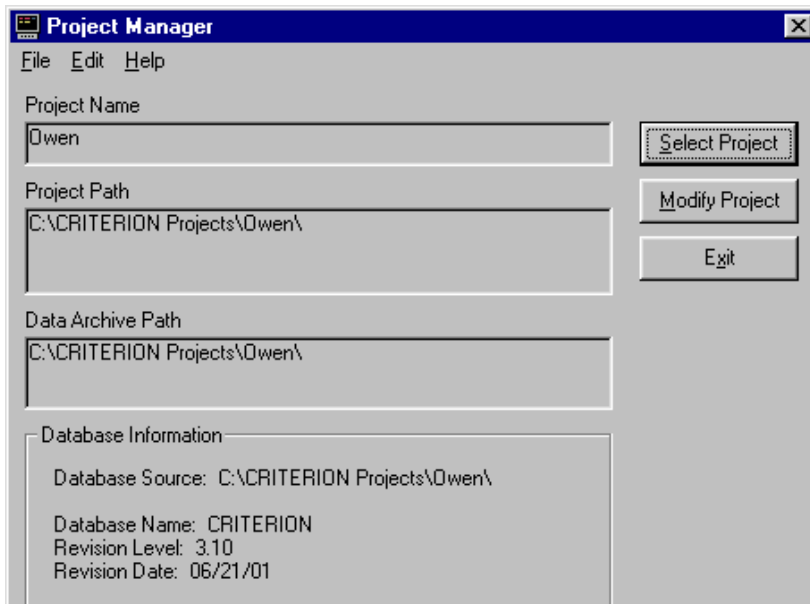This window will appear:
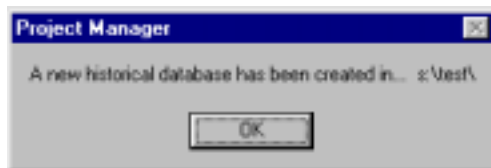
Click <OK>.

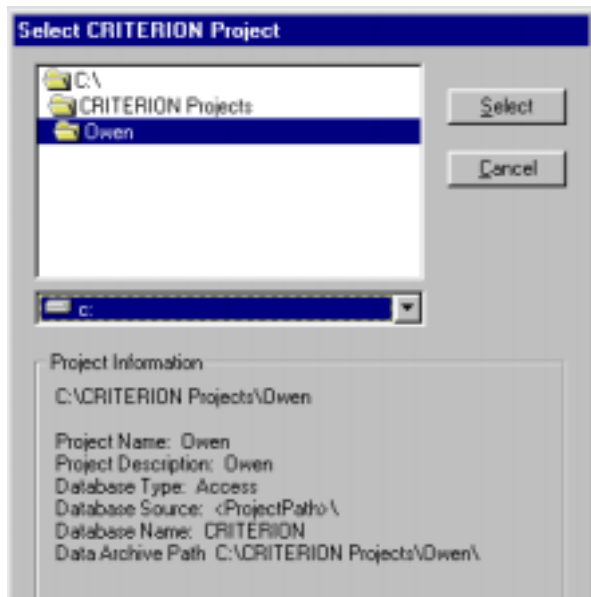The following window will appear, showing you where your historical database was created:
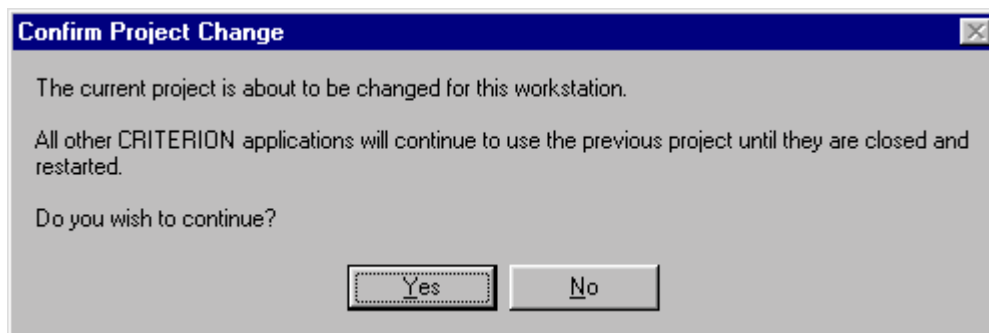
Click <Finish> and the following window will appear:

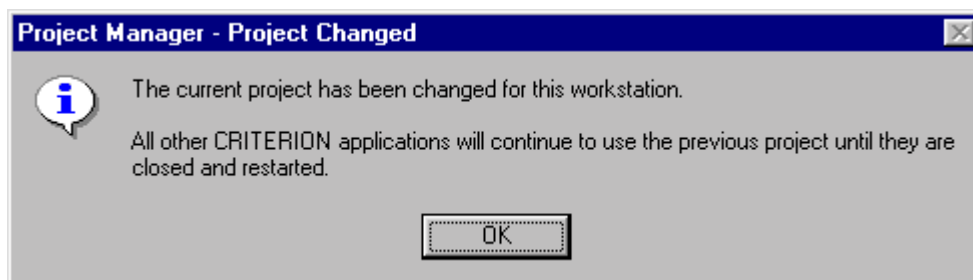Click <OK>, and you will return to the main window:

Now click on <Select Project> and this window will appear:

Select CRITERION Project

```
C:\
CRITERION Projects
Owen
```

```
c:
```

Project Information

C:\CRITERION Projects\Owen

Project Name: Owen
Project Description: Owen
Database Type: Access
Database Source: <ProjectPath>\
Database Name: CRITERION
Data Archive Path C:\CRITERION Projects\Owen\

Change your drive specification, and map the path to the folder you just created and then click on <Select>.
After doing that, this window will appear:

Confirm Project Change

The current project is about to be changed for this workstation.

All other CRITERION applications will continue to use the previous project until they are closed and restarted.

Do you wish to continue?

Yes   No

Click on <Yes>, and the following window will appear:

Project Manager - Project Changed

The current project has been changed for this workstation.

All other CRITERION applications will continue to use the previous project until they are closed and restarted.

OK

Select <OK>. You will return to the main window, and then select <Exit>.

Now when you start Criterion Administration, you will be mapped to the database you just selected on the network.

10. APPENDIX A - SELECTING A CONTROL CHART

10.1 SELECTING A VARIABLES CONTROL CHART

Note: This option is set on the Control Chart tab of the Variables Characteristics Setup window, which can be accessed by double-clicking on a characteristic in the product tree.

In many cases, data for a single characteristic is charted over time. When a single variables characteristic is charted, an X-Moving R, X R, or X S control chart is used to plot process mean and variation. General descriptions of these control charts follow; calculations for control charts are specified in Analysis on-line help.

Use the X-Moving R chart when a subgroup is a single data value (i.e., subgroup size = 1). When subgroup size is one, control limits are calculated using moving ranges. Moving ranges are simply the differences between two subgroup (sample) values.

WARNING: An X-Moving R chart should only be used to monitor processes for which the data are approximately normal. To test normality of data, chart the data using an Analysis histogram. The Analysis histogram will not only chart the data, but actually test normality using a chi-square "goodness of fit" test.

When subgroups include more than one sample, use an X-R or X-S chart. The X-R chart is intended for characteristics with small subgroup size. For an X-R chart, control limits are calculated using subgroup ranges (difference between the largest and smallest sample values in the subgroup). The X-S chart is intended for characteristics with larger subgroup size. Subgroup standard deviations are used to calculate control limits.

The table below gives further suggestions for selecting a control chart for analysis of a single characteristic.

For variables data from processes where

- production is slow so samples not logically in subgroups, data approximately normal

- samples taken from a "batch" (e.g. a chemical mixture), data approximately normal

- logically, 2 <= subgroup size <= 10

- logically, subgroup size > 10

Select this chart

- X - Moving R

- X - Moving R

- X and R

- X and S

11. APPENDIX B - WARNING CHECKS

As each sample of data is collected, the Acquire application checks for measurements that lie outside of the specification range. Similarly, as each subgroup of data is completed, the data is checked for unnatural trends that may indicate an out-of-control situation on the manufacturing process. Several different warning sets are available. Each characteristic record contains a field that specifies the warning set that should be used. If the field is set to "none", no warnings set is applied, and warnings are not checked. If the field refers to one of the warning sets listed below, then the associated warning set is used. It is also possible to specify (for each characteristic) a subset of warnings that will be ignored when they are evaluated. All such warning options may be set for each characteristic using the Characteristic Setup window in the Admin application.

Samples plotted on the run chart and subgroups plotted on the control chart indicate the presence of warnings by changing the color and/or shape of the plot point. The colors and shapes used to indicate warnings are set using the Preferences window.

Available warning sets in Vantage are:
- Custom Warning Set A (Variables)
- Ford Warning Set (Variables)
- GOT Warning Set (Variables)
- ISO Warning Set (Variables)
- NBS Warning Set (Variables)
- Q101 Warning Set (Variables)
- USDA Warning Set (Variables)
- Standard Warning Set (Variables)
- Ford Warning Set (Attributes)
- ISO Warning Set (Attributes)
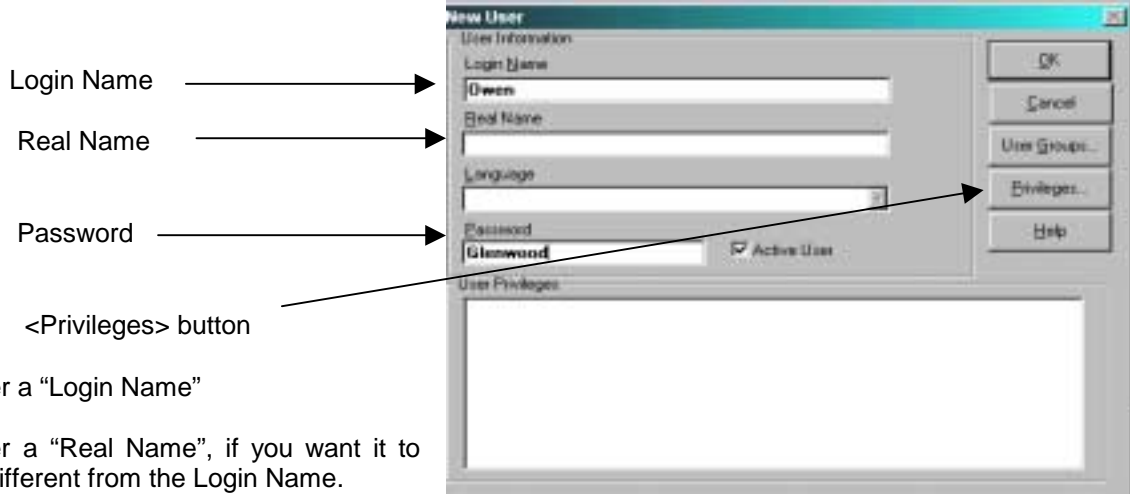- Standard Warning Set (Attributes).

12. QUICK START

1. Setting Up Users

A. Go to <Start><Programs><Criterion><Administration> to start the administration portion of Criterion SPC.

B. In Administration, click on <Users> in the file menu, then click on <User Accounts…>.

B. The following window will pop-up:
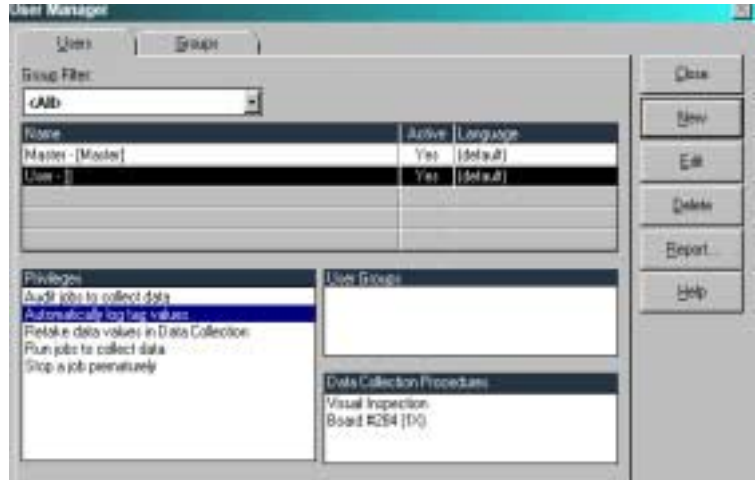
C. To add users, click on the <New> button on the right side, and the following window will pop-up:

Login Name ——————→

Real Name ——————→

Password ——————→

<Privileges> button

D. Enter a "Login Name"

E. Enter a "Real Name", if you want it to be different from the Login Name.

F. Enter a "Password" which is unique for that user. (Optional)

G. Next, click on the <Privileges> button, and the following window will pop-up:
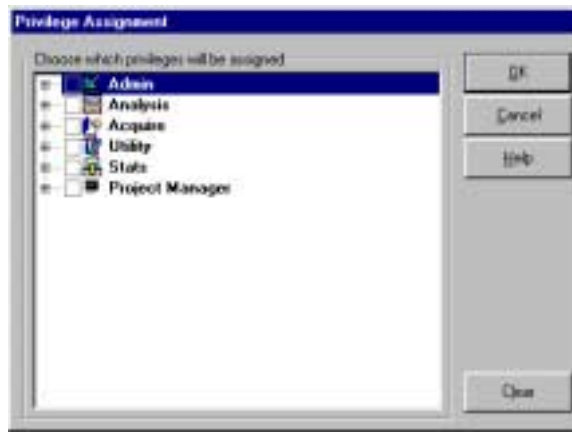
H. Click on the [+] sign to expand the list of privileges for each option. If you want to set up a person who will be an Administrator, check ALL the boxes by the options. A (√) sign will appear next to the category which has privileges selected.

Note: If you are setting up a user only to collect data, check only the following options:
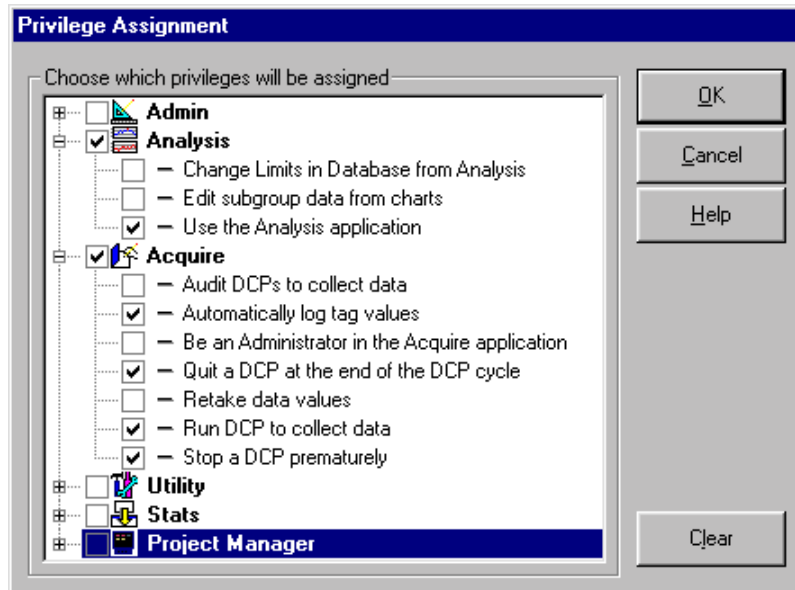
I. Click <OK>. Window will disappear.

J. Click <OK>. Window will disappear.

K. Click <New> to add another user, or click <Close> to complete this process.

L. Close Administration and re-enter, logging in as "Administrator". It is necessary to do this now, so your accounts will be set up in a later step.


2. Setting Up a Data Source

A. Open the List Viewer in Administration (under the <Setup> option in the file menu).

B. Click on "Data Source" in the List Viewer, it will now be highlighted in blue.

C. Click on the icon on the top of the list that says "New Data Source" when you hold your mouse over it. (It will be the second from the left.)

D. A window will pop up like this:

E. Enter a name for your data source. (e.g. VisionMaster or AP212)

F. Click on OK.

G. In the list viewer, there will now be a small (+) sign by "Data Source". Double click on this
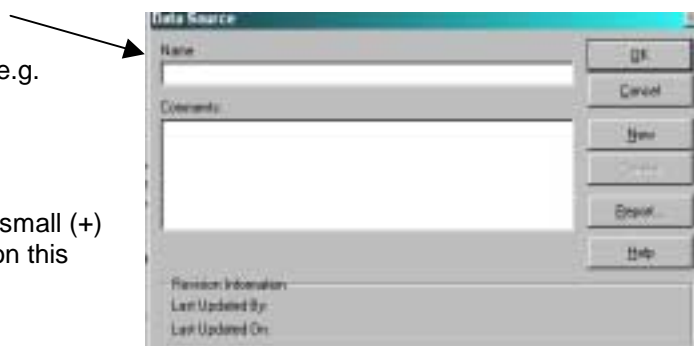
sign.   You will now see a list with your new
data source name.

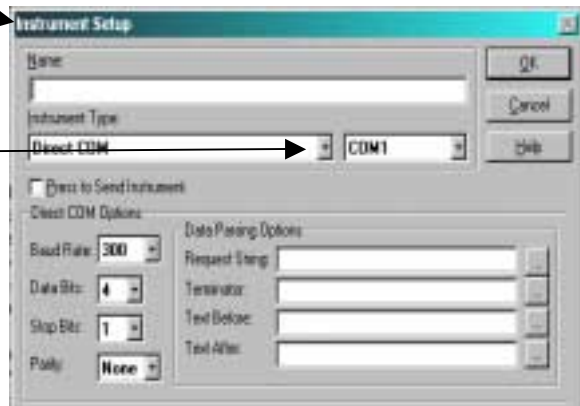H.   Click on the data source name, so it is highlighted in blue.

I.   Now, click on the icon on top that says "New Instrument" when you put your mouse over it.   (Second icon from the left)

J.   The "Instrument Setup" window will pop up:

K.   Enter the name again. (Same as in step E).

L.   Now click on the combo box, and select "ASCII File Import".

M.   The window will change to look like this:

Ellipse button

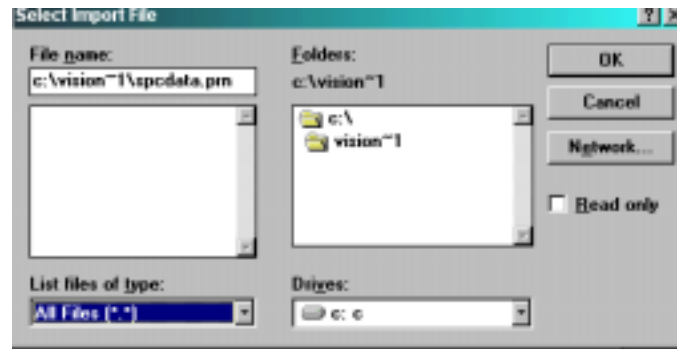N.   Now click on the "Ellipse" button and a new window called "Select File Import" will appear:

O.   Use this window to map a path to your data source.

Note: If you are using the SP2D system, the path will be:

C:\SP2D\Output\spc.dat

If you are using VisionMaster or VisionMaster AP212, the path will be:

C:\VisionMaster\spcdata.prn

Note: You will have to change the "List Files of type:" to "All Files (*.*) for the VisionMaster.
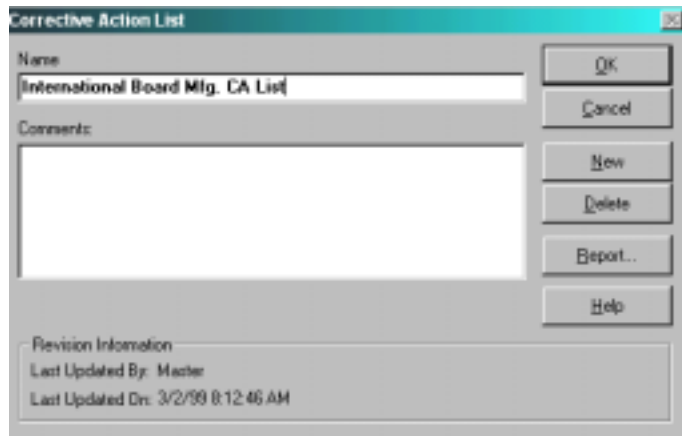
P.   Click on <OK> in this window, then click on <OK> again on the Instrument Setup window, and your data source is now set up.

NOTE: This data source will be used in setting up Characteristics, as well as in your Mathline.

3. Setting Up a CA (Corrective Action) List - Optional

CA lists are related to WARNINGS, which are selected in the "Characteristic" setup.   When you receive a warning while collecting data, this list (CA) will give you a list of available options for recording how you responded to the warning.

A. On the List Viewer, click on <Corrective Action Lists>, to highlight it.

B. Click on the <New Corrective Action List> icon (2nd from left on top).
C. This window will appear:

D. Give your new CA list a name.

E. Click on <OK>.

F. Double click the (+) sign by Corrective
    Action List to expand Your list, and then
    click on it to highlight it.

G. Click on the <New Corrective Action>
    icon on top (2nd from left)

H. The following window will pop-up:

I. Enter a code for this Corrective Action.
    (Hint: use consistent codes for each list,
    i.e. A, B, C, etc.)

J. Enter a Weight. This value can correspond to the severity of the action taken, in relation to the warning.

K. Enter a description of this action. (i.e. Called Supervisor, Removed board, etc.)

L. When you are done, click on <OK>.

M. If you wish to create another Corrective Action, repeat steps 7-12.

4. Setting up a Tag List   (Optional)

These are used to "tag" data with specific information about the data collection. You can use these tags to sort
data in the Analysis application.

A. In the List Viewer, click on "Subgroup Tag Lists", so it is highlighted.

B. Click on the icon that says "New Subgroup Tag List" when you put your mouse over it. (2nd from the left.)

C. The following window will pop-up:

D. Enter a name for your tag list:

E. Then click on <OK>.

F. Double click the (+) sign by "Subgroup
    Tag List" in the List Viewer.

G. Click on the name of your new tag list,
    so it is highlighted.

H. Click on the icon that says "New Subgroup Tag" when you put your mouse over it. (2nd from the left.)
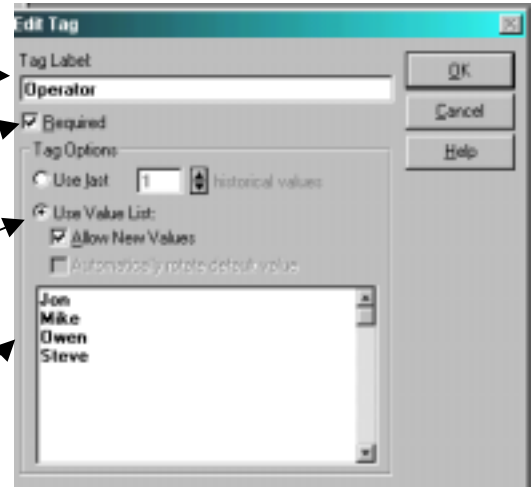
I. The following window will pop-up:

J. Enter a name for the data tag in the "Tag Label" line.

K. If you want this data tag to be mandatory, click in the "Required" box.

L. Click on the "Use Value List" box. This will allow you to enter tag names in the text box on the bottom.
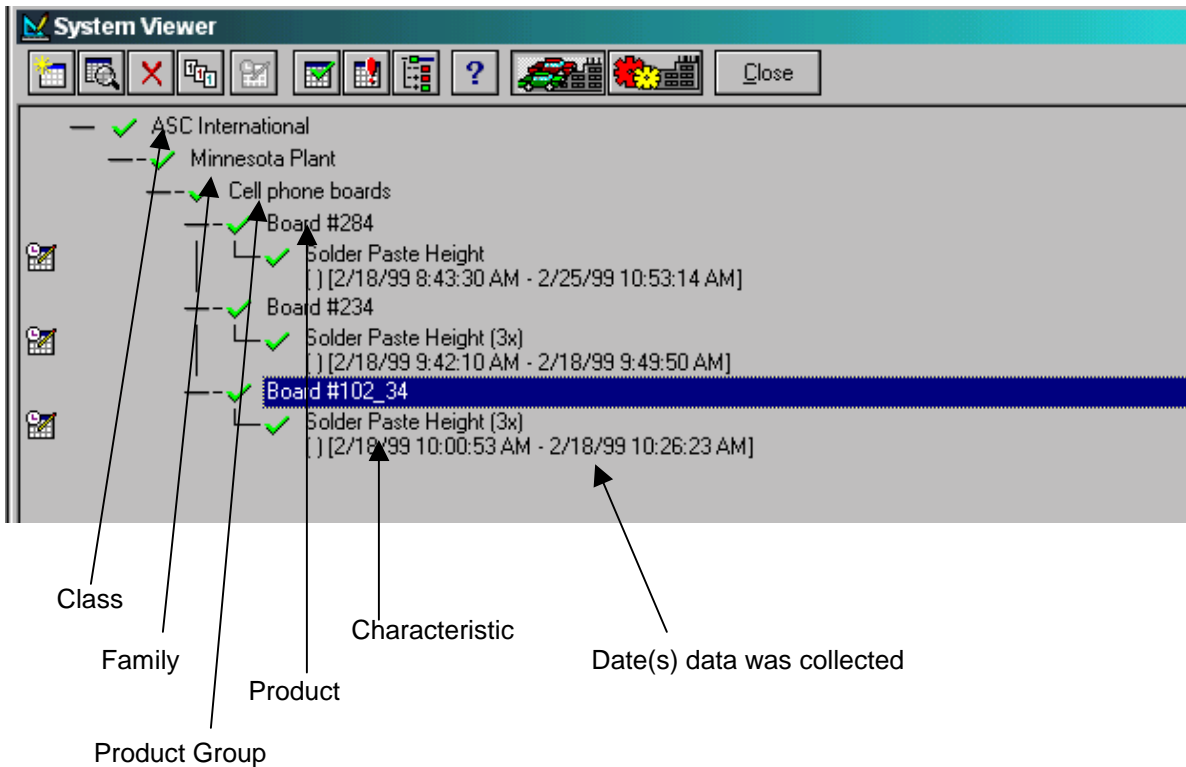
M. Enter the desired data tag names in the text box. All these names will be an option when the user collects data, and will allow you to sort data by these tags in the Analysis section of Criterion.

Edit Tag

Tag Label:
Operator

OK
Cancel
Help

☑ Required

Tag Options
○ Use last [1] ⬍ historical values
⦿ Use Value List:
  ☑ Allow New Values
  ☐ Automatically rotate default value

Jon
Mike
Owen
Steve

*Some suggested tag labels might be: Operator Name, Shift, Line, Product, Printer, etc.

5. Configuring Your System Viewer (Products)

Under the "Setup" option of administration, open <System Viewer>

System Viewer

ASC International
— Minnesota Plant
—— Cell phone boards
——— Board #284
———— Solder Paste Height
            ( ) [2/18/99 8:43:30 AM - 2/25/99 10:53:14 AM]
——— Board #234
———— Solder Paste Height (3x)
            ( ) [2/18/99 9:42:10 AM - 2/18/99 9:49:50 AM]
——— Board #102_34
———— Solder Paste Height (3x)
            ( ) [2/18/99 10:00:53 AM - 2/18/99 10:26:23 AM]

Class
Family
Product Group
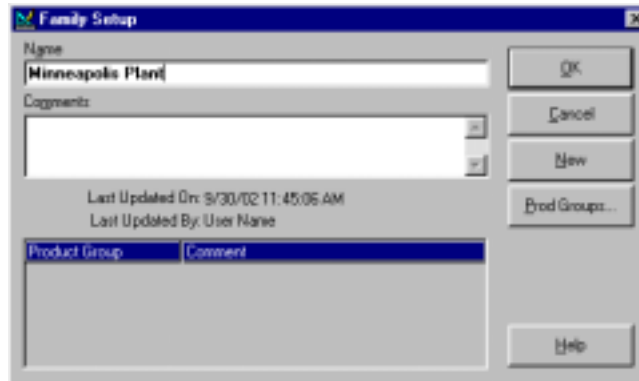Product
Characteristic
Date(s) data was collected

The System Viewer is used to create a hierarchy for data collection. It is used to organize individual products for which data will be collected, as well as for the specific characteristics of those products. Start at the highest

level, "Class", which can be a company name, and then list the "Family". This can be different plants, or different departments within the company. Under "Family" is "Product Groups". List the different products, (i.e., cell phone boards, PC boards, etc.) which you will be manufacturing. Under "Product Groups", is "Products". Here you list the specific product name, (i.e. Board #234.) From the Product Name window, click on <Characteristics>, and then select <Variables>. A "Variables Characteristic Setup" window will open. (See Figure 1.) Use this to configure the particular characteristics (i.e. height of solder paste, width of solder pad, etc.) for the individual products.

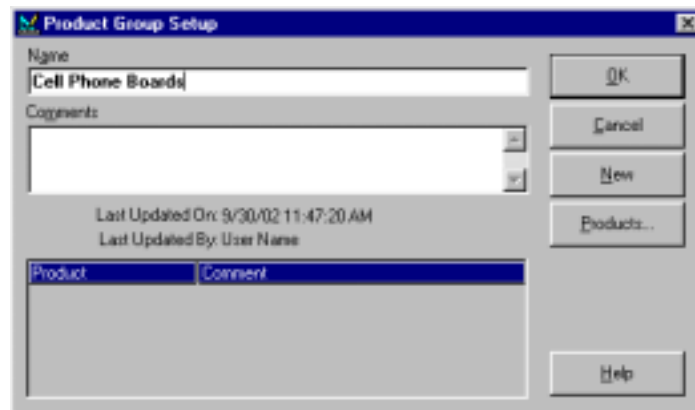A. Click on the and the following window will appear:
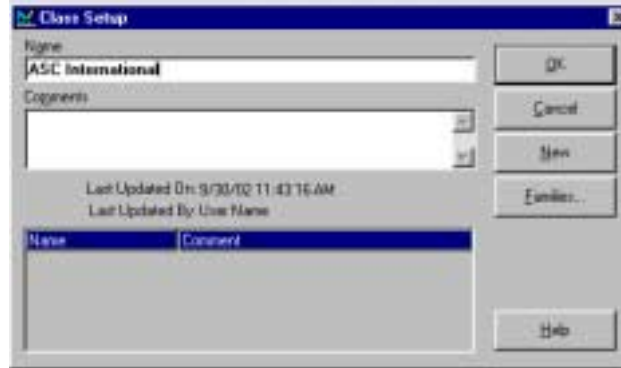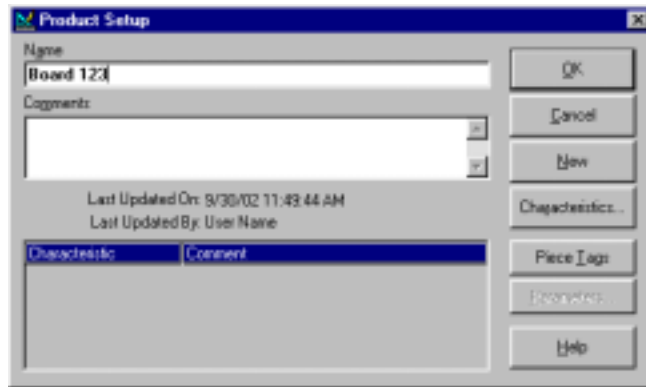

B. Enter a Class name (e.g. Company Name), and then click on the <Families> button, and this window will appear:
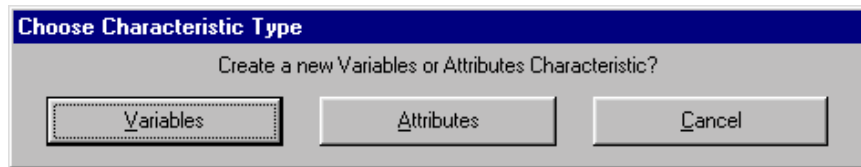

C. Enter a Family name (e.g. Minneapolis Plant) and then click on the <Prod. Groups> button, and this window will appear:

D. Enter a Product Group name (e.g. Cell Phone Boards) and then click on the <Products> button, and this window will appear:

E. Enter a Product name (e.g. Board 123) and then click the Characteristics> button and this window will appear:

F. Click on the <Variables> button, (it defaults to this button), and the following window will appear:
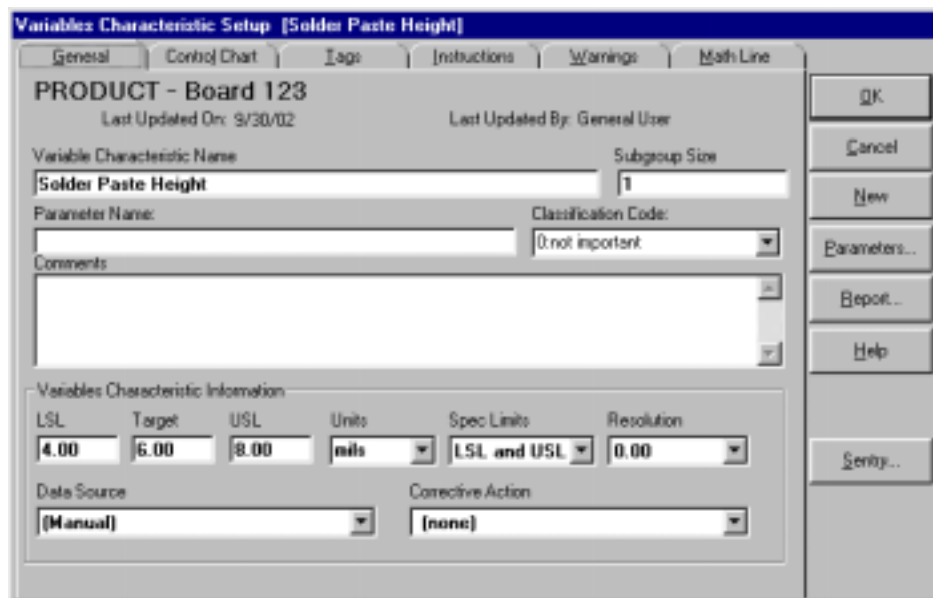
In this window, there are six tabs, and we will go through them in order.

GENERAL

A. Enter a name for that Characteristic, (i.e. Solder Paste Height (1X).) The (1X) refers to the subgroup size you will be selecting in the next step.

B. Select the subgroup size. If you select "1", when you collect data, every individual data point you collect with Acquire will be plotted in the graph. If you select a number higher than 1, for example 4, Acquire will plot the four readings in a disposition chart, average those values, and then plot just the *average* of those readings in the graph. Note: Once this value is selected, and data is recorded for this characteristic, it cannot be changed.

C. Enter the values for Lower Specification Limit (LSL), Target, and Upper Specification Limit (USL).

D. Set the Units. You need to type "mils" if you use mils. (It is not in the combo box.)

E. Select your data source. (e.g. VisionMaster) (See Setting Up a Data Source if you data source list is empty).

F. Select a Corrective Action List. (Optional - See Setting Up A CA List for more information).

CONTROL CHART

A. Select the desired Control chart for Warning Generation. This chart must correspond with your subgroup size. You can't have a subgroup size of 1, and try to select an X-bar chart. You will be prompted with a warning when closing the Characteristic window if you try to select an improper chart type. If your subgroup size is 1, select X and mR chart.

B. Select the desired Control Chart Limits.

TAGS

Select the desired Tag List. Tag lists allow you to "tag" data, with specific information. (See Setting up a Tag List for more info.)

INSTRUCTIONS

Select the option to include/exclude specific characteristic instructions. These allow you to provide additional information/instructions to the user/operator. Create the file in either document format, or CAD format, and then use the ellipse button (…) to map the path to the specific file. The appropriate box on the left side of the window must be checked for this option to be turned on

WARNINGS

A. Select the desired warning list from the available list. The Standard Warning Set includes many of the recognized industry standard warnings.

B. You may turn specific warnings in the list on/off by double clicking on the specific line, and you will see the status change from ON/OFF.

NOTE: We suggest leaving warnings set to "None" until you become more familiar with Criterion.

MATHLINE

This should be preset when you receive your system, but if it is not, follow these steps.

Left column   Middle column   Right column
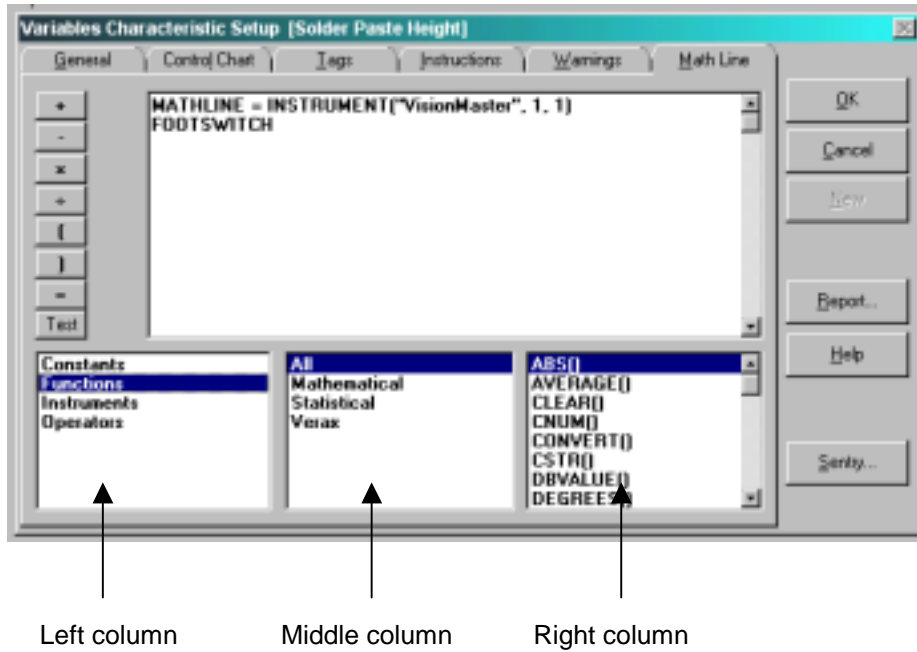
A. At the bottom of the page, in the left column, click on the <Functions> option, then click on <All> in the middle column, then in the right column, scroll down to <MATHLINE>, and double click on it.

B. Next, in the left column click on <Instruments>, then in the right column, click on the appropriate Instrument you are using. (If there is nothing listed, you need to go to "Data Source" and set up a data source.)

C. Hit the right arrow key ONCE, and then hit <Enter>, to move the cursor to the second line.

D. Next, in the left column, click on <Functions>, then <All> in the middle column, then in the right column, scroll down to <FOOTSWITCH>, and double-click on it.

Now you may click on <OK>, and this completes the setup of a characteristic. As you will see later, it is much easier to make new characteristics after this point using the "Clone" function.

6. Configuring Data Collection Procedures (DCP's)

Under the <Setup> option, click on <List Viewer>. (See Figure 2.) This is where you set up Data Tag Lists, Data Collection Procedures, Corrective Action Lists, and other options.

Data Tag List

Corrective Action (CA) List

Data Source

Data Collection Procedures (DCP's)
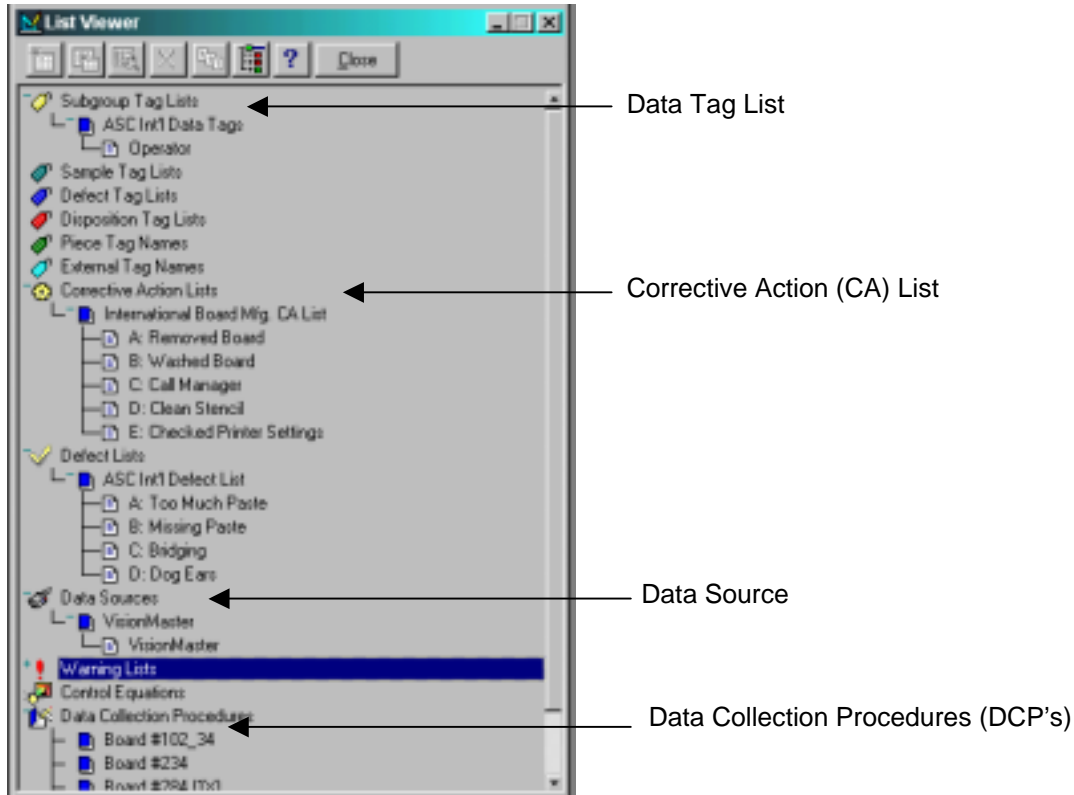
Setting Up a Data Collection Procedure (DCP)

A Data Collection Procedure (DCP) is a macro that specifies the process to be used for collecting data on a particular feature or characteristic.

A. In the list viewer, click on "Data Collection Procedures", so it is highlighted in blue.

B. Click on the icon on the top of the window that says "New Data Collection Procedures" when you place the cursor over it. (Second from left)

C. This window will appear:

D. There are three tabs that we will use, and we will start with the GENERAL tab.

E. Enter a name for this DCP. You want the name to reflect the board name and characteristic(s) for which you are going to collect data. (i.e. Board 234 (3X.)

F. Check the "Show Process Capability" box.
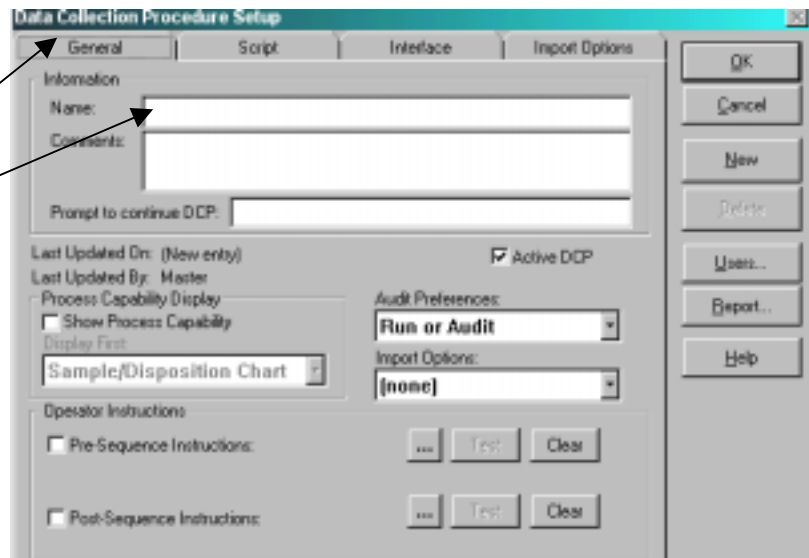
G. Next, click on the "Script" tab, and this window will appear:

H. If the list in the top half of the window is not expanded, click on the pluses to expand the list.

I. Highlight the characteristic you want this DCP to collect data for, and then click on the "Add" button. This will add it to the bottom window.

 "Add" button

"Selected Characteristic"

Data Collection Procedure Setup

| General | Script | Interface | Import Options |

- ✔ ASC International
  - ✔ Minnesota Plant
    - ✔ Cell phone boards
      +- ✔ Board #284
      -- ✔ Board #234
        └ ✔ Solder Paste Height (3x)
           ( )2/18/99 9:42:10 AM - 2/18/99 9:49:50 AM)
      +- ✔ Board #102_34

○ Product
○ Process

[Add] [Remove] [Clear] □ Use Local Cache

| Group | Characteristic |
| 1 | Board #234\Solder Paste Height (3x) |

[Move Up] [Move Down] [Group] [Ungroup]

OK
Cancel
New
Delete
Users...
Report...
Help

J. Next click on the "Interface" tab, and this window will appear:

Note: This allows you to configure how your Data Collection window will appear while collecting data.

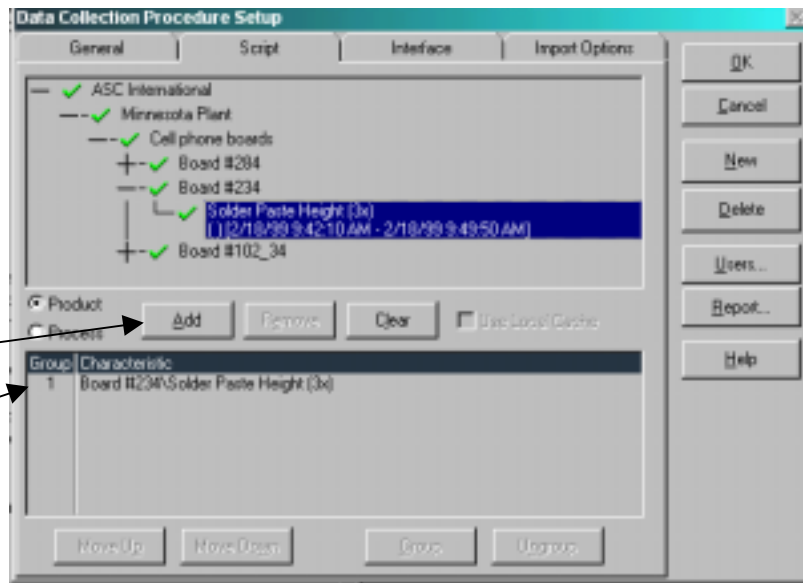K. In the "Display Options", you can choose to select or remove particular segments of your Data Collection window. The "Preview" window shows you a small version of what your window will look like.

"Preview" window

"Users" Button

Data Collection Procedure Setup

| General | Script | Interface | Import Options |

Characteristics:
...\Solder Paste Height (3x)

Preview
...\Solder Paste Height (3x)
(Variables)

Display Options
☑ Live Data Indicator
☑ Sample/Disposition Chart
☑ DCP & Characteristic Information
☑ Data Edit/Review

Chart Options
☑ Show Single/Chart 1   [default]
  □ Show maximized after SG
  Path: Board #234\Solder Paste Height (3x) [...]

☑ Show Chart 2   Normal Histogram
  □ Show maximized after SG
  Path: Board #234\Solder Paste Height (3x) [...]

OK
Cancel
New
Delete
Users...
Report...
Help

L. Try clicking on these options to see how your Preview window changes.

M. Under the "Chart Options" heading, you can choose what type of graph will be present on the Data Collection Window. (You can choose to have one large graph, or, by checking the box by "Show Chart 2", you can have two graphs, and both will be updated simultaneously while collecting data.)

N. Next, click on the <Users> button on the right side of the window, and the following frame will pop-up:

O. This is where you give individual users "rights" to collect data for a particular DCP. Highlight the user name under "Available Users", and click on the <Add> button to add their name to the list of "Selected Users". If a person is not listed here, when they log into the Acquire program, this specific DCP will not show on their list of available DCP's, and they will not be able to collect data for it.
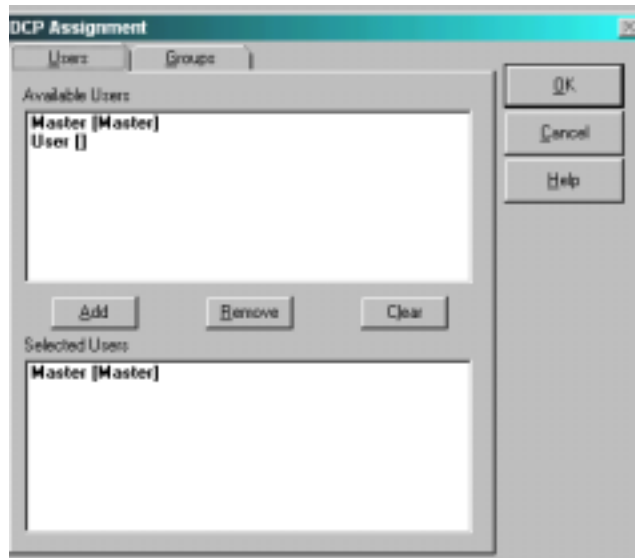
Now click on <OK> to close this window, and then click on <OK> again, and now you have created a DCP and will be able to collect data for a specific characteristic.

7. Acquire

Acquire is the application used to collect data for specific products. This is very easy to use, and we will go through the steps to use for data collection

   A. Start Data Collection using the Shortcut, or start it through the programs startup menu.

   B. The user will log in using their specific Login Name, and enter their password.

The following window will pop-up:

This is the default window for data collection. It shows you a list of available DCP's that you have rights to collect data for.

<Run> button

List of available DCP's
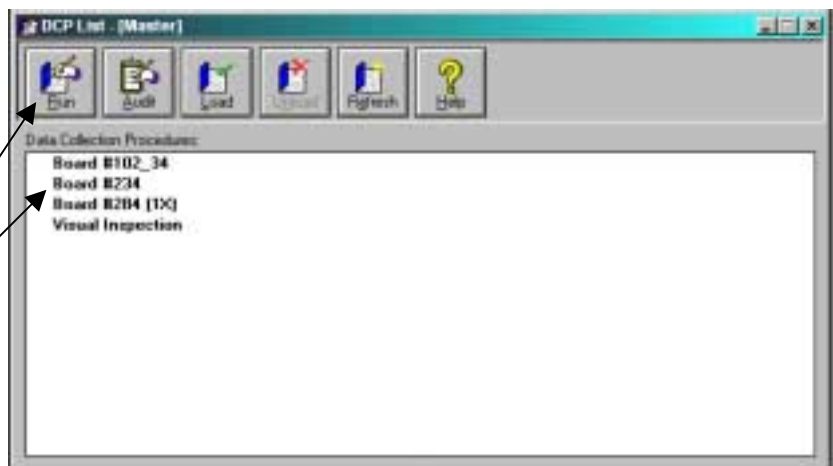
To start a DCP, double click on the name in the list, or click on it once to highlight it, and then click on <Run>.

After this, the data collection window will open, and you are ready to start collecting data. The data collection window will look similar to this:

NOTE: The first time you run a DCP there will be no chart until you have recorded 2 data points.

C. After you have collected the number of data points that was determined in the subgroup size in the administration setup, you will be prompted: "Do you want to continue this DCP?",
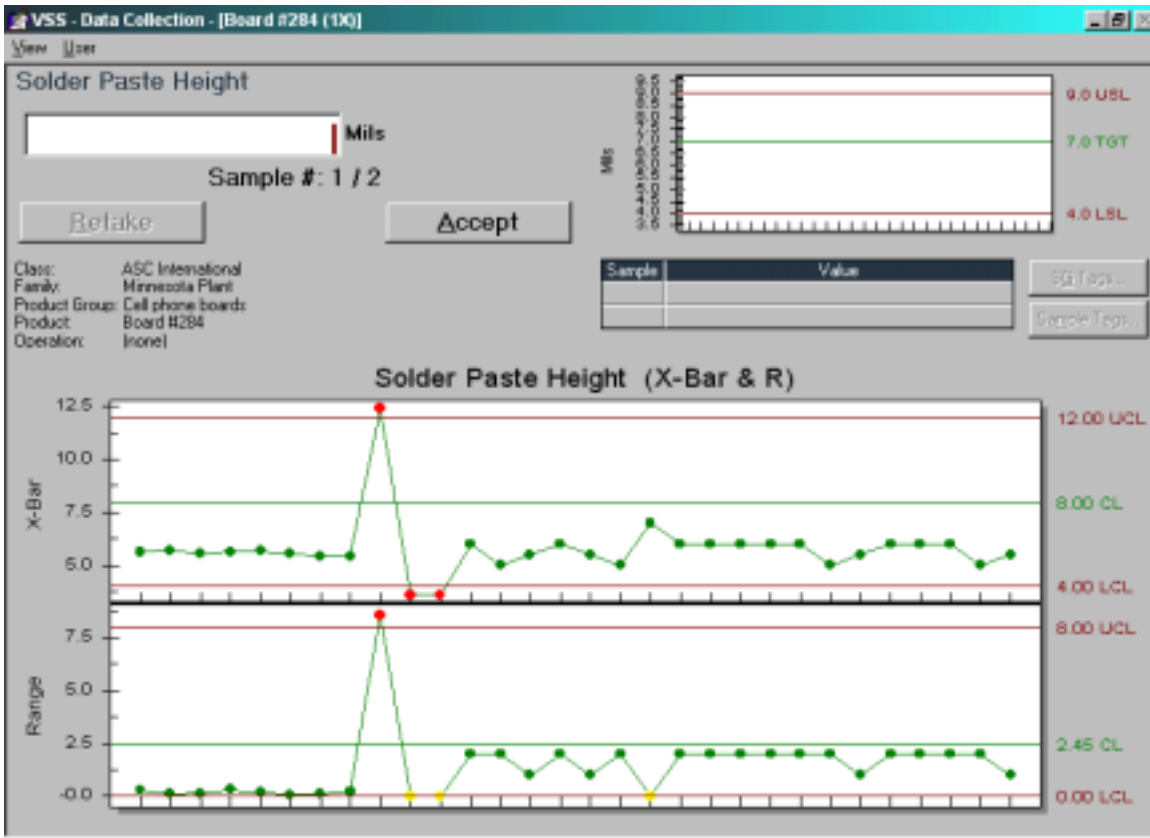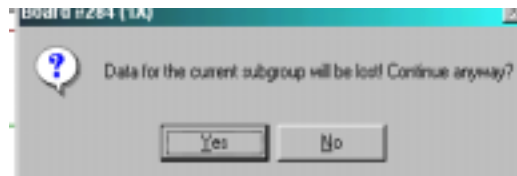
D. Select "NO" to end this DCP, or select "YES" to collect data for another subgroup.

E. You can also stop a DCP by clicking on <User> in the file menu, then click on <Stop DCP>.

If you select "NO", in Step D, or stop a DCP using the procedure in Step E, the following window will pop-up:

Select "Yes" to stop the DCP.

Note: The only time you will lose any data, is if you have a subgroup size greater than 1, and you have not taken all the readings. You will NOT lose data that has been plotted in the graph.

After this, you will return to the default window shown in Step B above.

You may now do one of three things:

1. Leave Acquire in the default DCP window.
2. Close Acquire using <File>, then <Exit> in the file menu.
3. Click on <User>, then <Log User>. This will leave Acquire at the Login window, waiting for the next user to log in.

8. Analysis

Analysis is the application used to recall data for a specific product and time period, and analyze it. This reporting software is very powerful, and very configurable.

    A.   Login using your Login Name and password.

B.   At the default screen, go to <File>, then <New>, and the following window will appear:
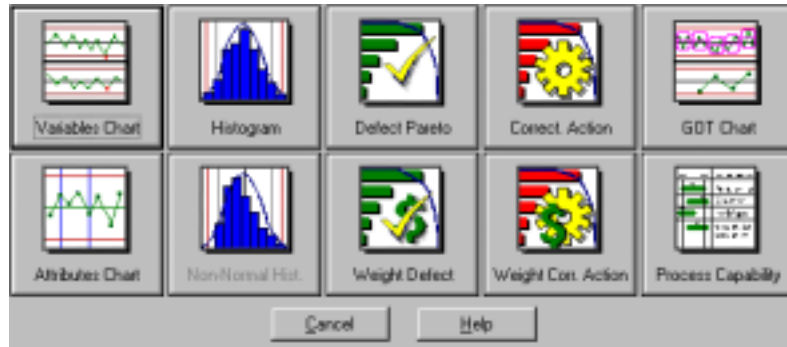
C.   To make a "Variables Chart" click on the Image, and this window will pop-up:

D.   Using the System Viewer in the window, expand this list until you locate the characteristic you want to see data for.

System Viewer

Desired Characteristic

<Add> button

Selected Characteristic
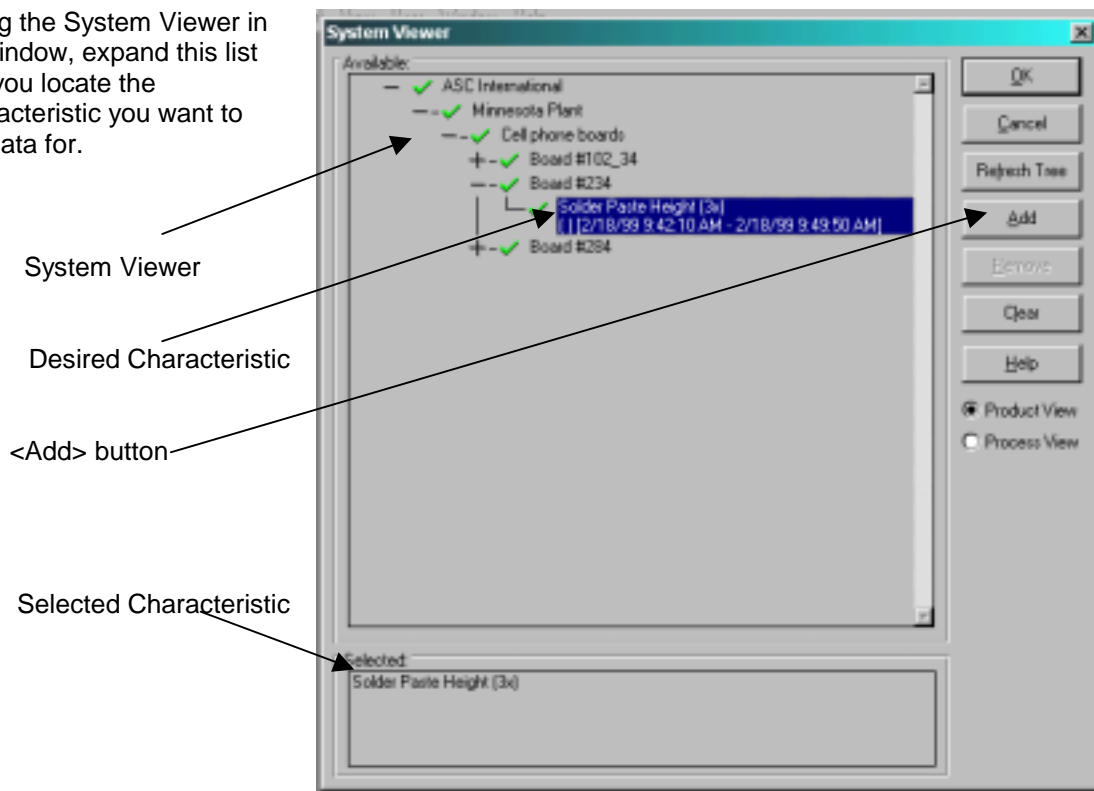
Highlight the characteristic, and then click on the <Add> button, or just double click on the desired characteristic, to add it to the "Selected" window at the bottom of the page.

Click on <OK>. The following window will pop-up:

Here, you can select different criteria by which to sort data. In this example, we have selected the data for the last 8 hours. You may instead choose data within a specific time frame.

Date & Time Selection

Specific Date/Time Range

Data Selected
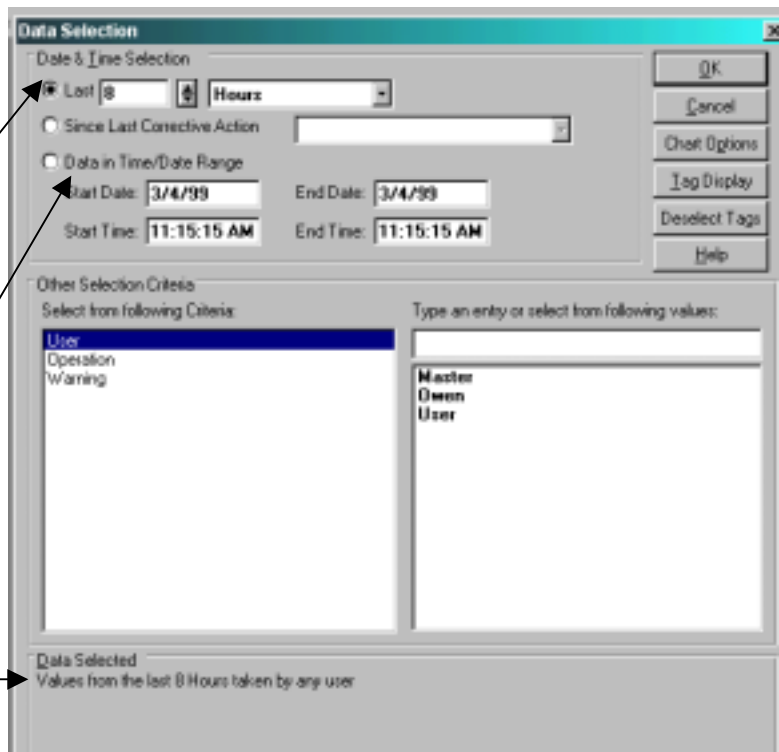
Click <OK>. Now, the chart will appear, showing your selected data.

To edit the look of your chart, click on <Chart/Report>, then <Options>. In this window, you can configure the look of your chart to meet your needs.

To change this variables chart to a histogram, without going through all the initial steps, click on <Chart/Report>, then click on <Change Report Type>, and you will be prompted to select your new chart type.

In the histogram chart window, follow the same steps as in Step 9, to configure the layout of your chart.
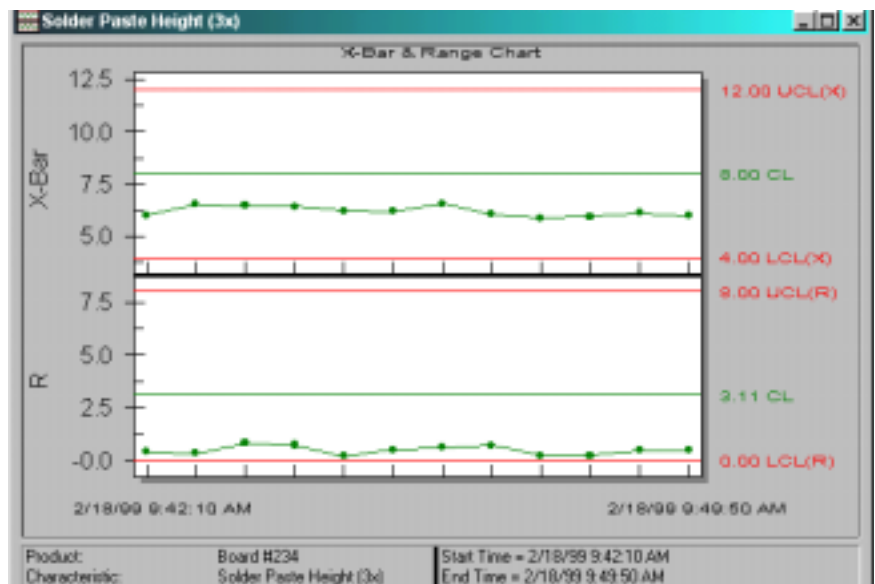
You can save these charts by clicking on <File>, then <Save As>.

To close out of Analysis, go to <File>, <Exit>.

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13. GLOSSARY

Arrow Keys - Keys that are labeled with arrows that point up, down, right, or left. These keys move the cursor, on the display, in the direction of the arrow.

Attributes Data - Data that is assessed qualitatively rather than with a measured value and can be counted for recording and analysis. Examples include characteristics such as the presence of scratches or blemishes, or the installation of all required fasteners. Other examples are characteristics that are measurable (could be treated as variables data), but are recorded in a simple yes/no fashion, such as the acceptability of a shaft diameter when measured on a fixture. Attributes data is what results from the counting of defects (nonconformities) and defectives (non-conforming units). Such data is analyzed using Pareto charts and p, np, c, and u control charts. (See also Variables Data.)

Average - The sum of values in a group divided by the number of values in that group; designated by a bar over the symbol for the values being averaged: X bar is the average of the X values within a subgroup; X double-bar is the average of subgroup averages.

c - For attributes data, the total number (count) of individual defects in a subgroup of fixed size.

c Chart - A control chart of the number of defects in a subgroup. C charts are typically used when each unit can have multiple defects.

Calibration - Adjustment of a gage or measuring instrument to a reference standard for the purpose of reducing measurement bias.

Capability - (Should be determined only after a process is in a state of statistical control.) A measure of the ability of a process to generate products that meet specifications. Represented as a proportion of specification (tolerance) spread to actual process spread. (See also Cp, Cpk, Cm, and Cmk.)

Center Line - The line on a control chart that typically represents the average value of the items being plotted.

Characteristic - A dimension or quality of a product (process), which can be measured (variables data) or counted (attributes data); a qualitative or quantitative measurement of a unit.

Cm - A value similar to Cp, but using a value of s that is dependent on the average of subgroup ranges. (See also Cp)

Cmk - A value similar to Cpk, but using a value of s that is dependent on the average of subgroup ranges, as above. (See also Cpk.)

Configure - To connect and program a computer and its peripheral devices so that they operate smoothly as one system.

Control - **See Statistical Control.**

Control Chart - A graph of information about a characteristic that shows plotted values of a statistic calculated from data on the characteristic. The graph will also have a centerline and one or two control limits. Control charts have two basic uses: as a judgment tool to determine if a process has been operating in statistical control, and as an aid in maintaining statistical control.

Control Limit - A line (or lines) on a control chart used as a basis for judging the significance of the variation between subgroups. Plotted points that are outside the control limits indicate lack of statistical control. Control limits are commonly located 3 standard deviations away from the centerline.

Cp - Process Potential - A capability index that is the ratio of the specification range to the range of the actual six-sigma spread of the process. Cp is a measure of process potential because it has no regard for the location of the data.

Cpk - Process Capability - A capability index that considers both the process spread and the proximity of the process spread to specification limits. Cpk is the ratio of the lesser of (USL - mean) and (mean - LSL) over the three-sigma spread of the process. A ratio of 1.33 or greater is usually desired.

CR - The inverse of Cp (1/Cp). This value ranges from 0 to infinity. A smaller value indicates greater process potential.

Cursor - The active position on a display (for example, indicating what part of the display has been selected or where new information will be entered). The cursor is indicated by a character or field that is highlighted, flashing, or underlined.

Cursor Keys - Keys that are labeled with arrows that point up, down, right, or left. These keys move the cursor, on the display, in the direction of the arrow.

Database - A structured set of related information stored in some format that allows for easy retrieval.

Defect - A specific occurrence of a condition that does not conform to specifications or other standards. Defects are sometimes called discrepancies or nonconformities. c and u control charts are used to analyze and control the occurrence of defects. Defects should not be confused with defective units.

Defective Units - Product units (or parts) that do not conform to specifications or other inspection standards; also called unacceptable or non-conforming units. p and np control charts are used to analyze and control the production of defective units. The presence of one or more defects in a unit causes it to be defective.

Distribution - A way of describing the output of a system containing variation. Specific individual values from a distribution are usually not predictable but, as a group often forms a pattern that can be described in terms of its location, spread, and shape.   Location, or central tendency, is commonly expressed by the mean or average; spread (or variation) is expressed in terms of standard deviation or the range of a sample. Shape involves many characteristics, such a symmetry and peakedness, but these are often summarized by using the name of a common empirical distribution such as the normal, binomial, or Poisson.

Export - The transfer of data and/or setups from the database to another storage medium.

Family - A set of related product groups.

Histogram - A graphical representation of the frequency distribution of sampled values or data points.

Individual - A single measurement. In variables data, a subgroup is usually constructed of several individuals.

Local Area Network (LAN) - A collection of inter-connected computers that allows users to share data and peripherals within a limited area.

LCL - Lower Control Limit - For control charts, the lowest plotted value at which a process is still considered in control. (See also **Control chart, UCL**.)

LSL - Lower Specification Limit - The lowest value of a product dimension or measurement which is acceptable. Specification limits are defined by physical constraints, and should be established by a design engineer - NOT a quality administrator. (See also **USL**.)

Mean - The average of the values in a group of measurements.

Median - The middle value when a group of measurements are arranged from lowest to highest; if the number of the values is even, the median is, by convention, the average of the middle two values.

Menu - A list of options displayed on a screen or window.

Moving Range Chart - A control chart that plots the range between adjacent subgroup averages. Often used in processes where individual samples (subgroups of size one) are analyzed.

Non-conforming Units - Units that do not conform to specifications or other inspection standards. (See also **Defective Units**.)

Nonconformity - A specific occurrence of a condition that does not conform to specifications or other standards. (See also **Defects**.)

Nominal Specification - The optimal value for a given measurement (used with variables data); usually the midpoint between LSL and USL. Also called target dimension.

Non-Normal Distribution - Any distribution which does not conform to the common normal distribution, or bell curve. (See also **Normal distribution**.)

Normal Distribution - A continuous, symmetrical, bell-shaped frequency distribution for variables data that underlies the control charts for variables. Any normal distribution is completely described by specifying its mean and standard deviation. When measurements are normally distributed, about 68.27% of all measurements lie within plus or minus one standard deviation unit of the mean. About 95.45% lie within plus and minus two standard deviation units of the mean, and about 99.73% lie within plus and minus three standard deviation units of the mean. These percentages are the basis for control limits and control chart analysis (since subgroup averages are normally distributed even if the output as a whole is not), and for many capability decisions (since the output of many industrial processes follows the normal distribution).

np - For attributes data, the total number of defective units in a subgroup. Given by n (number of units in subgroup) times p (proportion of defective units).

np Chart - For attributes data, a control chart of the number of defective units in each subgroup.

Operands - Values or symbols that are manipulated in a mathematical expression. For example, in the expression "a + 2" , "a" and '2" are operands. (See also **Operators**.)

Operators - Symbols that are used to combine operands in a mathematical expression. For example, in the expression "a + 2", "+" is the operator.

p - For attributes data, the proportion of defective units in a subgroup.

p Chart - For attributes data, a control chart of the proportion of defective units in each subgroup. (See also **p**.)

Pareto Analysis - An analysis of frequency of occurrence of various defects (or other data), using a Pareto Chart. The Pareto Principle holds that a small number of defects are responsible for the majority of problems. (See also **Pareto Chart**.)

Pareto Chart - A simple tool for problem-solving that involves ranking all types of problem causes or sources of variation according to their contribution to cost or to total variation. Typically a few causes account for most of the cost, so problem-solving efforts are best prioritized to concentrate on the "vital few" causes, temporarily ignoring the "trivial many."

Path - The location of a file within the hierarchy of directories of a computer's filing system.

Poisson Distribution - A discrete probability distribution for attributes data that applies to defects (non-conformities) and underlies the c and u control charts.

Pre-control - An initial period of development, before UCL and LCL are well defined; the "gearing-up" of a process for SPC.

Process - The combination of people, equipment, materials, methods and environment that produce a given product or service. A process can involve any aspect of business. Statistical Process Control is a key tool for managing the output of processes.

Process Average - The location (average value) of the distribution of measured values of a particular process characteristic, usually designated as an overall average.

Process Spread - The extent to which the distribution of individual values of the process characteristic varies; often shown as the process average plus or minus some number of standard deviations. For example, the six-sigma spread of a process characteristic is equal to the distance between the mean plus three standard deviations and the mean minus three standard deviations.

R - The range of values in a subgroup, i.e. the difference between the highest value and the lowest value in the subgroup.

R-bar - The average of subgroup ranges.

R Chart - A control chart that displays the range of data values recorded in each subgroup.

Range - The difference between the highest and lowest values in a subgroup. The expected range increases both with sample size and with the standard deviation.

Reasonable Limits - Reasonable limits are used to reduce entry of erroneous data by screening out values that cannot realistically be considered possible measurement results. Reasonable limits can be defined by entering the maximum and minimum numerical values to be accepted as measurements for this characteristic in the Upper RL and Lower RL boxes respectively. The Enforce Reasonable Limits box must be checked in order for the application to apply these limits at the time of data collection. When this box is checked, it specifies that measurements outside of these limits should not be accepted during data collection.

RS232 - Communications interface that is commonly used between electronic devices such as computers, modems and printers; requires a standard information protocol including baud rate, data bits, stop bits, termination characters, and parity checking methods prior to connection. (See also Baud Rate, Stop Bits, and Parity.)

s - The sample standard deviation.

s Chart - A chart available in VSS which displays the standard deviation for each subgroup of data selected.

Sample - A collection of items to be measured for estimation purposes. Sometimes refers to a single measurement.

Shape - A general term for the overall pattern formed by a distribution of values.

Sigma - s - The Greek letter used to designate a standard deviation.

Sources of Variation - Any causes that act to create variation in the outcome of a process. Sources of variation tend to drive a process out of control or away from an ideal situation.

Specification - The engineering requirement for judging acceptability of a particular characteristic. Specifications and specification limits should never to be confused with control limits. (See also **LSL** and **USL**).

Spread - A general concept for the extent by which values in a distribution differ from one another; dispersion.

Stable Process - A process that is in a state of statistical control.

Standard Deviation - A specific measure of the spread of values of a (quality) characteristic of a process or the spread of a sampling statistic from the process; denoted by the Greek letter s (sigma).

Statistic - A value calculated from or based upon sample data (i.e.: a subgroup average or range), used to make inferences about the process or distribution that produced the output from which the sample came.

Statistical Control - A process is in control when the values of its quality characteristics only vary due to inherent natural randomness, and unpredicted sources of variation are not present. Statistical control is evidenced on a control chart by the absence of points beyond the control limits and by the absence of non-random patterns or trends within the control limits.

Statistical Process Control (SPC) - The use of statistical techniques such as control charts to analyze a process or its outputs so as to take appropriate actions to achieve and maintain a state of statistical control and to improve process capability.

Subgroup - One or more measurements taken together and used to analyze the performance of a process at a given time. Subgroups are typically made up of measurements from consecutive pieces, although random samples are sometimes used.

Target Dimension - For variables data, the optimal value for a given measurement; usually the midpoint between LSL and USL. (See **also LSL, USL**.)

Trend - An unusual or nonrandom pattern in the observed values of a characteristic (on a control chart) which suggest the presence of a previously unknown source of variation.

u - For attributes data, the average number of defects per unit in a subgroup. This number may exceed one, since each unit may have multiple defects.

u Chart - For attributes data, a control chart of the average number of defects per unit in a subgroup.

UCL - Upper Control Limit - For control charts, the highest value at which a process is still considered to be in control. (See also **Control Chart, LCL**.)

USL - Upper Specification Limit - The highest value of a product dimension or measurement which is acceptable. Specification limits are defined by physical constraints, and should be established by a design engineer - NOT a quality administrator. (See also **LSL**.)

Variance - The square of the standard deviation; (s2). (See also **Sigma(s)**.)

Variables Data - Quantitative data that consists of actual measurements of quality characteristics. This data is analyzed in terms of subgroups that contain one or more measurements. Examples include the diameter of a bearing journal in millimeters, the closing effort of a door in kilograms, the concentration of electrolyte in percent, or the torque of a fastener in Newton-meters. (See also **Attributes data**.)

Variation - The extent to which repeated measurements of the same process characteristic yield different values. Variation within a subgroup or sample is usually described in terms of range, variance, or standard deviation.

Warning Criteria - Conditions that signal an out-of-control process.

X-bar - For variables data, the average (mean) of values in a subgroup.

X double-bar - For variables data, the average of (X-bar) values of many subgroups. (See also **X-bar**.)

X-bar and R Chart - For variables data, control charts which plot the average value and range of the values in a series of consecutive subgroups. (See also **control chart, X-bar, R, subgroup**.)

X-bar and s Chart - For variables data, control charts which plot the average and standard deviation of the values in a series of consecutive subgroups. (See also **control chart, X-bar, standard deviation, subgroup**.)