

SQCpack

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Welcome

Thank you for using SQCpack.

This section contains some topics of general interest regarding SQCpack.

Note: *You can adjust the size and position of the help window so that it opens in a convenient location.*

New users

If you are a new SQCpack user, we recommend the following sections to help you become familiar with using SQCpack:

[Introduction to SQCpack](#)

[Learning with the sample database](#)

[Step by step guide for important SQCpack tasks](#)

About PQ Systems

Since 1984, PQ Systems has been providing solutions to help organizations implement quality improvement programs and demonstrate proof of their quality performance. We offer a comprehensive network of products and services designed to help all industries improve quality and comply with standards. PQ Systems provides the expertise, training, and solutions necessary to assist organizations through every step of the quality process. Our highly-regarded products have made us a leader in the industry, but our commitment to customer service and support keeps customers coming back.

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SQCpack® takes the guesswork out of a quality control program. *SQCpack* is a proven and easy-to-use Statistical Process Control (SPC) application, which includes all the functionality needed to comply with critical quality standards. It utilizes the power of data analysis to help reduce variability, enhance productivity, and improve profitability. It combines powerful SPC techniques with flexibility, making SPC analysis easier than ever.

GAGEpack® is a powerful gage management application that helps manage a complete history of measurement devices, instruments, and gages...all while keeping you compliant with critical standards. *GAGEpack* is the easy way to stay organized and maintain inventory, measurement systems analysis (MSA) studies, calibrations, certificates, and traceability all in one place.

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How to contact PQ Systems

PQ Systems invites your questions and comments about our products and services.

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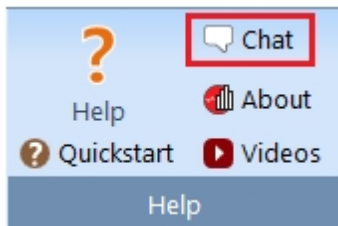
Application support

How to contact PQ Systems application support

Phone: 800-777-5060 or 937-885-2255

Email: support@pqsystems.com

Chat: Click the **Chat** button in the SQCpack ribbon (shown below) to chat with PQ Systems application support.



Please feel free to contact the PQ Systems experienced application support team. Our experts can answer questions about software problems, data analysis, and applications.

Before you contact application support, please check to see if the answer to your question is in this help document.

Please follow these steps to help our technical advisors answer your questions quickly:

1. Have your license/serial number ready. It is listed in the **About** dialog box. You can access this dialog box by clicking the **About** button in the SQCpack ribbon (shown above).
2. Be at your computer, if possible.

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Types of SQCpack licenses

License types

SQCpack can be licensed with two different types of license.

Per-computer (workstation) license: This type of license allows you to install SQCpack on one computer. Both perpetual and subscription per-computer licenses are available.

SQCpack concurrent-user license: Concurrent-user licenses, also called floating licenses or flexible-use licenses, allow customers to install SQCpack on terminal servers, Citrix servers, and an unlimited number of computers. A license server meters usage of SQCpack, enabling no more than the licensed number of users to simultaneously run the software. The concurrent-user license model offers the following advantages to enterprise customers:

- You install SQCpack on a terminal server or a Citrix server only once, rather than having to install it on many computers throughout your organization.
- The administration of license management is simple, since there is only one license number to purchase and renew.
- A concurrent-user license is economical, since it allows sharing of floating licenses among multiple users. This provides you with enterprise-wide software access at a reasonable cost.

- You can [roam a concurrent-user license](#) so that you can run SQCpack when you are not connected to the network.

Maintenance

While SQCpack is under maintenance, you have [these benefits](#).

Your copy of SQCpack will be under maintenance for one year after purchase. After that, if you have a perpetual license, you will need to purchase additional years of maintenance.

- **Perpetual license** - You can purchase a yearly maintenance agreement for your perpetual license.
- **Subscription license** - Maintenance is included as part of your subscription. A **concurrent-user** license is a subscription license.


Roaming concurrent-user license

When you are connected to the network where the PQ Systems License Manager (PQLM) is installed, you obtain a license token from PQLM when you start SQCpack.

In order to run SQCpack when you are disconnected from the network, you must obtain a *roaming* license. The roaming license is good for the requested number of days and expires at midnight of the last roaming day.

Obtain a roaming license

To obtain a roaming license, click **About** in the **Help** section of the ribbon bar, then click the **Roaming license** button.



SQCpack Roaming License

Current license status:
 You have a non-roaming license

License Check In or Out:
 Requested number of roaming days: 1
 Roaming will be through midnight of: 3/20/2015
 Check-out Roaming License

? Close
 You must be connected to your network to check in or out a roaming license.

Enter the number of roaming days that you desire, then click the **Check-out Roaming License** button.



The dialog changes to show that you now have a roaming license that is good for the specified number of days.

Now you can disconnect from the network and run SQCpack.

Returning a roaming license before expiration

While a roaming license is allocated to a computer, no one else on the network can use that license token. If the computer with the roaming license returns to the network and no longer needs the roaming license, it can return the roaming license to the pool of available licenses.

To return a roaming license, click **About** in the **Help** section of the ribbon bar, then click the **Roaming license** button.



The dialog should indicate that you currently have a roaming license, as shown above.

Click the **Check-in Roaming License** button to return the roaming license.

About SQCpack

SQCpack is the next generation of data management and charting software from PQ Systems. The software stores your quality data and generates process performance charts. Charts can use internal SQCpack data or external data from a variety of data sources to help optimize processes and demonstrate proof of quality performance.

Designed with a focus on providing a simplified user-experience, SQCpack streamlines the process of creating and customizing charts so that you can more easily make data-driven business decisions.

SQCpack's features:

- Data management
 - SQCpack stores data in Microsoft SQL Server.
 - Easy-to-use data management features allow you to define and store your quality data.
 - Data may be manually entered via an easy-to-use data editor.
 - Data entry operators can be prompted when it is time to enter new data. Light pole support is included.
 - Supervisors can be notified by email or text when entered data is out-of-control or out-of-spec.
 - Multiple users can edit data in the same data group at the same time.
 - Direct gauge input via USB or serial port is supported.
 - Gauge input via a multiplexor with multiple gauges is supported.
 - Data can be imported into SQCpack from CSV data files.
 - Data can be imported into SQCpack from complex data files such as those created by CMMs.
 - Data can be imported from your existing SQCpack 6.5 databases.
 - Quickly search for a data group from the list of available data groups.
 - Specifications can be stored in multiple places:
 - Specifications that are stored in a chart definition.
 - Specifications that are provided by a chart's data.
 - Specifications that are provided by a characteristic that is being charted (only for charts using data in an SQCpack data group).
 - Specifications that are provided by a *Common Specifications Set*.
- Alerting
 - Alerting monitors new data as it flows into a database and analyzes the data for out-of-control and/or out-of-spec signals.
 - Alerting allows you to receive a message (email, text, or SQCpack) when new data is out-of-control and/or out-of-spec.
 - Alerting logs out-of-control and/or out-of-spec signal information to the SQCpack database. This signal information can be read and analyzed by other applications.
 - Alerting can monitor internal data as it flows into the SQCpack database from any source (data entry, CMM Integration, Fixtures, or import).
 - Alerting can monitor external data as it flows into databases such as Oracle, SQL Server, Microsoft Access, Microsoft Excel, etc.
- Security
 - You can require users to login to SQCpack.
 - If you choose to require user login, you can define users and assign rights to each user.
 - Users can login to SQCpack using their Windows or domain credentials, or by providing an SQCpack user name and password.

- The optional auditing feature keeps track of who changed what in the SQCpack database.
- Divisions allow you to partition your SQCpack database so that users can see only the data, charts and reports in their division.
- Charting
 - StatBoard allows you to quickly visualize the status of a group of charts.
 - A chart creation wizard guides you through the steps to create a new chart.
 - Charts can use data from various external data sources to provide process improvement information from enterprise data that is stored outside of SQCpack.
 - Charts to external data fetch the most recent data without having to import the data, so your SPC charts are always automatically up-to-date.
 - Compute and interact with control limits directly on the chart.
 - Compute and display multiple sets of control limits on your charts when your process shifts.
 - Charts provide many options for labeling and formatting the x-axis of the chart.
 - Charts include options for multiple date formats when labeling the x-axis.
 - You have complete control of how your charts look, including colors, fonts, line styles, and fill patterns.
 - Changes instantly appear on your chart as you edit the chart definition.
 - Charts allow you to filter data from your data source so that your chart contains only relevant data.
 - Easily ask *ad-hoc* questions about your data through chart data filtering to help focus your improvement efforts.
 - Provides a summary of all of your charts, so that you can focus your attention on processes that need it most.
 - Select the specific SPC statistics to show on your charts.
 - Simplified chart annotations allow you to display descriptive information about your process.
 - Multiple charts can be open concurrently to give you a broad view of your improvement efforts.
 - Sort your charts alphabetically by name, chart type, description, data group name, characteristic name, category, or last modified date.
 - Quickly search for a chart from the list of available charts.
 - Thumbnail images of your charts help you navigate quickly to the chart you want to view.
 - Charts using quality data that is stored in SQCpack data groups can automatically refresh when data is added, deleted or changed.
 - Specifications used by a chart can come from the following sources:
 - Specifications that are stored in the chart definition.
 - Specifications that are provided by the chart's data.
 - Specifications that are provided by the characteristic that is being charted (only for charts using data in an SQCpack data group).
 - Specifications that are provided by a Common Specifications Set.
- Command parameters
 - SQCpack allows users to employ command parameters to perform common tasks such as displaying a chart, saving a chart as an image file, printing one or more charts, or opening a data group for data entry.
 - Command parameters can be passed on the command line to SQCpack.
 - Command parameters can be placed in a .SQCX command file. You can double-click an SQCX command file to execute the commands, or drag-and-drop an SQCX file onto SQCpack to execute the commands.
 - You can drag a data group or chart from SQCpack to your desktop (or any other folder) to

create an SQCX command file.

- Language translations
 - English (United States)
 - Chinese (Simplified)
 - French (France)
 - German (Germany)
 - Portuguese (Brazil)
 - Spanish (Mexico)

Installing, updating and administering SQCpack

This section contains topics to help you install and update SQCpack.

Deploying and updating the software

Deployment options

SQCpack can be deployed in the following ways:

- Installation on the local computer (manually or via Group Policy)
- Deployment from a network share
- Deployment in a Remote Desktop Services / Citrix / Terminal Services environment

Installation on the local computer (manually or via Group Policy)

In order to install SQCpack on a computer, you can run the installation program `sqcpack_7.0_setup.exe` or install the `sqcpack_7.0_setup.msi` file.

To update an existing SQCpack installation, simply run the newer version installation program (EXE or MSI).

When SQCpack is first installed on a computer, it will have a **demo** license that works for 14 days or 300 runs.

Installation using the `sqcpack_7.0_setup.exe` installation file

To install SQCpack for the first time, or to update SQCpack to a newer version, run the **`sqcpack_7.0_setup.exe`** using an account that has *Administrator privileges* on the computer.

Silent installs

With the silent install command line parameter set, the entire installation will execute silently, without a user interface, or any user intervention. When input is required on dialog boxes, the default values of dialog controls will be used. If you would like to do a silent install, start the install program with the command line argument shown below:

```
sqcpack_7.0_setup.exe /s
```

Logged installs

If the installation program encounters an error, you may be asked by PQ Systems application support to perform a logged install. If the logging command line parameter is set, the installation will keep a verbose log of all the internal installation variables, as well as Windows Installer's own installation log.

```
sqcpack_7.0_setup.exe /l=FullPathToTheLogFile
```

Skip installation of SQL Server LocalDB

SQL Server LocalDB is used to allow SQCpack to operate with single-user databases. If your organization has no need for single-user databases, you can skip installing SQL Server LocalDB. To skip installing SQL Server LocalDB, start the install program with the command line argument shown below:

```
sqcpack_7.0_setup.exe /NoLocalDB
```

Installation using the sqcpack_7.0_setup.msi installation file

To install SQCpack for the first time, or to update SQCpack to a newer version, use the **sqcpack_7.0_setup.msi** using an account that has *Administrator privileges* on the computer.

Silent installs

With the silent install command line parameter set, the entire installation will execute silently, without a user interface, or any user intervention. When input is required on dialog boxes, the default values of dialog controls will be used. If you would like to do a silent install start the install program with the command line argument shown below:

```
msiexec /i sqcpack_7.0_setup.msi /qn
```

Silent uninstall

```
msiexec /i sqcpack_7.0_setup.msi /qn CmdLine="/s /UNINSTALL"
```

- or -

```
msiexec /qn /x sqcpack_7.0_setup.msi
```

Skip installation of SQL Server LocalDB

SQL Server LocalDB is used to allow SQCpack to operate with single-user databases. If your organization has no need for single-user databases, you can skip installing SQL Server LocalDB. To skip installing SQL Server LocalDB start the install program as shown below:

```
msiexec /i sqcpack_7.0_setup.msi /qn CmdLine="/s /NoLocalDB"
```

Installation via Group Policy using the sqcpack_7.0_setup.msi installation file

You can use **sqcpack_7.0_setup.msi** (a silent MSI installation file) to install or update SQCpack as described in [Installing SQCpack via Group Policy](#).

Deployment from a network share

Please refer to the topic "Running and updating SQCpack from a network share" in the [SQCpack 7 Technical Overview](#) document.

Deployment in a Remote Desktop Services / Citrix / Terminal Services environment

Please refer to the topic "Deploying in a Remote Desktop Services / Citrix / Terminal Server environment" in the [SQCpack 7 Technical Overview](#) document.

Installing SQCpack via Group Policy

You can use **sqcpack_7.0_setup.msi** (a silent MSI installation file) to install or update SQCpack remotely via Active Directory Group Policy.

There are two significant benefits from using Group Policy to install and update SQCpack:

1. You can easily and quickly push the installation or update of a specific SQCpack version to all

of the computers in your organization that use SQCpack.

2. SQCpack will be automatically installed or updated the next time the target computer is started or restarted. An advantage of this approach is that SQCpack user(s) on the target computer *do not* require Administrator privileges in order to obtain the new version of SQCpack.

How to skip installation of SQL Server LocalDB

SQL Server LocalDB is used to allow SQCpack to operate with single-user databases. If your organization has no need for single-user databases, you can skip installing SQL Server LocalDB. To skip installing SQL Server LocalDB set the CMDLINE property as shown below. The **/s** parameter specifies a silent install.

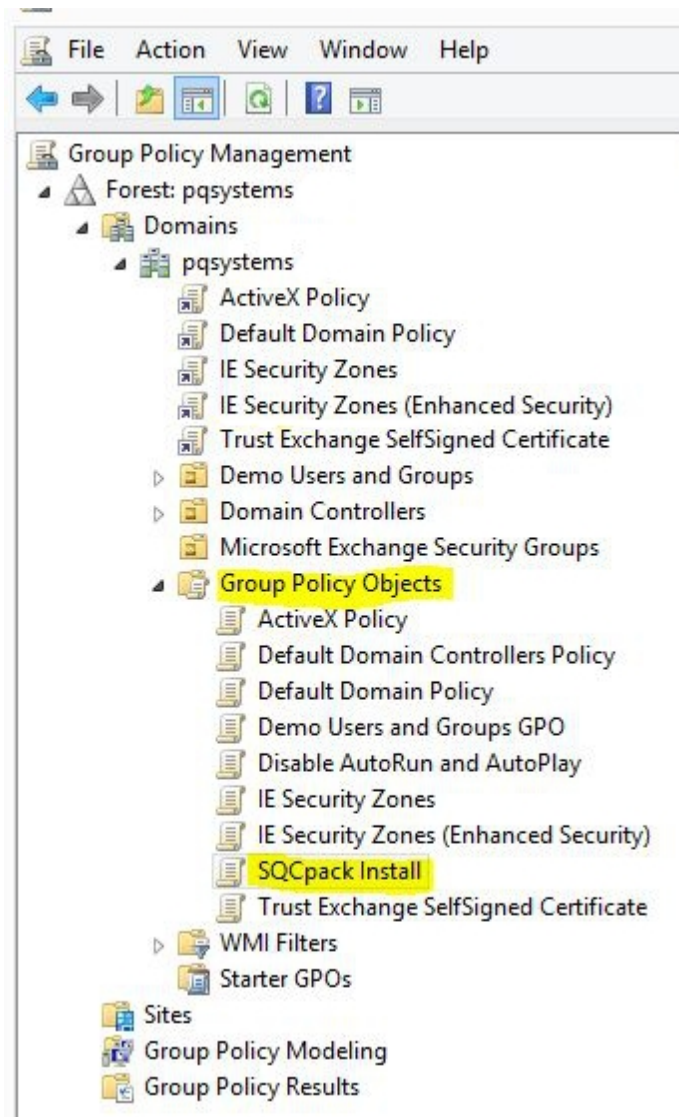
sqcpack_7.0_setup.msi CMDLINE="/s /NoLocalDB"

Follow these steps to install or update SQCpack using Group Policy. You will need to be a member of the Domain Admins security group in Active Directory.

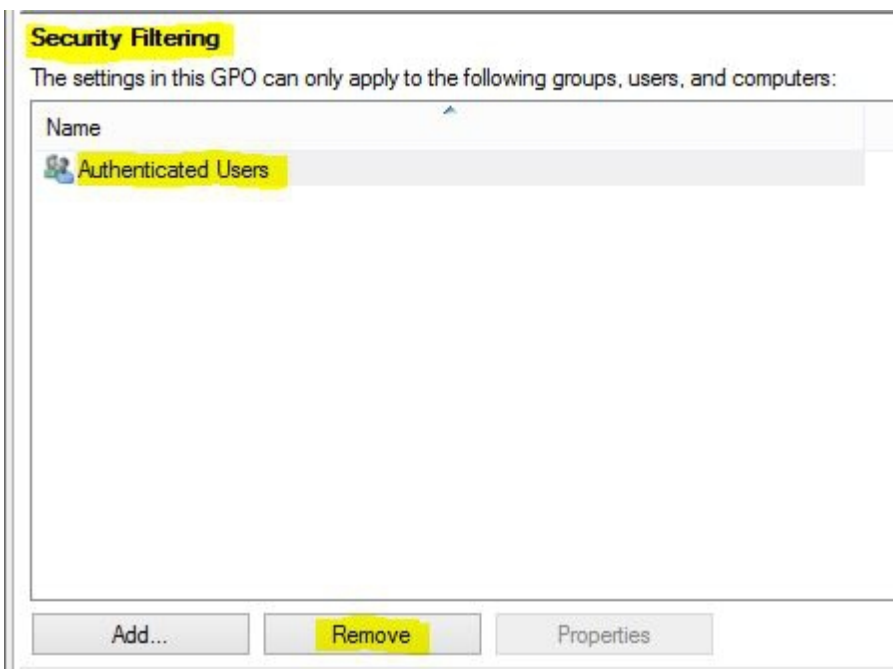
1. **Download** the MSI version of the SQCpack install, i.e. **sqcpack_7.0_setup.msi**. If you need help obtaining the MSI version of the SQCpack install, please contact [PQ Systems Application Support](#). Group Policy installs need the MSI version of the SQCpack install, not the EXE version.
2. **Create a distribution point.** In order to publish the SQCpack install, you must create a distribution point on a computer (typically a server) in your network. Create a network shared folder and give *Authenticated Users* *read* rights to the share and *read* rights to the underlying folder. You can give the share and folder any name you like, but we will use "GPO-Software-Installs" in this example. Copy the **sqcpack_7.0_setup.msi** file into the "GPO-Software-Installs" folder. Rename the **sqcpack_7.0_setup.msi** file so that it shows the full version of the SQCpack it contains, e.g. **sqcpack_7.0.15203.1_setup.msi**.
3. **Open Group Policy Management** from **Start > Administrative Tools > Group Policy Management**.

If it is not installed, go to *Server Manager* (also in Administrative tools) and go to the **Features** tab on the left-hand side and click **Add Features** in the pane on the right. Check the box in the new window that says *Group Policy Management*, and then click through the next few screens. *Group Policy Management* will install and then you can open it.

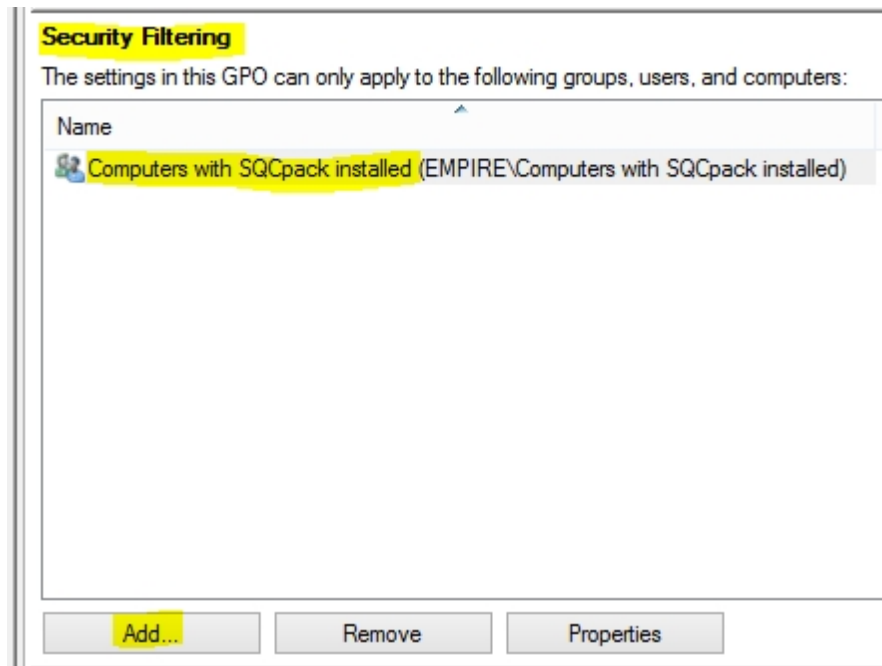
Follow these steps:



Create a new unlinked GPO by right-clicking on *Group Policy Objects* (shown above) and selecting **New**. For this example, we gave the new GPO the name *SQCpack Install*.

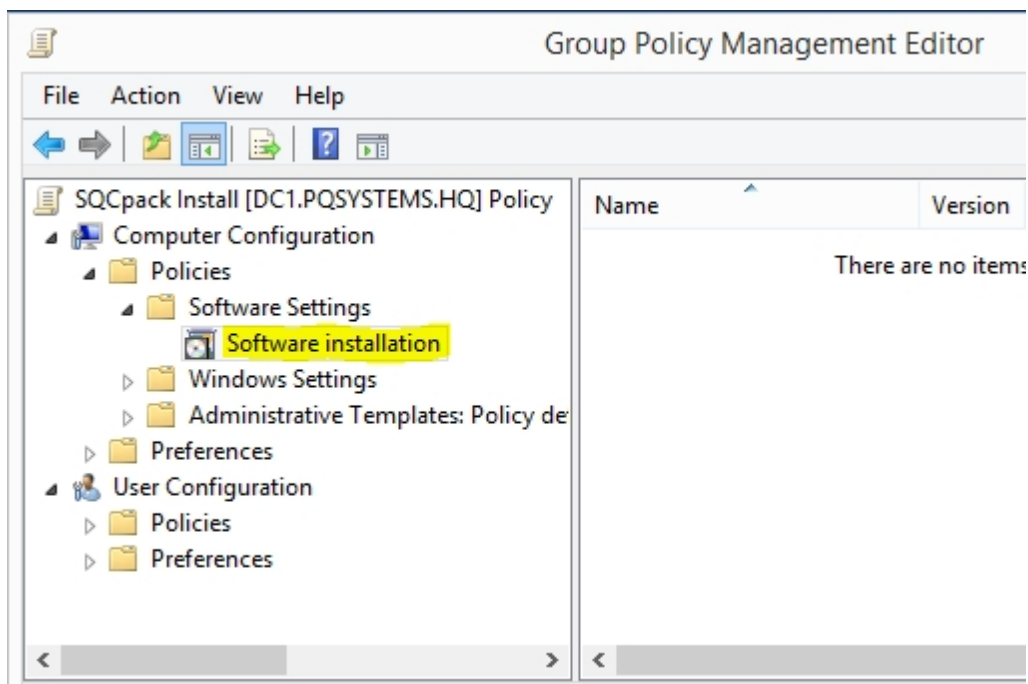


Select the *SQCpack Install* GPO in the left pane. In the right *Security Filtering* pane select *Authenticated Users* and click **Remove** (because we don't want SQCpack installed for every user in the domain).



Click the **Add** button to add the computers that will have SQCpack installed. You can either add individual computers or add an Active Directory group that contains the desired computer accounts. For this example, an Active Directory global security group named "*Computers with SQCpack installed*" will be used, as shown above. Thus, SQCpack will be installed and updated on all the computers in the "*Computers with SQCpack installed*" group.

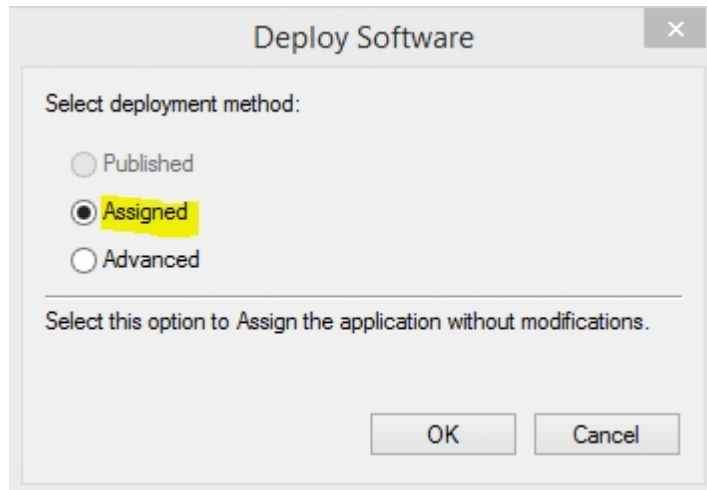
Right-click on the *SQCpack Install* GPO in the left pane and select **Edit**. The *Group Policy Management Editor* opens as shown below.




In the left pane, right-click on the *Software Installation* node and select **New > Package**. In the

file open dialog navigate to the distribution point share you created in step 1, select the SQCpack install MSI file (in this example it is named **sqcpack_7.0.15203.1_setup.msi**), and click **Open**.

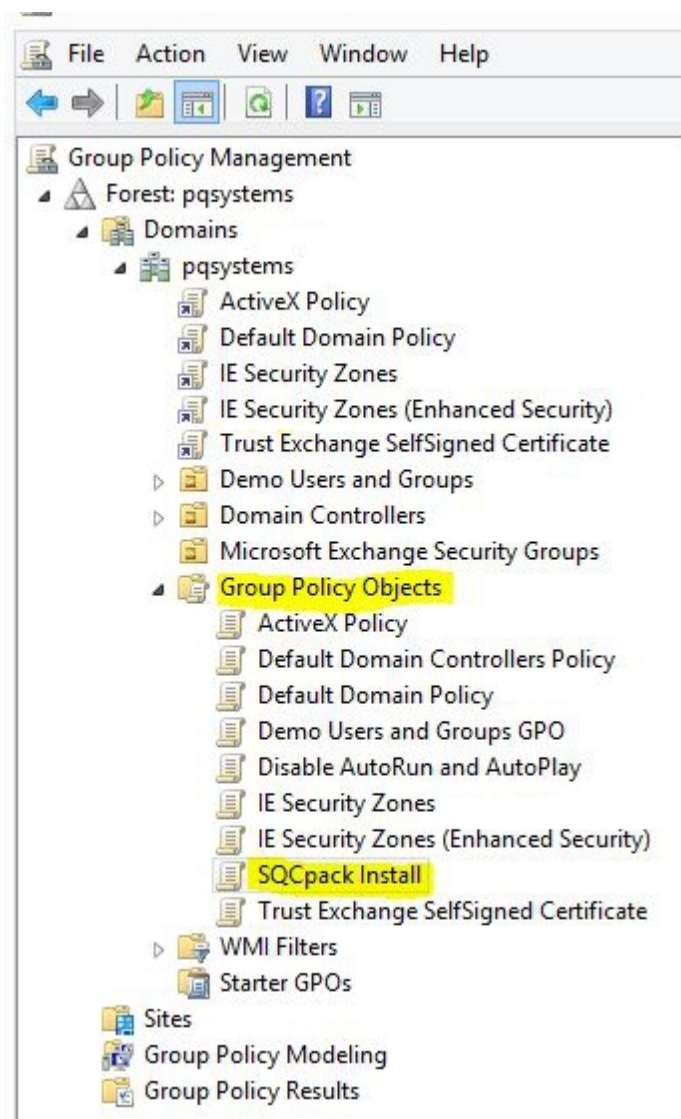
IMPORTANT: You must select the MSI install file via a UNC file path like **\ComputerName\ShareName\sqcpack_7.0.15203.1_setup.msi**, not via a drive letter like **C:\GPO-Software-Installs\sqcpack_7.0.15203.1_setup.msi**. If you use a drive letter, the remote install will fail.



Select the **Assigned** deployment method and click **OK**. Be patient, eventually the new package will appear in the right pane as shown below.

| Name | Version | Deployment state | Source |
|---|---------|------------------|---|
|  sqcpack_7.0.15203.1_setup | 7.0 | Assigned | \\BOBS\Public\Misc\GPO_Software\sqcpack_7.0.15203.1_setup.msi |

Close the *Group Policy Management Editor* window and return to the Group Policy Management window.



Select the Organizational Unit (OU) node in the left pane that identifies the computers that will have SQCpack installed. For this example, we will use the domain named **pqsystems** as the Organizational Unit. Right-click on the desired OU and select "**Link an existing GPO...**", then select the **SQCpack Install** GPO. **If you skip this step then SQCpack will not be installed on the target computers.**

Close the *Group Policy Management* window.

4. **Reboot each target computer where SQCpack will be installed.** It may take a couple of reboots before the target computer finally notices that SQCpack should be installed.

If you want to force the target computer to immediately recognize that SQCpack should be installed, then open a command window on the target computer and enter:

```
gpupdate /force /boot /logoff
```

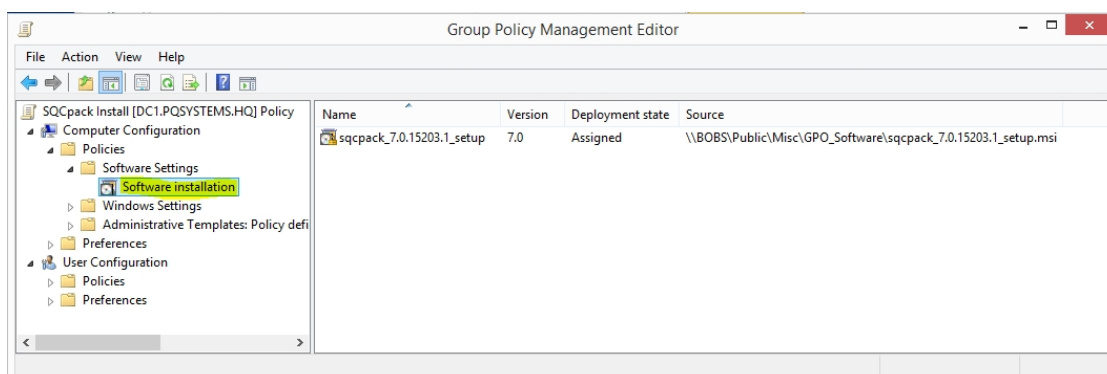
If you omit the **"/boot /logoff"** arguments you will be told when a reboot is needed and asked if you want to reboot now.

5. **INSTALLING UPDATES - When it is time to install an update to SQCpack**, follow these steps.

Place the MSI installation file for the new version of SQCpack in the distribution point share you created in step 1.

Open the *Group Policy Management* program, select the *SQCpack Install* GPO in the left pane, right-click and select **Edit**.

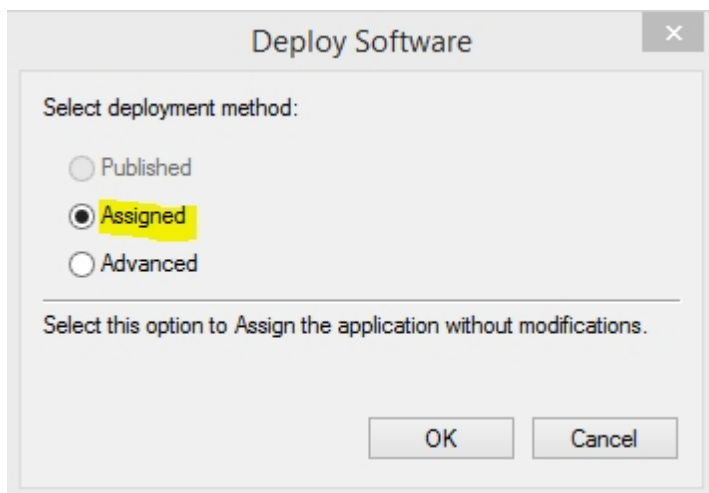
The *Group Policy Management Editor* opens as shown below.



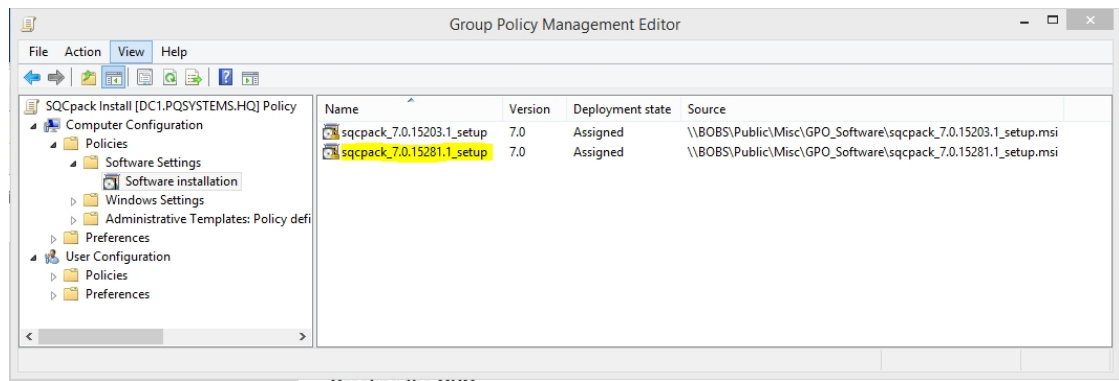
Navigate to the *Software installation* node in the left pane, then right-click and select **New > Package**.

In the file open dialog, navigate to the distribution point share you created in step 1, select the SQCpack install MSI file (in this example it is named **sqcpack_7.0.15281.1_setup.msi**), and click **Open**.

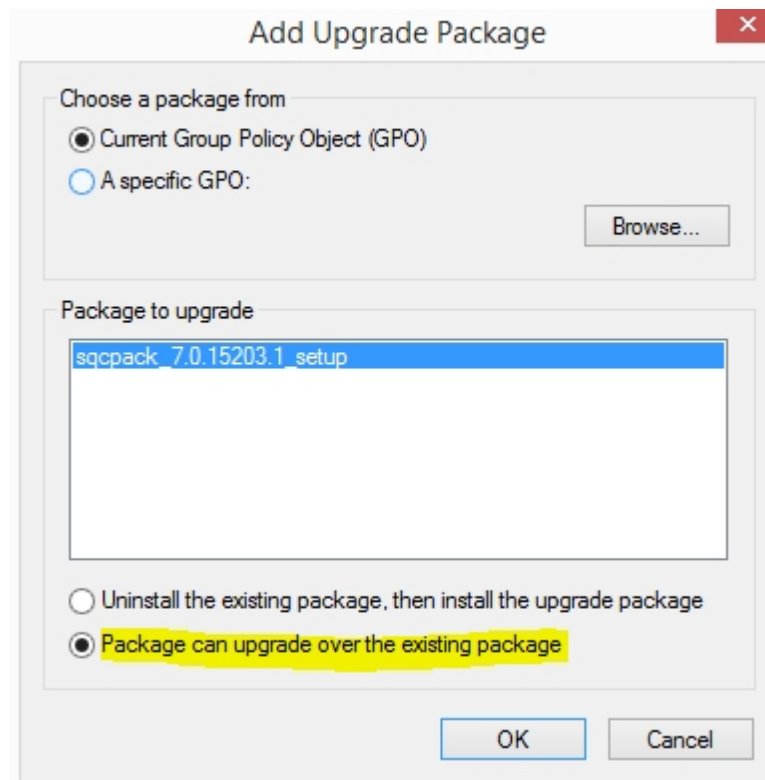
IMPORTANT: You must select the MSI install file via a UNC file path like `\ComputerName\ShareName\sqcpack_7.0.15281.1_setup.msi`, not via a drive letter like `C:\GPO-Software-Installs\sqcpack_7.0.15281.1_setup.msi`. If you use a drive letter, the remote install will fail.



Select the **Assigned** deployment method and click **OK**. Be patient, eventually the new package will appear in the right pane as shown below.

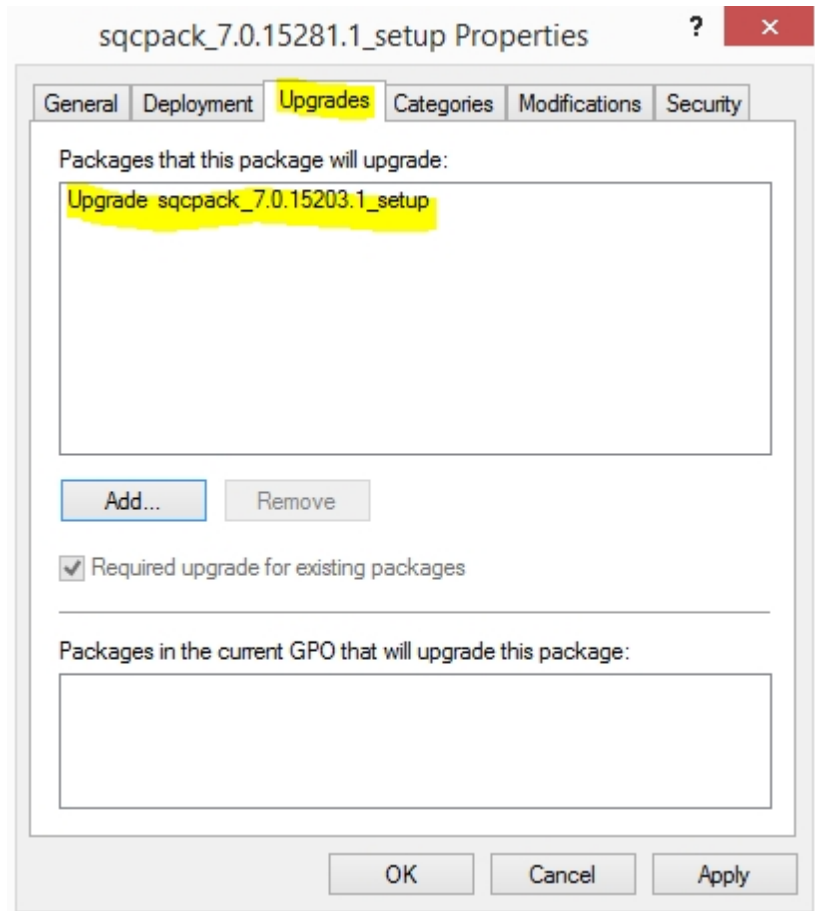


Right-click on the newly created package (**sqcpack_7.0.15281.1_setup** in the example above) and select **Properties**. Navigate to the **Upgrades** tab and click the **Add** button. The following window will appear.



For the **Package to upgrade** select the most recent SQCpack install (the one the target computers are currently running).

Select **Package can upgrade over the existing package**, then click **OK**.



Click **OK** to close the Properties window.

Close the *Group Policy Management Editor* window and the *Group Policy Management* window.

Reboot each target computer where SQCpack is installed. It may take a couple of reboots before the target computer finally notices that SQCpack should be upgraded.

If you want to force the target computer to immediately recognize that SQCpack should be upgraded, then open a command window on the target computer and enter:

```
gpupdat e / f o r c e / b o o t / l o g o f f
```

If you omit the **"/boot /logoff"** arguments you will be told when a reboot is needed and asked if you want to reboot now.

After the reboot, the updated version of SQCpack should be present on the target computer.

Resources on using Group Policy to install software

- [Group Policy Software Deployment \(redgate article\)](#) - Start reading at **Saving to Share**.
- [Installing software using GPO \(YouTube video\)](#)

Managing the software license

SQCpack can be licensed in a variety of ways.

Per-computer (workstation) license: This type of license allows you to install SQCpack on one computer. Both perpetual and subscription per-computer licenses are available.

SQCpack concurrent-user license: Concurrent-user licenses, also called floating licenses or flexible-use licenses, allow customers to install SQCpack on terminal servers, Citrix servers, or an unlimited number of computers. A license server meters usage of SQCpack, enabling no more than the licensed number of users to run the software simultaneously. The concurrent-user license model offers the following advantages to enterprise customers:

- You install SQCpack on a terminal server or a Citrix server only once, rather than having to install it on many computers throughout your organization.
- The administration of license management is simple, since there is only one license number to purchase and renew.
- A concurrent-user license is economical, since it allows sharing of floating licenses among multiple users. This provides you with enterprise-wide software access at a reasonable cost.

How to activate a per-computer (workstation) license

Before you begin this procedure, you will need your License Number and Update Code in the SQCpack License Registration certificate or email.

To activate a per-computer (workstation) license:

1. Click **Activate License** in the **License** group of the SQCpack ribbon bar.

The **PQ Systems License Utility** dialog displays.

The screenshot shows the 'PQ Systems License Utility' dialog box. It is divided into two main sections. The top section, 'Current License Information', contains fields for 'Licensed To:', 'License Number: SQCN-A-DEMO-1-D83', 'Expires On: (YYYY-MM-DD)', and 'License File: C:\ProgramData\PQ Systems\SQCpack\7.0\SQCpack_A.L32'. The bottom section, 'Enter New License Information Here', contains fields for 'Licensed To:', 'License Number: SQCN - A - 1 -', 'Expires On: (YYYY-MM-DD)', and 'Update Code:'. At the bottom of the dialog are 'Update' and 'Exit' buttons.

2. Optionally enter your name or company name in the **Licensed To** field.
3. In the **License Number** field, enter the license number you received from PQ Systems.
4. In the **Expires On** field, enter your expiration date. A perpetual license will not have an expiration date.
5. In the **Update Code** field, enter your update code. You can copy the entire update code to the clipboard and paste it into the first *Update Code* field.
6. Click **Update**.

How to activate a concurrent-user license

A concurrent-user license, also called a floating license or flexible-use license, allows customers to install

SQCpack on terminal servers, Citrix servers, or an unlimited number of computers. A license server meters usage of SQCpack, enabling no more than the licensed number of users to simultaneously run the software.

Summarized instructions for activating a concurrent-user license can be [found here](#).

Detailed instructions for activating a concurrent-user license can be [found here](#) in the **PQ Systems License Manager Installation and Administration Guide**.

Please contact [PQ Systems application support](#) if you have any questions or need help with setting up your concurrent-user license.

Deployment considerations for Alerting features

The **Alerting** features of SQCpack are handled by a background utility program called the **Alerting Service**. The Alerting Service is implemented differently depending on whether the currently open SQCpack database is a single-user database or a multi-user database.

Single-user database - When a single-user database is open, the **Local Alerting Service** is automatically run as a background task by SQCpack, the CMM Integration utility, or the Fixtures utility. The local Alerting Service automatically stops when it is no longer needed by SQCpack, CMM Integration, or Fixtures. A single-user database works well when you are evaluating SQCpack and learning how to use the program and the alerting features, but a multi-user database should be used for production work after you progress past the demo and learning phase. See [Why you should use a multi-user database](#).

Multi-user database - In order for Alerting to work with a multi-user database, it is necessary to install and configure a **Master Alerting Service** on a *single* computer in your network. The Master Alerting Service runs as a Windows service on this computer and is responsible for evaluating the active alerts in your multi-user database(s) and sending notification messages when alert signal conditions are detected. See [Installing the Master Alerting Service](#).

Installing the Master Alerting Service

Select the computer that will host the Master Alerting Service

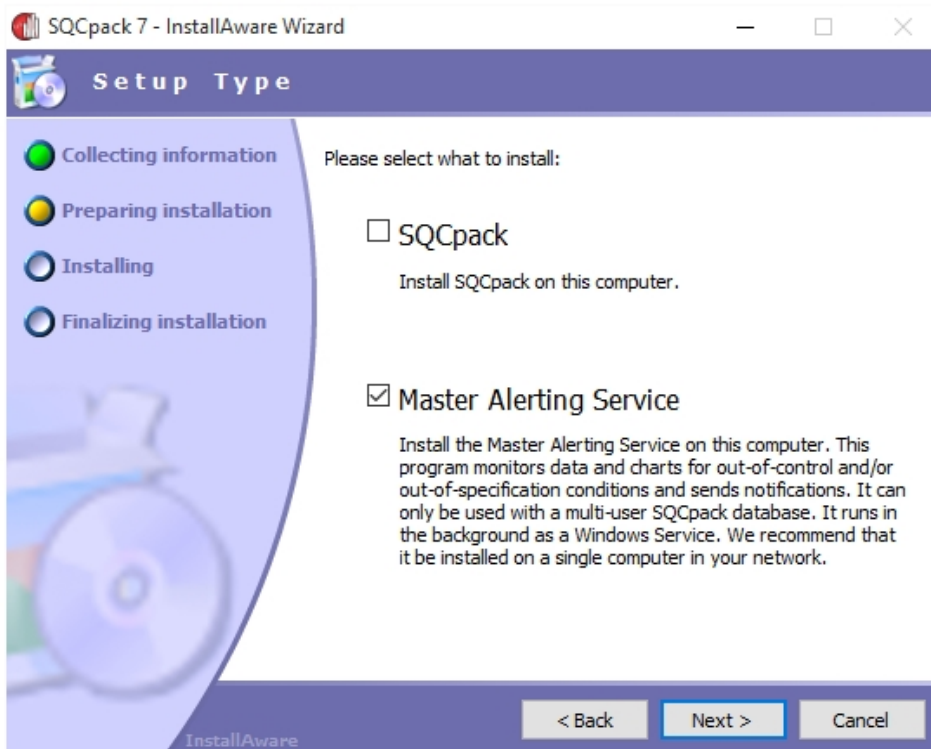
In order for Alerting to work with alerts that are defined in a multi-user database, it is necessary to install and configure a Master Alerting Service on a single computer in your network. The Master Alerting Service runs as a Windows service on this computer and is responsible for evaluating the active alerts in your multi-user SQCpack database(s) and sending notification messages when alert signal conditions are detected.

It is *strongly* recommended that the computer where the Master Alert Service is installed have a static IP address. Each instance of SQCpack in your network needs to be able to establish an IP connection to the Master Alerting Service. This can be challenging when the Master Alerting Service computer has a dynamic IP address.

Typically the Master Alerting Service runs 24/7 on this computer so that it is always available to evaluate new data for signal conditions and send notification messages. Remember that if the Master Alerting Service computer is not running, then no alerting will take place.

Install the Master Alerting Service

Run the EXE version of the SQCpack install program (the MSI version is a silent install and doesn't have an option to install the Master Alerting Service). During the install the following window will allow you to install the Master Alerting Service:



On the computer where you install the Master Alerting Service, you can also install SQCpack if you desire (assuming that SQCpack is properly licensed on that computer).

The Master Alerting Service neither consumes nor requires an SQCpack license.

After the Master Alerting Service is installed, please continue by following the instructions in **Master-Alerting-Service-Installation.pdf**. This file can be found in the following location:

64-bit operating system

C:\Program Files (x86)\PQ Systems\SQCpack 7\MasterAlertingService\Master-Alerting-Service-Installation.pdf

32-bit operating system

C:\Program Files\PQ Systems\SQCpack 7\MasterAlertingService\Master-Alerting-Service-Installation.pdf

Introduction to SQCpack

This section contains topics that provide you with an introduction to SQCpack.

What is SQCpack used for?

SQCpack software helps with data management and work tasks related to statistical process control and quality improvement. Statistical process control, (SPC), is a collection of statistical charts and tools to help monitor, understand, and improve key metrics related to the quality of a product, process, or service. The SPC approach has been in use for decades and is well proven. To be competitive today, organizations must actively engage in understanding and improving the quality of their products and services.

Two important functions of SQCpack are data management and visual intelligence.

Data management

Before you can improve something, you must be able to measure it. To help collect and store these measurements, SQCpack provides a robust and flexible data management system. It allows organizations

to define, manage, and store data for quality metrics in a way that reflects their unique work processes. It also provides administrative capabilities such as managing system users, user permissions, and data segregation tools that are important in multi-location enterprise deployments.

Visual intelligence

At the center of the SPC approach is a set of statistical charts. SQCpack provides a full complement of SPC charts. More importantly, it provides tools for efficiently managing and monitoring large numbers and varieties of these charts. This allows many different users, each with differing needs, to gain the benefits of understanding important quality data in easy-to-find and easy-to-consume visual form. Building this quality-related visual intelligence among employees is a key part of the quality improvement journey.

Important SQCpack concepts and terminology

SQCpack database

SQCpack stores data in a database. When running SQCpack, your work is being saved in the *current* SQCpack database. You will typically not be aware of or need to know about the database. In most deployments, data will be stored in a single database; however, SQCpack supports having more than one database if needed. The database used by SQCpack is **Microsoft SQL Server**. The SQCpack database is typically deployed on a server computer (although a workstation computer can be used if desired), so users in different locations access the same SQCpack database.

SQCpack users

SQCpack manages a list of users. SQCpack can be set up to require users to login with names with or without passwords. If you decide not to require user login, everyone who is running SQCpack is doing so in the name of the **admin** user who has full permissions.

User roles

SQCpack allows you to define *user roles*. Think of this as a named set of permissions. For example, you might define a role named **Data Entry**. Next, you might define a user named **Fred** and put him into the Data Entry role. The Data Entry role can be defined so that users in this role are limited to performing only data entry and restricted from other SQCpack options.

Data groups

SQCpack allows you to create, modify, enter data into, and delete data groups. Think of a data group as a named collection of data columns that are related in some way. For example, you might create a data group named **Bicycle, Part 1234**. It might contain these columns: Manufacturing Date, Model Number, Front Wheel Diameter, and Back Wheel Diameter. This data group has four columns. Manufacturing Date and Model Number are called **Identifiers**. Front Wheel Diameter and Back Wheel Diameter are called **Measurements**. Data groups may contain different combinations of Identifiers, Measurements, Counts, and Calculated columns. Define data groups to reflect your specific work processes and quality metrics.

Alerting

An alert definition sends an email, a SQCpack message, or a text message to one or more persons when out-of-spec or out-of-control conditions are detected. Alert definitions may be based on data flowing into SQCpack data groups. They may also be based on SQCpack charts that look at data flowing into systems outside of SQCpack. Each alert definition specifies one or more charts that will be monitored for out-of-control and/or out-of-spec conditions.

Data entry configuration

SQCpack allows you to define named configurations that determine how the data entry editor behaves. Each data group specifies which data entry configuration will be used when editing that group's data.

Charts

SQCpack allows you to create, modify, view, and delete chart definitions. A chart definition has a name, a chart type, a data source, and a collection of settings for customizing the chart details. Some chart

definitions are created automatically. For example, when you create a data group, a chart will automatically be created for each measurement and count column. Other chart definitions are created by users to perform specific types of analysis. A chart definition may be created so that it gets data from a SQCpack data group. Alternatively, chart definitions may be defined in such a way that their data comes from an external data source like an Excel spreadsheet or an SQL Server database.

Reports

SQCpack allows you to create, modify, preview, and print reports. Reports typically contain tabular and/or statistical data summarizing many different quality metrics. Some reports are created by SQCpack, but others may be defined and fully customized to present the information you need.

Certificate of analysis

SQCpack allows you to [create a Certificate of Analysis](#) for a data group. Your [Certificate of Analysis](#) may be fully customized to present the information you need to send to a specific customer.

Divisions

SQCpack may be deployed across multiple locations that all share a database. In this scenario, the list of data groups and list of charts can be quite large. To help segregate this data, you may define named divisions. For example, you might create a division for Michigan and a division for Ohio. As you create groups and charts, you can classify them as belonging either to the Ohio division or the Michigan division. Next, you may classify your users as associated with either the Ohio or the Michigan division. When the Ohio user is running SQCpack, he or she will see and be aware of only the Ohio data. The same will be true for the Michigan user.

Categories

Categories are another way to segregate data. When creating groups, charts, or reports, you may classify them as belonging in zero or more categories. For example, if you are making a painted part for Ford, the data group, charts, and/or reports may be categorized as painted and Ford. Later, when looking at a list, users can sort and/or filter the list based on these categories.

Choice lists

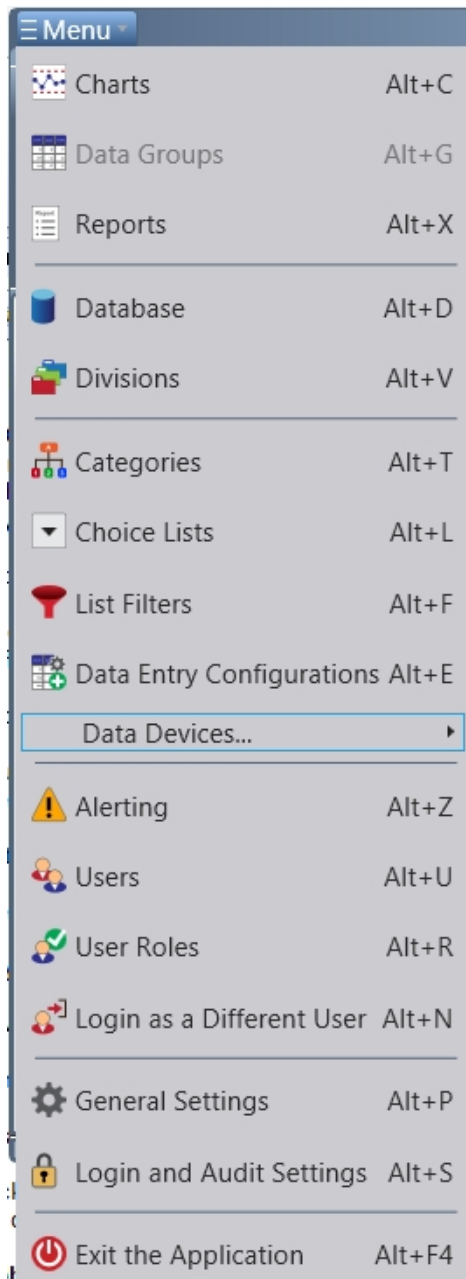
You may define your own named choice lists to help with data entry throughout the program. For example, imagine that you work with 20 different known part names. If these are in a choice list, the user can select these from a combo box during data entry. This saves typing and ensures consistent entry of data for later analysis.

List filters

The SQCpack database is able to store large quantities of data. For example, we know of users who have thousands of groups and thousands of charts. To make it easier and faster to find what you are looking for, you may define named list filters. For example, you might create a list filter that says *show groups only where the category equals 'production'*. While looking at the list of groups, you may apply this filter to reduce the size of the list quickly, making things easier and faster to find.

Navigation menu

To move from one view to another in SQCpack, use the navigation menu. This is always located in the upper left corner of the screen.



Clicking on this displays a list of the other screens you may wish to use. Note that the contents of the navigation menu will vary based on the current user permissions. The admin user will see all of the options but a data entry user may have fewer options.

Ribbon bar

Throughout SQCpack, the region at the top of the screen contains a ribbon bar. This bar includes buttons. The selection of available buttons changes as you navigate to different views. Arrow scroll buttons will appear on either side of the ribbon bar if any buttons are not visible due to the size of the window. Buttons in the ribbon bar often affect the currently selected item in the work area below.

Finder and Finder tabs

The main work area of SQCpack contains a tabbed user interface below the ribbon bar. As you display charts or open groups for data entry, additional tabs will open in this area. Clicking on any tab will bring it to the front of the list of tabs. The tab on the far left in this area is named the **Finder**. The Finder tab cannot be closed. It contains one of three lists: the list of data groups, the list of charts, or the list of reports. The finder is the main place in the interface where you select SQCpack items (such as charts or groups) to work with.

Description of important SQCpack workflows

SQCpack allows users to perform a large number of workflows. In this section, we introduce a few of the most important ones to help you plan for your deployment.

Creating the SQCpack database

When SQCpack is first installed, it will default to using a sample database. This is useful for exploring SQCpack, experimenting, and learning about SQCpack features. However, once you start using SQCpack for production data, you will create a new database.

Creating a new database should be undertaken infrequently. Typically, you will do this only once early in your use of SQCpack.

To create a new database, select **Database Settings** from the navigation menu. For more detailed explanations, see the topic [Getting started with your own SQCpack database](#).

Create a user role

Early in your deployment of SQCpack, some planning should be done to consider the types of users who will be using SQCpack and what permissions they will need to do their work effectively. The special user named **admin** will always have full permissions. Consider three possible user roles:

- 1) admin users (who can do everything)
- 2) supervisor users (who can do most things)
- 3) restricted users (who are limited to do only what they need)

To manage user roles, select **User Roles** from the navigation menu. Add, edit, and delete named roles as needed. Remember that later that each defined user will belong to one or more user roles and this will determine their permissions within SQCpack.

Create a user

From the navigation menu, select **Users** to manage your list of SQCpack users. See detailed instructions in [Getting started with your own SQCpack database](#).

Create a data group

A data group is a named collection of related data columns. Data groups are the main containers for data you gather, monitor, and chart in order to improve quality. Data groups may contain columns that are defined as **identifiers, measurements, counts, or calculated columns**. Once a data group has been defined, you may open it for data entry. During data entry, rows of data are added to a spreadsheet view. The data group can be thought of as the *definition* for this data entry spreadsheet.

There are many ways to organize data into data groups. Some processes will require a group with many columns. Others may require a data group with only a few columns. Generally, a data group should reflect a natural point of data collection in your work process, and it should contain columns for all the data gathered at that work location.

From the navigation menu, select **Data Groups** to see your list of groups. Use the **New** button to create a new data group.

Display a chart

One of the most important things you will do with SQCpack is to display a chart, in order to think about what you see and decide if a response is required. Each time you view a chart in SQCpack, it can show you the most current data it knows about. This allows you to stay aware of the status of important quality metrics throughout your work day.

Charts are displayed in tabs in SQCpack. You may have multiple chart tabs open at a time, allowing you to switch quickly between different charts.

To display a chart, select **Charts** from the navigation menu. When the chart list is displayed, sort or filter the list to find the chart you seek quickly. Select the chart, then click the **Display** button in the ribbon. When you are finished viewing a chart, click the **X** button in the upper right corner of the chart tab. Note that some charts may be defined as chart groups, multi-charts, or StatBoards. These will show in the list like any other chart but may render multiple charts when displayed. See [Chart filters](#).

Enter new data

SQCpack allows you to enter data for any data group. Once a data group has been defined, you may *open* the data group for data entry. This presents a tab containing a grid style data entry form. During a typical data entry session, you will add rows to this grid. While adding new data, you may view a real-time control chart that can be displayed on the data entry form. Additionally, during data entry, you may be prompted about out-of-control and/or out-of-specification conditions.

Select **Data Groups** from the navigation menu to see the list of data groups in the Finder. Select a data group and then click the **Enter Data** button in the ribbon bar. This opens a tab for data entry. When you are finished, click the 'x' button in the upper right corner of the tab to close the data entry tab.

Create a chart

SQCpack allows you to create charts based on data you enter into SQCpack data groups. It also allows you to create charts based on data that lives outside of SQCpack. For example, you may have data in an Excel spreadsheet or a different SQL Server database that you want SQCpack to present as an SPC chart that can be viewed easily in SQCpack.

To create a new chart, you will use the **new chart wizard**. The new chart wizard guides you through three easy-to-follow steps that will result in a new chart.

From the navigation menu, select **Charts**. Next, click on the new button to create a new chart. In step 1, select the type of chart you want. In step 2, select the data source for the chart. In step 3, select specific columns for your chart. When you click the Finish button, your new chart will be displayed. Use the **Edit** button to begin customizing the chart. Read more about this process in [Creating and customizing charts](#).

Migrating from earlier SQCpack versions

If you are using a previous version of SQCpack, specifically SQCpack version 6.5, data groups and charts have already been defined in that SQCpack database. This data can migrate into the new SQCpack. For a detailed explanation of the import process see the section [Importing data from SQCpack 6.5](#).

To begin an import of SQCpack 6.5 data, select **Data Groups** from the navigation menu. Next, select **Import from SQCpack 6.5** under the **Data** button in the ribbon bar. Click **Browse** to select a SQCpack 6.5 database, select the groups you wish to import, then click **Import**.

If you are migrating from an earlier version of SQCpack 7.0 or higher, it is important to be aware of changes to the SQCpack database schema. Schema refers to the collection of tables and columns which make up the database. Once a database is *migrated* to the newest schema, it is important that all SQCpack users sharing a database, are running the same new version of SQCpack. For this reason, it can be important to plan for and select a cutover date where all users sharing a database will start using the new SQCpack on the same date. When SQCpack opens a database, it checks to see if the database needs to be converted to a new schema. If so, it will inform the user and present options about how to proceed.

Migrating from CHARTrunner versions

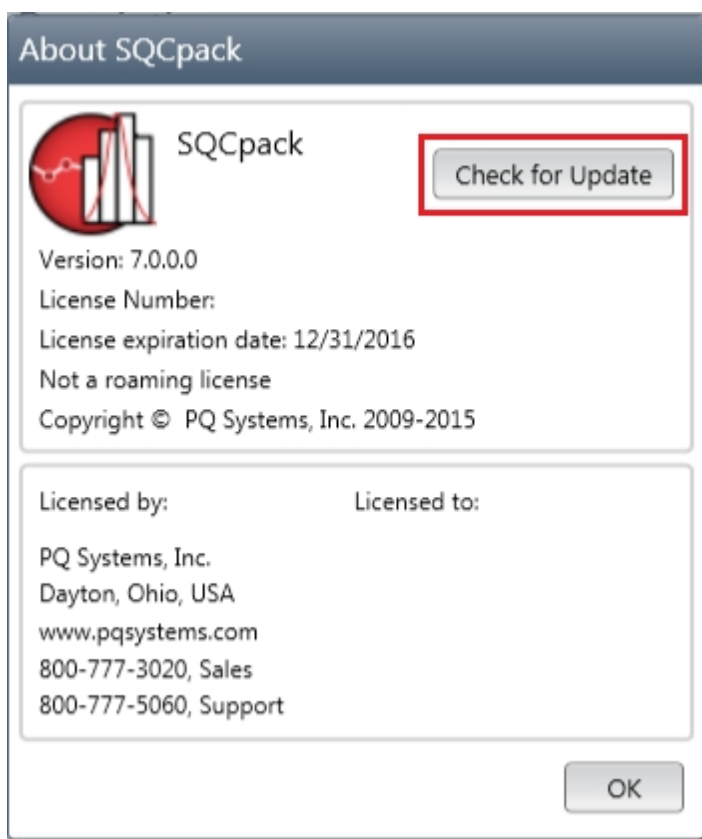
If you are currently using CHARTrunner (or CHARTrunner Lean), your chart definitions may be imported into SQCpack. In fact, SQCpack is the migration path for upgrading from CHARTrunner. SQCpack has most of the same charting functionality as CHARTrunner, in addition to its data management features.

From the navigation menu, select **Charts**. Click the **Import Chart** button in the ribbon bar. Select the CHARTrunner (or CHARTrunner Lean) charts you wish to import.

For more details on importing from CHARTrunner, see this section: [Importing chart definitions from CHARTrunner Lean and CHARTrunner](#)

Maintenance updates and major upgrades

SQCpack periodically checks for a newer version. If one is available, a popup message will briefly appear on your computer desktop. Click on the popup message for more information about the newer version of SQCpack. You may also check if a new version is available by clicking the **About** button located in the ribbon, and then clicking the **Check for Update** button. If an update is available, the [Software updating](#) dialog will appear.



The SQCpack version number is composed of these four sections:

Major.Minor.Build.Revision (e.g. 7.0.15213.1)

Maintenance update

When the Major.Minor of the version number doesn't change, it is a maintenance update.

A maintenance update is available at no cost. Typically bug fixes are included, but no new features are included in a maintenance update.

Major version upgrade

When the Major.Minor of the version number increases, it is a major version upgrade.

A major version update is available to you only if are currently under a [maintenance agreement](#).

Often a major upgrade will include database schema changes that are incompatible with the prior version. If you want to install a major version upgrade, during your evaluation of the new version it is best to only use the sample database, a single-user database, or a new multi-user database specifically for the new upgrade version of SQCpack.

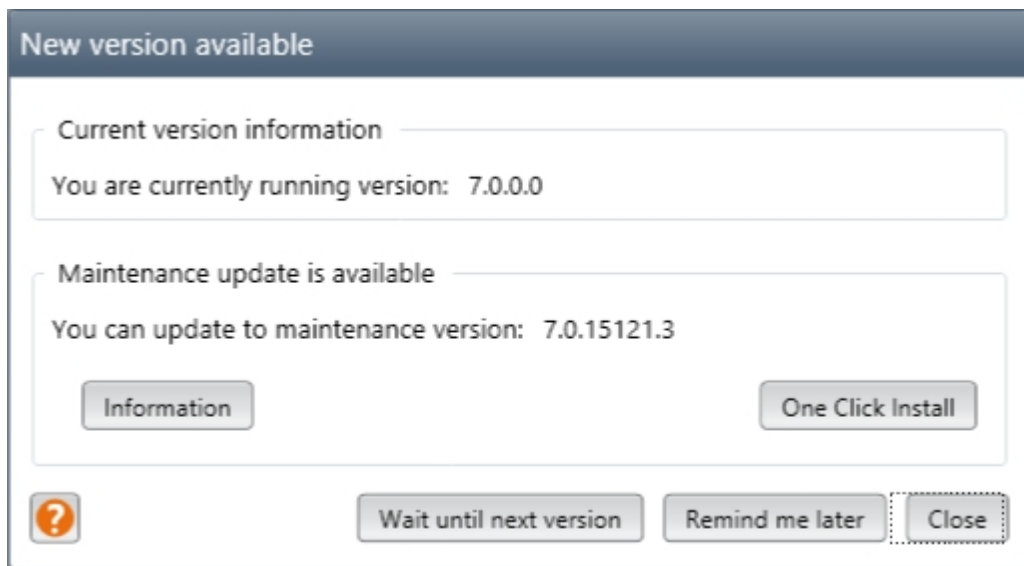
Contact [PQ Systems application support](#) if you have any questions about upgrading to a new major version of SQCpack.

Software updating

SQCpack periodically checks for updates. If an update is available a pop-up message appears to alert you. If you click on the pop-up message, the **New Version Available** dialog appears (as shown below).

To manually check for an update, open the **Help > About** dialog and click the **Check for Update** button.

The following dialog is used to update SQCpack:



The difference between maintenance updates and major updates is discussed in [Maintenance updates and major upgrades](#).

Information - Display the [software updates](#) page on the PQ Systems website. Here you can download the installation file for the update and learn what have been made.

One Click Install - Click this button to begin an automatic download and installation of the maintenance update or major upgrade.

Wait until next version - Click this button to close the dialog and not remind you about the displayed maintenance update and/or major upgrade again.

Remind me later - Click this button to close the dialog and remind you about the displayed maintenance update and/or major upgrade at a later time.

Learning with the sample database

This section contains some learning topics you can work through using the sample database that comes with SQCpack.

Start SQCpack and open a sample database

The first time you run SQCpack, on a PC where it has never been installed, it will automatically open a sample database. The sample database contains data groups, charts, and other information so that you can learn about and explore SQCpack features before you start with your own database.

If SQCpack has been previously installed on the PC, it may start either with no database open or with one of your previous databases open. In this case, select **Database** from the navigation menu. This displays the database settings view where you can open the sample database.

The sample database is a single-user database that is typically found in the following location:

C:\Program Files (x86)\PQ Systems\SQCpack 7\SampleData\SampleDatabase.mdf

Use the hyperlink for **Open a single-user SQCpack database** to open the sample database.

Admin user's password

The sample database by default does not have user logins enabled. If you decide to enable user logins, the default password for the admin user is **admin**.

Caution: After you review the sample database, but **before** you start creating data groups, entering data, and creating charts, be sure **to create your own production database**.

A common scenario is that first time users start adding production data into the sample database. For information about creating your own production database, review the general topic [Getting started with your own database](#).

More specifically, PQ encourages you to create a multi-user database for your production database. You can read about the details in the topic [Why you should use a multi-user database](#).

Review sample charts

From the navigation menu, select **Charts**. This will display the Finder tab and the list of charts (in the sample database) will be displayed.

If you select one chart, by clicking on it, and then click the **Display** button in the ribbon bar, the chart will be displayed in a new tab. To close the chart, click on the **X** in the upper right corner of the tab for this chart. Display and explore several other charts in the list to get a feel for different chart options. Note that you can display a chart by **double-clicking** the chart in the list **or** by using the Display button in the ribbon bar.

Next, display any sample chart. Leave the chart open but click on the **Finder tab**. Now, display a different chart. Notice that you now have two chart tabs open. You can continue this process and get several chart tabs open at the same time. This allows you to quickly switch among several open charts.

Close any charts you have open. On the Finder tab, focus on the list of charts. Next, click on the column header for **Name**. Click on **Name** a second time. You will notice a triangle pointing up or down. This indicates that the list is sorted by this column name. You can do this with **any** column heading in the chart list. Try this out on several columns. As your list of charts gets longer, this feature can help you zero in on the chart you are looking for.

Next, find the **Search in list** box above the chart list. Type the word *Health* into this box. Notice that the list of charts has become much shorter. SQCpack has filtered the list to show only charts where the word *Health* appears. Next, click the **Clear** button next to the search box. This clears your search criteria and refreshes the chart list to show all the charts. This is a powerful way to zero in on the chart you are looking for. It can also be used in the data groups list.

Next, find the combo-box for **Filter**. From the filter combo-box, select the filter named **General Division**. This will filter the list so that only charts classified as belonging to the **General Division** will be shown. This

feature allows you to define named filters that limit the contents of your list. This filter uses the division, but other filters might use chart name, chart type, description, or combinations of these to limit the contents of your list. Click the **Clear** button to restore the full list.

From this section, you have learned how to display charts and have also used some features of the chart list. To learn more about charts, here are some selected topics:

[Supported chart types - overview](#)

[The new chart wizard](#)

[The chart editing process](#)

[Create a chart using data external to SQCpack](#)

[Working with multiple charts](#)

Review sample data groups

From the navigation menu, select **Data Groups**. This will display the Finder tab. The list of data groups (in the sample database) will be displayed.

Select the data group named **A26 – Tapered Spacer**, by clicking once on it. Next, click the **Enter Data** button in the ribbon bar. The data entry form for this data group will open in a new tab. To close the data entry form, click on the **X** in the upper right corner of the tab. Do the same thing to explore several of the groups in the finder list. You will notice that each group shows a different set of columns in the data entry form. A data group is set of related columns for which you gather and enter data at the same time.

Open any group for data entry. Next, click back on the **Finder** tab. Now select a *different* data group by clicking to select it, then clicking the **Enter Data** button in the ribbon bar. Now you have **two** tabs visible, and each one is a data entry view for a different group. This demonstrates that you may have many groups open at the same time for data entry. Clicking the appropriate tab allows you to easily switch among different data groups.

Close any data entry tabs you have open. On the finder tab, focus on the list of data groups. Click once and then a second time on each column heading. You will see a triangle pointing up or down. This indicates how the list is sorted. You may sort on any visible column. This can help you to zero in on the data group you want to work with. Your preferences for how this list is sorted will be remembered from session to session.

Next, find the **Search in list** box above the data group list. Type the word *Health* into this box. Notice that the list of data groups has become much shorter. SQCpack has filtered the list to show only data groups where the word *Health* appears. Next, click the **Clear** button next to the search box. This clears your search criteria and refreshes the data group list to show all the groups. This is a powerful way to zero in on the data group you are looking for. It can also be used in the charts list.

Next, find the combo-box for **Filter**. From the filter combo-box, select the filter named **General Division**. This will filter the list so that only data groups classified as belonging to the **General Division** will be shown. This feature allows you to define named filters that limit the contents of your list. This filter uses the division, but other filters might use name, description, category, or combinations of these to limit the contents of your list. Click the **Clear** button to restore the full list.

To create a new data group, use the **New** button in the ribbon bar. This process is covered in other topics.

From this section, you have learned how to open a data group for data entry and have also seen some features of the data group list. To learn more about data groups, here are some selected topics:

[The primary SQCpack objects](#)

[Create an SQCpack data group](#)

[Enter data into an SQCpack data group](#)

[Reference - Creating and customizing data groups](#)

[Reference – The data entry process](#)

[Reference – Importing data into SQCpack](#)

Entering data

Part of working with SQCpack is **entering data** for quality metrics that you are measuring, monitoring, and trying to improve. The data entry process revolves around a data group. A data group has a name and contains a collection of related columns for storing data. The columns might be related, based on a product you produce or some step in your process where you measure related metrics.

A data group may consist of some combination of these types of columns:

Identifiers – such as Date, Shift, Operator name, Part number

Measurements – such as Length, Diameter, Weight

Counts – such as Number of errors, Number of complaints

Calculated - value calculated from other columns

From the navigation menu, select **Data Groups**. This displays a list of data groups. **Double click** on any data group to open it for data entry. The data entry view is displayed in a new tab in the work area.

The data entry view consists of three sections: 1) the data entry grid (upper left), 2) the chart (upper right) and 3) the notification area (bottom).

To enter data, type numbers into the data grid in the upper left. This is a spreadsheet-like grid which allows you to add new rows of data at the bottom and edit existing rows by moving around among the cells.

As you enter data into the grid, the chart on the right will be updated to reflect the data you enter. If the group contains multiple measurements or multiple counts, the chart will change as you move from one column into another in the data entry grid. For example, when you are in the Length column, the chart for Length will be displayed. When you are in the Number of Errors column, the chart for Number of errors will be displayed. As you move from row to row, the data you enter is automatically saved – so you never need to explicitly save what you have typed.

Each time you run SQCpack, you do so in the context of a SQCpack **User**, and each user operates in the context of a **User Role**. Depending on your **User Role**, you will have different permissions throughout SQCpack. For example, you may be able to view data in the data entry view but not be able to change the data.

Once you are finished with a data entry view, click the **X** to close the tab.

From this section, you have learned how to open a data group for data entry and begin entering data. To learn more data groups and entering data, explore these topics:

[Create an SQCpack data group](#)

[Reference – The data entry process](#)

[Reference - Creating and customizing data groups](#)

[Customizing the data entry experience](#)

[Create a data entry configuration](#)

Basic chart customization

In an earlier topic, we learned how to display any chart and work with the list of charts. In this topic, we'll discuss how to make basic changes to a chart.

From the navigation menu, select **Charts**. This will display the Finder tab, and the list of charts (in the sample database) will be displayed. Find the chart named **North line only**. Double click on this chart to display it in a new tab.

To make changes to any chart, we must **Edit** the chart. In the ribbon bar, click on the **Edit** button. This does

two things: 1) it puts the chart into edit mode and 2) displays the **Chart Editor**.

The Chart Editor is shown to the right of any chart. It contains two tabs: 1) Properties and 2) Styles. Within these tabs are a collection of **edit panels**. Each edit panel allows you to change some property or some style of the chart being displayed/edited. When you have finished making changes, click on the **Exit Edit** button in the ribbon bar. Do this now to see the effect. This will close the chart editor and put the chart back in full display mode.

Next, click on **Edit Chart** again, to make changes. In the chart editor, expand the **Display Options** edit panel by clicking on the down triangle. This exposes several properties that you may want to change. Check the box for **Horizontal grid lines**. You will notice that the chart is now showing horizontal lines. Check the box for **Vertical grid lines**. Now the chart should also show vertical grid lines.

Something else to notice is the chart name that is displayed in the tab above the chart. The name is now preceded by an **asterisk** character. This is an indication that the chart is “dirty.” In other words, the chart has been changed but the changes have not yet been saved. Click the **Save** button to save these changes.

There are many properties and styles you may customize for each chart. Put the chart into edit mode and expand each of the edit panels. Explore and experiment with these properties. Keep in mind that edit panels change based on chart type. For example, there are different edit panels for a Histogram than for a Pareto chart. However, the basic editing process you worked through above remains the same for all chart types.

From this section, you have learned how to make basic changes to a chart using the chart editing process. Here are other topics that will help you work with charts:

[Reference – Creating and customizing charts](#)

[The new chart wizard](#)

[Supported chart types - overview](#)

Getting started with your own database

This section contains important information regarding creating and using your SQCpack database.

Why you should use a multi-user database

When you are ready to create a production database, we recommend that you create a multi-user database

On the Database form are options for creating either **single-user** or **multi-user** SQCpack databases. Both types of databases are stored in Microsoft SQL Server.

- A **single-user** database uses Microsoft SQL Server Express 2014 LocalDB (which is installed during the SQCpack installation).
- A **multi-user** database uses Microsoft SQL Server 2008 or higher. The free [Microsoft SQL Server Express](#) may be used if you do not already own SQL Server. See [Installing SQL Server Express](#) for information on how to install SQL Server Express on a computer in your organization.

A **single-user** SQCpack database has the following limitations, that are not present with a **multi-user** database. To avoid these limitations, we recommend that a **single-user** database be used only for evaluation purposes and not for production purposes.

- A **single-user** database can be used only on the computer where SQCpack is installed. A **single-user** database is really a **single-computer** database. **You should never create a single-user database on a network share with the**

hope that you will be able to open the database from multiple computers - It will not work reliably.

- Since a **single-user** database can be used only on the computer where the database lives, the only way to perform a backup of the database is to install the backup software on that computer. In that scenario, you have to deal with questions such as, "Who is responsible for ensuring the backups are done?", and "Where are the backups going to be stored?" If SQCpack is installed on multiple computers, you must deal with these backup questions for each computer.
- Performing a backup of a **multi-user** database is much easier. If you are using the non-Express version of SQL Server, your SQL Server administrator can instruct SQL Server to perform automatic backups of your database. If you are using SQL Server Express, you can purchase inexpensive backup software to perform automatic scheduled backups (see [Establish your database backup plan](#) for more information).

If you would like some help getting SQL Server Express installed in your organization, please [contact PQ Systems application support](#).

When you could use a single-user database for production purposes

There is one scenario, described below, where it may make sense to use a **single-user** database for production purposes.

If the following conditions are all true, it would be reasonable to use a **single-user** database:

- SQCpack will be used on a **single** computer. It doesn't matter if different people will use SQCpack on that one computer. The main consideration is that SQCpack is used on only one computer. The **single-user** database will reside on this one computer.
- You can install backup software for SQL Server on this one computer (we have had good results using [this backup software](#)). Ideally, the backup software should run automatically each day and store the backup on a different computer. Don't store the backup on the same computer unless the entire computer is being regularly backed up to another location. You want to be able to get to your backup even if the entire computer is destroyed. See [Establish your database backup plan](#) for more information.

Installing SQL Server Express

You can use the free Express edition of Microsoft SQL Server to host your SQCpack **multi-user** database(s).

Limitations of the Express edition: Microsoft SQL Server Express 2014 supports 1 physical processor, 1 GB maximum memory for the *buffer cache*, and 10 GB maximum storage per database. If you find that any of these limitations become a problem with your use of SQCpack in your organization, then you may need to purchase a SQL Server license that does not have these limitations.

Any version of SQL Server Express 2008 or higher may be used. The following instructions assume that SQL Server Express 2014 will be installed. The instructions for SQL Server Express 2012 are very similar.

Decide where to install SQL Server Express

The computer on which you install SQL Server must be running during periods when SQCpack is being used. It must also be running when the backup of SQL Server is performed. Typically, this computer is running all the time.

If there is a Windows Server computer where you can install SQL Server Express, this is usually a good choice. If not, you can install SQL Server Express on a non-server computer that has sufficient resources to handle SQL Server Express.

Requirements for the computer where SQL Server Express 2014 is installed

Expand the **System Requirements** section [here](#) for Microsoft's recommended computer system requirements for running SQL Server Express 2014. Microsoft recommends a minimum of 512MB of RAM - in PQ's opinion that is rather low and we recommended at least 2GB of RAM (more is better).

The **computer where SQL Server Express is hosted should have a static DNS address** so that other computers that are running SQCpack can reliably connect to the SQL Server computer. Contact your IT department to arrange for the SQL Server host computer to have a static IP address.

If the SQL Server host computer has a dynamic IP address, you may run into problems when your DNS system gets out of date with the dynamic IP address assigned by DHCP. The result is that computers running SQCpack cannot connect to the SQCpack database.

Installing SQL Server Express 2014

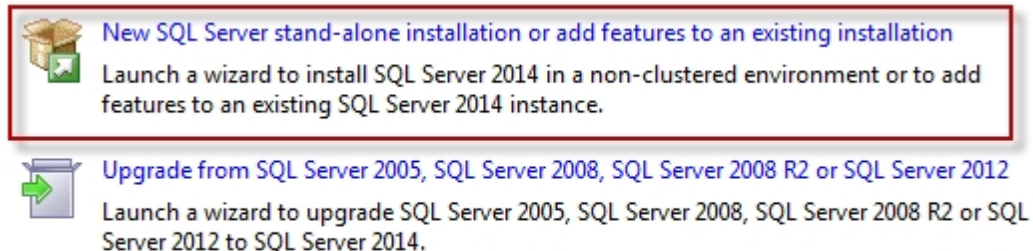
You can download the install for SQL Server Express 2014 [from here](#).

Ensure that you select the "**ExpressAndTools**" version, which includes SQL Server Management Studio Express.

Download the 32-bit version of the install program if you are running a 32-bit operating system; otherwise, download the 64-bit version. Save the install file to your Desktop so that you can easily find it after the download completes. Or save it to the location of your choice.

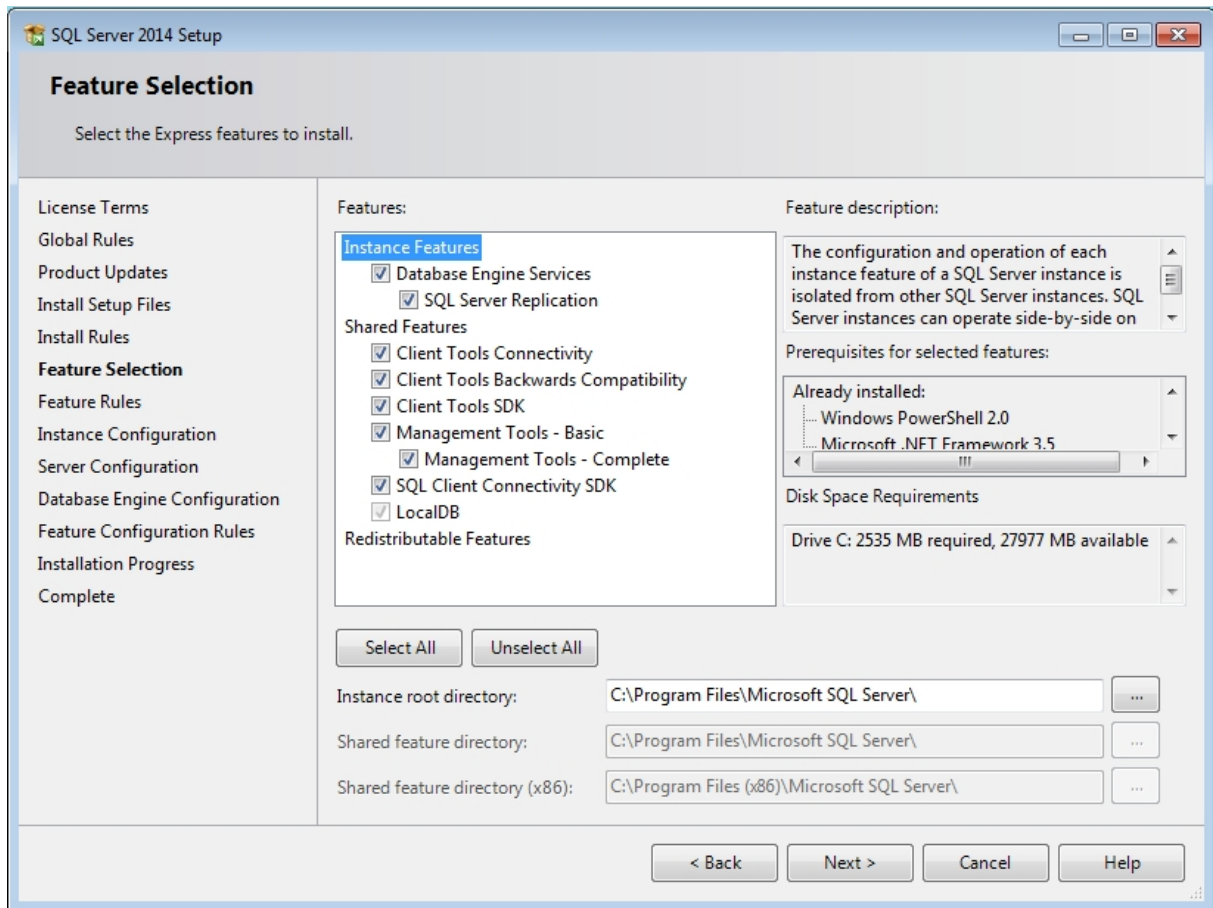
Run the install program that you have downloaded.

Confirm that you want to run the install. You can accept the default for the location into which to extract the installation files. Be patient; this can take some time.

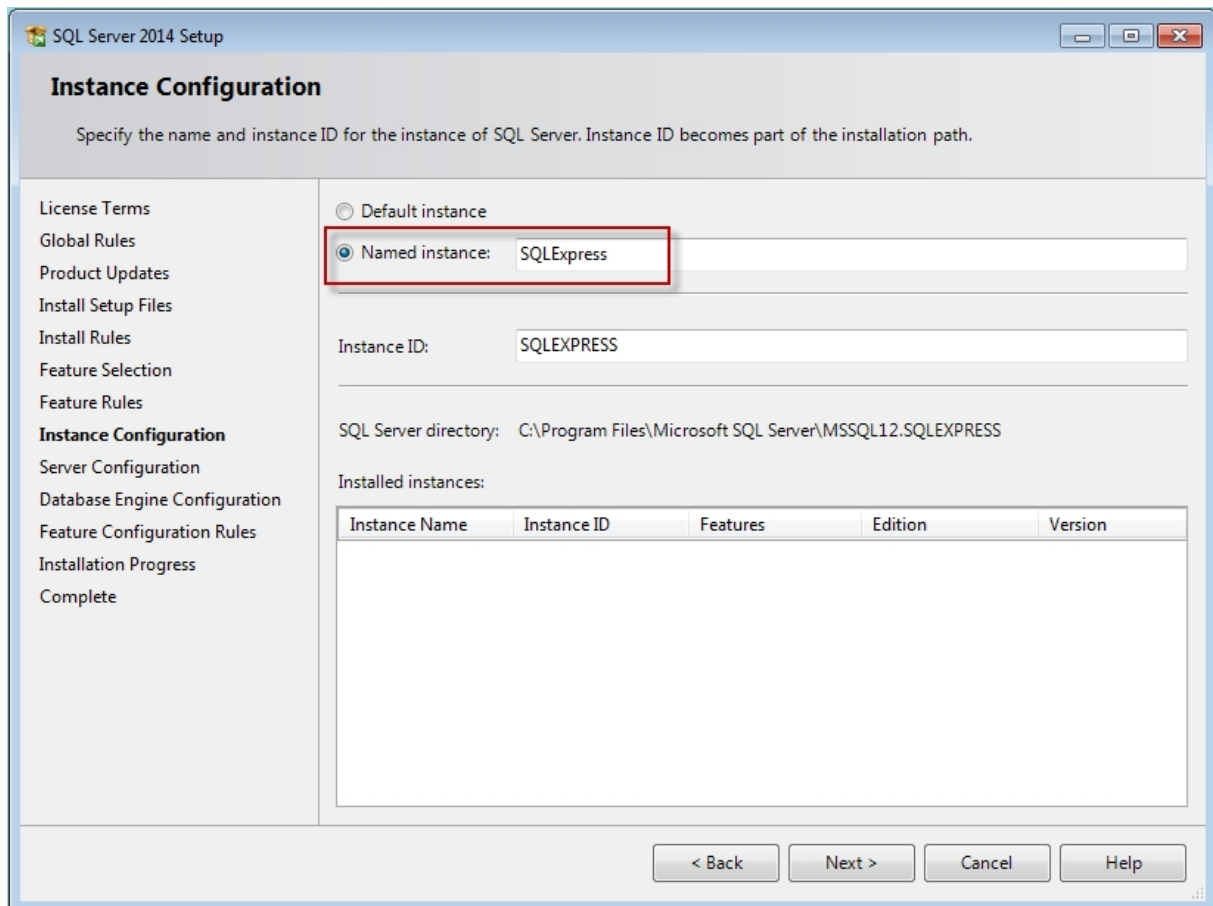


Select the choice for a **New SQL Server stand-alone installation**, as shown above.

Accept the license terms and click **Next**.

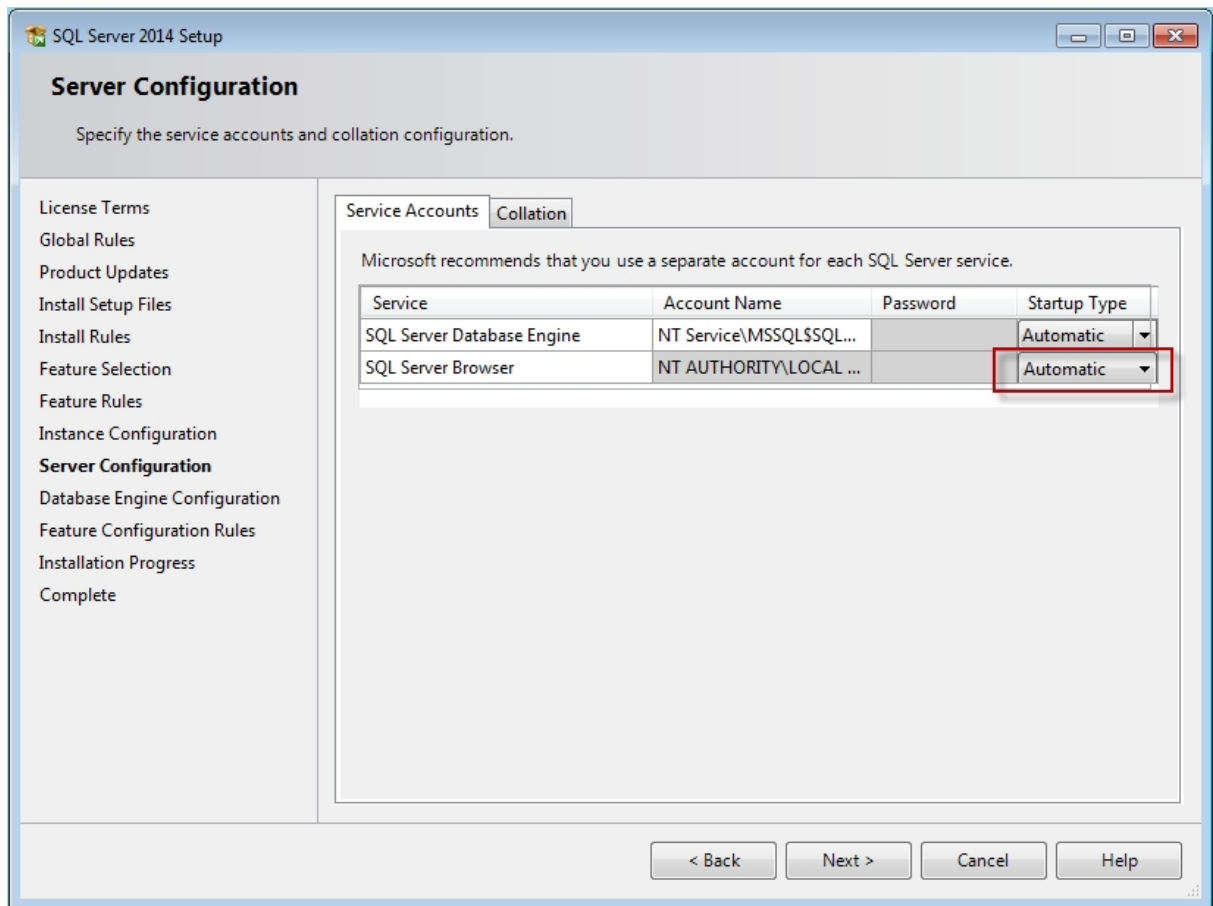


On the **Feature Selection** dialog, you can take the defaults as shown above.



Next, the **Instance Configuration** dialog appears as shown above.

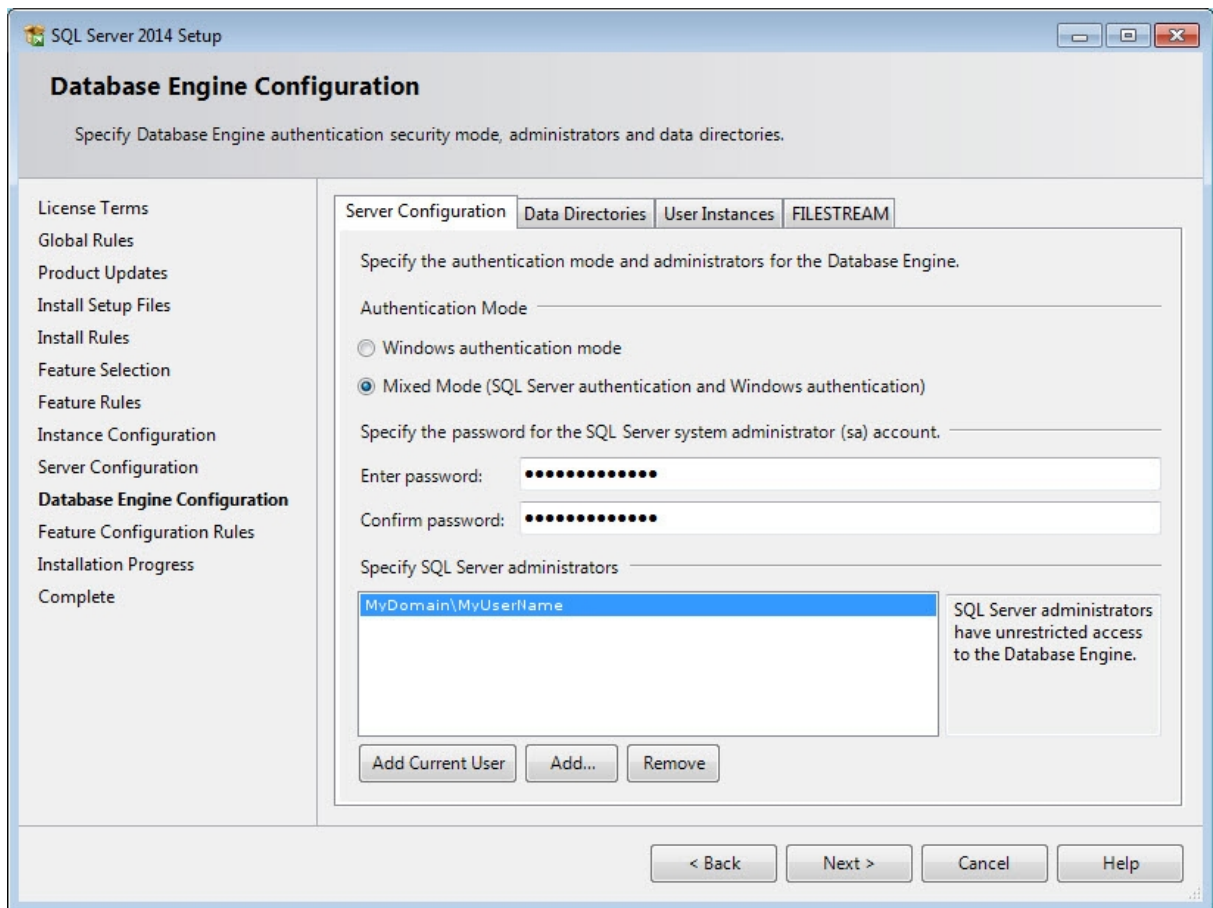
We recommend that you take the default instance name of "SQLEXPRESS," unless you have a reason to want to use a different instance name. Click the **Next >** button.



Next, the **Server Configuration** dialog appears as shown above.

Change the **Startup Type** for **SQL Server Browser** to **Automatic**. You want **SQL Server Browser** to start automatically when Windows starts, in order to help other computers in the network to find this instance of SQL Server.

Click the **Next >** button.



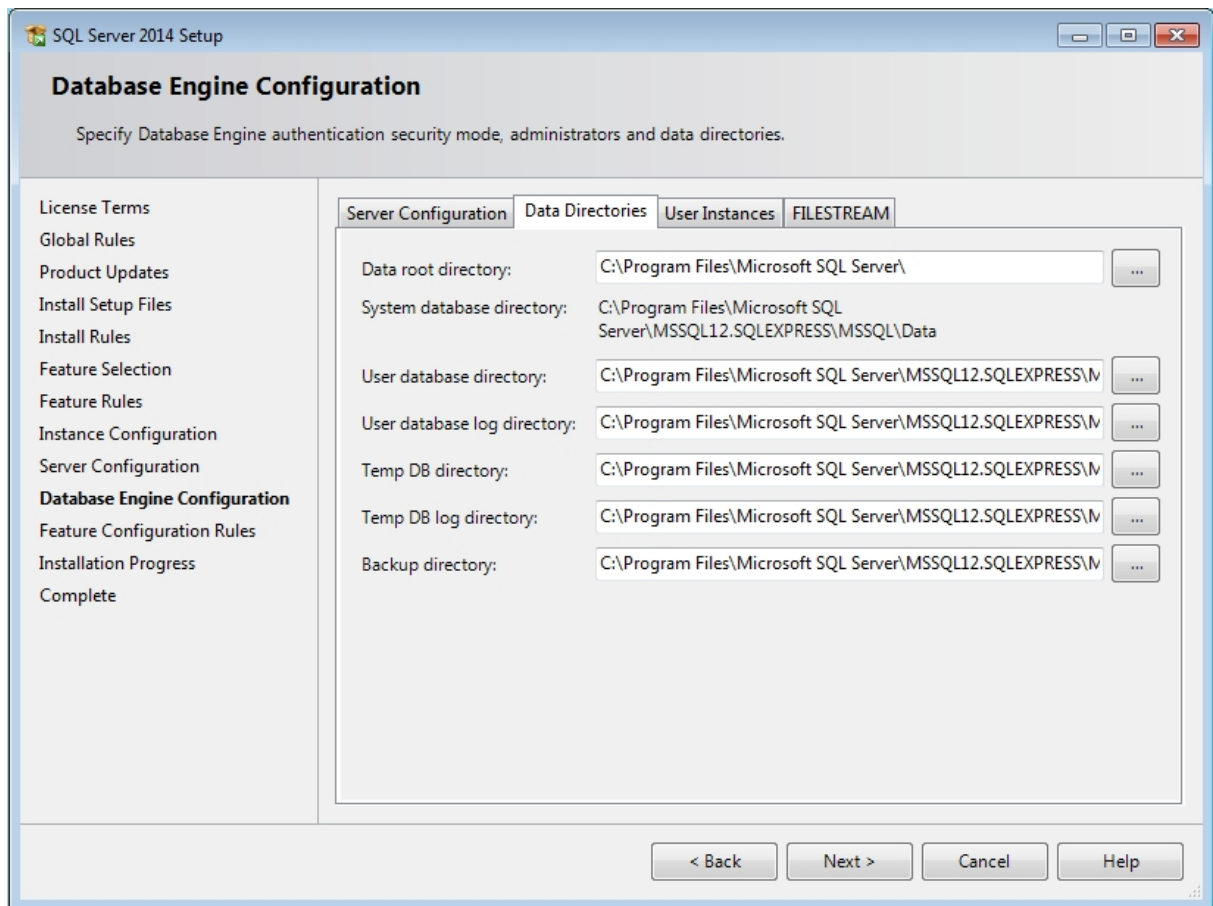
Next, the **Database Engine Configuration** dialog appears as shown above.

Select **Mixed Mode** for the **Authentication Mode**.

In the **Enter password** and **Confirm password** fields, enter the password that will be assigned to the **sa** user. The **sa** user is the SQL Server administrator account that has full privileges for this SQL Server. We recommend using a strong (i.e. complex) password of at least 20 characters (longer is better, you can use up to 128 characters). Store the password in a secure location, such as a password storage application. If you don't have a password storage program, we like using the free [Password Safe](#). Password Safe can be used to create a strong password of any desired length.

Under **Specify SQL Server administrators**, the install software will already have added the Windows account of the user who is performing the installation. Add additional users as needed. These accounts will authenticate to SQL Server using **Windows authentication mode**.

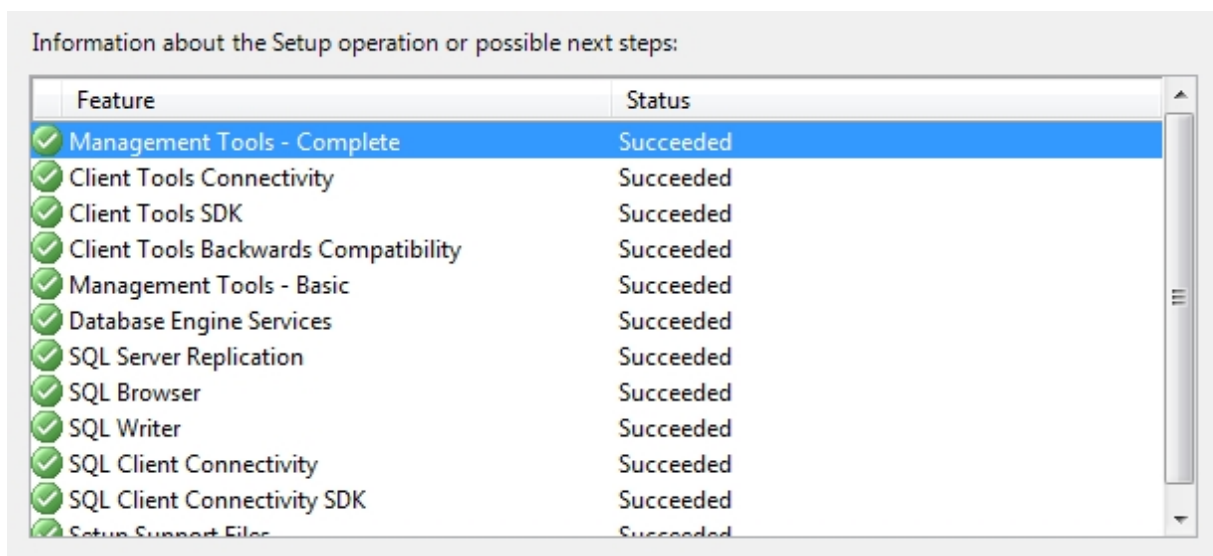
Click on the **Data Directories** tab.



Change the **Data root directory** if you want to store the SQL Server database files in a different location.

The database files should be stored on a fast disk with sufficient free space to allow your SQCpack database(s) to grow.

Click the **Next >** button. Installation of SQL Server will start and can take some time, so go get something to drink and be patient.



When the installation completes, you should have a Succeeded status for all installed features, as shown above.

Next steps:

[Configure SQL Server](#)

[Create a new database](#)

[Setup SQL Server security](#)

[Establish your database backup plan](#)

[Login, user roles, and users](#)

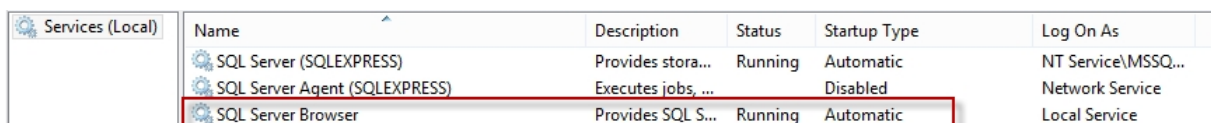
Configure SQL Server

Typically, the person who performs the following steps must be a member of the **sysadmin** SQL Server role (typically someone in your IT department or the person who installed SQL Server Express if that's what you are using).

Setup the SQL Server Browser service for automatic startup

The SQL Browser Service helps client computers locate running instances of SQL Server.

If the SQL Browser Service is not running, the drop-down list of available SQL Server instances in SQL Server Management Studio, or in SQCpack, will not include any instances on this computer.



| Name | Description | Status | Startup Type | Log On As |
|-------------------------------|--------------------|----------|--------------|--------------------|
| SQL Server (SQLEXPRESS) | Provides stora... | Running | Automatic | NT Service\MSSQ... |
| SQL Server Agent (SQLEXPRESS) | Executes jobs, ... | Disabled | Disabled | Network Service |
| SQL Server Browser | Provides SQL S... | Running | Automatic | Local Service |

Open the Services applet, start the SQL Server Browser service, and set the Startup Type to **Automatic**.

Configure SQL Server to allow connections via the TCP/IP network protocol

Configure this with **SQL Server Configuration Manager** as explained in [this article](#) under *Enable Protocols*.

Set Up SQL Server for SQL Server Authentication

Start SQL Server Management Studio, connect to the desired SQL Server, and open the properties of the server node, as shown below.

Script ▾ Help

Server authentication

☐ Windows Authentication mode

☒ SQL Server and Windows Authentication mode

Login auditing

☐ None

☒ Failed logins only

☐ Successful logins only

☐ Both failed and successful logins

Server proxy account

☐ Enable server proxy account

Proxy account: ...

Password:

Options

☐ Enable C2 audit tracing

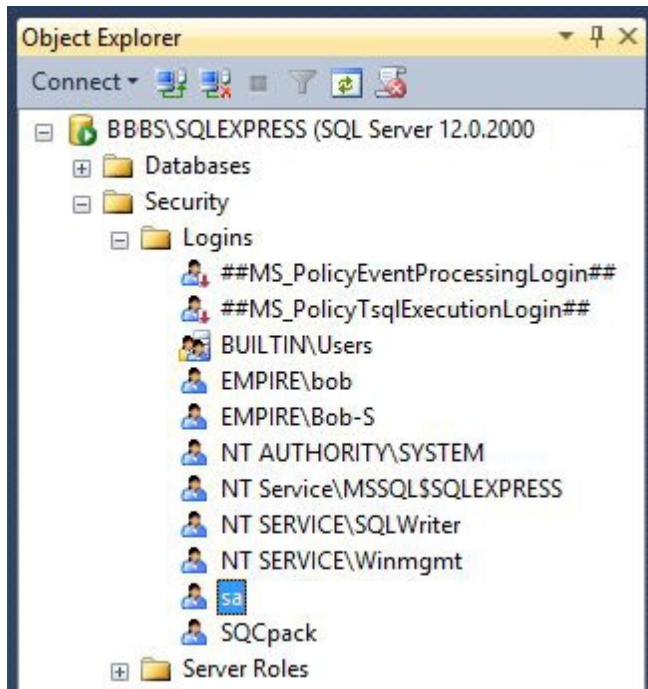
☐ Cross database ownership chaining

OK Cancel

Enable **SQL Server and Windows Authentication mode** as shown above.

Ensure that the sa account is secure

The **sa** account is the SQL Server system administrator account that is used when SQL Server Authentication is enabled.



Expand the **Logins** node, as shown above, and select the **sa** user. This user should have a secure password and the **Enforce password policy** should be enabled. Follow these instructions if changes are needed.

Right-click on the **sa** user and select **Properties** (or double-click on **sa**) and the **Login Properties** dialog opens.

In the **Enter password** and **Confirm password** fields, enter the password that will be assigned to the **sa** user. The **sa** user is the SQL Server administrator account that has full privileges for this SQL Server. We recommend using a strong (i.e. complex) password of at least 12 characters (longer is better; you can use up to 128 characters). Store the password in a secure location, such as a password storage application. If you don't have a password storage program we like using the free [Password Safe](#). Password Safe can be used to create a strong password of any desired length.

IMPORTANT: Ensure that **Enforce password policy** is selected. This causes SQL Server to lock the account after a number of failed login attempts. You definitely want the lockout behavior to be enforced. Password policy is determined by the computer's **Local Security Policy**, or the domain's **Domain Security Policy**, as [explained here](#).

Set the database recovery model

Each SQL Server database has a [Recovery model](#) that is set to either *Simple* or *Full*.

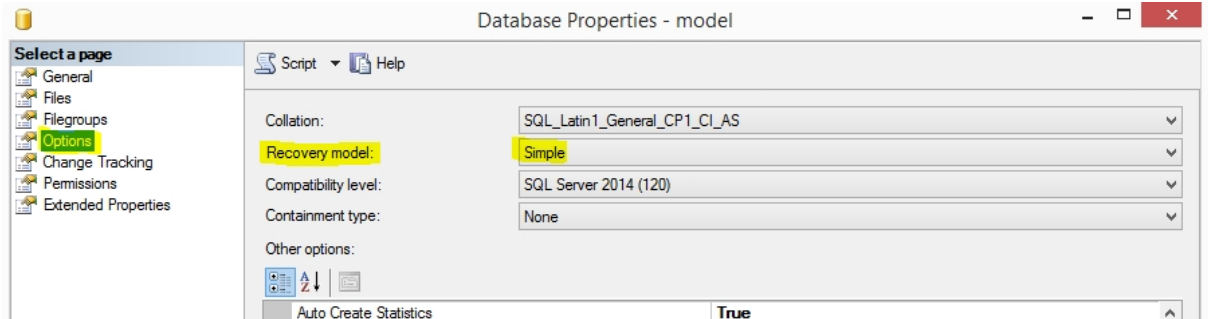
In general we recommend that your SQCpack database(s) use the *Simple* recovery model so that your database log file doesn't continue to increase in size until a database backup of the log file occurs.

Follow these steps to specify the *Simple* recovery model for a specific SQCpack database:

1. Start SQL Server Management Studio and connect to the SQL Server that hosts the SQCpack database.
2. Under the *Databases* node in Object Explorer, right-click on the SQCpack database and select *Properties*.
3. Select *Options* as shown below, and set the *Recovery model* to *Simple*.
4. Click *OK* to save your changes.

Follow these steps if you want the *Simple* recovery model to be the default for all newly created SQL Server databases:

1. Start SQL Server Management Studio and connect to the SQL Server that will host your SQCpack database(s).
2. Under the *System Databases* node in Object Explorer, right-click on the *model* database and select *Properties*.
3. Select *Options* as shown below, and set the *Recovery model* to *Simple*.
4. Click *OK* to save your changes.



Verify that SQCpack can connect to the SQL Server instance

Start SQCpack on a computer other than the one where SQL Server is installed. Select **Database** from the navigation menu. Click the **Create DBC file for connecting to a multi-user database** link. The **Create DBC file** dialog will open.

Click the drop-down arrow for the **Server Name** field. The SQL Server instance that you are configuring for SQCpack should appear in the list. If it does not, follow the advice [in this topic](#) to diagnose and fix the connection problem. Select the SQL Server instance that will host the SQCpack database.

For the authentication type, select Use Windows Authentication if the Windows account you are using is a member of the **sysadmin** SQL Server role. Otherwise, select SQL Server Authentication and enter the username and password for the sa user.

Select the **master** database (or any other existing database) from the drop-down list of database names.

Click the **Test Connection** button. You should see the "Connection was successful" message. If you don't, follow the advice [in this topic](#) to diagnose and fix the problem.

Click the **Cancel** button.

Next steps:

[Create a new database](#)

[Setup SQL Server security](#)

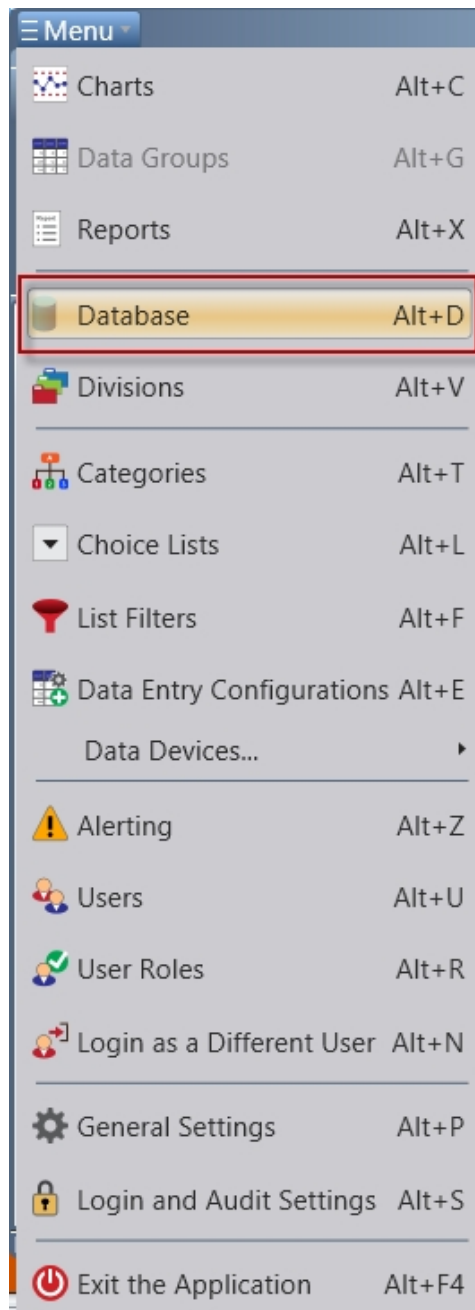
[Establish your database backup plan](#)

[Login, user roles, and users](#)

Create a new database

Typically, the person who performs the following steps must be a member of the **sysadmin** SQL Server role (typically someone in your IT department or the person who installed SQL Server Express if that's what you are using).

To create a new SQCpack database, select **Database** from the navigation menu.

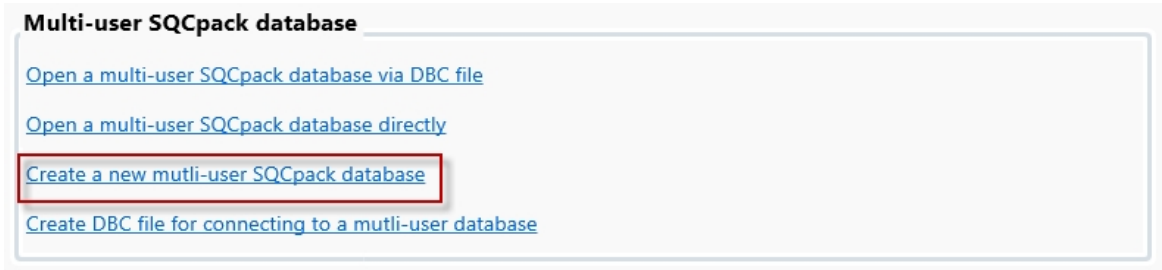


For the reasons [explained here](#), we recommend that you create a **multi-user** database for production work. The remainder of this topic assumes that you will create a new **multi-user** database, since this is the type of database recommended for a production database.

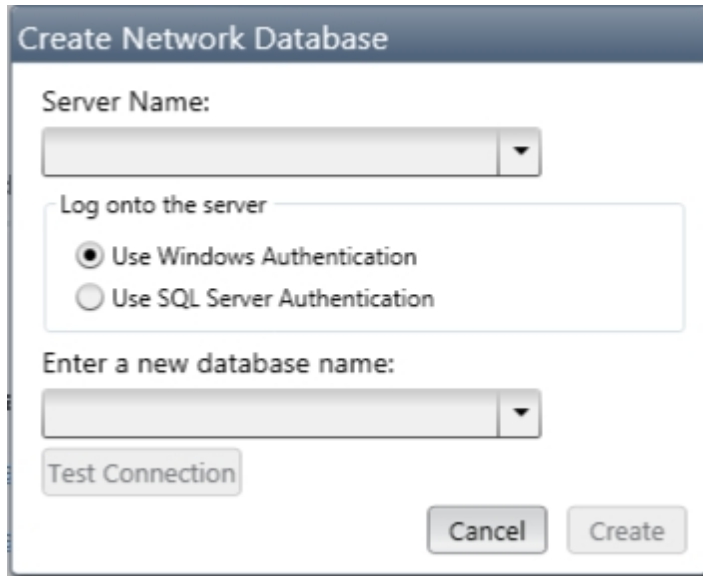
Whoever performs the next steps must have sufficient rights to create a new database on the SQL Server that will be used to host the **multi-user** database. Typically, this means that the person will be a member of the **sysadmin** server role and thus can create a new database.

If you are using SQL Server Express, then typically anyone who is a member of the administrators group on the computer where SQL Server Express is installed will be a member of the **sysadmin** server role and thus have sufficient SQL Server rights to create the new database.

If you are not using the Express version of SQL Server, then please contact the administrators of the SQL Server you intend to use or your IT department, and have them perform the following steps to create the new multi-user database on the chosen SQL Server.



On the Database dialog, navigate to the **multi-user** database area and click on **Create a new multi-user SQCpack database**.



In the **Server Name** field, enter the name of the SQL Server you will use to host the new SQCpack database. You can click the drop-down arrow to select from a list of available SQL Server instances.

Select to authenticate, using either **Windows Authentication** (your Windows login credentials are used to authenticate to SQL Server) or **SQL Server Authentication** (you log in with a user name and password that are defined in SQL Server).

Enter a name for the new SQCpack database. A typical choice for the database name is **SQCpack**.

Click the **Create** button to create the new database.

Follow the instructions in [Setup SQL Server security](#). You should not give your SQCpack users *any* rights (at the SQL Server level) to the new multi-user SQCpack database. Using the recommended DBC file approach will allow the SQCpack application itself to have sufficient rights in the new database, while your users themselves will have no rights to the database.

Using a copy of a database

Each SQCpack database, either single-user or multi-user, has a Globally Unique Identifier ([GUID](#)) that identifies that particular database.

SQCpack makes the assumption that each database it opens has a unique GUID. If this is not the case, then SQCpack can erroneously talk to the wrong database.

When SQCpack creates a new database, it assigns a unique GUID to the new database.

However, if you make a backup of database A, then restore that backup to database B, both A and B have the same GUID. In that case, you must manually change the GUID for database B so that it is unique.

How to change the database GUID

Start SQCpack, open the database that needs a new GUID, and login as a member of the Administrators user role (if logins are enabled in that database). It would be best if you were the only person to have the database open at this point.

Press **Ctrl-Alt-Shift-G** to assign a new GUID to the database.

Setup SQL Server security

Typically, the person who performs the following steps must be a member of the **sysadmin** SQL Server role (someone in your IT department or the person who installed SQL Server Express, if that's what you are using).

Follow these instructions to securely open your **multi-user** SQCpack database by creating and using a DBC file.

DBC stands for Database Connection, in case you were wondering. The DBC file contains the name and instance of the SQL Server to connect to, plus the name of the database. It also contains the authentication type, user name, and encrypted password (when SQL Server authentication is used).

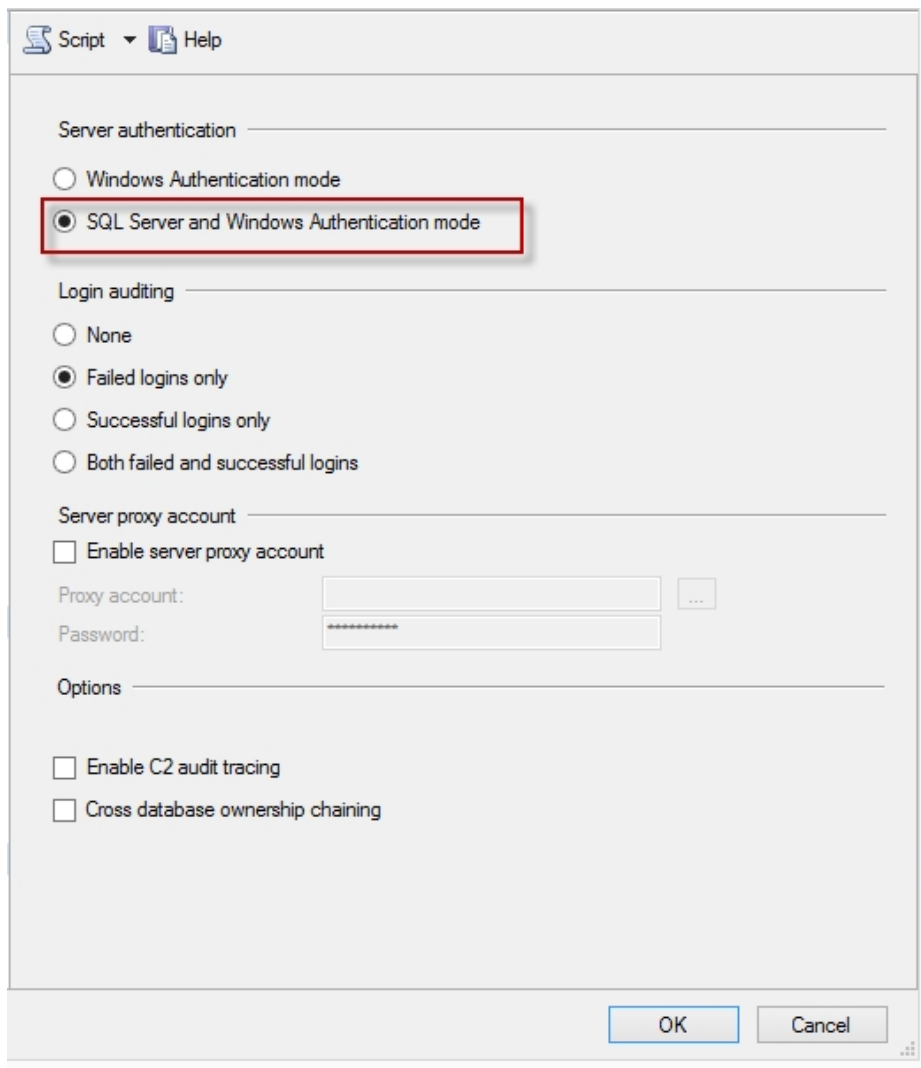
Using the DBC file allows you to give your SQCpack users **no** rights (at the SQL Server level) to the **multi-user** SQCpack database. The DBC file approach allows the SQCpack application itself to have sufficient rights in the database, but your users will have no rights to the database (at the SQL Server level).

Why is it important that SQCpack users have no rights to the database at the SQL Server level? Because that way, users cannot use SQL Server Management Studio to make changes to the SQCpack database directly, i.e., outside of SQCpack's user security system.

WARNING: Do not set up your SQCpack users to authenticate to SQL Server using Windows Authentication. For Windows Authentication to work with SQCpack, you will have to give your users sufficient rights to be able to create, modify, and delete database tables. With these rights a user can use SQL Server Management Studio to change or destroy the SQCpack database.

Set Up SQL Server for SQL Server Authentication

Start SQL Server Management Studio, connect to the desired SQL Server, and open the properties of the server node, as shown below.



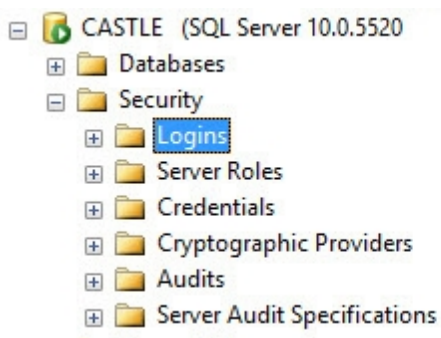
Ensure that **SQL Server and Windows Authentication mode** is enabled as shown above.

Ensure that the sa account is secure

Follow the instructions in [Configure SQL Server](#) to ensure that the **sa** account is secure.

Create the SQL Server user that SQCpack will use to access the database

In Object Explorer, navigate to the Logins node as shown below, right-click on the **Logins** node, and select **New Login ...** We will create the SQL Server user who has full access to your SQCpack database(s).



The following new login dialog will appear.

The screenshot shows the 'Login - New' dialog box. On the left, a tree view shows 'General', 'Server Roles', 'User Mapping', 'Securables', and 'Status'. The 'General' tab is active. The 'Login name' field contains 'SQCpack'. Under 'Authentication', 'SQL Server authentication' is selected. The 'Password' and 'Confirm password' fields are masked with dots. The 'Specify old password' checkbox is unchecked. The 'Enforce password policy' checkbox is checked. The 'Mapped to certificate', 'Mapped to asymmetric key', and 'Map to Credential' options are unchecked. The 'Mapped Credentials' table is empty. The 'Default database' is set to 'master' and the 'Default language' is set to '<default>'. The 'Connection' section shows 'Server: CASTLE2' and 'Connection: EMPIRE\bob-s'. The 'Progress' section shows a 'Ready' status. The 'OK' and 'Cancel' buttons are at the bottom right.

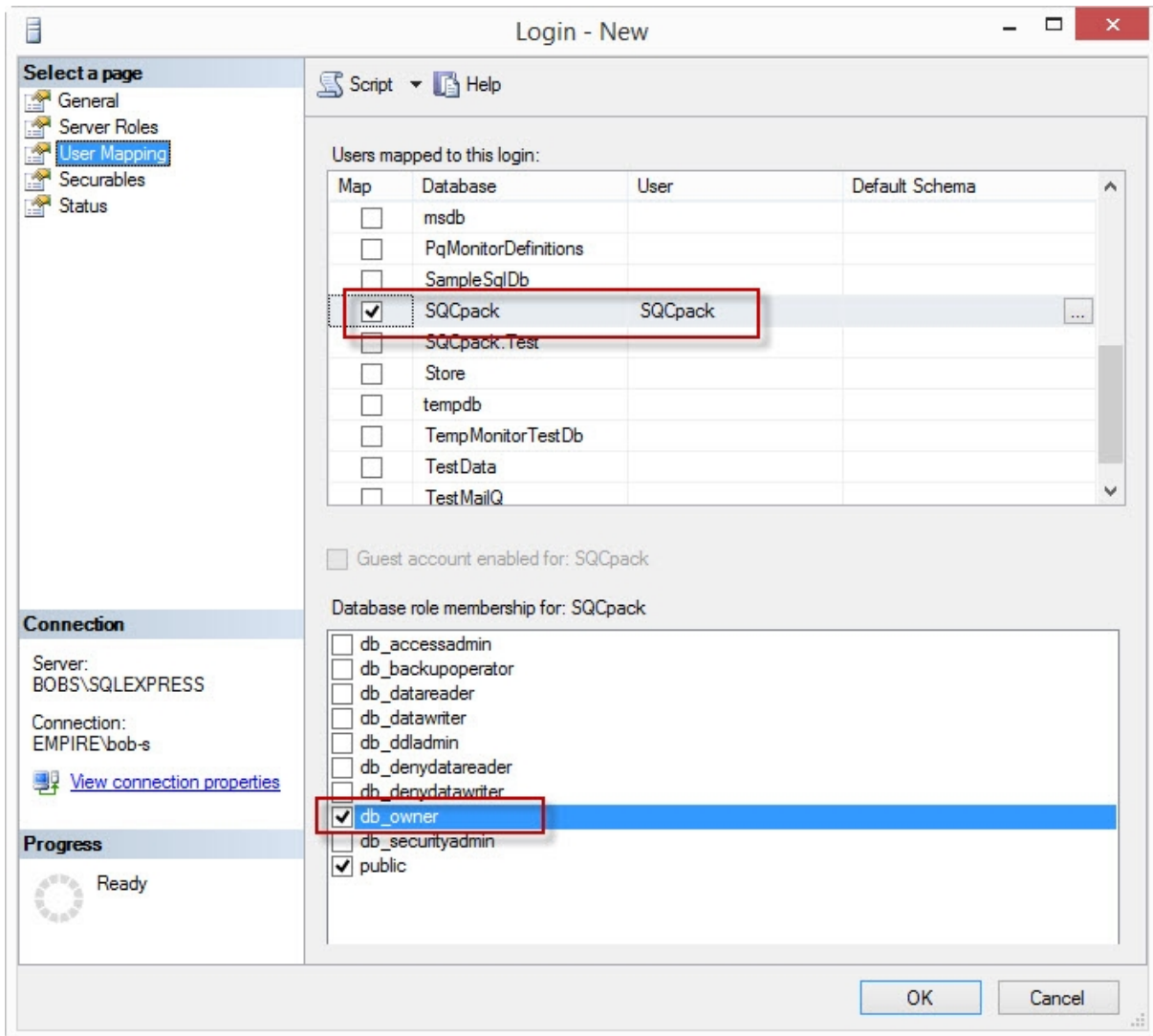
For the **Login name**, you can select anything you like. For this example, "**SQCpack**" is used as the user name.

Select to use **SQL Server authentication** for this new user and enter the password in both password fields. We recommend using a strong (i.e. complex) password of at least 12 characters (longer is better, you can use up to 128 characters). Store the password in a secure location, such as a password storage application. If you don't have a password storage program, we like using the free [Password Safe](#). Password Safe can be used to create a strong password of any desired length.

Enforce password expiration - We typically suggest that you do not select *Enforce password expiration* so that the password you assign to the SQCpack user doesn't expire. If the SQCpack user's password does expire, you will have to recreate the DBC file used to open the SQCpack database, and until the DBC is recreated no users will be able to use SQCpack.

Enforce password policy - It is **IMPORTANT** that you ensure that *Enforce password policy* is selected. This causes SQL Server to lock the account after a number of failed login attempts. You definitely want the lockout behavior to be enforced. Password policy is determined by the computer's **Local Security Policy**, or the domain's **Domain Security Policy**, as [explained here](#).

Select the **User Mapping** tab on the left side.



Under **Users mapped to this login**, select the SQCpack multi-user database you created, as shown above. If you have multiple SQCpack databases, select them all. In this example, the database is named SQCpack.

Under **Database role membership**, select the **db_owner** database role. This will give the SQCpack user you are creating full rights to the SQCpack database. Full rights are needed by the SQCpack application because it creates, modifies, and drops tables associated with data groups.

Click **OK** to create the new user login for SQL Server.

Notice that we are not giving the users who will be using SQCpack *any* rights to the new database at the SQL Server level. This prevents these users from using SQL Server Management Studio to make unauthorized changes directly to the SQCpack database.

To create a DBC file that is used by SQCpack to connect to the new multi-user database, see: [Create a DBC file to connect to your database](#)

Create a DBC file to connect to your database

Ensure that a DBC file is used to open your SQCpack database(s)

SQCpack needs db_owner database role rights to SQCpack s SQL Server database. That s because SQCpack needs to be able to create, drop, and modify tables in the SQCpack database.

You don't want your users to have *any* rights to the SQCpack database in SQL Server. This prevents users from using SQL Server Management Studio to make unauthorized changes to the SQCpack database, or from reading data they are prevented from seeing while in SQCpack.

The DBC file mechanism allows SQCpack to have full rights in the SQCpack database, while the user who runs SQCpack has zero rights in the SQCpack database.

In order to use a DBC file and get protection from unauthorized changes, your SQL Server must be setup to allow SQL Server authentication. If your organization does not permit your SQL Server to use SQL Server authentication we recommend that you not use SQCpack because you would be allowing unauthorized changes to your SQCpack database if Integrated Authentication was used.

Create a DBC file for each SQCpack database

If you have not yet created a DBC file for each of your SQCpack databases, then follow these instructions:

A DBC file is used by SQCpack to securely connect to a multi-user database. You must create a DBC file for each multi-user database you create.

Typically the DBC file is placed in a network share so that it can be used by each SQCpack instance in your organization.

To create a DBC file, run SQCpack, navigate to the Database dialog (you can use the **Alt-D** hotkey), and under **Multi-user**, click on **Create DBC file for connecting to a multi-user database**. The following dialog appears.

In the **Server Name** field, enter the name of the SQL Server used to host the SQCpack database. You can click the drop-down arrow to select from a list of available SQL Server instances.

Select to authenticate using **SQL Server Authentication**.

In the **User Name** field, enter the name of the SQL Server user you created above.

In the **Password** field, enter the SQL Server password for the specified user.

In the **database name** field, enter the name of the SQCpack database you want to connect to. You can click the drop-down arrow to select from a list of available databases.

Click the **Create** button and save the DBC file to the desired location on disk.

You will probably want to store the DBC file on a network share or mapped drive so that all users of SQCpack have access to it to enable them to open the SQCpack database.

Test the newly created DBC file

On the Database dialog in SQCpack, click on **Open a multi-user SQCpack database via DBC file**. Select the DBC file you just created and click the **Open** button.

Establish your database backup plan

It is crucial that you establish a regular backup of your SQCpack database(s), so that in the event of a catastrophe, you can recover the contents of your database(s).

If you used SQCpack 6.5, you can recall that it was impossible to perform a reliable backup of the 6.5 database while other people were using the database. This is no longer the case with SQL Server. You can perform a backup of your SQCpack database at any time, even while multiple users are concurrently making changes to the database via SQCpack.

We recommend doing a backup of each SQCpack database *at least once each work day*.

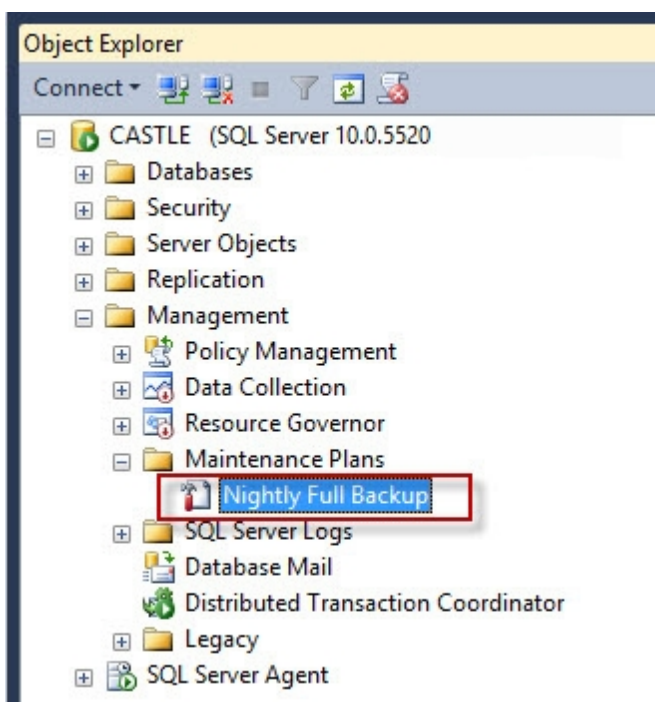
Don't depend on file-level backups

An SQCpack database consists of two files on the disk: the database file with an MDF file extension and the log file with an LDF file extension. These two files are opened for exclusive access by the SQL Server database engine. While you *may* (or may not) be able to perform a file-level backup of *these files*, if you have to restore from a file-level backup, it is very likely the resulting database will not be usable.

In order to successfully and reliably perform a backup of a SQL Server database you **must** use backup software that is designed to work with SQL Server.

Backing up regular SQL Server

If your organization already owns a non-Express version of SQL Server that will host your SQCpack **multi-user** database, the SQL Server administrator (typically a member of your IT department) can use SQL Server Management Studio to set up a Maintenance Plan to regularly back up the SQCpack database(s), as shown below.



Please contact your SQL Server administrator and arrange for regular backups of your SQCpack database(s).

If you choose to back up to a computer disk, please use a disk that is on a different computer from the SQL Server computer, so that in the event of a catastrophic failure of the SQL Server computer, you will be able to gain access to your backups.

Store backups off-site

It is recommended that backups also be stored at an off-site location to guard against a catastrophic loss of both the SQL Server computer and the local backup storage.

Backing up SQL Server Express

If you use the free SQL Server Express edition to host your SQCpack database, you may have to obtain backup software that is designed to work with SQL Server. The Express edition of SQL Server cannot create a Maintenance Plan to perform backups like the non-Express editions of SQL Server are able to do.

See **Recommended SQL Server backup software** below for information about the backup software we like to use at PQ Systems.

Backing up SQL Server Express LocalDB (used for a single-user database)

If you have chosen to use a **single-user** production SQCpack database, please see the comments above for **Backing up SQL Server Express**.

To enter the server name in the backup software, you will need to enter the following exactly as shown to connect to the LocalDB instance:

```
(localdb)\MSSQLLocalDB
```

Recommended SQL Server backup software

If you are using SQL Server Express (multi-user database) or SQL Server Express LocalDB (single-user database), you cannot use a SQL Server Maintenance Plan to perform scheduled backups (because the Express edition doesn't support it). You may have to obtain backup software that is designed to work with SQL Server.

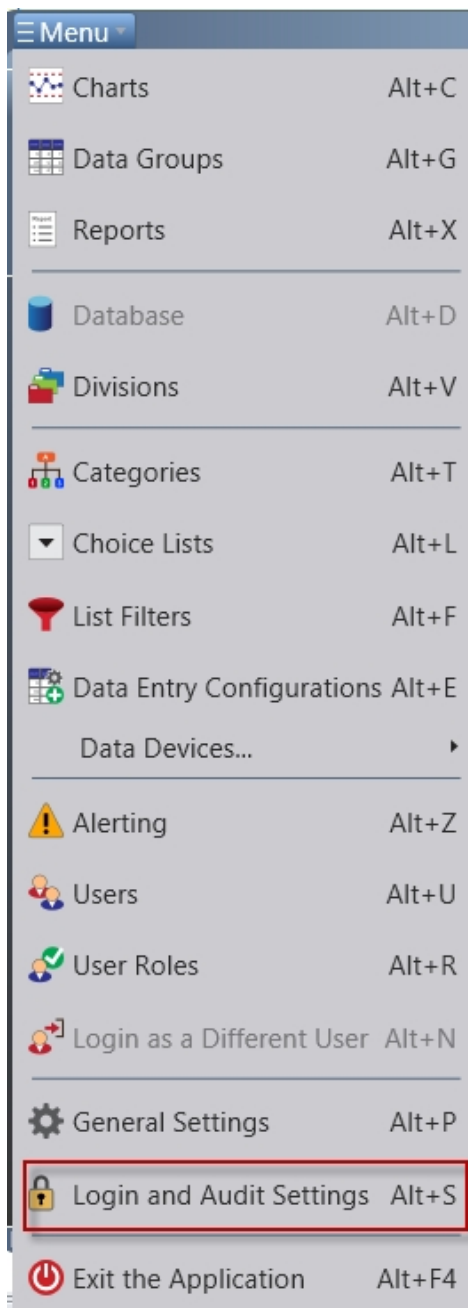
At PQ Systems, we have had good results using [SQL Backup and FTP](#). This backup software is reasonably priced (it is *free* for up to two databases) and can back up your database(s) on a regular schedule. It can manage the number of backups to retain; the backup location can be a disk, an FTP site, or cloud storage, or a combination of these locations.

Login, user roles, and users

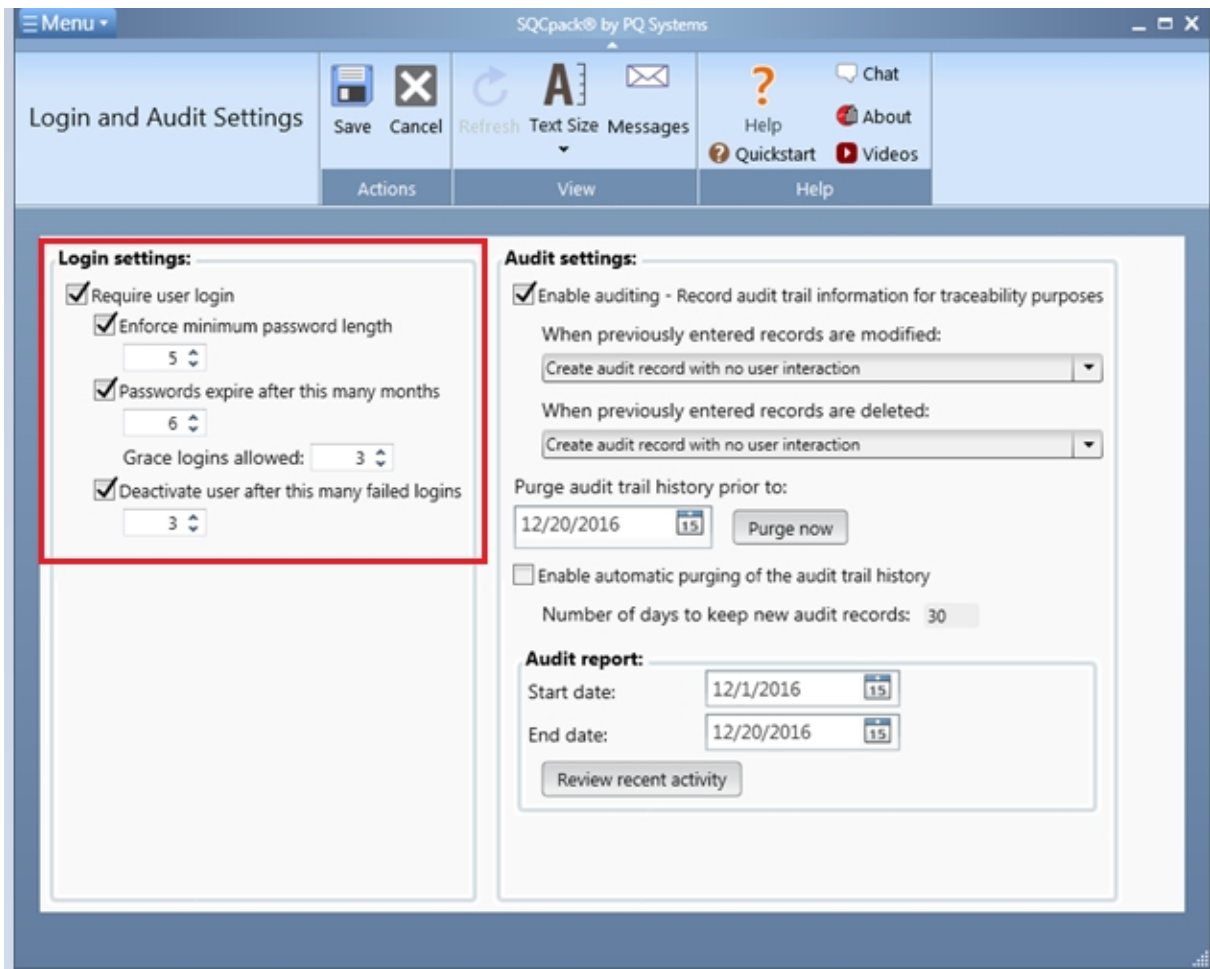
If you want to have a security system where certain users can perform only certain operations within SQCpack, then you must turn on user login and understand the relationship between users, user roles, and SQCpack entities such as data groups, charts, and reports.

How to turn on user login

To turn on user login, start by selecting **Login and Audit Settings** from the navigation menu.



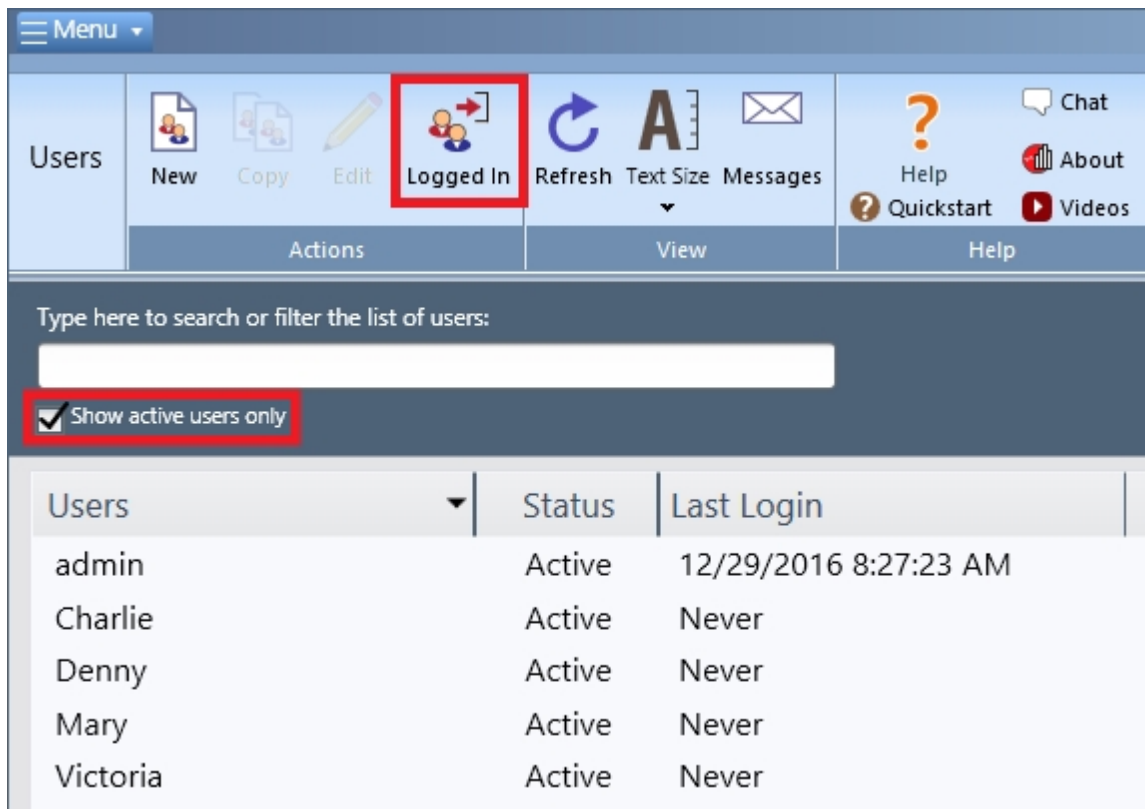
The **Login and Audit Settings** dialog opens as shown below.



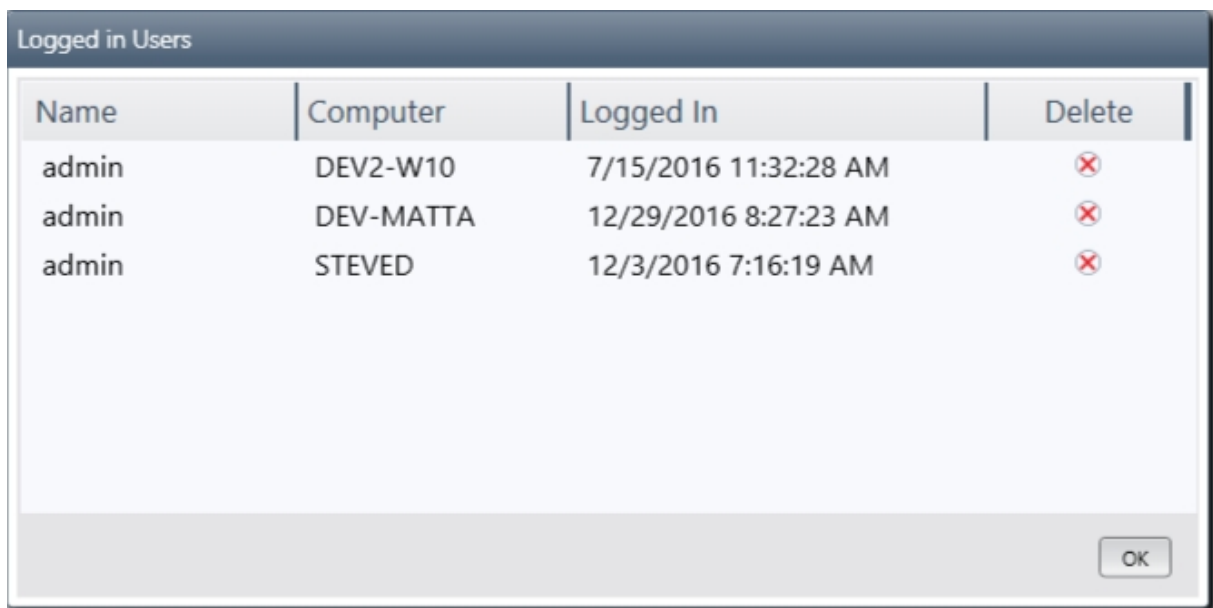
Select **Require user login** as shown above to turn user login on. The optional checkboxes below **Require user login** allow you to customize aspects of the user login experience.

Viewing user information

From the menu, select **Users** (or press ALT+U) to open the Users window.



The **Show active users only** checkbox will filter the list to show only enabled users. The **Logged In** button will show the users that are currently logged into the database.



For information on editing users, see [Add a user](#).

When a user logs into SQCpack

See the help topic [Log in to SQCpack](#) for a description of the user experience during the login process.

What are User Roles and how do they affect what a user can do in SQCpack?

SQCpack allows you to define *user roles*. Think of a user role as a named set of permissions. For example, you might define a role named **Data Entry**. Next, you might define a user named **Fred** and put him into the Data Entry role. The Data Entry role can be defined so that users in this role are limited to performing only

data entry and restricted from other SQCpack options.

A user role defines the permissions a user will have in SQCpack, i.e., what they can and cannot do with respect to data groups, charts, reports, and other types of SQCpack entities, as shown below.

An SQCpack user becomes a member of one or more user roles. In this way, the user *inherits* the permissions contained in the roles he or she is a member of. If the user is a member of multiple user roles, the effective permissions will be the most powerful permission contained in any of the assigned roles.

Edit User Role - Data entry

User role:
Data entry

Permissions for users in this role:

| | |
|--------------------------|----------------|
| Data Group | View |
| Data Editor | Open Full Edit |
| Chart | None |
| Category | None |
| Choice List | Use |
| Database Settings | None |
| List Filter | Use |
| Audit Settings | None |
| General Settings | None |
| Users | None |
| User Roles | None |
| Division | None |
| Data Entry Configuration | None |
| Report | None |
| Alerting | None |

Full None Default

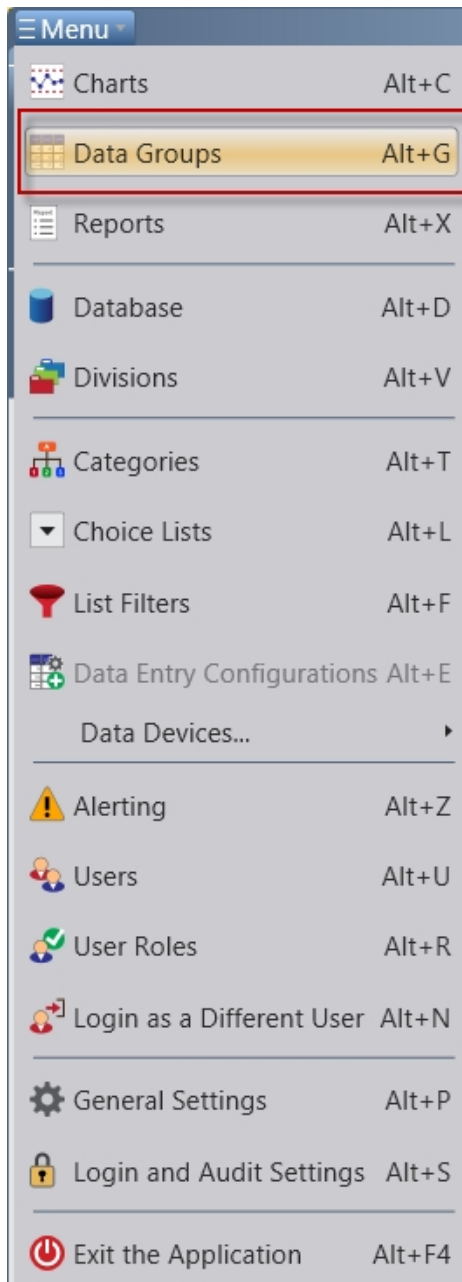
OK Cancel

An example of a **User Role** is shown above. It demonstrates the various types of SQCpack entities and the various permissions that can be assigned to each entity.

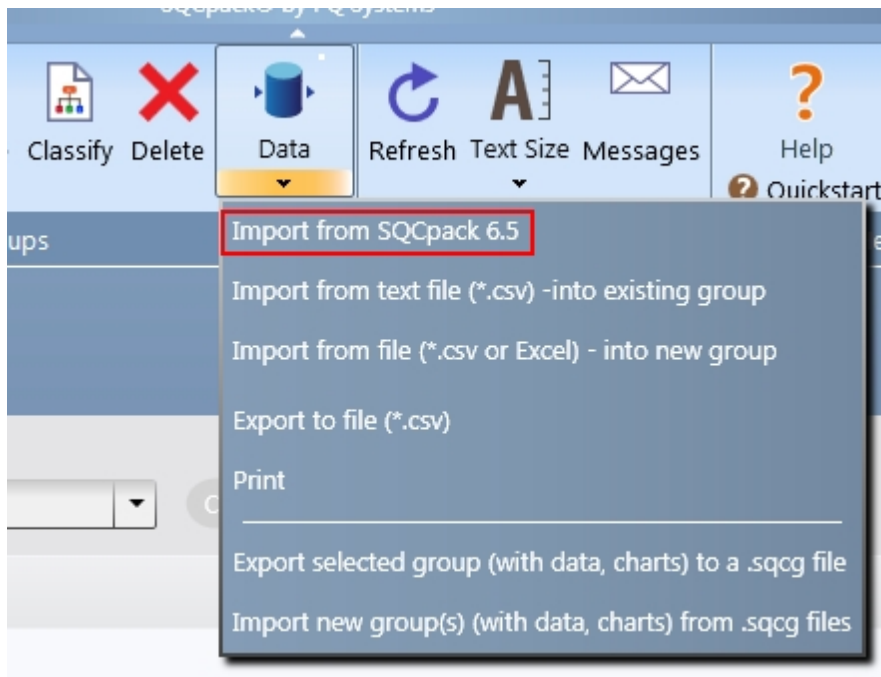
Importing data from SQCpack 6.5

If you are using a previous version of SQCpack, specifically SQCpack version 6.5, data groups and charts have already been defined in that SQCpack database. This data can migrate into the new SQCpack.

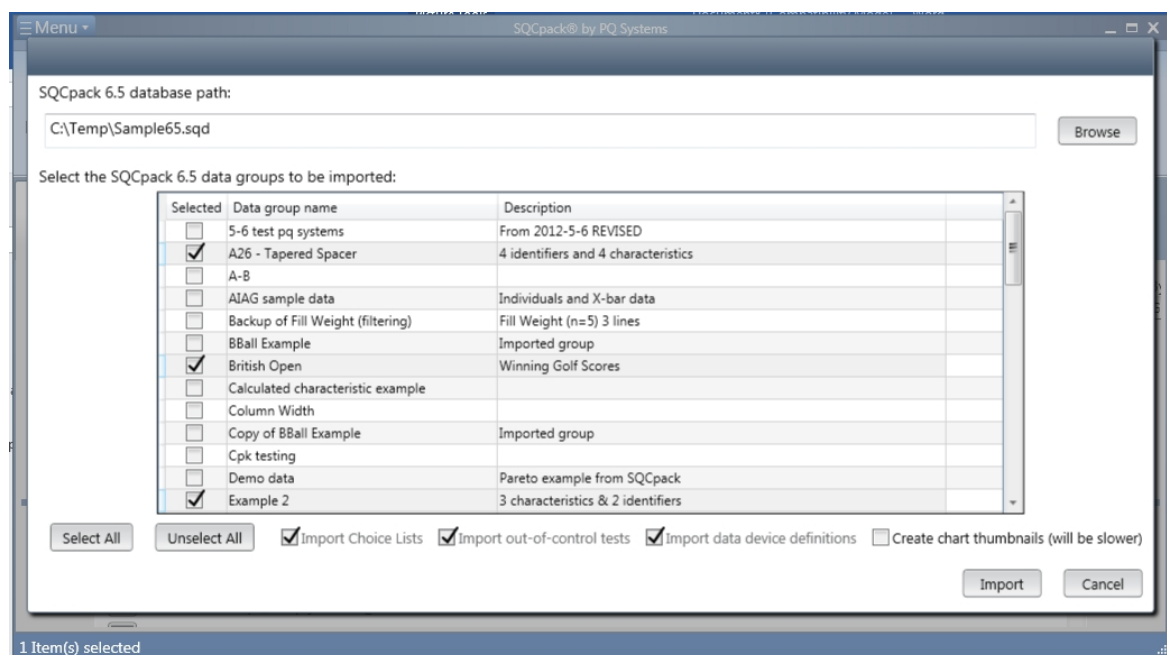
To begin an import of SQCpack 6.5 data, select **Data Groups** from the navigation menu, as shown below.



Next, select **Import from SQCpack 6.5** under the **Data** button in the ribbon bar, as shown below.



An import dialog that looks similar to the one shown below opens.



Click the **Browse** button to select the SQCpack 6.5 database that you want to import.

Select the data groups that you wish to import from the 6.5 database.

Click **Import** to start the import process.

During the import, the selected data groups plus the charts owned by each data group will be imported. In addition, all choice lists, out-of-control tests, and data device definitions will be imported. This dialog will close when the import process is complete.

If the 'Create chart thumbnails' checkbox is selected, each chart that is imported will have a thumbnail rendered sequentially. Due to the significant amount of time this can take for large numbers of charts, we have made it optional.

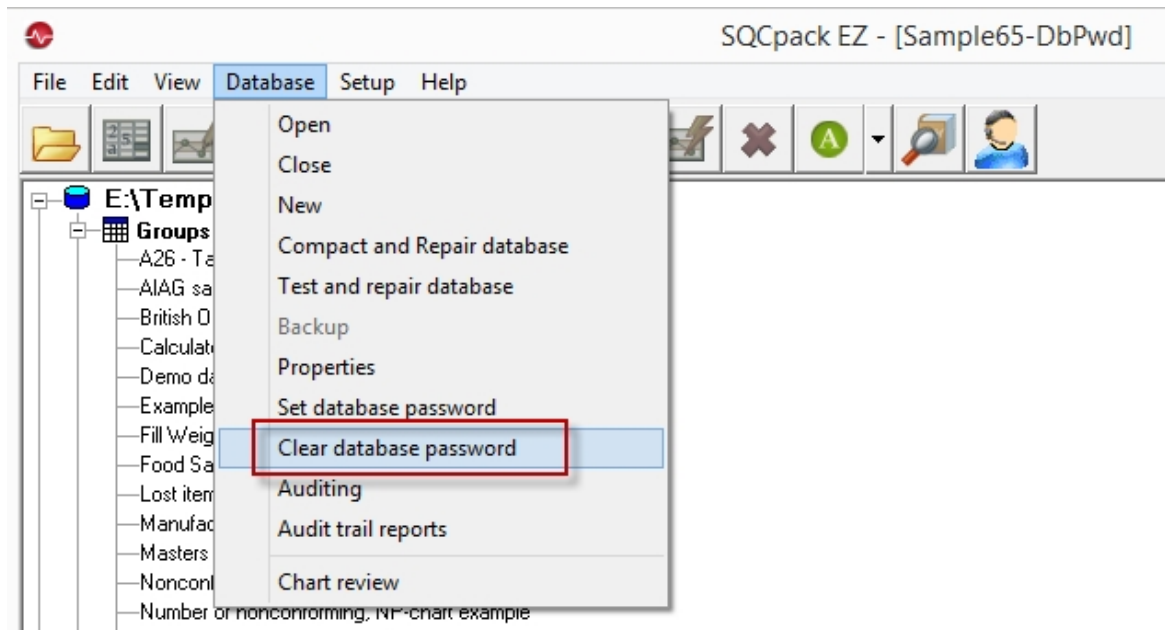
Cannot import because the SQCpack 6.5 database requires a password

If you get a warning message about the SQCpack 6.5 database requiring a password, you must disable the need for passwords and then import the 6.5 database. The 6.5 database can have a database password assigned. It can also have user logins turned on.

Disable database password

Follow these steps to disable the database password.

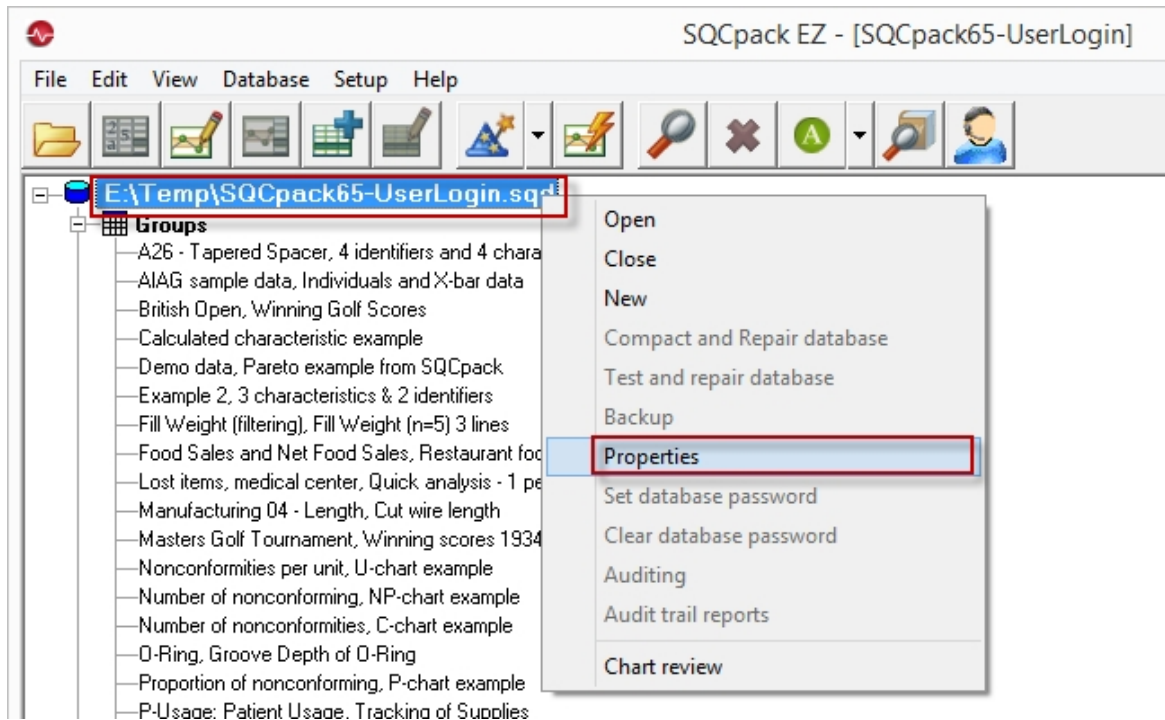
In SQCpack 6.5 open the database, then select **Database > Clear database password**, as shown below.



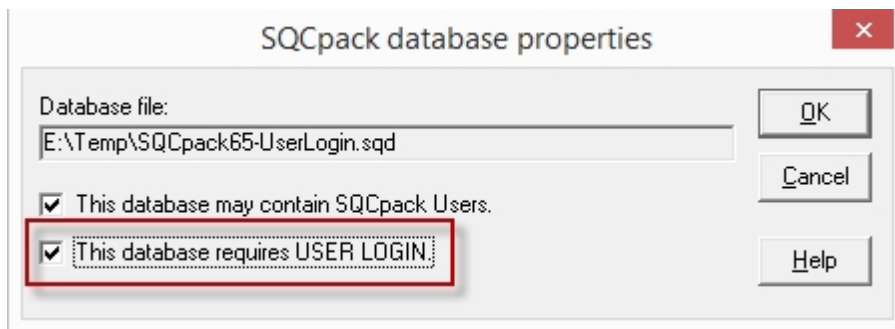
Disable user logins

Follow these steps to disable user logins. Note that **you must login as the SUPERVISOR user** in order to perform these steps.

In SQCpack 6.5 open the database, then right-click on the database name, as shown below - Then select **Properties**.



The following database properties dialog opens.



Remove the selection for the "This database requires USER LOGIN" property. Close SQCpack 6.5.

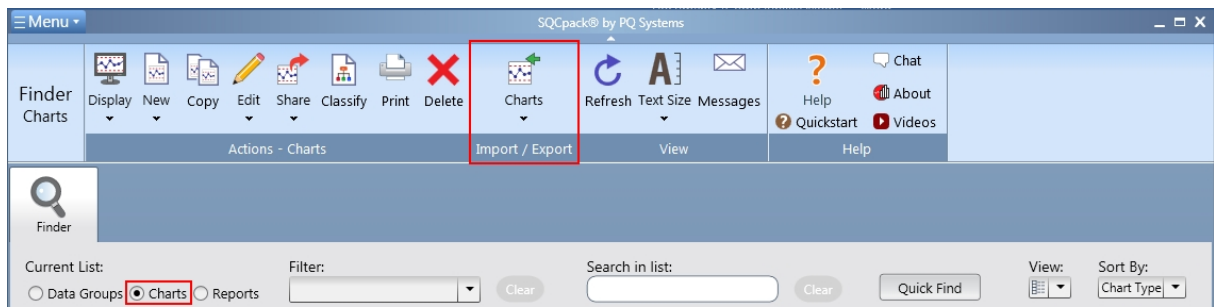
Now that database and user logins have been disabled, you should be able to import the 6.5 database into SQCpack 7.

Importing chart definitions from CHARTrunner and CHARTrunner Lean

CHARTrunner and CHARTrunner Lean stored chart definitions on disk in one or more chart folders.

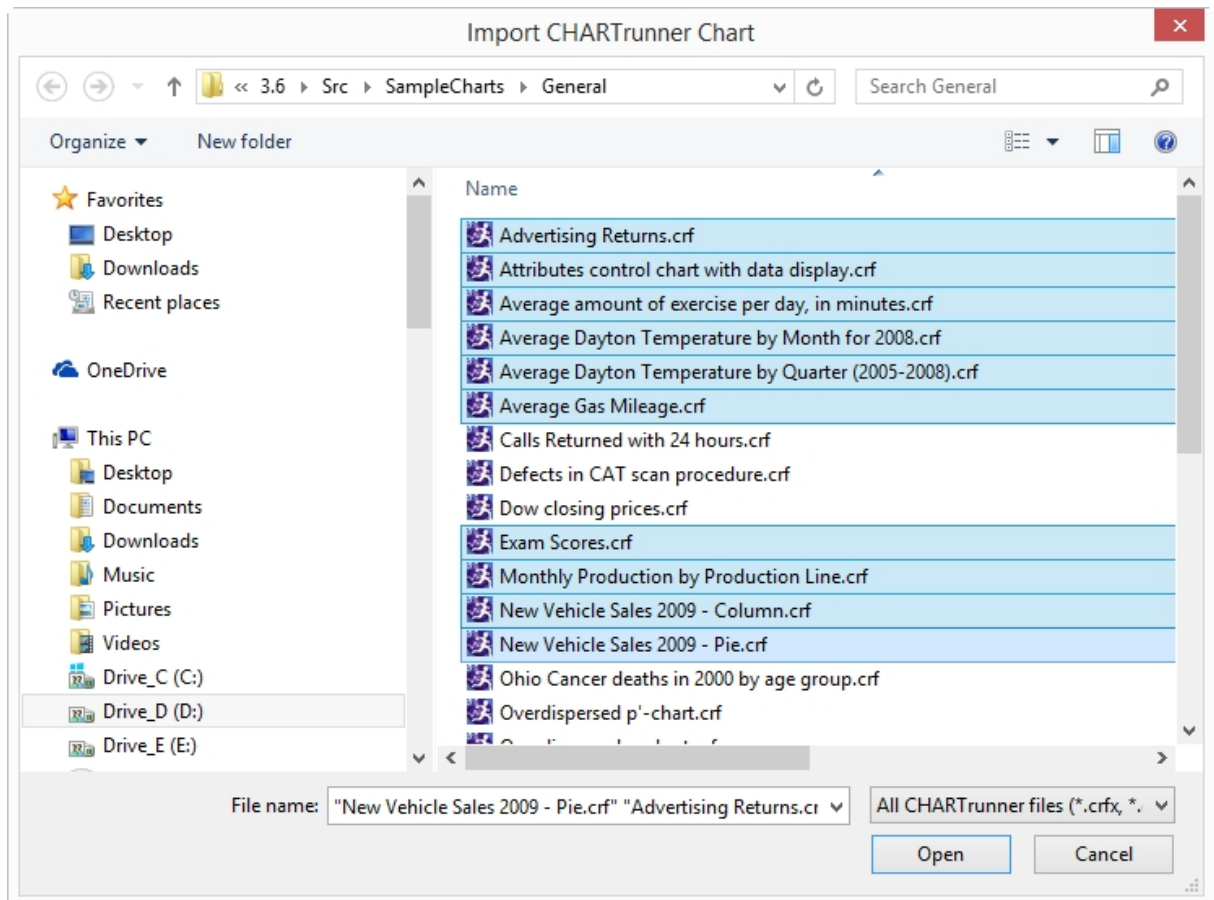
SQCpack can import your CHARTrunner and CHARTrunner Lean chart definitions from where they exist on disk and store them into the specified SQCpack database.

Follow these steps to import your chart definitions.



On the **Finder** tab select **Charts** as the current view, as shown above.

Click on **Import Chart** in the ribbon.



Navigate to the folder that contains the chart definitions you want to import, then select the specific chart definitions in that folder that you want to import.

If you want to import all the chart definitions in the folder, click on one chart definition and press Ctrl-A to select all of them.

You can Ctrl-click with the mouse to select multiple discontinuous chart definitions.

To select all chart definitions from "Chart A" to "Chart D" do this: Select "Chart A" by clicking it with the mouse. Navigate to "Chart D," and Shift-click it. This selects all the chart definitions from "Chart A" through "Chart D".

Click the **Open** button when you have selected all the chart definitions you want to import from this folder.

If you want to import chart definitions from other folders, you can repeat this process for each folder.

Important data organization concepts

This section contains some important data organization concepts to consider while using SQCpack.

One database vs. multiple databases

When you begin using SQCpack, you will most likely work in a single database. As you add data groups and charts, over time you may start asking the question, "Should I divide this data across multiple SQCpack databases?"

If you are currently using SQCpack 6.5, you may be in the habit of creating and using many different databases. SQCpack 6.5 used Microsoft Access for data storage. For a number of reasons, it was prudent not to let the Access database grow too large - thus customers with lots of data tended to distribute their data across multiple Access databases. SQCpack 7 uses Microsoft SQL Server for data storage. SQL Server is more robust than Access and the size of the SQCpack database is no longer a primary reason for having multiple databases.

In SQCpack 6.5 if you had lots of data groups, and thus lots of charts and perhaps reports, you might spend considerable time finding the correct data group, chart or report to use in a given situation. This was another reason that customers tended to create multiple Access databases - simply to limit the number of data groups a user had to deal with.

SQCpack 7 has robust options for filtering and segregating data. A user can be setup to only see the data groups, charts and reports that he is concerned with. Thus, the database might contain thousands of data groups, but user Fred sees only the 5 data groups and the associated charts that he is concerned with.

We suggest that you **use a single database** rather than using multiple databases. In some cases, multiple databases may be required, and SQCpack can be configured this way; however, **most** installations should use a single SQCpack database.

Single-user vs. multi-user databases

To manage your SQCpack database, select **Database** from the navigation menu.

On the **Database** form are options for creating or opening either **single-user** or **multi-user** SQCpack databases.

Both **single-user** and **multi-user** databases are stored in Microsoft SQL Server.

A **single-user** database is stored on your local computer and is usable only on that computer (think of it as a **single-computer** database). A **single-user** database uses Microsoft SQL Server Express 2014 LocalDB. The database cannot be accessed from other computers in your network. The primary reason SQCpack supports the **single-user** database is to make it easy for users to quickly install and evaluate SQCpack to see if it meets their needs. We recommend that you **do not** use a **single-user** database for production purposes. For the reasons, please see [Why you should use a multi-user database](#).

A **multi-user** database is typically stored on a **server** computer that is running Microsoft SQL Server 2008 or higher. If you already have SQL Server in your organization, you may want to host your SQCpack **multi-user** database on an existing SQL Server. Alternatively you can install the [free Microsoft SQL Server Express](#) on a computer in your organization and host your **multi-user** SQCpack database there.

Typically, your IT staff will be involved in determining which server will host your SQCpack database and will create the initial SQCpack database for you. Once this multi-user (or network) database has been established, other computers with SQCpack can easily be configured to use and share this database as the common store for SQCpack data.

For production work with SQCpack, we strongly recommend using only

multi-user databases. Once the decision has been made to use SQCpack, a multi-user database should be created and used for production work.

Finder (Data Groups, Charts, Reports)

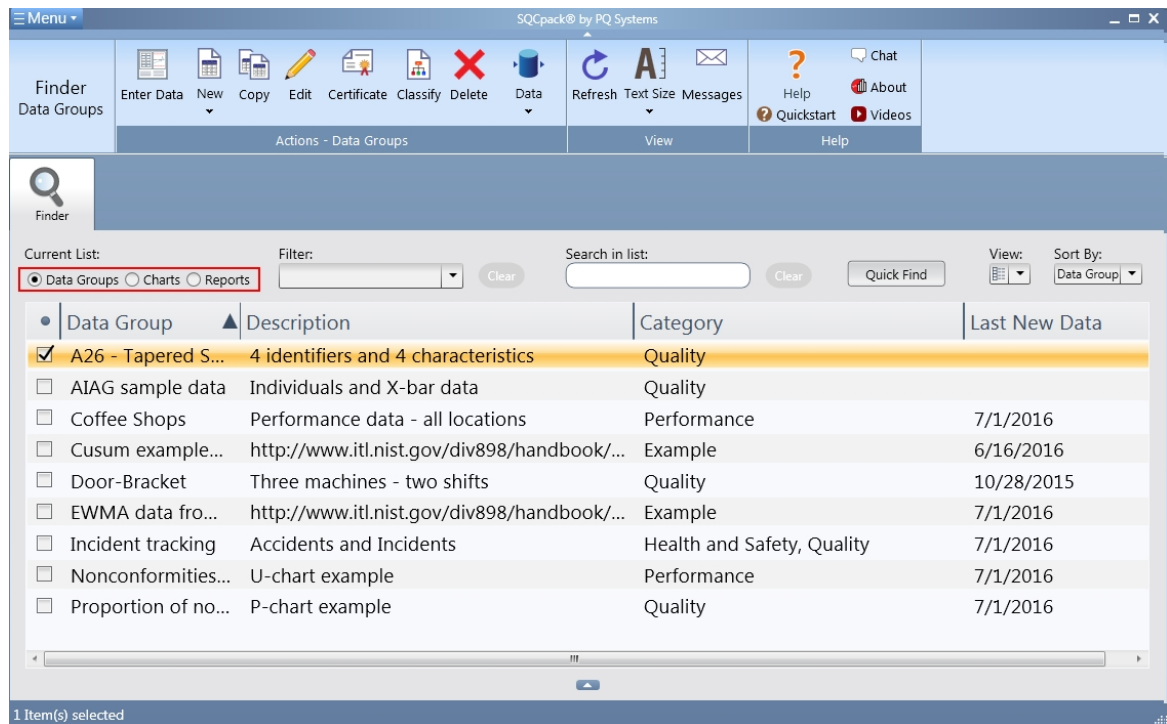
SQCpack helps you to manage many different objects or **entities**. These include user roles, users, divisions, categories, choice lists, and several others.

However, the three most important objects in SQCpack are these:

1. Data groups
2. Charts
3. Reports

Each of these objects has a name and description within the system. Additionally, each of these may be **classified** as belonging to one or more Divisions and falling into zero or more categories.

Within SQCpack, when you select one of these from the navigation menu, you will see the **Finder** tab in the work area. A list of these objects will be displayed in the Finder tab. The radio buttons in the upper left (in the red rectangle) indicate what type of objects are currently in the list. Here, the data groups are being displayed in the Finder:



Definitions

A **Data Group** is a named collection of columns that are related in some way. In a production environment, it may be helpful to think of a data group the same way you think of a part number or process name. Each column defines data that you are collecting and storing to track, audit, or improve quality. Data groups may contain varying collections of these column types:

1. Identifiers (or tags)
2. Measurements
3. Counts
4. Calculated columns

A **Chart** is a definition of a quality improvement chart. It has a name, a chart type, and a collection of

settings that define where the data comes from and how the chart looks.

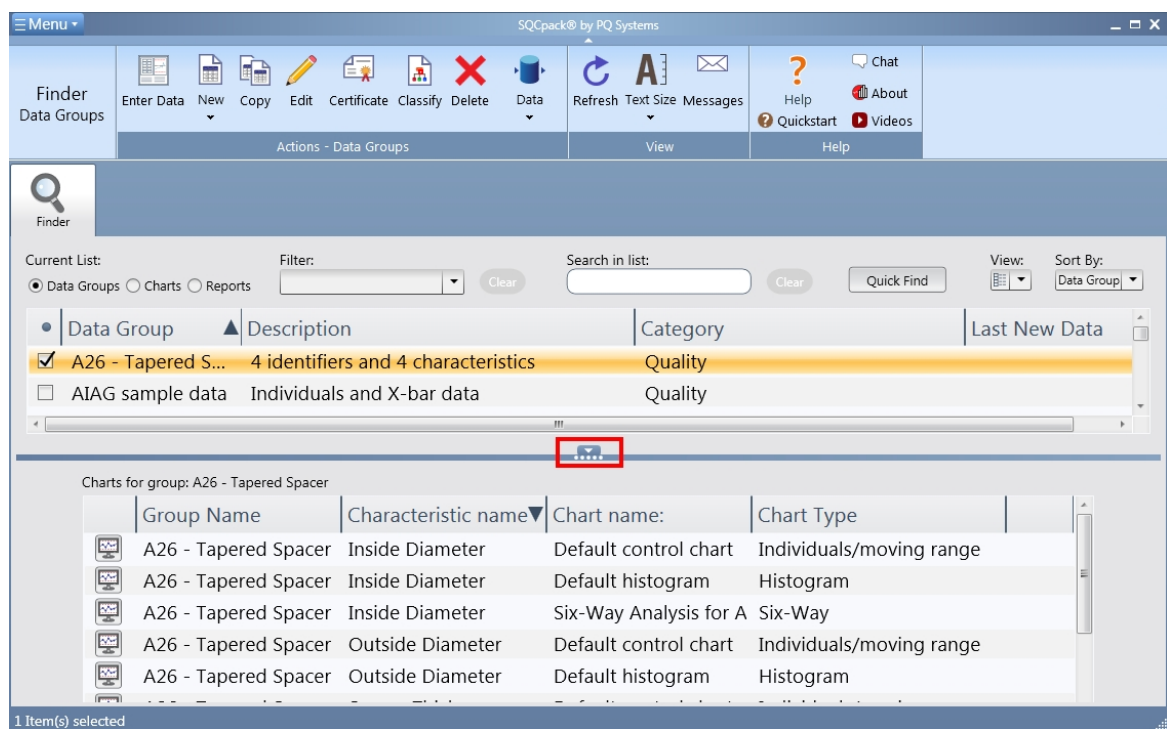
A **Report** defines rows and columns, for previewing on the screen or for printing that summarizes statistical data from a SQCpack database. A report has a name and a collection of report sections that define its contents.

Finding what you seek

The list of data groups, charts, or reports offers options to make it easy to find the one you are looking for. First, you can always **sort** the list by any of the columns you see. For example, you can sort the data groups by **name**, or you can sort the chart list by **chart type** by clicking in the column heading. Click a second time to reverse the sort order. As your lists get longer, this makes it easy to quickly scroll to the one you want.

In addition to sorting the rows, you may **search** by typing text into the **search box**. For example, when viewing the list of data groups, if you type *PN3* into the search box, the list of groups will be filtered so that you see only groups that contain *PN3* in the name, description, category, or chart type column. This can shorten the list, making it much easier to find the one you want.

You can show or hide a list of charts related to the selected data group(s) by clicking the small blue arrow button below the Data Groups list. The charts pane can be resized by dragging the blue window splitter (highlighted below). These charts can be sorted by selecting the column heading you want to sort by, or by holding down CTRL and selecting multiple column headings.



Finally, you may define named **list filters** that allow you to change the contents of the list you are viewing easily by selecting from a drop-down list of named filters. These are discussed in [List Filters - groups, charts, reports](#).

Divisions

Divisions are a data segregation tool within SQCpack. They allow a diverse group of users to share the same database but keep their data separate so that lists do not get too long, and different groups of users can focus on only the data and charts that are important to their processes.

A division is really just a name. For example, you might define an **Ohio** division and a **Michigan** division. This is done by selecting **Divisions** from the navigation menu.

When you create or edit a data group, a chart, or a report, you can **classify** the item using the **Classify** button in the ribbon bar. This allows you to assign the item to one or more divisions. By default, all items are set to **All divisions**. This means they are visible to all SQCpack users.

Divisions work in conjunction with SQCpack **Users**. Users may be defined as having access to **All divisions** or as having access to, for example, only the **Ohio** division. When a user is defined with access to only the **Ohio** division, he or she will see only data, charts, and reports that have been classified as belonging to the **Ohio** division.

Using the Divisions feature is optional. You may decide that all data is visible to all users. If so, you may never use the **Classify** button for data groups, charts, or reports to classify them by a division. Please note that Divisions are easily implemented later, so ignoring this feature when you first start with SQCpack does not present a problem.

Although Divisions help to segregate data, they also help to **support the use of a single database** for all of your quality improvement data. When all quality improvement data is located in a single database, users who need a full enterprise view of quality improvement efforts are able to create and view charts and reports that cross organizational boundaries. For example, if you do have an Ohio and a Michigan division, some users, perhaps the corporate quality manager, for example, will be interested in seeing data from both divisions summarized in reports and charts.

Categories

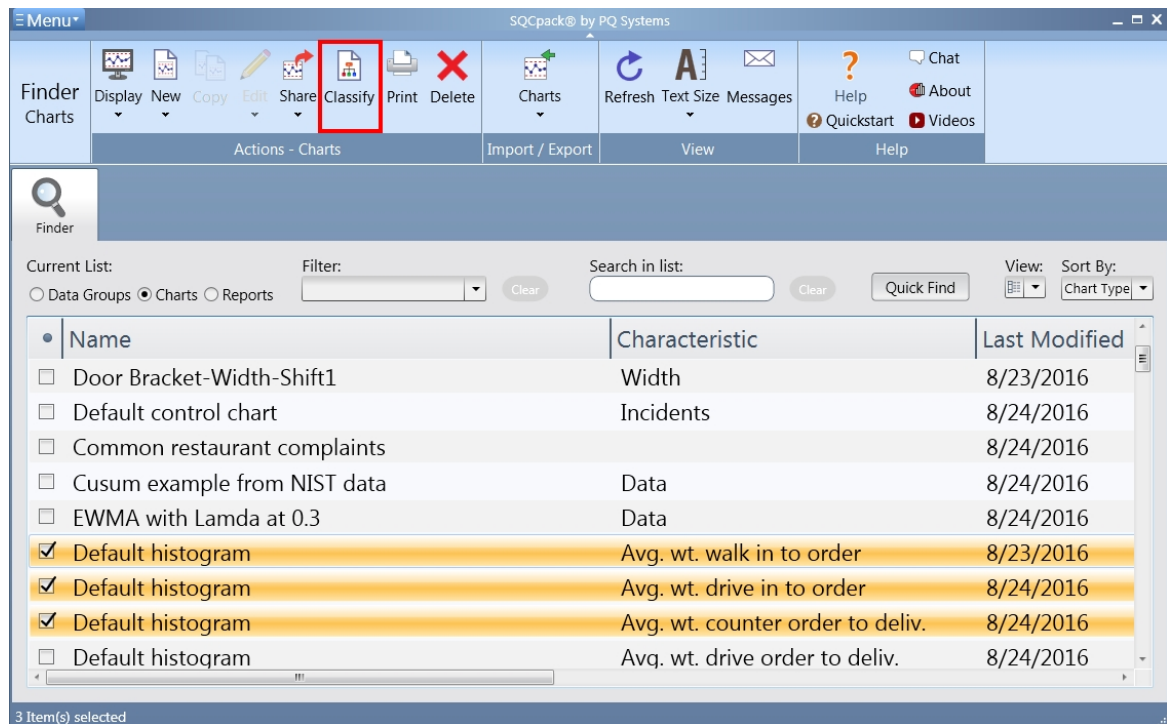
While Divisions allow you to segregate data into separate groups, **Categories** provide a means of grouping related data together. The primary use of categories is to filter the finder lists so they show items that are related – that is, items that have been classified as belonging in the same category. For example, imagine that your firm produces three different products. Work on all three products may occur in different locations. Sometimes, you want to see only the data groups or charts related to *one* of the products. In this case, each product would be defined as a Category in SQCpack. Then, as groups, charts, and reports are created, they would be classified as belonging in one of the three product categories.

Unlike Divisions, categories are not applied to SQCpack users, so they are not really connected to specific SQCpack users. They are applied only to data groups, charts, and reports.

Category is one of the columns in the data groups, charts, and reports lists. It is always an option to sort your list by category. This will put items in the same category together in the list. The other place where categories can be used is when defining list filters. A list filter is a named set of conditions that can be applied to a list to filter its contents. For example, you might define a list filter that shows only the groups where Category = Product A.

Note that a data group, a report, or a chart may be classified with zero or more categories, meaning that items may be defined as belonging to multiple categories.

To classify data groups, charts, or reports under categories, from the finder list, select one or more items and click the classify button (shown in the red rectangle). Next, select one or more categories from the list displayed and click the OK button. The selected categories will be applied to the selected items.



Like Divisions, Categories are an **optional** feature. You can begin to use SQCpack and never concern yourself with categories. It is easy to implement them at a later time when your lists begin to get longer than you would like, or when you find yourself spending too much time searching for the item you are interested in studying.

To create or edit Categories, select **Categories** from the navigation menu.

Charts from SQCpack data vs. charts from external data

SQCpack allows you to view a collection of chart types that support quality improvement analysis. Many of these charts are specific to statistical process control (SPC). Some of them are more general and allow you to visualize business data gathered for reasons other than quality improvement.

The data that you enter into SQCpack is typically, stored, analyzed, and monitored for specific quality improvement reasons. It may be a customer requirement, a regulation, an industry standard, or a problem-solving effort, but the data is entered so that SQCpack can do statistical analysis and allow you to visualize the results.

There are times when it may not make sense for SQCpack to manage the data that is important in your quality improvement efforts. For example, in a highly-automated manufacturing environment, it is likely that the process control system is gathering and storing data independent of SQCpack. However, it will be interesting and valuable to look at this data with the SPC charts available in SQCpack. To support these scenarios, SQCpack allows you to create charts from data that is managed **externally**.

SQCpack allows you to create charts. Each of these charts will get its data from some source. You can think of all charts as getting their data either from SQCpack data (**internal data**) or from **external** data. The ability to visualize SPC charts from external data is a powerful addition to SQCpack. In fact, some customers may use *this* feature of SQCpack primarily and rarely enter data into SQCpack data groups.

An interesting possibility that can be valuable in today's complex environments is that you can view multi-charts in SQCpack, where one chart gets data that has been entered into SQCpack, and the other chart gets data from a different system for example a production or enterprise system. To fully understand a process and how to improve it, this type of visualization is becoming more important.

The primary guidance from this section is that SQCpack can help you visualize data with SPC analysis even if your data is stored outside of SQCpack.

List Filters - groups, charts, reports

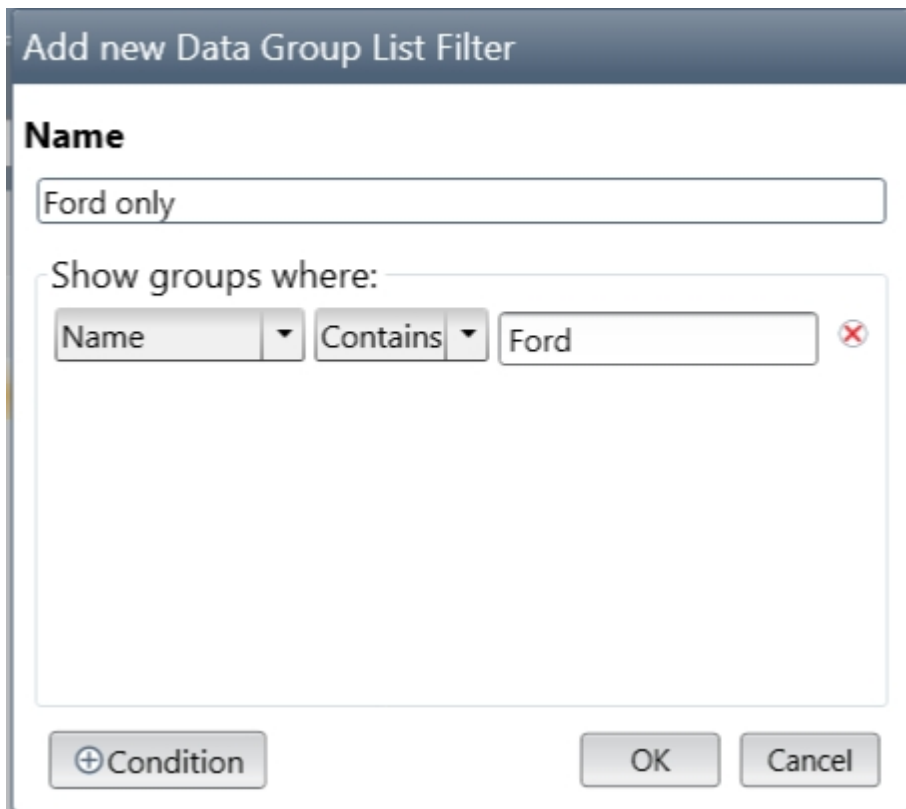
From the navigation menu, select **List Filters** to manage your list filters.

A List Filter is a named set of criteria used to filter lists, usually to make the list shorter so that locating items is easier.

List filters may be created for these lists, which appear in the Finder tab within the work area:

1. The data group list
2. The chart list

The simplest list filter uses a single criterion as in the following example:



In this case, you may have used a naming convention for your data groups that says, "anything we track for Ford," will have 'Ford' in the group name. For example, you might have groups similar to this:

Ford – Focus bumper rims
Ford – Focus mirror shells

Applying a list filter such as the one shown above, will limit the contents of the data group list to only those data groups with "Ford" in the data group name.

A list filter can be more complicated as well. In the following example, two criteria are used to further narrow the list of data groups that will show in the list.

Add new Data Group List Filter

Name

Ford - Focus only

Logical Operator

AND

Show groups where:

Name Contains Ford

Name Contains Focus

+ Condition OK Cancel

List filters are applied by selecting them from a drop-down list in the finder, shown below in the red rectangle. You can also select **<Create new Filter>** to easily create a new list filter directly from the finder.

Menu

SQCpack® by PQ Systems

Finder Data Groups

Enter Data New Copy Edit Certificate Classify Delete Data Refresh Text Size Messages Help Chat About Quickstart Videos

Actions - Data Groups View Help

Finder

Current List: Data Groups Charts Reports

Filter: <Create new filter> Coffee Division General Division Health and Safety Category Manufacturing Division Performance Category Quality Category

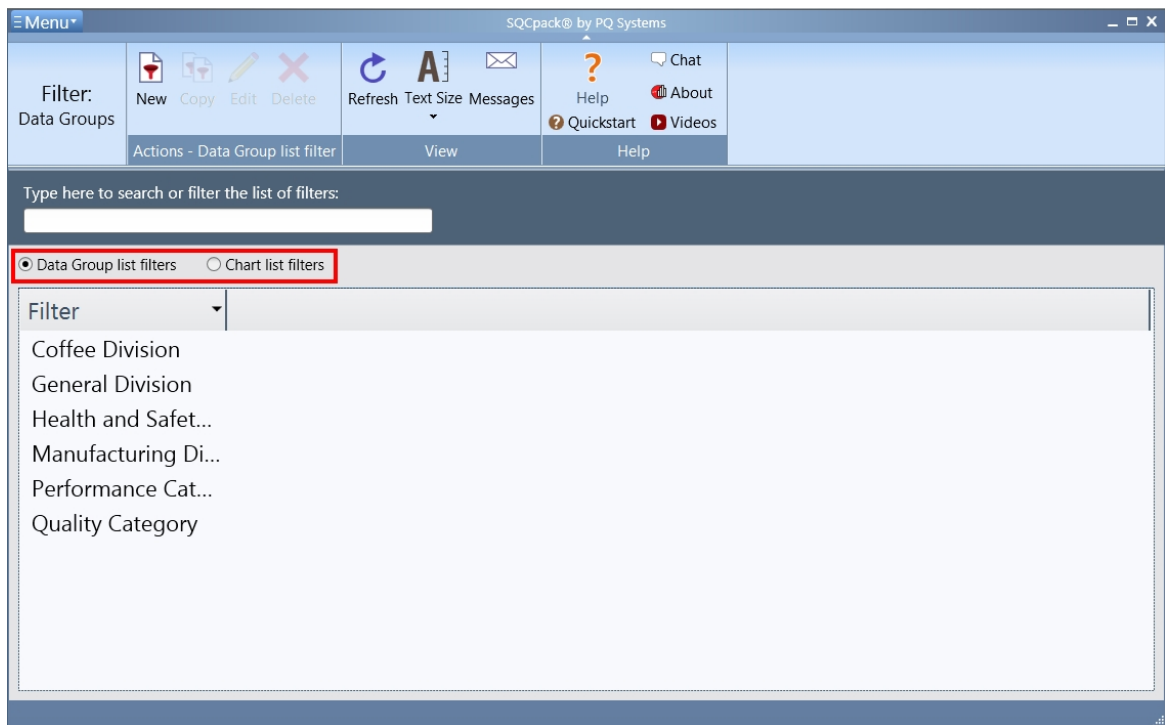
Search in list: Clear Quick Find View: Sort By: Data Group

| Data Group | Description | Category | Last New Data |
|--|--|----------------------------|---------------|
| <input checked="" type="checkbox"/> A26 - Tapered... | 4 id | Quality | |
| <input type="checkbox"/> AIAG sample d... | Indiv | Quality | |
| <input type="checkbox"/> Coffee Shops | Perfo | Performance | 7/1/2016 |
| <input type="checkbox"/> Cusum exampl... | http://www.itl.nist.gov/div898/hand... | Example | 6/16/2016 |
| <input type="checkbox"/> Door-Bracket | Three machines - two shifts | Quality | 10/28/2015 |
| <input type="checkbox"/> EWMA data fr... | http://www.itl.nist.gov/div898/hand... | Example | 7/1/2016 |
| <input type="checkbox"/> Incident tracki... | Accidents and Incidents | Health and Safety, Quality | 7/1/2016 |
| <input type="checkbox"/> Nonconformiti... | U-chart example | Performance | 7/1/2016 |

1 Item(s) selected

On the list filters List form, notice there is a radio button (shown below in the red rectangle) that allows you to

see only the data group list filters or only the chart list filters. List filters for charts work in the same way, except they are applied to the list of charts.



All list filters can contain one or more criteria based on the name, description, or category for the data group or chart.

Note: If you exit SQCpack with a list filter applied, it will be remembered and re-applied the next time you start SQCpack.

Naming conventions

Our experience of supporting SQCpack over many years shows that the number of data groups and charts you create will tend to grow over time. Eventually, the lists become long and some of your effort will be spent finding the correct item to work with. SQCpack has many features to make it both easy and fast to find what you are looking for. However, having a good set of **naming conventions** in place can make the work even easier.

The primary guidance here is that you spend some time thinking about how you will name your data groups and charts. We have seen many schemes used. If you produce a limited number of products, your convention might be to name groups starting with the product name or product identifier for which the group will be used. If you produce a large number of products, the part number for the product may be used in part of the group name. If you supply a limited number of customers with your product, you may use the customer name as part of the group name. If you are deploying SQCpack in a services organization, for example in a hospital, school, or financial services firm, then your naming convention might include the relevant characteristic being measured as the name.

Once you have created a data group or chart, you can always go back and change its name. However, having naming conventions that are consistently applied will allow your SQCpack database to grow larger and not impact the day-to-day users of the product with confusing or inconsistent names.

Terminology

Data Group

A **Data Group** is a named collection of columns that are related in some way. In SQCpack, data groups are one of the primary objects a user will create, manage, and interact with. The **columns** within a data group define a data table, which stores data rows for the data group. When creating a data group, you may define the following types of columns:

- Identifier columns
- Measurement characteristic columns
- Count characteristic columns
- Calculated characteristic columns

Note: throughout the documentation, the terms **characteristic** and **column** are used interchangeably. For example, a data group is defined by a set of columns. It may also be said that a data group is defined by a set of characteristics or that a data group is defined by a set of identifiers and a set of characteristics. Often, the term **group** is used as short hand for **data group**.

Characteristic

A characteristic defines a metric that you are measuring, counting, or calculating. The term “characteristic” is shorthand that might apply to **three different types** of characteristics:

- Measurement characteristic
- Count characteristic
- Calculated characteristic

All three of these are **characteristics** in the general sense. They are just different **types** of characteristics that may be defined within a data group.

Since characteristic and column are used interchangeably, it is important to know that one characteristic may define more than one *physical* column in a data group. For example, a characteristic named *Length* but defined with a subgroup size of three, will show three columns in the data entry grid. Likewise, a count characteristic named **Number of Errors** may show two columns in the data grid, one for **Number of Pages** and a second column for **Errors Found**.

Data table

A data table is a database storage concept. A data table is made of up some number of columns. The data is contained in rows. Within SQCpack, data rows for each **data group** are stored in a data table that is specific to the group.

Step by step guide for important SQCpack tasks

This section contains step-by-step guides for performing some important operations in SQCpack.

Login to SQCpack

When user login is enabled SQCpack will display the following login dialog when it starts. The user must successfully log in to use SQCpack.

There are two ways to log in to SQCpack:

1. Using your Windows user name (and indirectly your Windows password).
2. Using your SQCpack user name and password.

Login using your Windows user name

When **Login using your Windows user name** is selected the login dialog looks like the example shown above.

The **User name** field will contain your Windows user name. In the example shown above, the Windows computer is a member of an Active Directory domain, so the Windows user name is of the form Domain\UserName.

All you need to do is press **Enter** or click **Login** and you will log in (assuming an administrator has set up your SQCpack user account for Windows login, and specified your SQCpack user name in the form of MyDomain\Name).

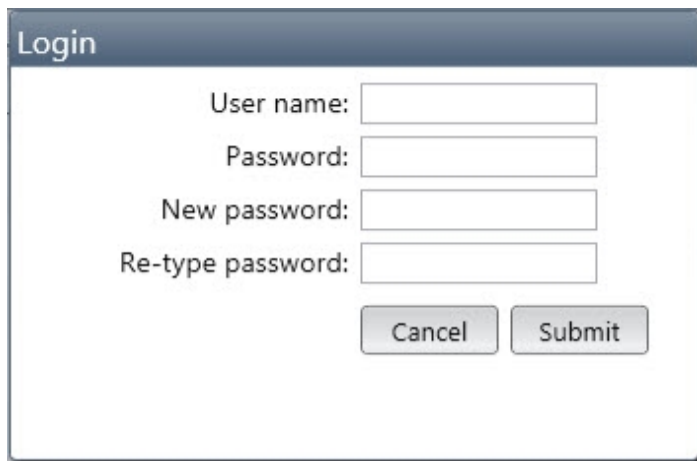
Login using your SQCpack user name and password

When **Login using your Windows user name** is not selected the login dialog look like the example shown above. You need to enter your SQCpack user name and password to log in.

If it is time for you to change your password, a message appears to let you know.

Change password

Click on **Change password** to change your password and the dialog changes as shown below.

A login dialog box titled "Login" with a dark blue header. It contains four text input fields: "User name:", "Password:", "New password:", and "Re-type password:". Below the fields are two buttons: "Cancel" and "Submit".

Login

User name:

Password:

New password:

Re-type password:

To change your password, enter your **User name** and your current **Password**.

Enter your new password into the **New password** and **Re-type password** fields.

Click the **Submit** button to change your password and log in to SQCpack.

Forgot password

If you forget your password, you will need to have an SQCpack administrator reset your password.

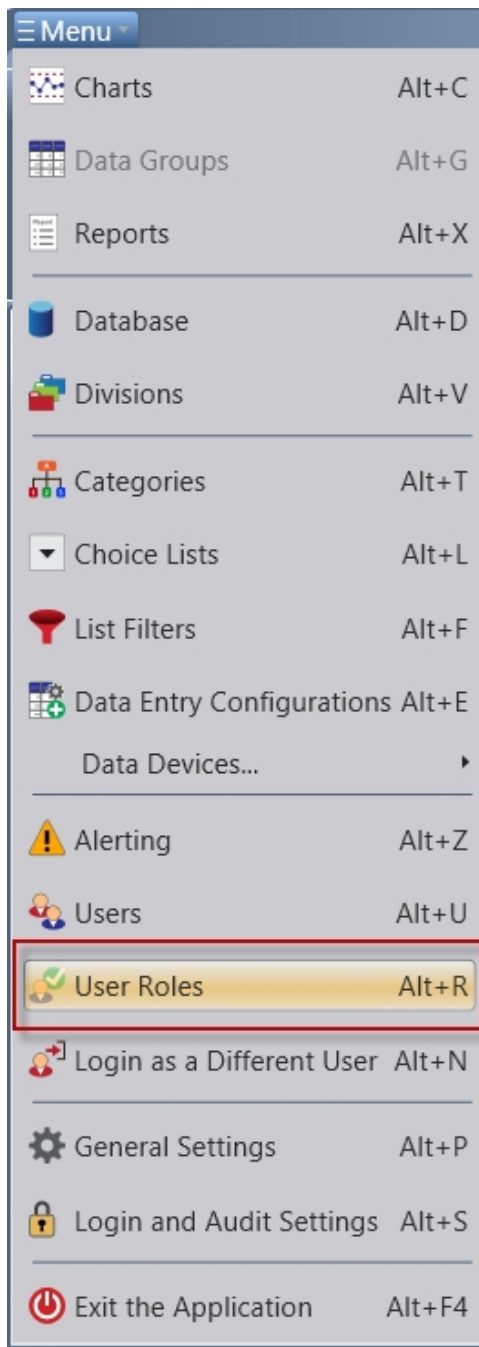
See also:

[Login management](#)

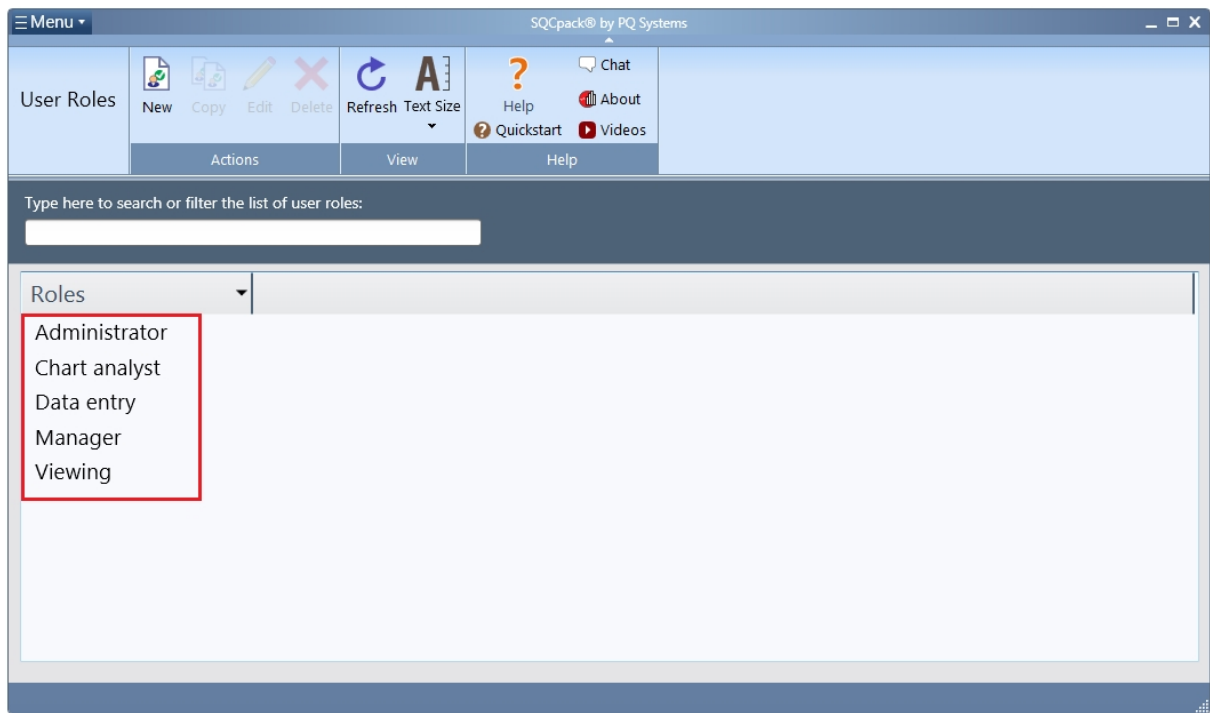
Add a user role

A User Role defines a set of permissions within SQCpack. For example, you might create a User Role named **View Only**. This role can be assigned to users who may run SQCpack and see the data and charts but who do not have permission to create or remove items from the database.

To create a user role, start by selecting **User Roles** from the navigation menu.



This will display the user role list view. This view shows a list of all user roles currently defined in the system. The ribbon bar includes buttons for creating a **new** user role, **editing** an existing user role, and making a **copy** of an existing user role.



Click the **New** button to create a new user role. This will display the user role editing form. On this form, enter the name for the user role and then set the permissions that users in this role will have when they are running SQCpack.

Adding new user role

User role:

Permissions for users in this role:

| | |
|--------------------------|------|
| Data Group | None |
| Data Editor | None |
| Chart | None |
| Category | None |
| Choice List | Use |
| Database Settings | None |
| List Filter | Use |
| Audit Settings | None |
| General Settings | None |
| Users | None |
| User Roles | None |
| Division | None |
| Data Entry Configuration | None |
| Report | None |
| Alerting | None |

Full None Default

OK Cancel

Enter a meaningful name for the new User Role. Set the permissions for each SQCpack entity by selecting from the drop-down list. When permissions have been set, click the OK button to save the new User Role. The user role list will now include this newly created User Role.

Note that this new User Role will have no impact on SQCpack until a user is assigned to this role. When this user logs into SQCpack, he or she will have the permissions assigned by this new role.

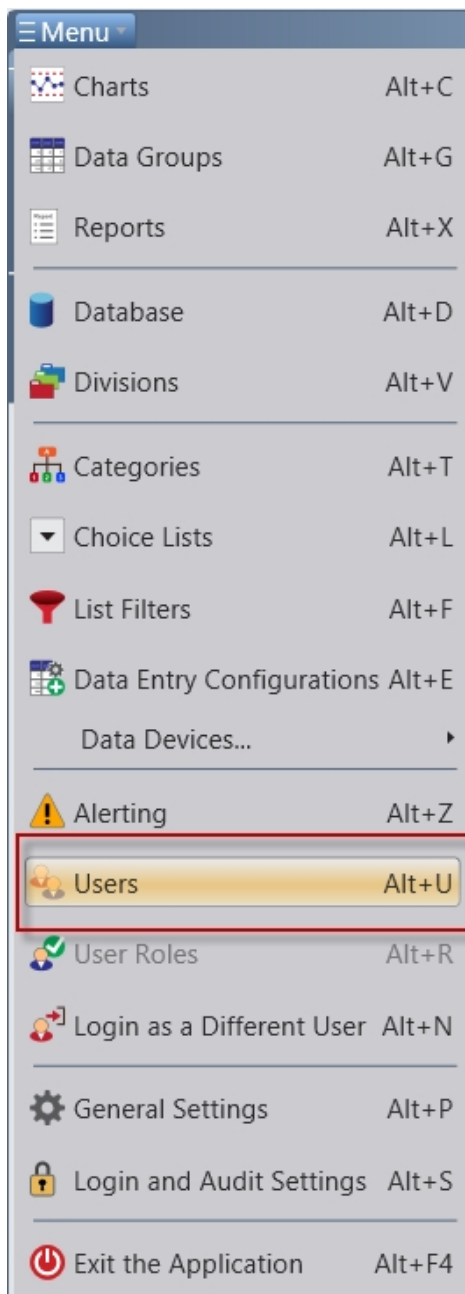
Note: A user role may not be deleted if any users are currently assigned to that role.

Add a user

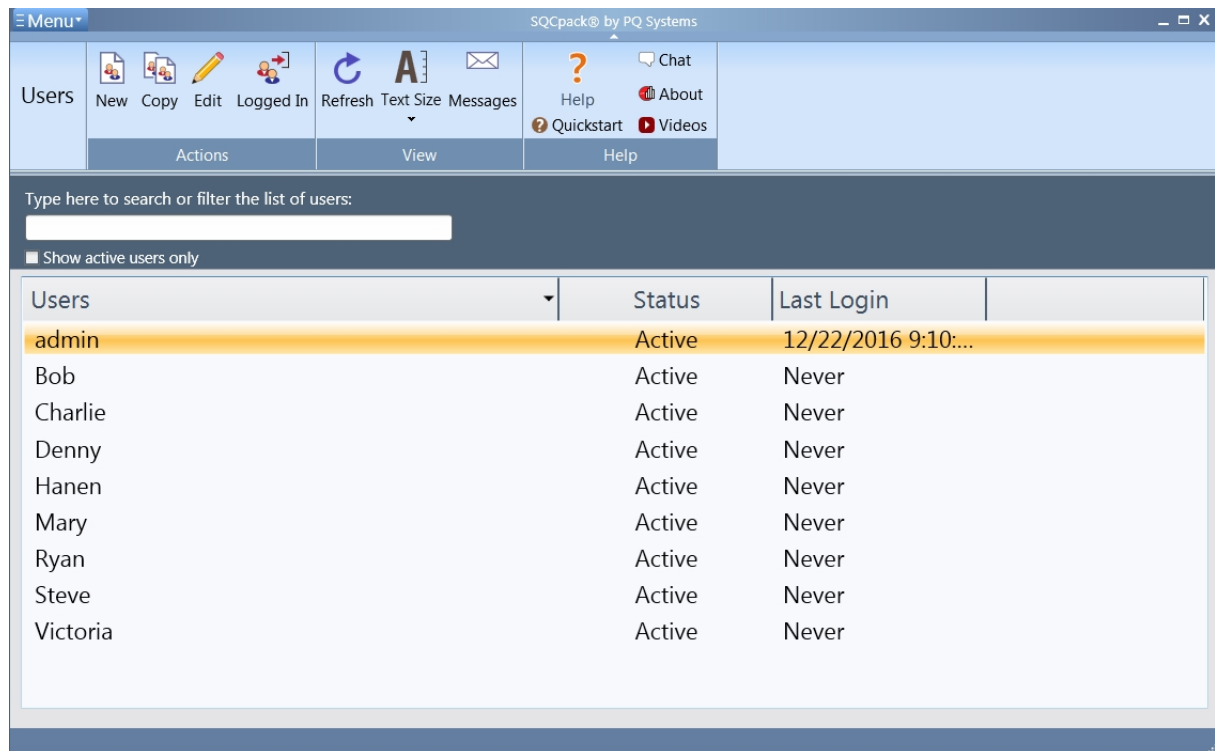
Each time SQCpack is used, it is in the context of an SQCpack user. If you have elected not to require users to log into SQCpack, the user context will always be the **admin** user, who has full permissions within the software. When login is required, SQCpack is running in the context of the **current** logged in user.

Tip: The option to set SQCpack to require user login (or not) can be found by selecting **Login and Audit Settings** from the navigation menu.

To add a new user to SQCpack, select **Users** from the navigation menu.



This will display a list of all users currently defined in the system, as shown below.



The ribbon bar includes buttons for creating a **new** user, **editing** an existing user, and making a **copy** of an existing user.

Click **Logged In** to see a list of the users who are currently logged into SQCpack. When a user logs into SQCpack, he or she is added to this list, which is stored in the SQCpack database. When the user closes the SQCpack application, or logs off, or logs in as a different user, the user's name is removed from this list. If the computer crashes or SQCpack terminates abnormally the user's record will remain in the list until manually removed (via the **Delete** button on that row of the list) or the next successful login/logout.

The **admin** user is special in these ways:

- All rights and privileges are permanently granted to the **admin** user.
- The **admin** user cannot be set to inactive.
- The **admin** user is not deactivated after a number of failed login attempts (7.0.16001.1 or higher).

Click the **New** button to create a new user. This will display the **Adding New User** dialog as shown below. On this form, enter the name for the user and specify various settings specific to this user as explained below.

User name - Enter a name for the user. This will be the name the user types in when logging into SQCpack.

Login using the Windows user name - When enabled and the user name is the same as the user's Windows login name, the user can login to SQCpack without entering a password. The user name entered here must match exactly what is displayed on the login dialog when **Login using your Windows user name** is selected. If you were adding a user who could login as shown in the example below, the user name would be **MyDomain\Name**.

Change password - Passwords are optional but are recommended. When you select **Change password**, the two password change fields are shown. Enter the new password into both password fields.

Require password change on next login - When enabled the next time the user attempts to log in they will have to change their password or they will not be allowed to log in.

This user is Active and can login - When this is enabled the user can log in to SQCpack. When this is not enabled, the user will not be able to log in to SQCpack.

User roles - You must select at least one User Role for each user. Rights and permissions within SQCpack are granted to a user by the User Role the user is assigned to. In order to assign multiple User Roles to a user select <multiple roles> and enable the roles for the user, as shown below.

Roles

User roles: <multiple roles>

- ☐ Administrator
- ☒ Chart analyst
- ☒ Data entry
- ☐ Manager
- ☐ Viewing

Divisions - Enable the box that applies for this user (if you are using Divisions). The Divisions setting allows SQCpack to show users data for their specific divisions. In the example below, the user will be able to see only data groups, charts, and reports that are in either the Michigan or Ohio divisions. Enable **All divisions** if you want the user to have access to all divisions defined in the database.

Divisions

Divisions: All divisions

- ☒ All divisions
- ☐ California
- ☒ Michigan
- ☒ Ohio
- ☐ Texas

Once the form is complete, click OK to save this new User. The new user will be displayed in the user list and will now be allowed to log in to SQCpack.

Note: SQCpack users are never deleted. Instead, they are not marked as being **Active**, preventing future logins into SQCpack. The reason the program keeps user records is that a user can be associated with data that is entered into data groups as well as data that is kept for audit trail purposes. For firms regulated by government bodies or complying with certain standards, this a software requirement that SQCpack meets.

See also:

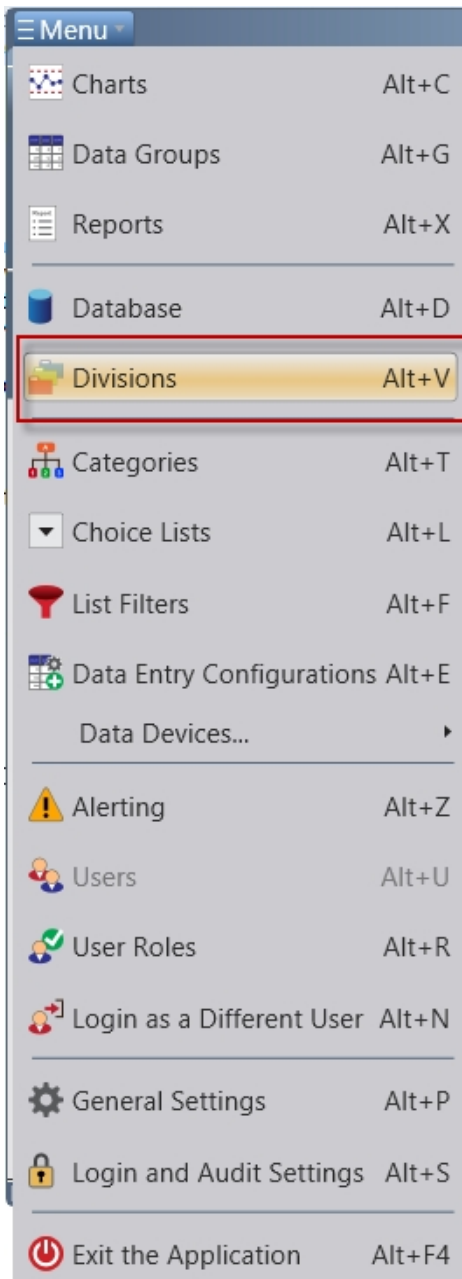
[Login management](#)

Add a division

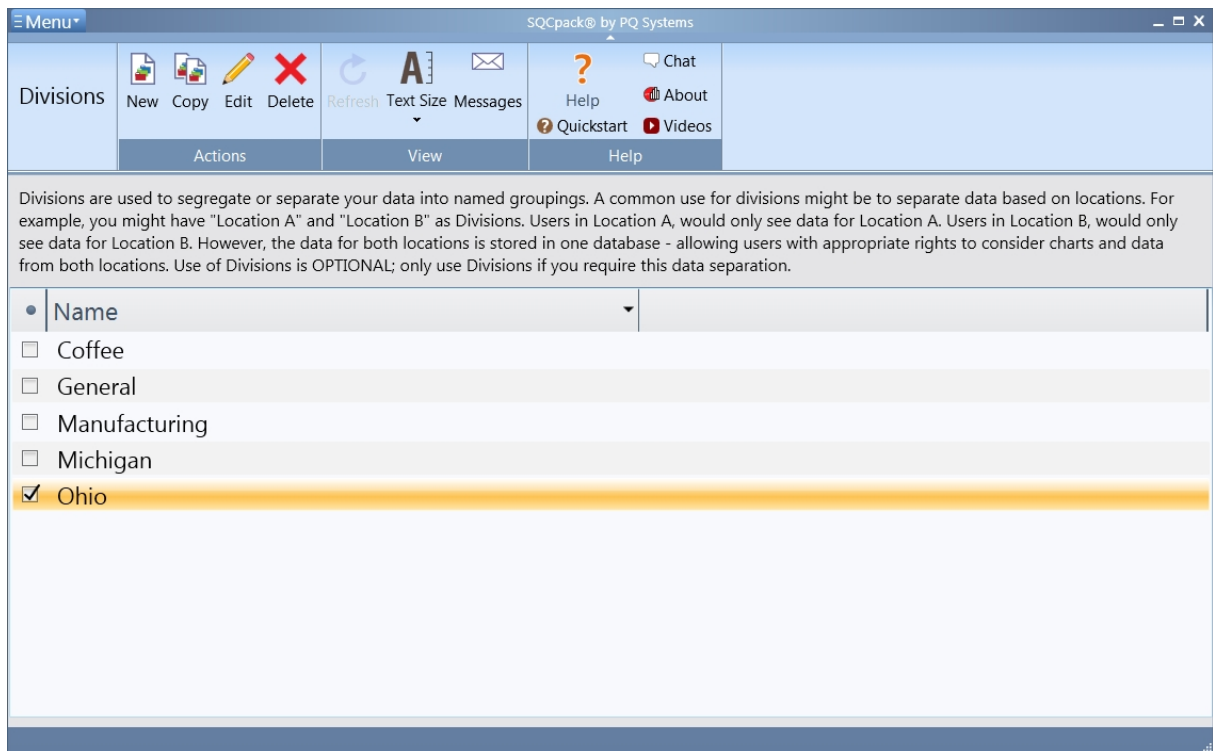
The idea of a Division is simple. It is just a name that is used to segregate SQCpack data in a meaningful

manner within the organization. For example, if your organization has two locations, one in Ohio and one in Michigan, you might define two divisions. As you add data and charts to the SQCpack database, you will classify them as being either the Ohio or the Michigan division. The same will be true for SQCpack users. The result is that a user in the Ohio division will see only data and charts that are in the Ohio division. A user in the Michigan division will see only data and charts that are in the Michigan division. Note that a user, perhaps a corporate quality manager, may be defined to see data and charts from **All divisions**.

To create a Division, start by selecting **Divisions** from the navigation menu.



This will display the division list view. This is a list of all divisions currently defined in the system. The ribbon bar includes buttons for **creating** a new division, **editing** an existing division, and **making** a copy of an existing division.



Click the **New** button to create a new division. This will display the **Add new Division** form as shown below.

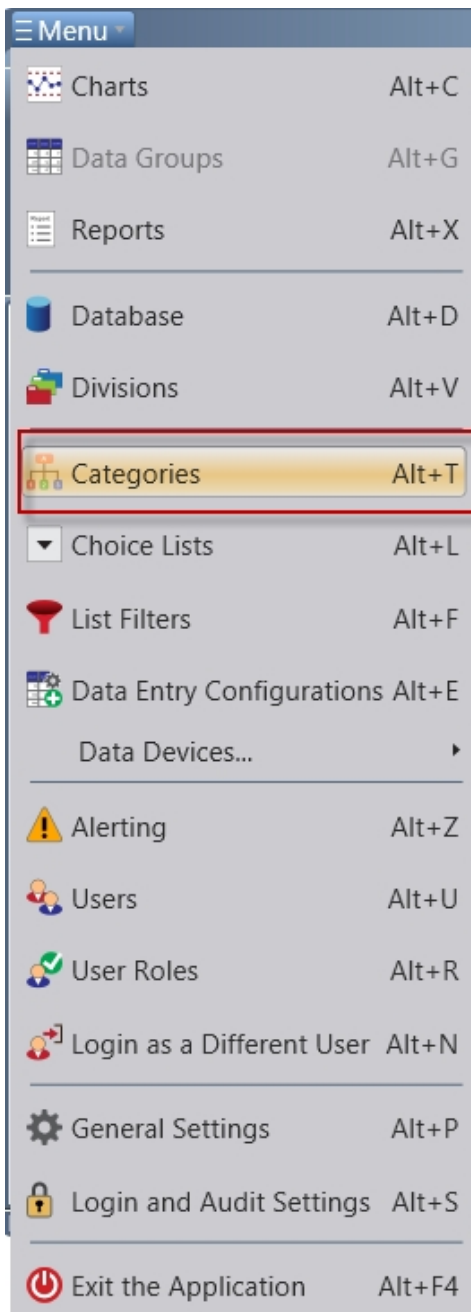
The screenshot shows the "Add new Division" dialog box. It has a title bar that reads "Add new Division". Inside the dialog, there is a label "Division name:" followed by a text input field containing the text "My new division". At the bottom of the dialog, there are two buttons: "OK" and "Cancel".

On this form, enter the name for the division. Click **OK** to save the new division. It will now show in the list of all divisions and it can be used to segregate data groups, charts, and reports.

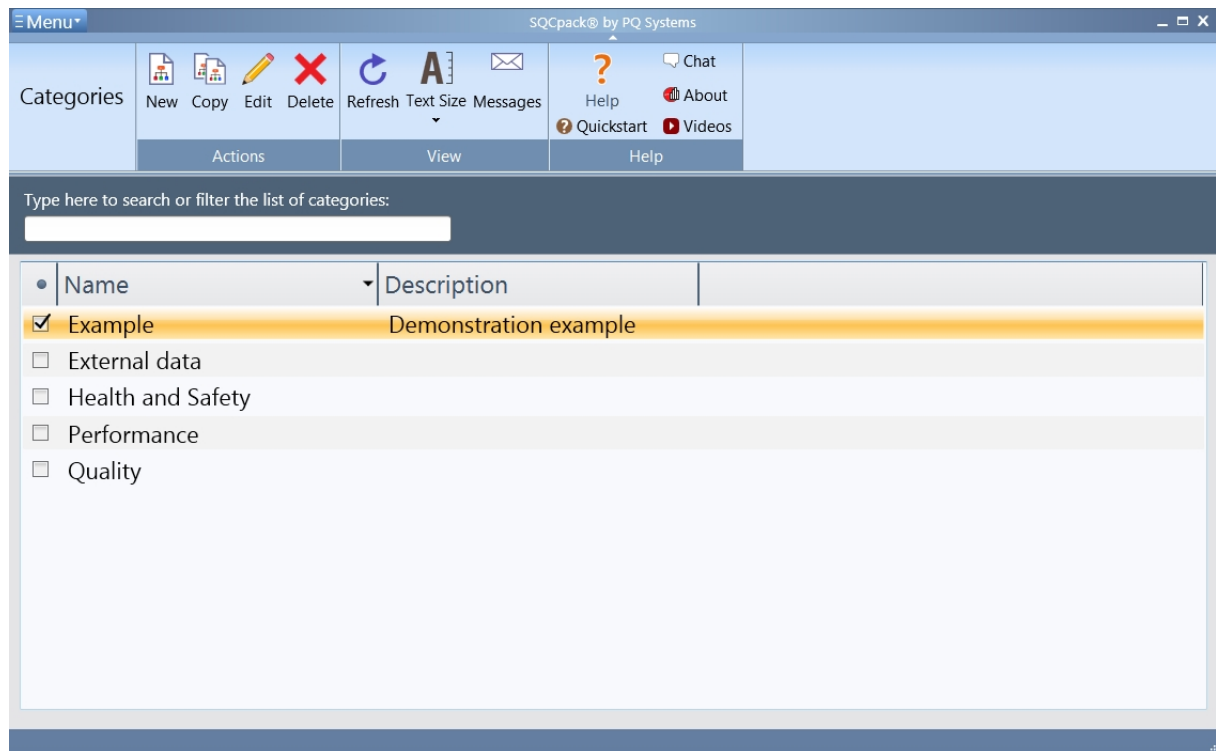
Add a category

"Category" is pretty simple. It is just a name that is used to classify data groups, charts, and reports to make them easier to find in lists. For example, when you create a chart, you might classify it as belonging to both the **Production** and the **Molding** categories. When a user is looking at a long list of charts, it will be easy to either sort or filter the list so that the **Production** charts and/or the **Molding** charts will be easy to find.

To create a Category, start by selecting **Categories** from the navigation menu.



This will display the category list view. This is a list of all categories currently defined in the system. The ribbon bar includes buttons for creating a **new** category, **editing** an existing category, and making a **copy** of an existing category.



Click the **New** button to create a new category. This will display the **Adding new category** form as shown below.

The screenshot shows the 'Add new Category' dialog box. It has a title bar 'Add new Category'. Inside, there are two text input fields: 'Category' and 'Description'. The 'Category' field contains the text 'MyNewCategory' and the 'Description' field contains the text 'Category Description'. At the bottom of the dialog box are two buttons: 'OK' and 'Cancel'.

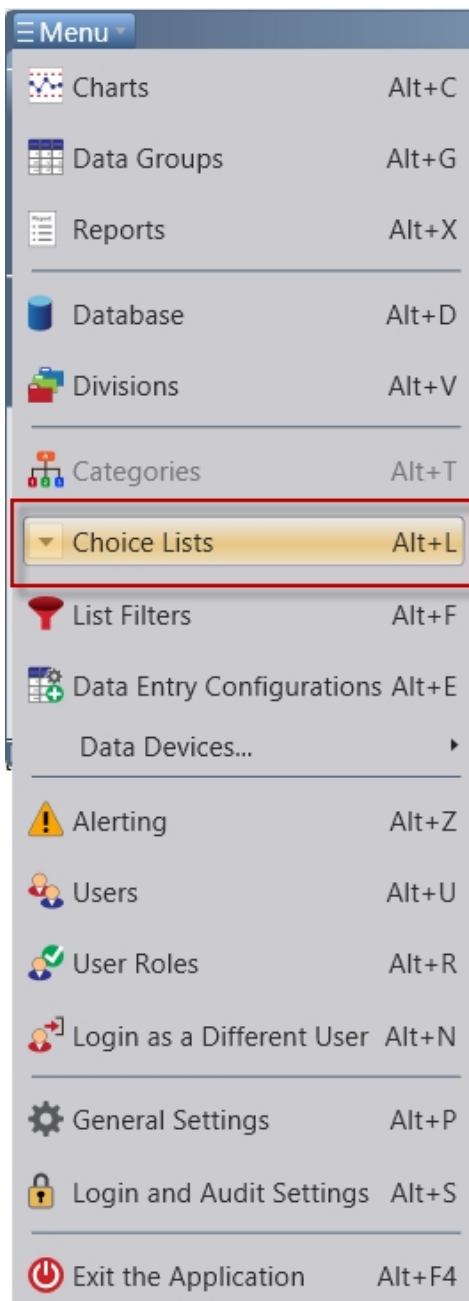
On this form, enter the name for the category.

Click **OK** to save the new category. It will now show in the list of all categories and it can be used to classify (**or categorize**) data groups, charts, and reports.

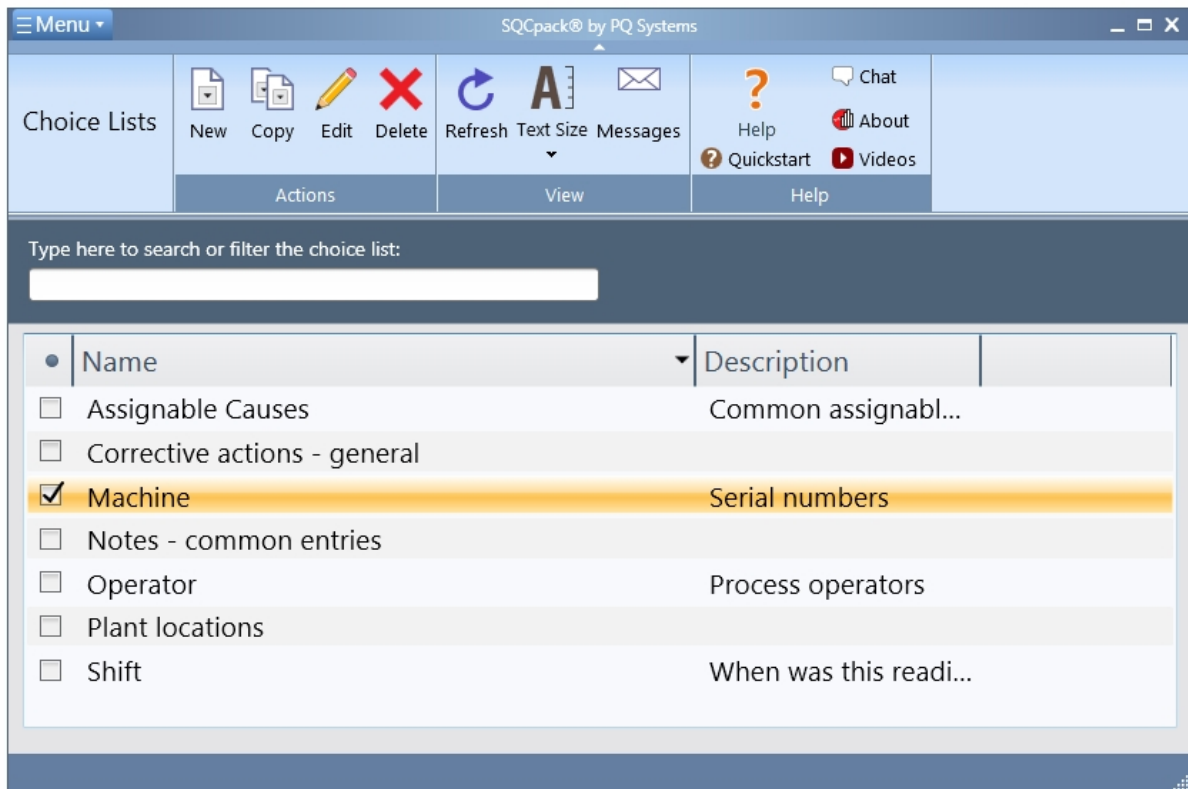
Add a choice list

A Choice List is a collection of text strings. Choice Lists are used during data entry both to reduce typing and to ensure consistency of recorded data. Choice Lists can be used to record identifiers, assignable causes, notes, and corrective actions during data entry. When creating data groups, the data group definition allows you to specify which choice list will be used for different purposes.

To create a Choice List, start by selecting **Choice Lists** from the navigation menu.



This will display the list of all choice lists currently defined in the system. The ribbon bar includes buttons for creating a **new** choice list, **editing** an existing choice list, and making a **copy** of an existing choice list.



Click the **New** button to create a new choice list. This will display the **Adding new choice list** form.

The screenshot shows the "Adding new choice list" form. It has a title bar with the text "Adding new choice list". The form contains the following fields and sections:

- Name:** A text input field with the value "My new choice list".
- Description:** A text input field with the value "A silly sample choice list".
- Choices:** A list box containing the following items:
 - This is my first choice
 - And another choice
 - Yet another choice
 - Finally, the last choice
 - [Empty choice item]
- Buttons:** "Paste", "OK", and "Cancel" buttons at the bottom right.

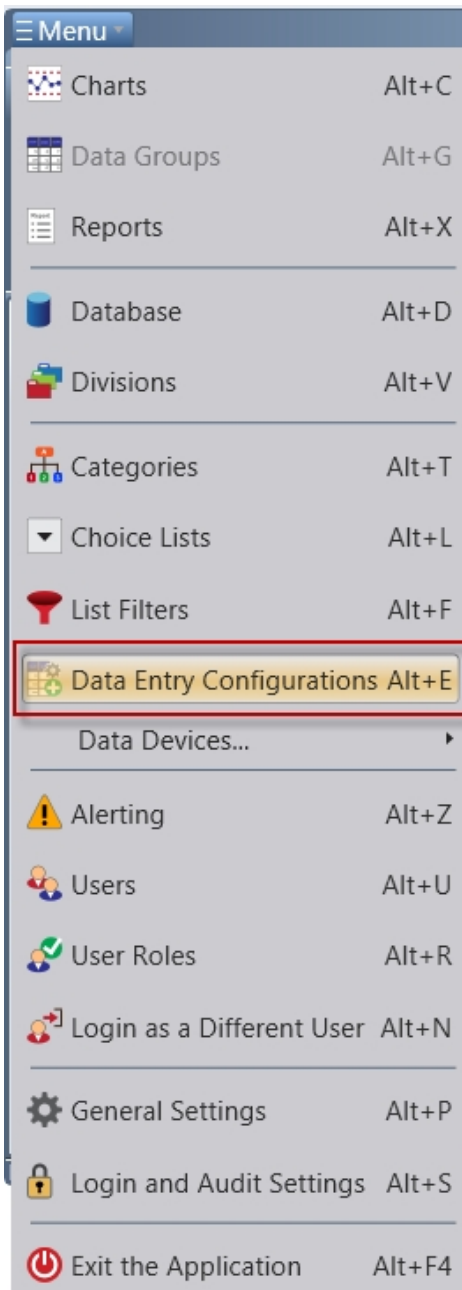
On this form, enter a name for the choice list and then add choice items to the list.

Click **OK** to save the new choice list. It will now show in the list and it can be used when setting up the choice lists for a data group and during data entry.

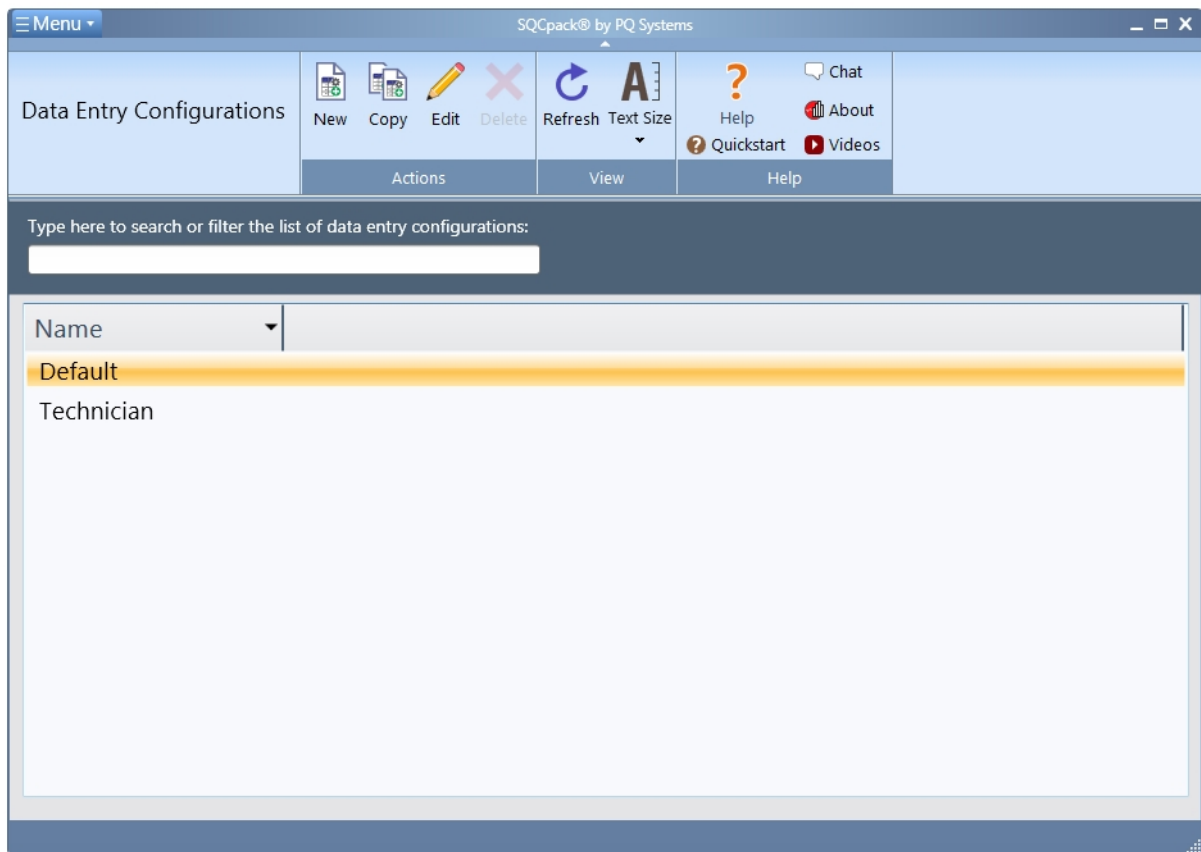
Create a data entry configuration

A Data Entry Configuration has a name and contains a collection of settings. These settings affect how data entry will behave. When defining a data group, specify which data entry configuration will be used for the data group. Having named data entry configurations allows you to specify data entry settings once and use these settings for many different data groups. When a data group is created, a default data entry configuration will be used unless a different one is selected.

To add a new Data Entry Configuration to SQCpack, select **Data Entry Configurations** from the navigation menu.



This will display the list of data entry configurations currently defined. The ribbon bar includes buttons for **new**, **copy**, and **edit** for working with data entry configurations.



Click the **New** button to create a new data entry configuration. This will display the form shown below. On this form, enter the name for the new data entry configuration and begin to adjust the settings.

Add new Data Entry Configuration

Name

Conditional actions:

When the color notification is canceled:

☒ Notify with color when data is out-of-spec / out-of-control

Notify based on:

Out of Spec

☒ Enter note/corrective action

☒ Optional entry

☐ Required entry

☐ Enter special cause

Out of Control

☒ Enter note/corrective action

☒ Optional entry

☐ Required entry

☐ Enter special cause

Other settings:

☒ Highlight out-of-spec data in Red

☒ Display real time chart for each data characteristic

☐ Enforce minimum width for chart of %

Number of samples to display

☐ Selecting enter commits the data value and remains on the characteristic.

Font size for data entry grid

Sample prompting:

☒ Enable sample prompting

Number of minutes between sample prompts:

When does a new time interval begin:

☐ Start after the prior interval expires (every 60 minutes), or

☒ Start after a new sample has been entered

Late sample warning delays:

Delay in minutes before entering 'Green' warning state:

Delay in minutes before entering 'Yellow' warning state:

Delay in minutes before entering 'Red' warning state:

When the prompt is canceled:

☐ Prompt using popup message when it is time for a new sample

☐ Prompt using tab color/light pole when not entered

☒ Prompt user for mandatory reason when sample not entered

Delay in minutes:

☒ Send email when sample not entered

Delay in minutes:

Email recipients, separate email addresses with a semicolon:

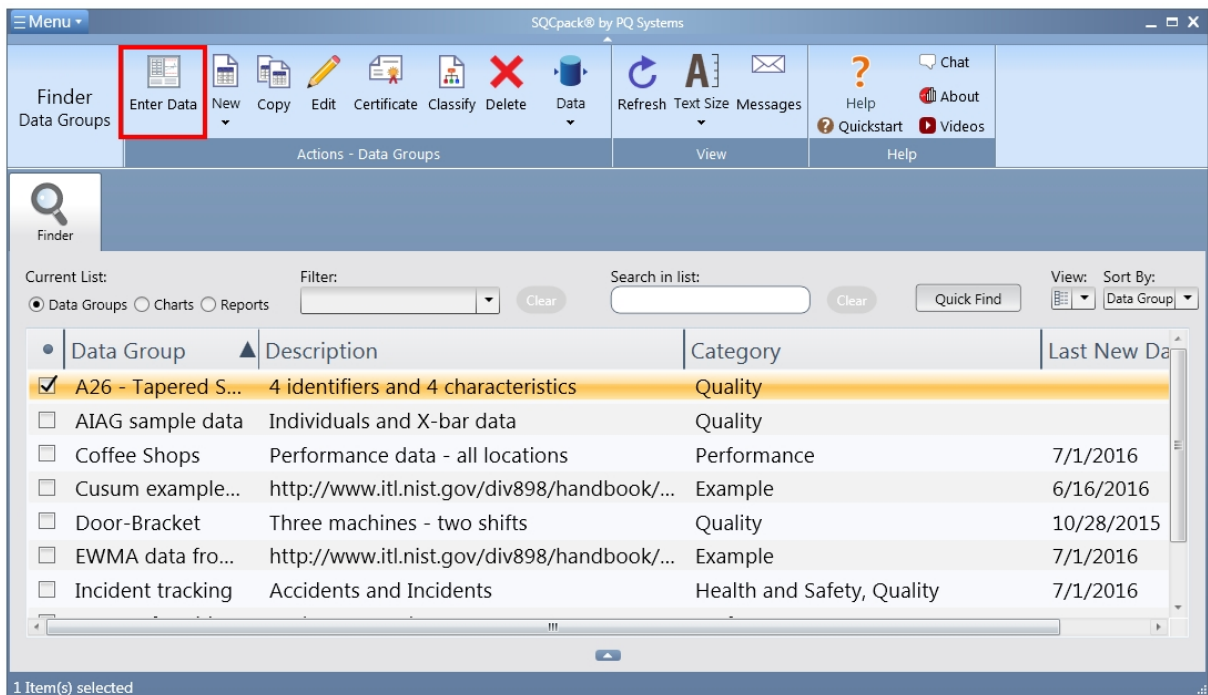
For details about how each setting on this form works, see the section [Customizing the data entry experience](#).

Once the form is complete, click **OK** to save this new data entry configuration. It will show up in the list and it will now be an option when defining or editing a data group to set its data entry configuration.

Enter data into an SQCpack data group

Data can flow into SQCpack in various ways. One of these is by typing data into the data group using the data entry option.

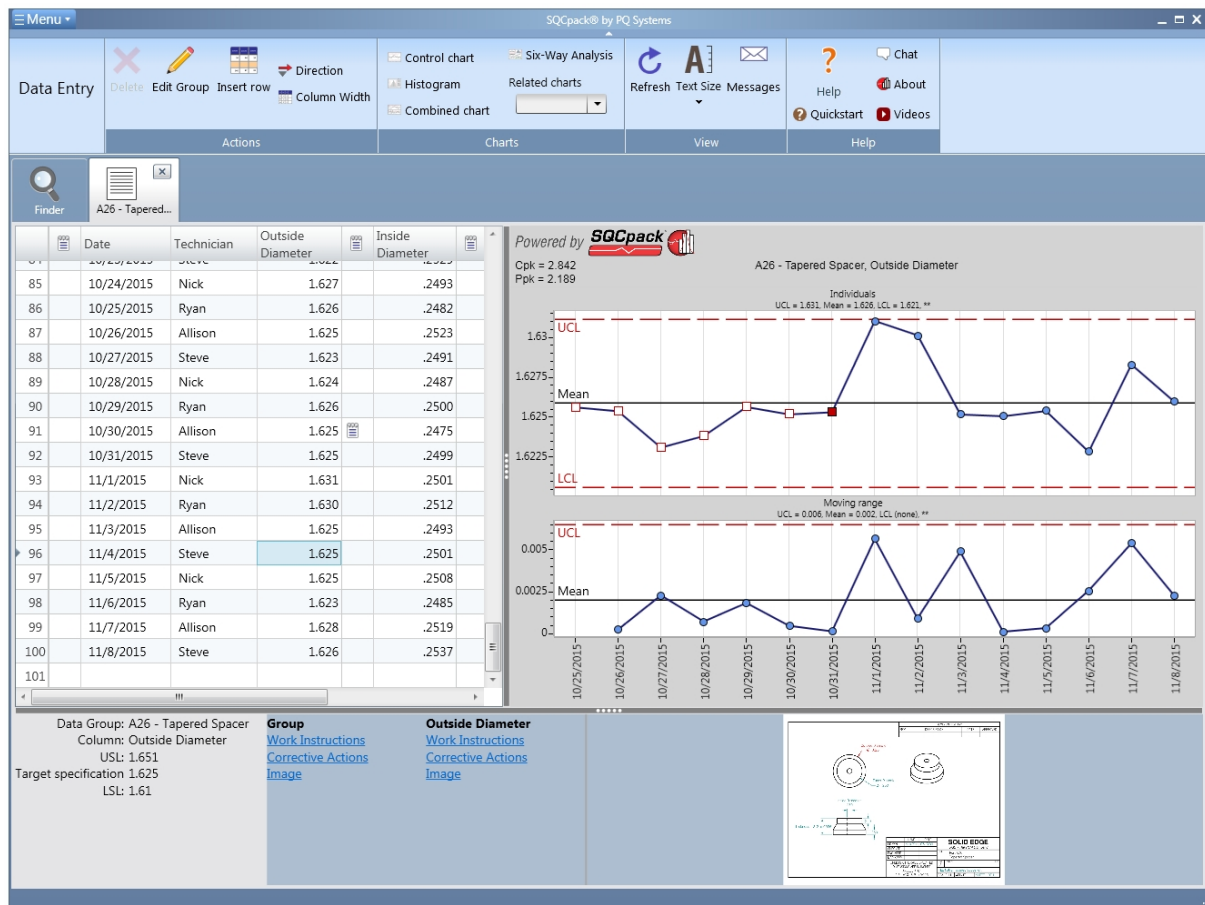
Select **Data Groups** from the navigation menu. Click once to select a data group in the list. Click the ribbon bar button named **Enter Data** (shown in the red rectangle below).



This will open a new tab in the work area. This is the data entry view. As with all tabs in the work area, clicking the **X** in the upper right corner will close the tab when you are finished.

The data entry view is divided into sections. In the upper left is the spreadsheet style data entry grid, where data entry occurs. At the bottom of the work area is a notifications area. In this section, you can read information that changes based on the current column and on what is currently happening. On the right is a real-time chart area, which can show data as you enter it on a control chart.

Keep in mind that every group is defined with a **data entry configuration**. This data entry configuration determines how groups behave during data entry. You may see different screen layouts and experience different behavior for different data groups, based on their data entry configuration.



Start entering data into the grid by typing and then pressing Enter when a value is complete. As you enter data, the chart at the right will be updated to show the newly entered data.

The data entry grid supports cut, copy, and paste functions. Column widths may be adjusted, and these will be remembered. The horizontal and vertical splitters may be adjusted to change the amount of screen space available for each section. These splitter positions will be remembered from session to session.

In the notification area at the bottom of the screen, the data entry user may launch documents for work instructions, corrective actions, and images that may help during data entry. These document windows may be sized and positioned by the user and their positions will also be remembered.

There are many options that can be used to customize the behavior of a data entry session. These will be discussed in later sections. Some topics to explore are:

[Entering data,](#)

[Customizing the data entry experience,](#)

[Prompting the user for new data,](#)

[Requiring the user to enter notes, causes, and corrective actions,](#)

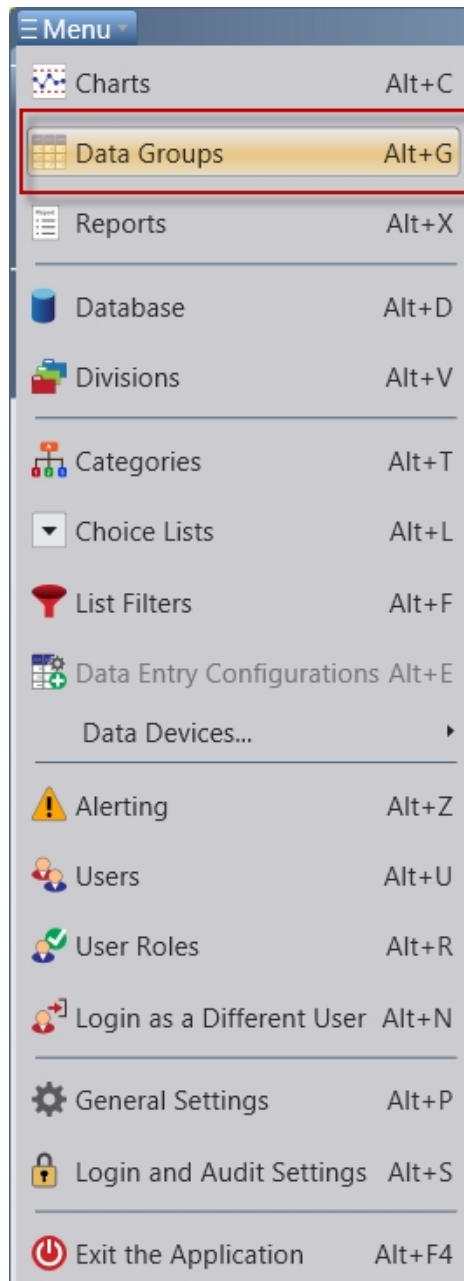
[Reference - Creating and customizing data groups.](#)

Create an SQCpack data group

The Data Group plays an important role in SQCpack. Think of a Data Group as named set of data columns that are related in some way. When data is entered or imported into SQCpack, quality improvement data is stored in the data group.

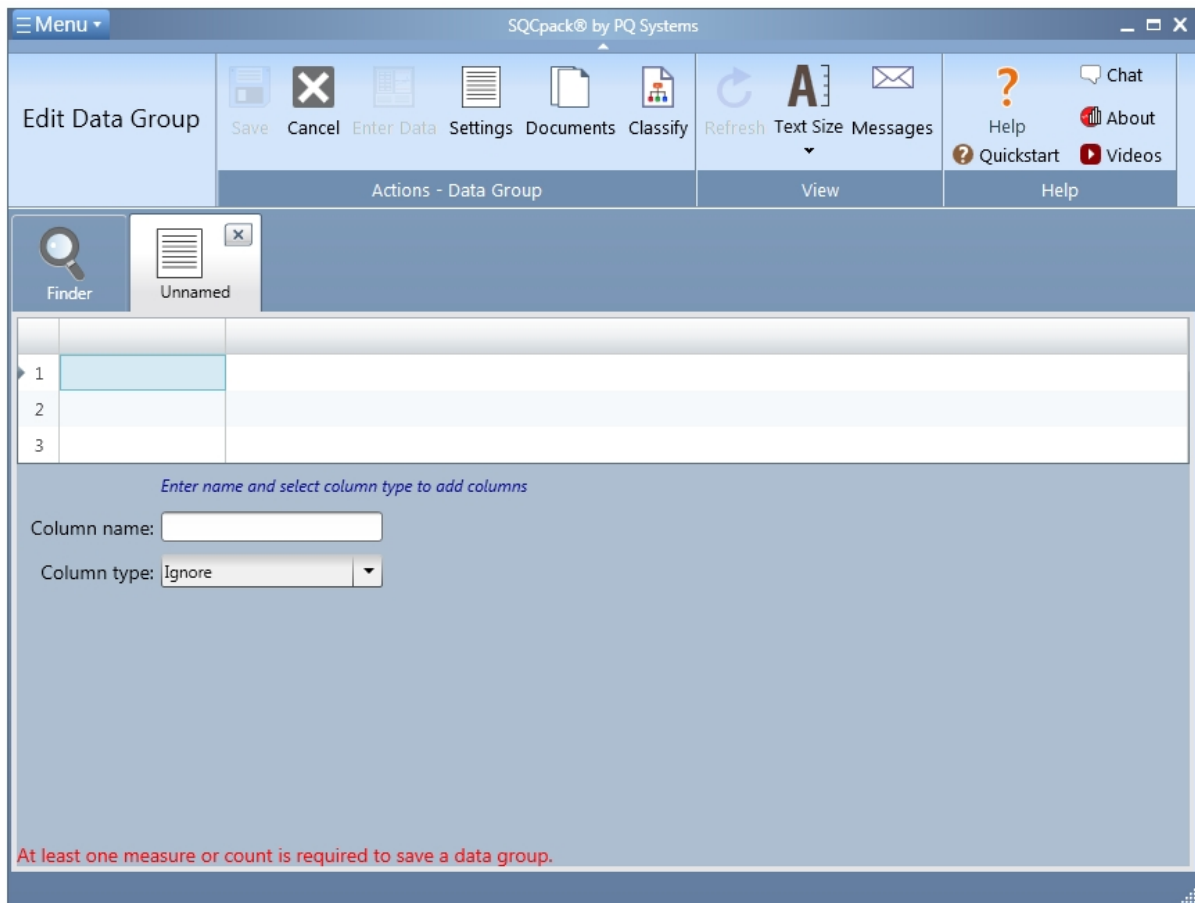
When you open a data group for data entry, you will see a spreadsheet-style data entry grid. The columns in this grid are defined by the data group. Different data groups will contain different sets of columns to reflect what is being measured, monitored, and recorded somewhere in your work processes.

To create a new Data Group, start by selecting **Data Groups** from the navigation menu.



This will display the list of currently-defined data groups.

The ribbon bar contains a **New** button. Click this button to create a new data group. This will open a new tab in the work area. This is the edit group view. Use this form to define and modify a data group.



Menu

SQCpack® by PQ Systems

Edit Data Group

Save Cancel Enter Data Settings Documents Classify Refresh Text Size Messages

Help Chat About Quickstart Videos

Actions - Data Group View Help

Finder Unnamed

| | |
|---|--|
| 1 | |
| 2 | |
| 3 | |

Enter name and select column type to add columns

Column name:

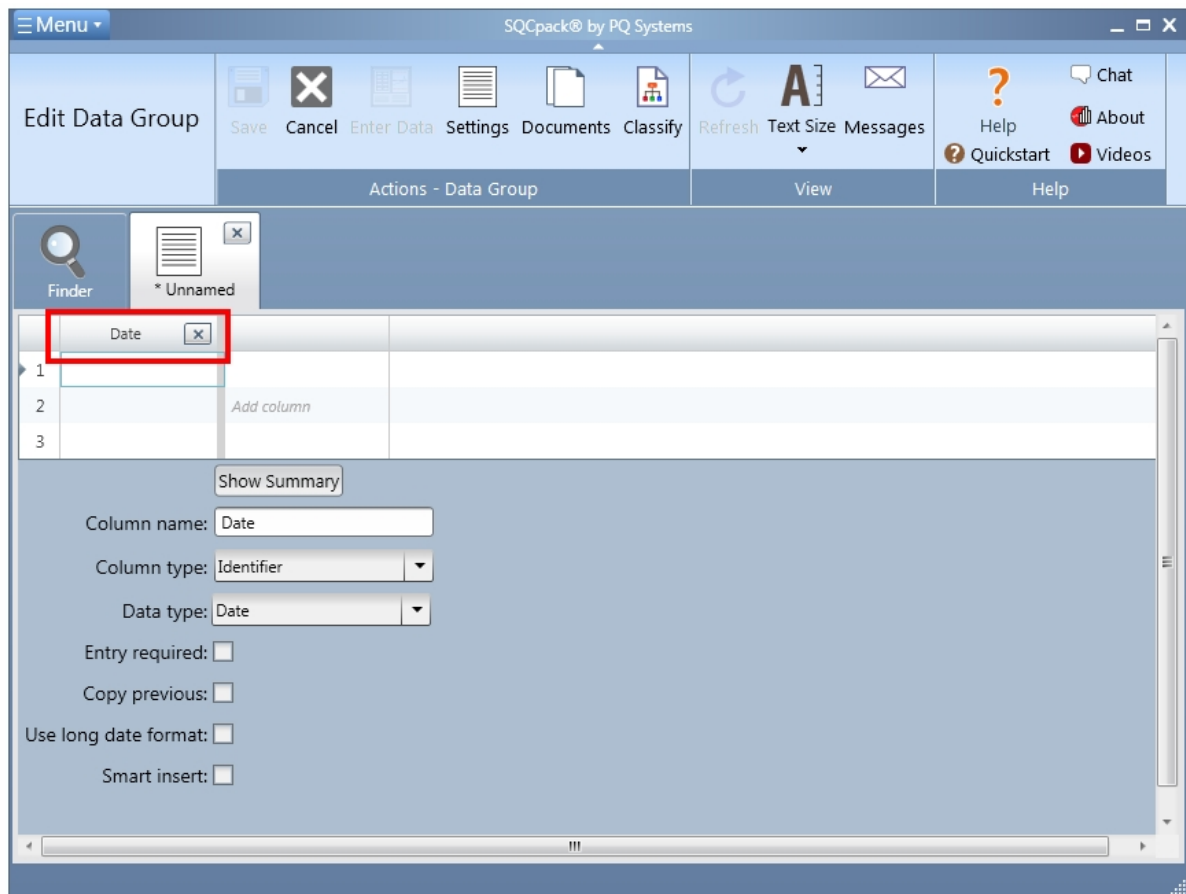
Column type:

At least one measure or count is required to save a data group.

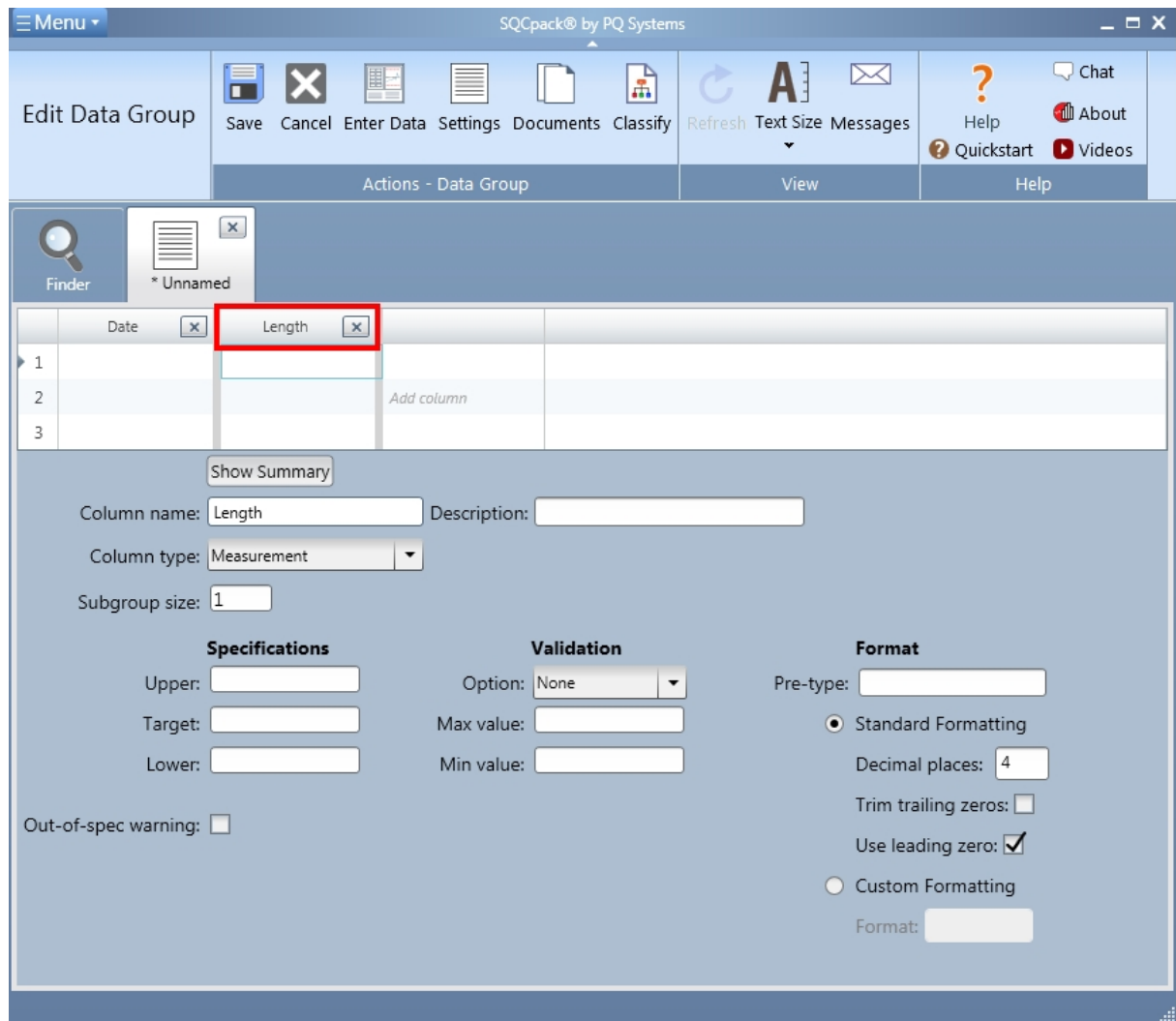
The grid near the top shows the data columns defined for the group. The area below the grid contains settings for the data column that is currently selected in the grid. As you click on different columns in the grid, the settings below the grid change to reflect the current column. Notice that no data entry happens in this grid. It is used to represent how the data entry form will look and to allow you to select different columns by clicking on the column.

Some practice with this form:

For **Column name**, enter **Date**. Next select **Identifier** for the **Column type**. Notice that this displays settings below to help define this date identifier. For **Data type** select **Date**. You have defined your first column for this group, which is an identifier. Notice how **Date** (shown in the red rectangle) is now the column header in the first column.



Next, click in the second column of the grid and enter **Length** for the **Column name**. This time, for **Data type**, select **Measurement**. This displays all the settings that are unique for **measurement** columns below. For now, leave all of this as it is. Notice how **Length** (shown in the red rectangle) is now the column header in the second column.



Just to see what happens, click back on the first column. Notice the screen, and then click back on the second column. The settings for each column are displayed below as you click on different columns.

While you are on the **Length** column, change the **Subgroup size** to 3. The grid above will be changed to reflect that **Length** is using a subgroup size (or sample size) of 3.

Click on the first blank column to the right of **Length**. For **Column name** enter **Errors**. For column type, select **Count**. Notice how the settings below are now different, allowing you to specify settings for the **count** data column. Click on each column and notice how the settings change.

To save this group, click the **X** in the upper right corner of the tab (or click the **Save** ribbon button). Answer **Yes** to save the group. Next, enter a name for this group. For example, enter **My first data group** and then click OK. This will close the edit group form, save the group, and ask if you want to enter data. For now, answer no. The new group will now show in the list of data groups.

When this group was saved, a data table was created in the database. This data table will be used to store all the data that will either be entered or imported into this data group. Also, for each measurement and count column in the group, SQCpack created some default charts. There are many more settings and options when creating a data group. See the section [Reference - Creating and customizing data groups](#) for more detailed explanations.

Create a chart from SQCpack data

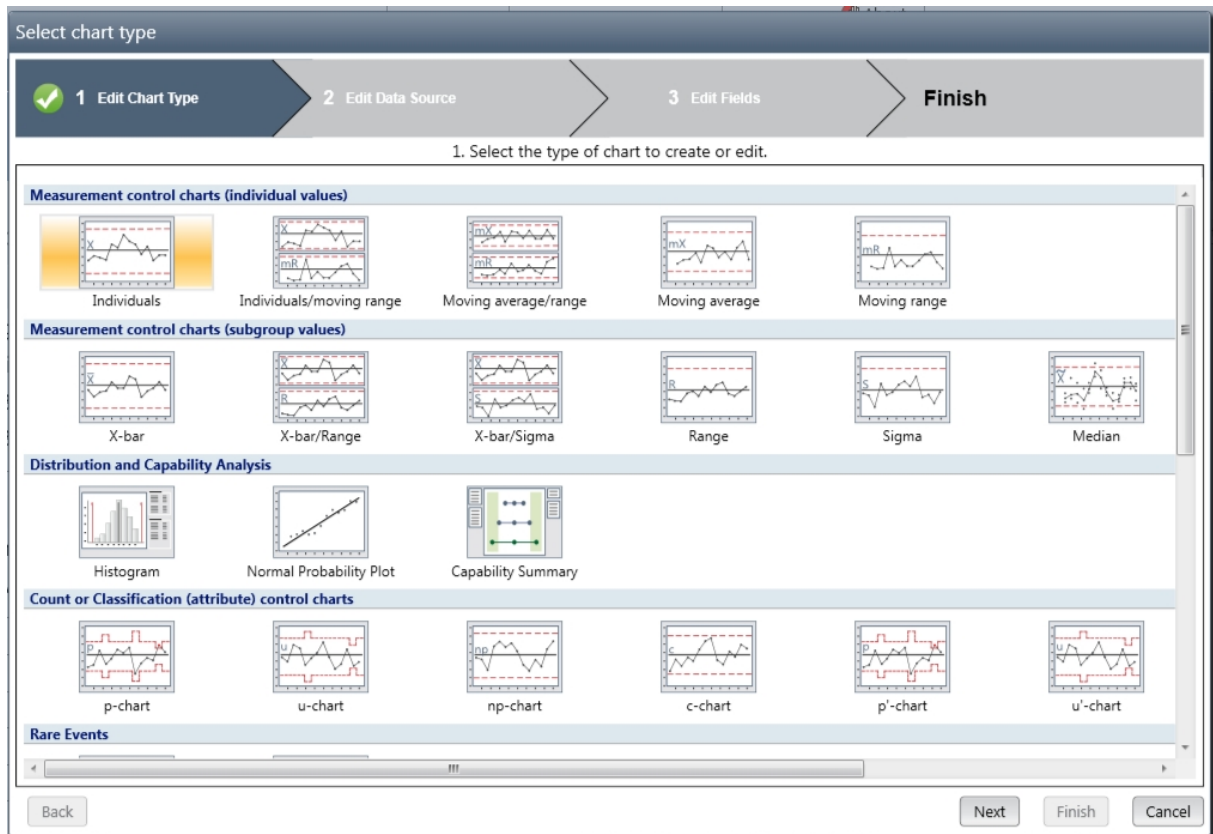
Some charts are created automatically by SQCpack. This happens when you create new data groups. Other charts are created by the user. Charts are created using a new chart wizard that breaks the process

down into three easy steps:

1. Select a chart type
2. Select the data to be charted
3. Specify chart data columns

In step 2, one option for where to get data for the chart is from SQCpack data. Ensure that you have at least one data group containing at least a few rows of data and then follow these steps.

Select **Charts** from the navigation menu. This will display the list of charts currently defined. In the ribbon bar. Click the **New** button to start the chart creation process. This will display the first step of the new chart wizard.



Select the first chart type, which is an individuals chart, then click the **Next** button.

From the **Data Source** drop-down list, select **SQCpack data**. While you are here, notice that the data *could* come from many other sources.

From the **Group** drop-down list, select the first data group you see. From the **Characteristic:** drop-down list, select the first characteristic you see. Step 2 of the new chart wizard will look similar to this:

Edit Data Source

1 Edit Chart Type 2 Edit Data Source 3 Edit Fields Finish

2. Select the data type, location, and contents to use for this chart.

Data Source:
SQCpack® data

Group:
A26 - Tapered Spacer

Characteristic:
Outside Diameter
Inside Diameter
Spacer Thickness
Taper Diameter
All characteristics

Back Next Finish Cancel

Click the **Next** button. This will display the last step, where you **edit fields** for the chart you are making. There are many options here, but your primary task is to tell the chart which columns to include. For SQCpack data, this has been mostly done for you, because of your selections on the previous step. Often, you will use the drop-down lists for the **Treat as** row to tell the chart how to **treat** the column for this chart.

The **Column mapping list style** button shows the current list style for columns in the Edit Fields step of the chart creation wizard. By default, this is set to Horizontal. For data with many columns, it may be easier to view them in Wrapping mode. The column mapping list style can be toggled by clicking the button.

Select columns to use

1 Edit Chart Type 2 Edit Data Source 3 Edit Fields **Finish**

3. Select which columns from the data source to use and how the chart should use each column.

Column mapping list style: **Wrapping List**

| | | | | | |
|--|--|--|--|-----------------------------------|---|
| Row number Identifier Row number | Row cause Cause Row cause | Row note Note Row note | Row action Corrective Action Row action | Date Identifier Date | Technician Identifier Technician |
| Outside Diameter(1) Measurement Outside Diameter(1) | Outside Diameter - cause Ignore Outside Diameter - cause | Outside Diameter - note Ignore Outside Diameter - note | Outside Diameter - action Ignore Outside Diameter - action | | |

Selected columns: Row number, Row cause, Row note, Row action, Date, Technician, Outside Diameter(1)

Data used: View Data 25 rows returned (does not include Sampling)

Order by: Row number

Sampling: None (No sampling defined)

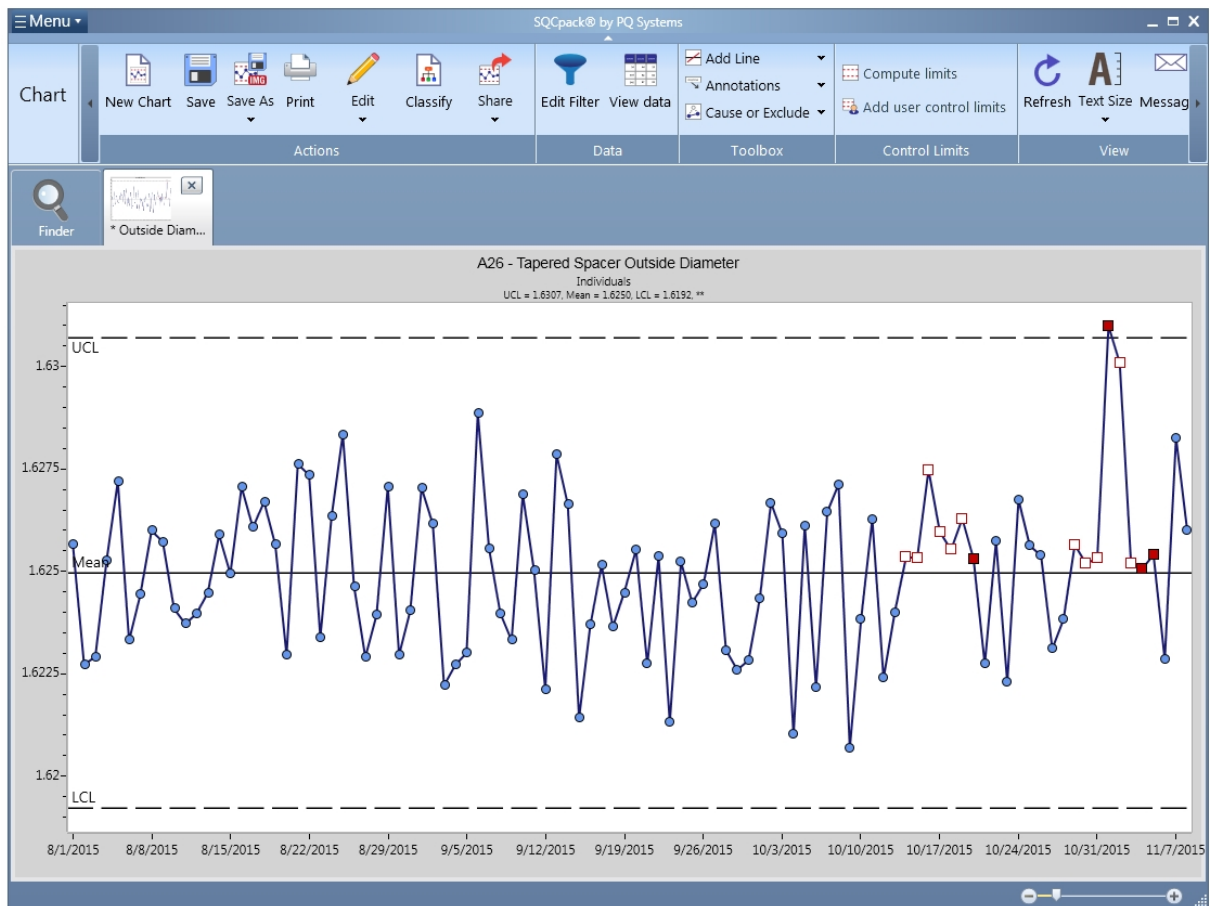
Filtering: Edit the Filter ☐ Apply the filter (filter not defined)

Rows to use: Last n values , where n= 25

Back Next Finish Cancel

That's it. You are done. Click the **Finish** button. This will display the chart on a new tab in the work area. To save this chart, click the **X** in the upper right corner of the tab, answer Yes to save the chart, enter a name for the chart, and then click OK.

This chart will now show in the chart list. When you wish to see the chart, double click its name in the list or select it and click the **Display** button in the ribbon bar. The chart will reflect the most current data each time it is displayed.



While any chart is displayed, click the **Edit** button in the ribbon bar to customize many different chart settings. Customizing charts is explored in more detail in these topics:

[Creating and customizing charts,](#)

[The chart editing process.](#)

Create a chart using data external to SQCpack

Charts are created using a new chart wizard that breaks the process down into three steps:

1. Select chart type
2. Select data source
3. Specify chart data columns

To follow the steps in this section, create a simple Excel sheet as shown here and save it in your **Documents** folder.

| Date | Measurement |
|----------|-------------|
| 8/1/2014 | 14 |
| 8/2/2014 | 16 |
| 8/3/2014 | 12 |
| 8/4/2014 | 11 |
| 8/5/2014 | 9 |
| 8/6/2014 | 18 |

| | |
|-----------|----|
| 8/7/2014 | 15 |
| 8/8/2014 | 13 |
| 8/9/2014 | 11 |
| 8/10/2014 | 17 |

From the navigation menu, select **Charts**. Next, click the **New** button in the ribbon bar to start the new chart wizard and show step one, which allows you to select a chart type.

Select the first chart shown, which is an individuals chart, then click the **Next** button.

From the **Data Source** drop-down list, select **Microsoft Excel**.

For the **Data File**, click the **Browse** button and select the Excel file from your **Documents** folder.

The **Worksheet** drop-down should automatically fill with the default name *Sheet1\$*. Click on the **Next** button to continue on to step 3.

Use the **Treat as** drop-down list to mark *Date* as an **Identifier** and *Measurement* as a **Measurement** column (as shown below).

We recommend that you also select an identifier that implies order, such as a date field, to be used as the **Order by** column.

1 Edit Chart Type 2 Edit Data Source 3 Edit Fields Finish

3. Select which columns from the data source to use and how the chart should use each column.

Field: Date Measurement
Treat as: Identifier Measurement
Display name: Date Measurement

Selected columns: Date, Measurement

Data used: View Data 10 rows returned (does not include Sampling)

Order by: Date

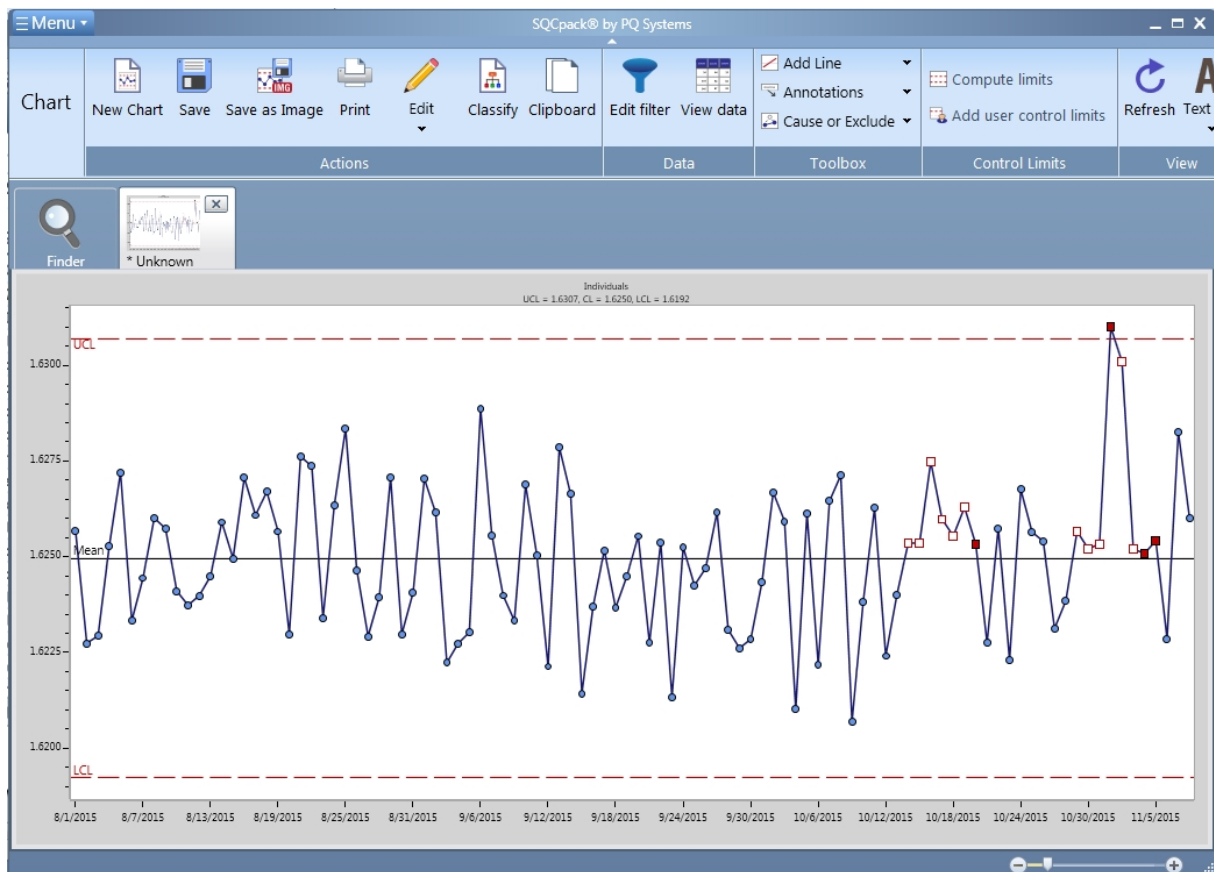
Sampling: None (No sampling defined)

Filtering: Edit the Filter ☐ Apply the filter (filter not defined)

Rows to use: All values

Back Next Finish Cancel

Click the **Finish** button. This will display your new chart as a new tab in the work area.



Click on the **X** to close this chart tab. Answer Yes to save the chart. Enter a name such as **My first chart**, and then click OK. The new chart now shows up in the chart list. Any time you display this chart, it will show the most current data from the Excel sheet.

SQCpack can create charts from many data sources. This example demonstrates the main work flow, but there are many more options. Explore the following topics to learn more:

[Creating and customizing charts,](#)

[The chart editing process](#)

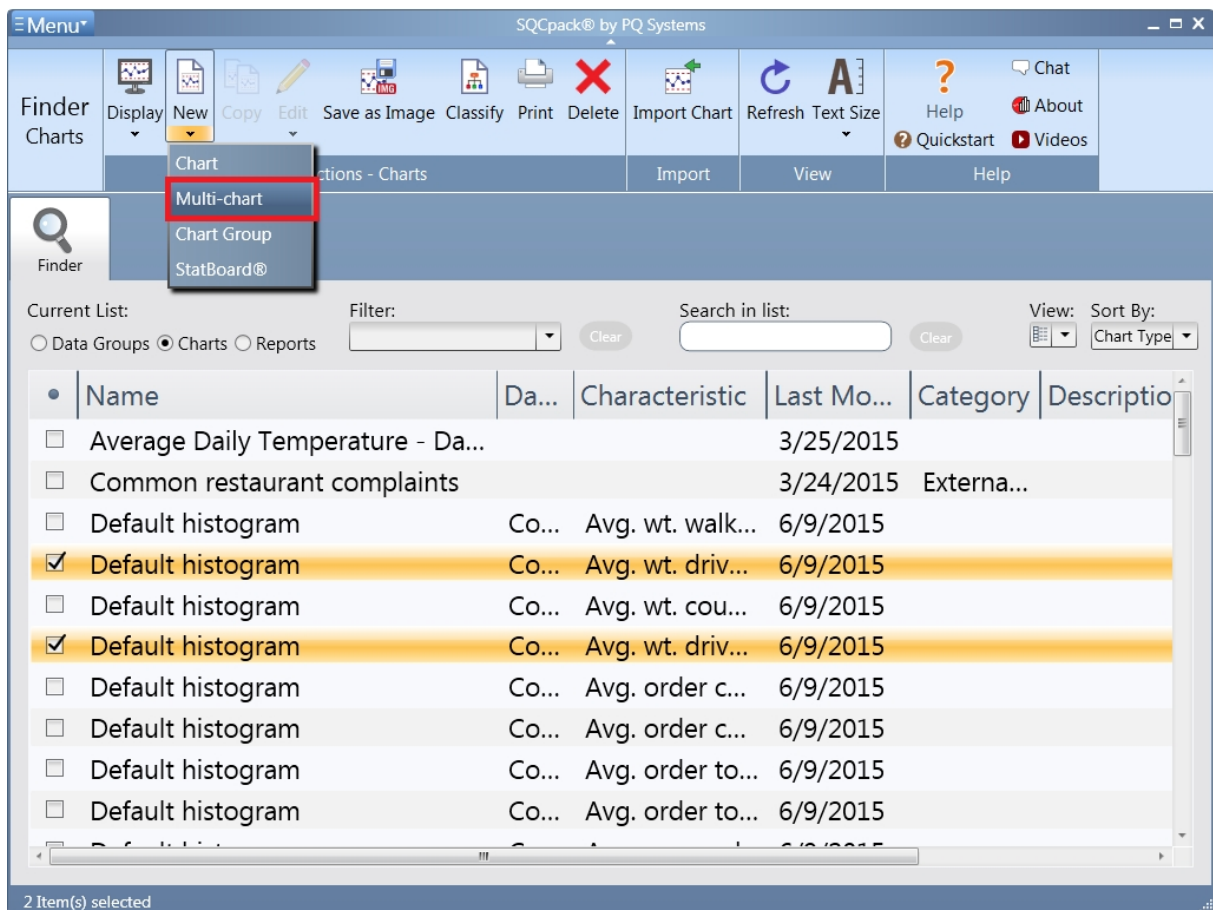
[Appendix D: Charting external data sources](#)

Create a multi-chart

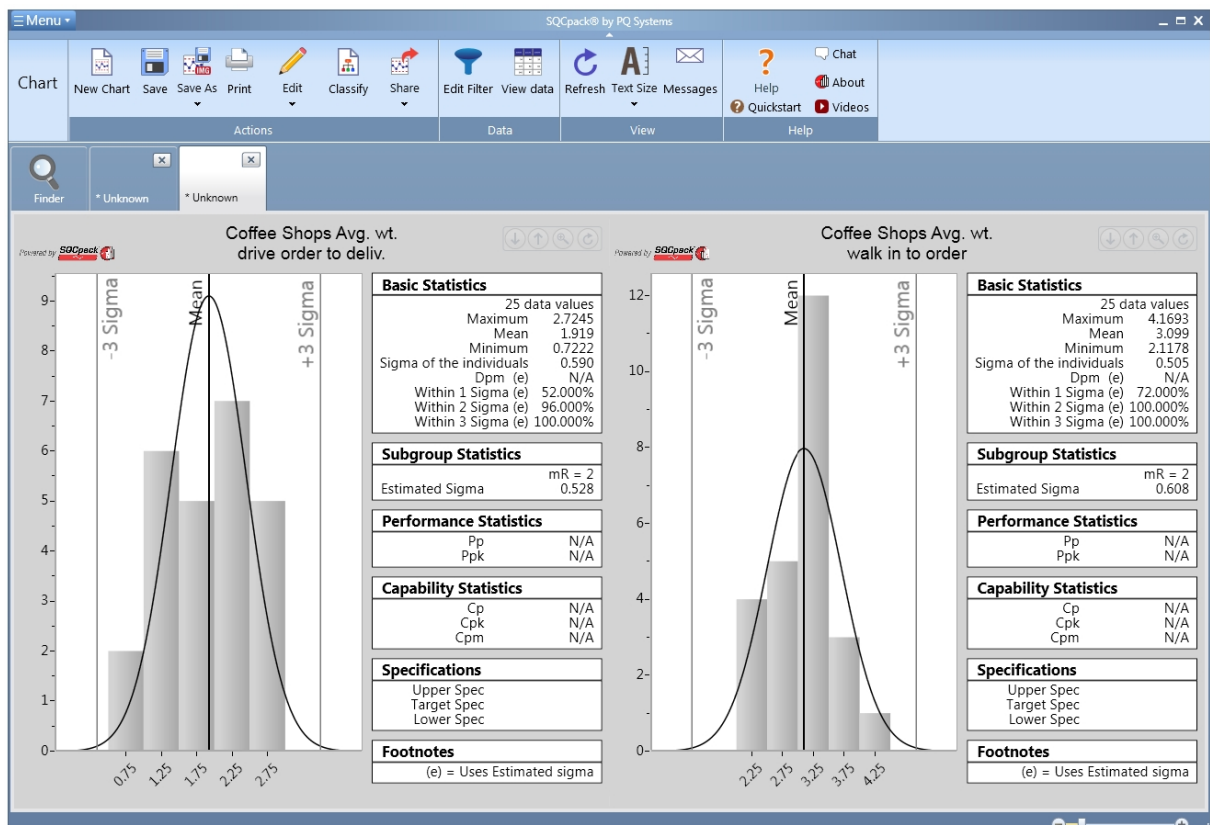
A multi-chart allows you to display or print a chart that contains multiple charts. For example, you might define a multi-chart that includes four of your most important charts. The multi-chart can then be displayed or printed on a single page.

Start by selecting **Charts** from the navigation menu. You will need two or more charts that have already been created to follow along. If you do not, see the previous topic, then create at least two charts to work with.

In the charts list, click on any chart, then click on the checkbox in the leftmost column. Do the same thing with a different chart. You now have two charts **selected** as shown below.



In the ribbon bar, click the drop-down triangle under the **New** button. One of the choices will be **Multi-chart**. Click on Multi-chart. This will create and automatically display a new multi-chart showing the two charts (that have been selected) in a new tab in the work area.



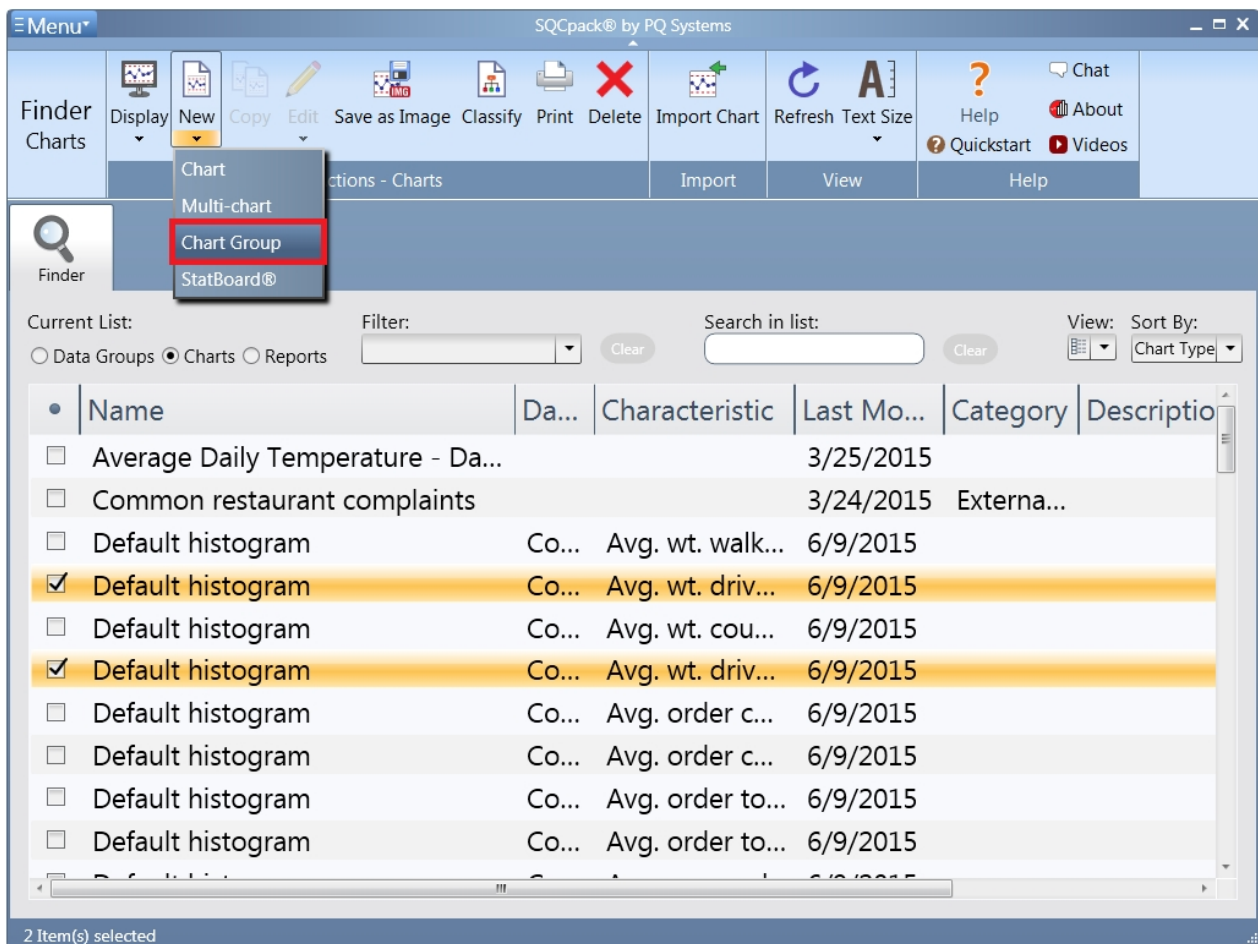
While viewing a multi-chart, several options are available. For example, you can zoom in on a single chart, zoom back out to the entire multi-chart, and move charts within the multi-chart to change their order. To learn more about multi-charts, see the topic [Working with multiple charts](#).

When you click the **X** to close this new multi-chart, you will be prompted to save it and give it a name. The multi-chart will then appear in your list of all charts.

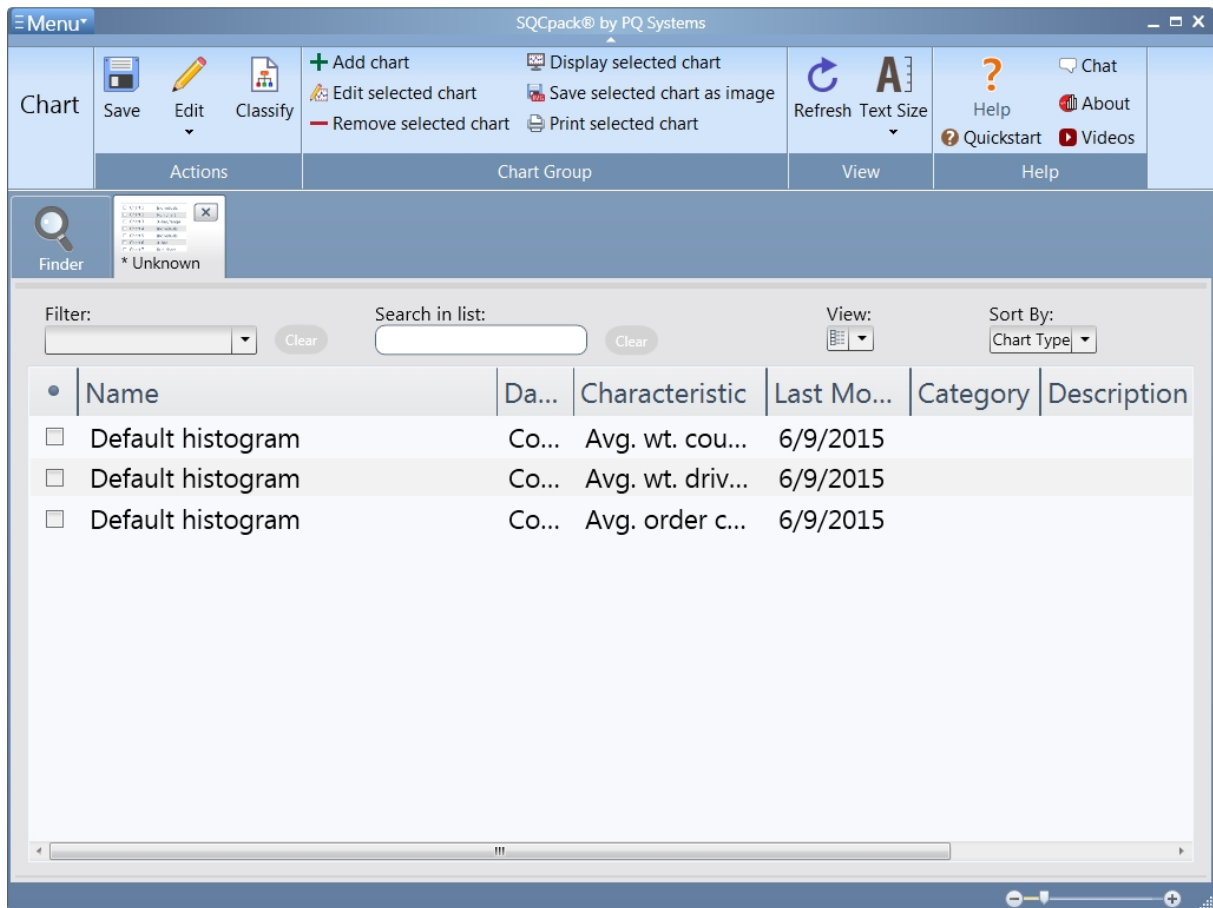
Create a chart group

A chart group is a named container for a collection of charts. Creating a chart group allows you to work with the collection of charts in a batch. For example, you may have a weekly quality meeting where you discuss charts on your ten most important quality metrics. Rather than print each chart separately, if you put them into a chart group, you can print the group with a single command, thus saving the time it would have taken to find and print each chart individually.

Start by selecting **Charts** from the navigation menu. You will need two or more charts that have already been created to follow along. If you do not have these, see the previous topics and create at least two charts to work with.

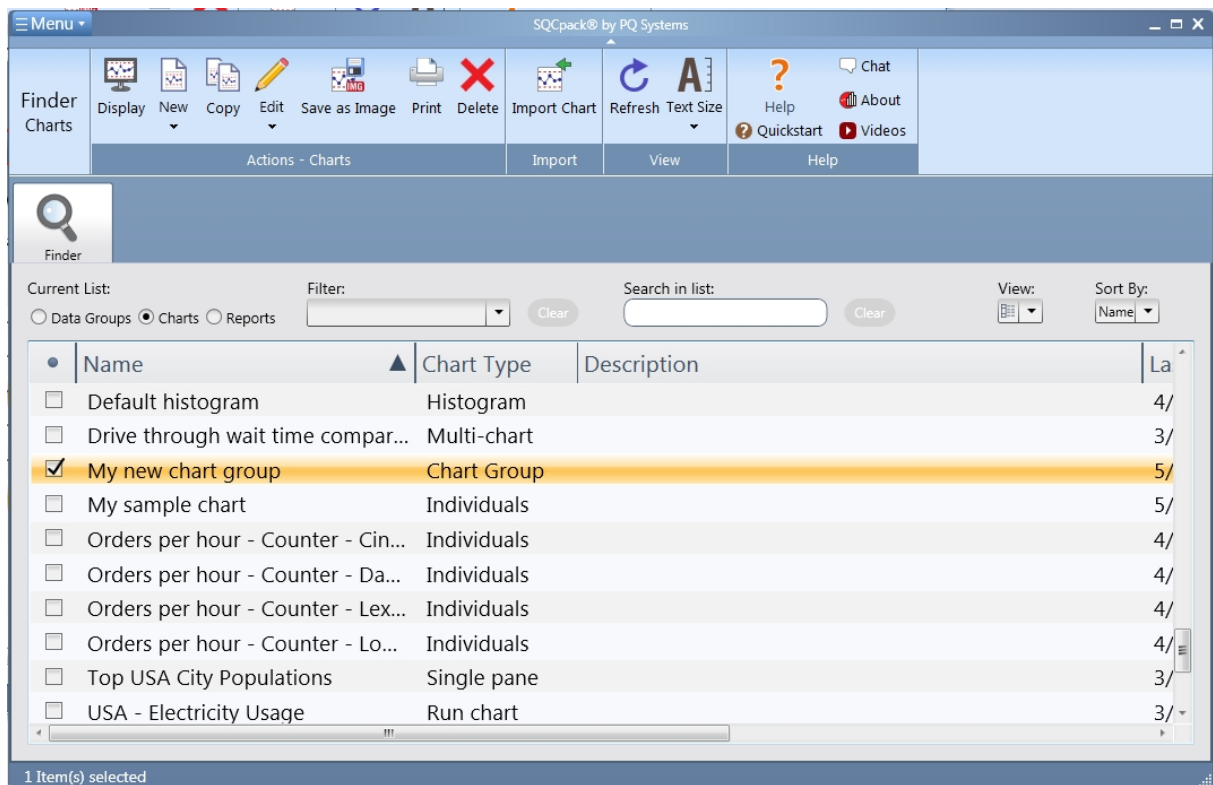


In the charts list, click on any chart, then click on the checkbox in the leftmost column. Do the same thing with a different chart. You now have two charts **selected**. In the ribbon bar, click the drop-down triangle under the **New** button. Choose the **Chart group** choice. This will create and automatically display a new chart group showing the two charts that were selected in a new tab in the work area. The chart groups look similar to your list of charts show in Finder. The difference is that it appears in its own tab and contains only the charts you have included in this chart group.



In the ribbon bar, you will notice several buttons that are specific to working with chart groups. Some things you can do with a chart group include printing all the charts and saving all the charts as images. To learn more about charts groups, see the topic [Working with multiple charts](#).

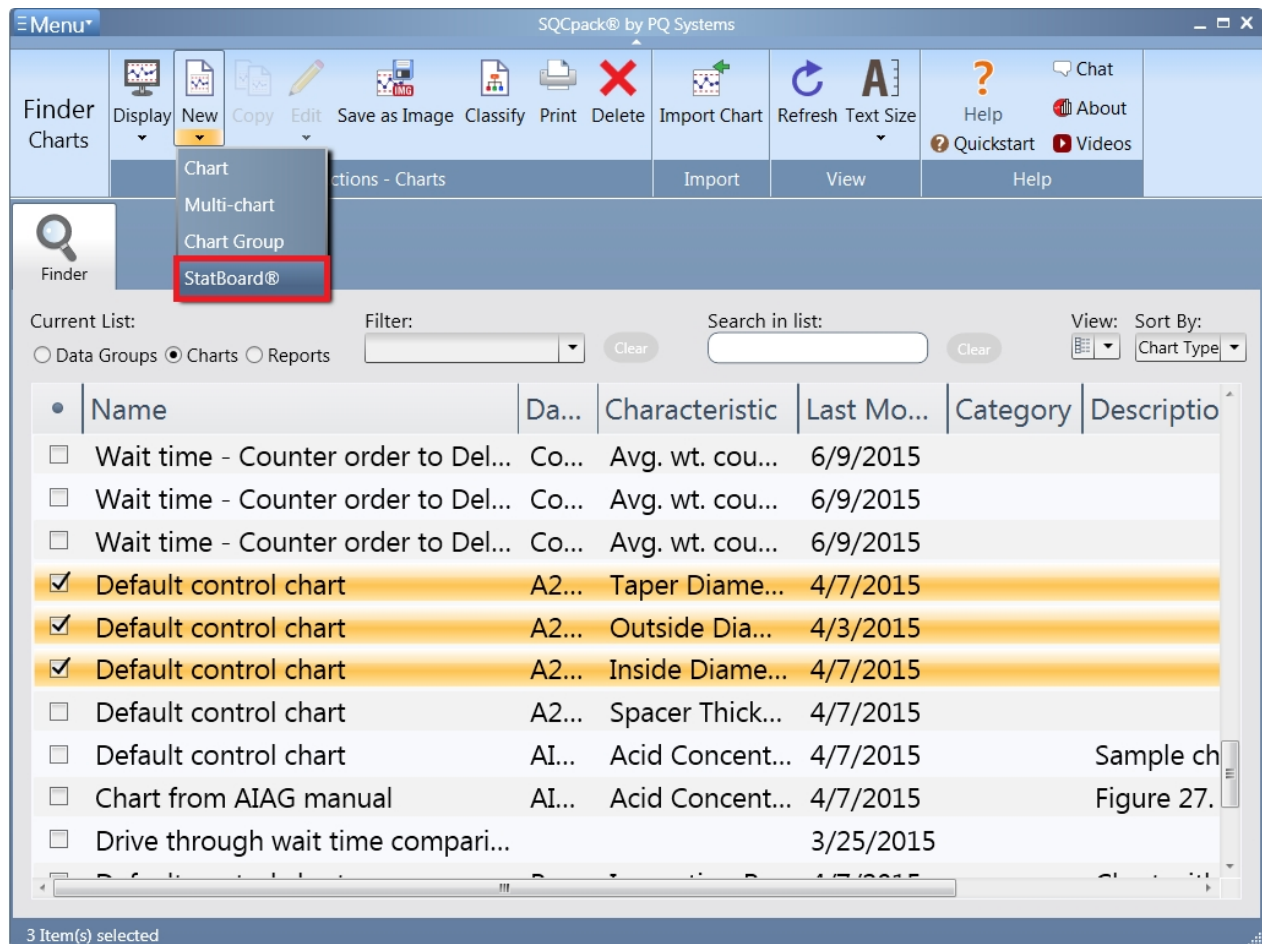
Click the **X** to close this chart group. You will be prompted to save and name the chart group. The chart group then appears in your list of charts and can be used and worked with as if it were a single chart.



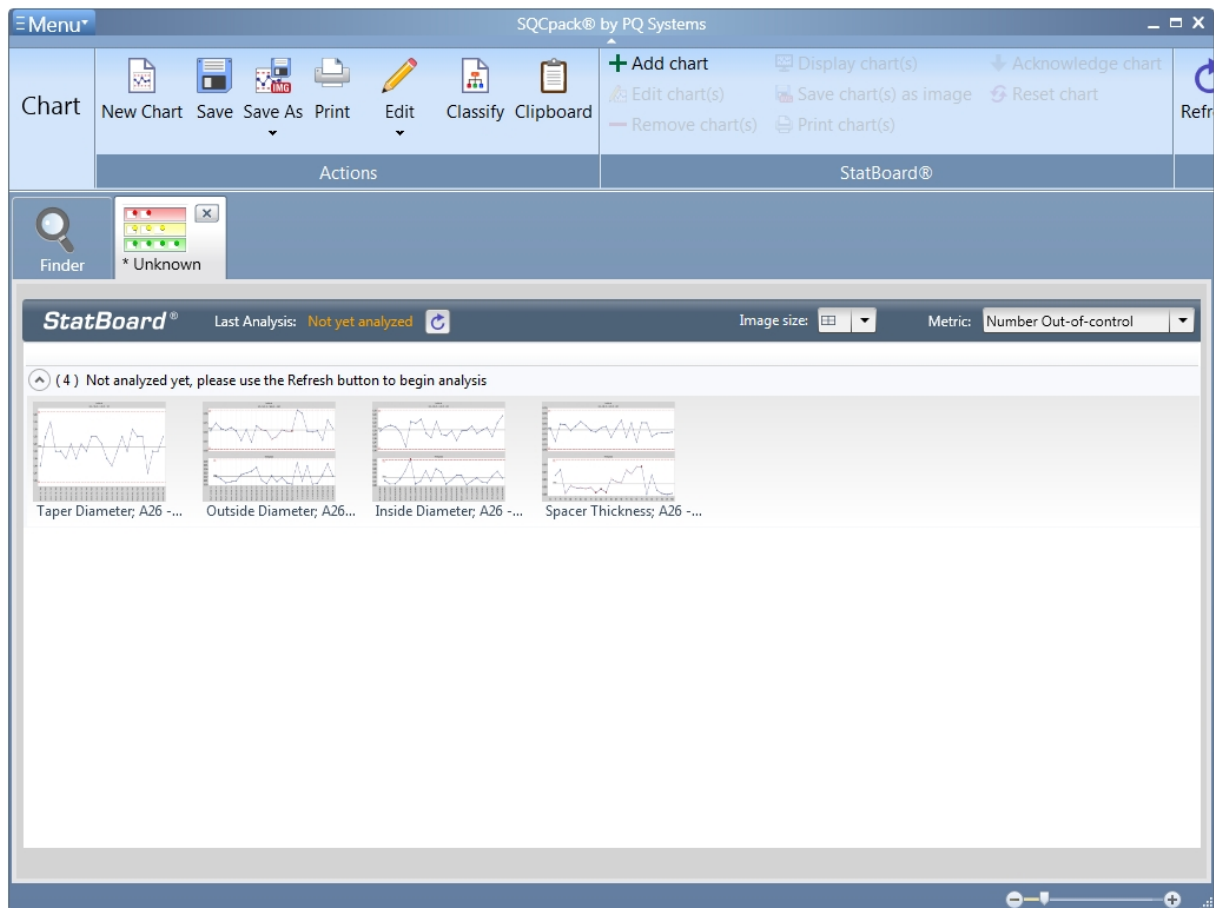
Create a StatBoard

A StatBoard is a specialized type of chart group. Remember that a chart group is just a named collection of charts. This describes a StatBoard as well. However, a StatBoard has additional features that allow you evaluate, rank, and visualize the charts based on statistics and criteria that you specify. A StatBoard allows you to easily consume information - at a glance - about a list of charts. The process for creating a StatBoard is almost the same as creating a chart group.

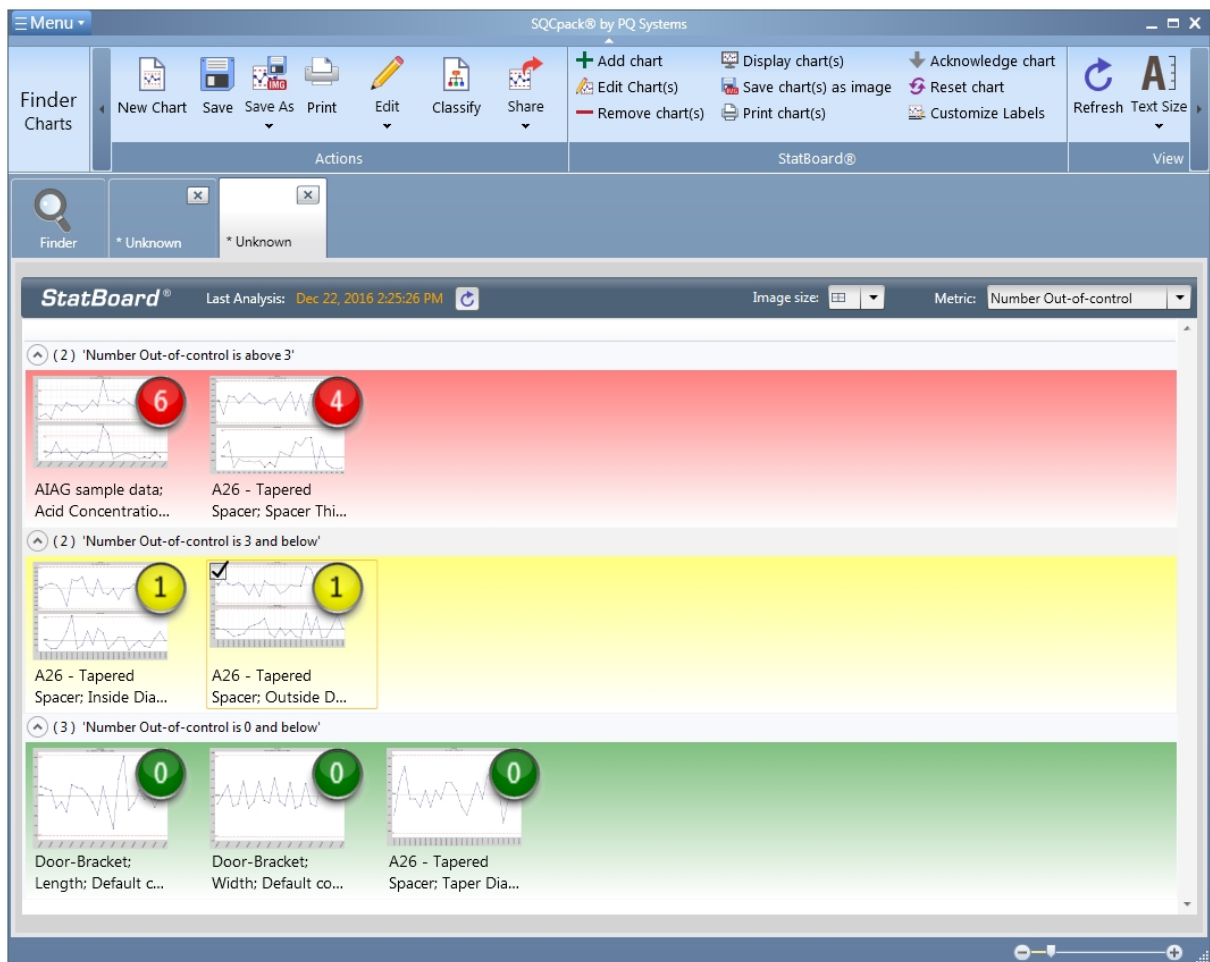
Start by selecting **Charts** from the navigation menu. You will need four or more control charts already created to follow along. If you do not have these available, see the previous topics and create at least four control charts to work with.



In the charts list, click on any chart, then click on the checkbox in the leftmost column. Do the same thing with other charts until you have four control charts selected. In the ribbon bar, click the drop-down triangle under the **New** button. Click on the **StatBoard** choice. This will create and automatically display a new StatBoard showing the four control charts that have been selected in a new tab in the work area. The StatBoard work area contains additional options that you did not see for chart groups.



When you first display a StatBoard, it has not yet been analyzed. Click the **Refresh** button to analyze and rank the charts. This will cause each chart to be evaluated for the number of out-of-control conditions. Next, the charts will be grouped into three categories: red, yellow, and green. The ones in red have the greatest number of out-of-control conditions. The count is indicated by a number in the colored circle, as shown below.

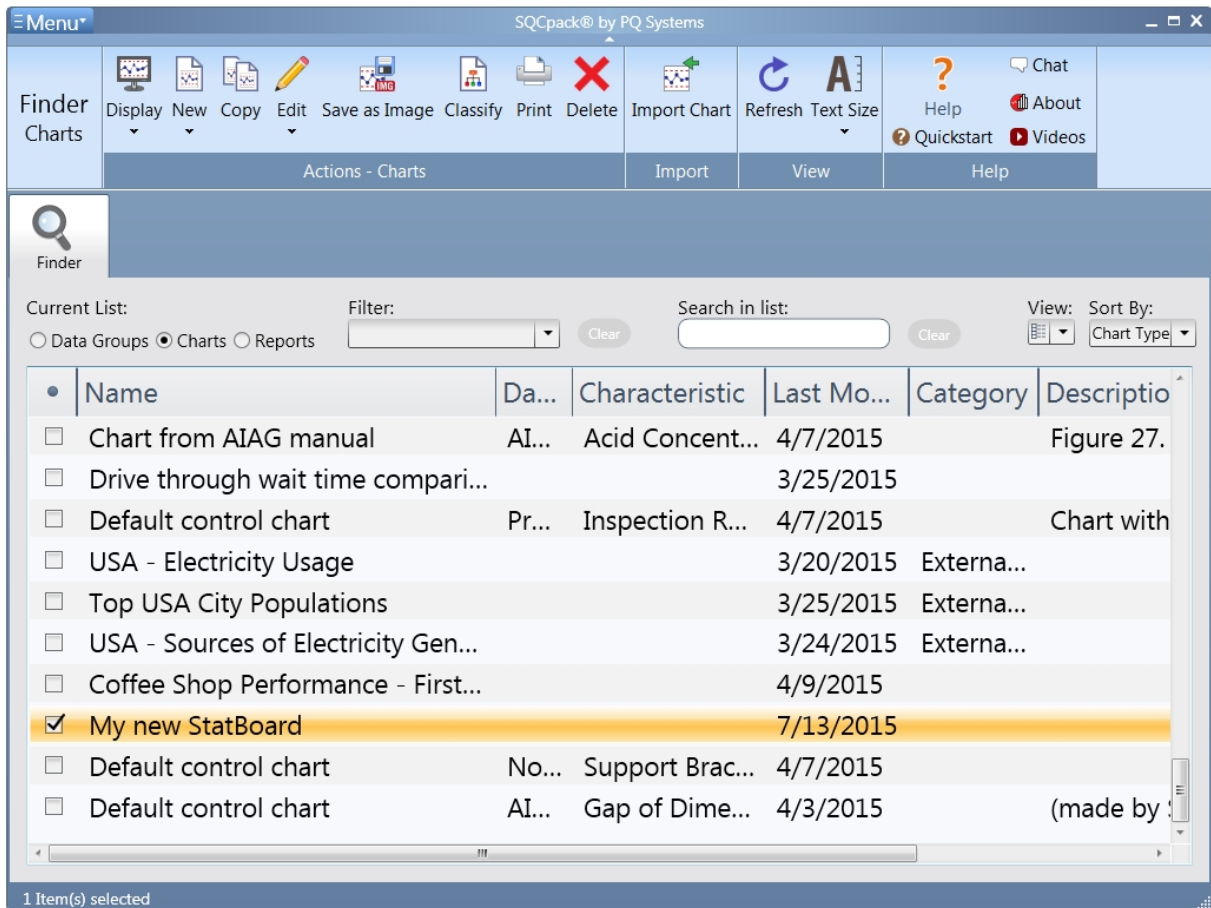


The ranking can be done based on any of these metrics:

- Number out-of-control
- Number out-of-spec
- Percent out-of-control
- Percent out-of-spec
- Cpk
- Ppk

The StatBoard is most useful when you have ten or more charts to consider. It is not uncommon for customers to include dozens or even hundreds of charts in a StatBoard. Once a StatBoard has been analyzed, you can easily sort out the signal (the red ones) from the noise, and focus your limited resources where the problems are most severe.

Click the **X** to close the StatBoard. You will be prompted to save the StatBoard and give it a name. It will then appear in your chart list along with your other charts.



Create a Certificate of Analysis

SQCpack allows you to create a Certificate of Analysis based on the characteristics in a data group. Each Certificate of Analysis is based on a Microsoft Word template document. You can customize your template documents to present the information you need to send to your customers.

This is an example of a Certificate of Analysis that was created by SQCpack:

PQ Systems

Certificate of Analysis

| | | | |
|-----------------------------|---------------------------|-----------------------|-----------------|
| Customer: | Acme Manufacturing | PO# | 42203 |
| Product: | A26 - Tapered Spacer | | |
| Article No.: | TSA-5523 | Specification: | Standard TS-443 |
| Finish: | 00653 | Material Lot # | 1141321 |
| Data Range: | 30 days up to 15-Jun-2015 | | |
| Certificate Created: | 7/16/2015 12:08:25 | | |

This template is an example of specifying a table of characteristic information by using characteristic-specific value tags.

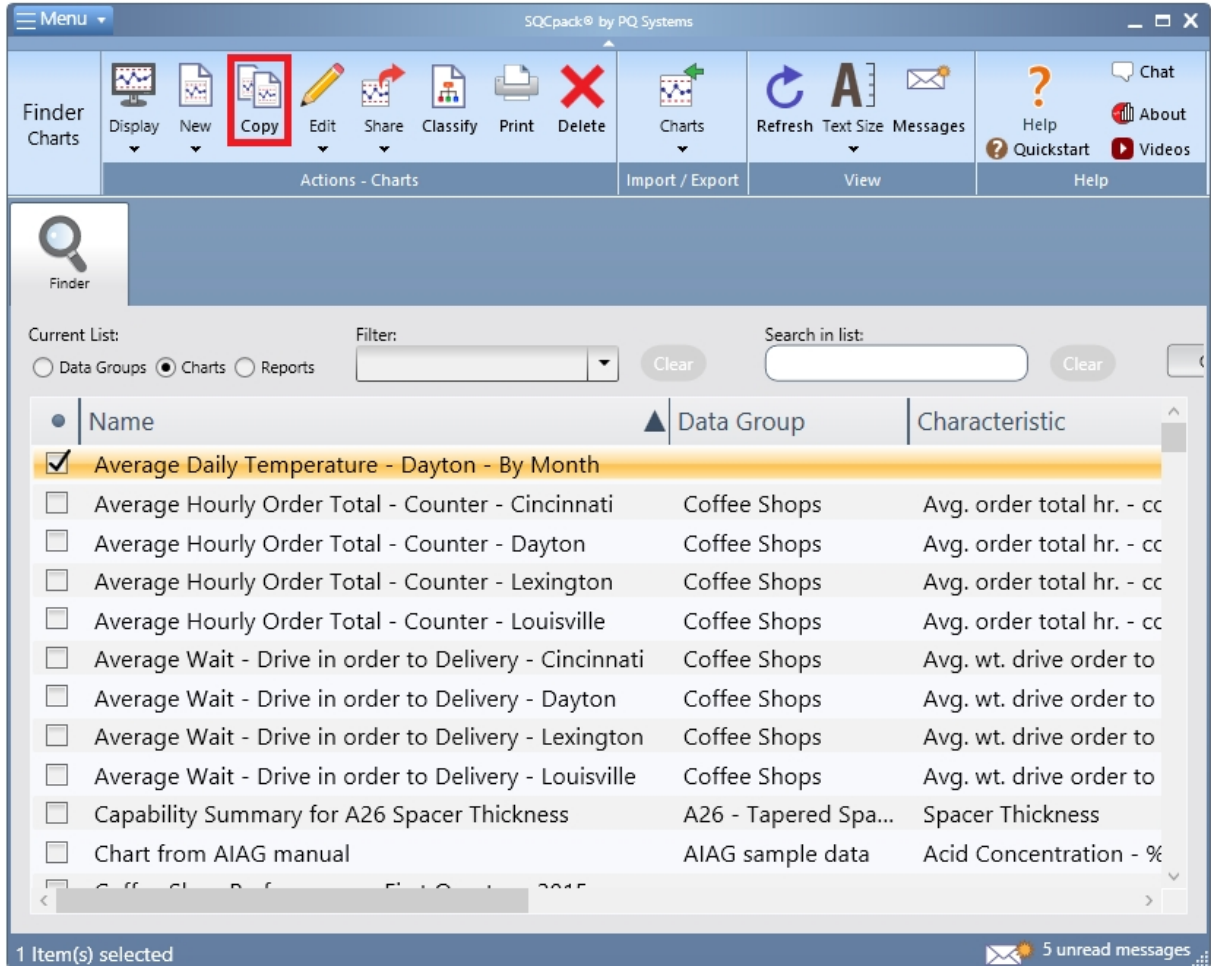
| Results: | Lower Specification | Upper Specification | Mean Value |
|------------------|---------------------|---------------------|-------------|
| Outside Diameter | 1.61 | 1.651 | 1.6257" |
| Inside Diameter | 0.245 | 0.255 | 0.2502" |
| Spacer Thickness | 0.81 | 0.815 | 0.8124 lbs. |
| Taper Diameter | 1.245 | 1.255 | 1.2506 |

[Follow these steps](#) to create your own Certificate of Analysis.

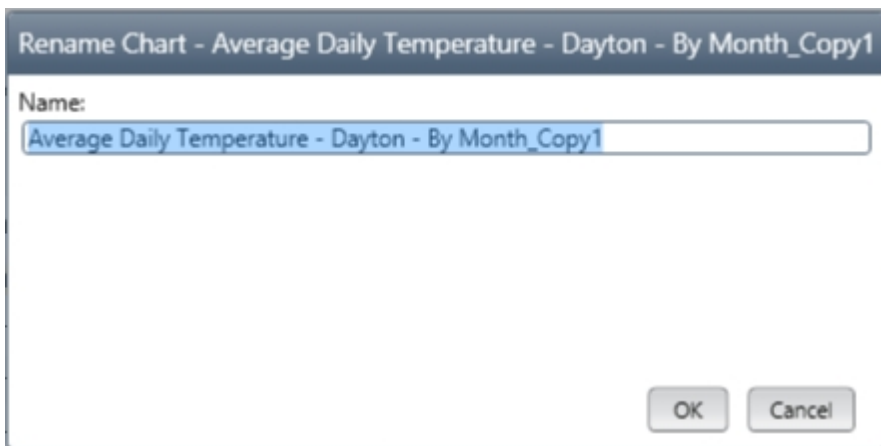
Copying charts, groups, and reports

SQCpack allows the copying of Data Groups, Charts, and Reports.

To copy a Data Group, Chart, or Report, Navigate to the appropriate finder by using the **Menu** button (or pressing ALT+C for charts, ALT+G for groups, or ALT+X for reports).



Select the chart, group, or report to copy and click the **Copy** button on the Actions - Charts ribbon bar.



Use the **Rename** dialog to rename the copied item and hit **OK** to save your changes.

Reference - Creating and customizing data groups

This section contains information about creating and customizing data groups in SQCpack.

What is a data group

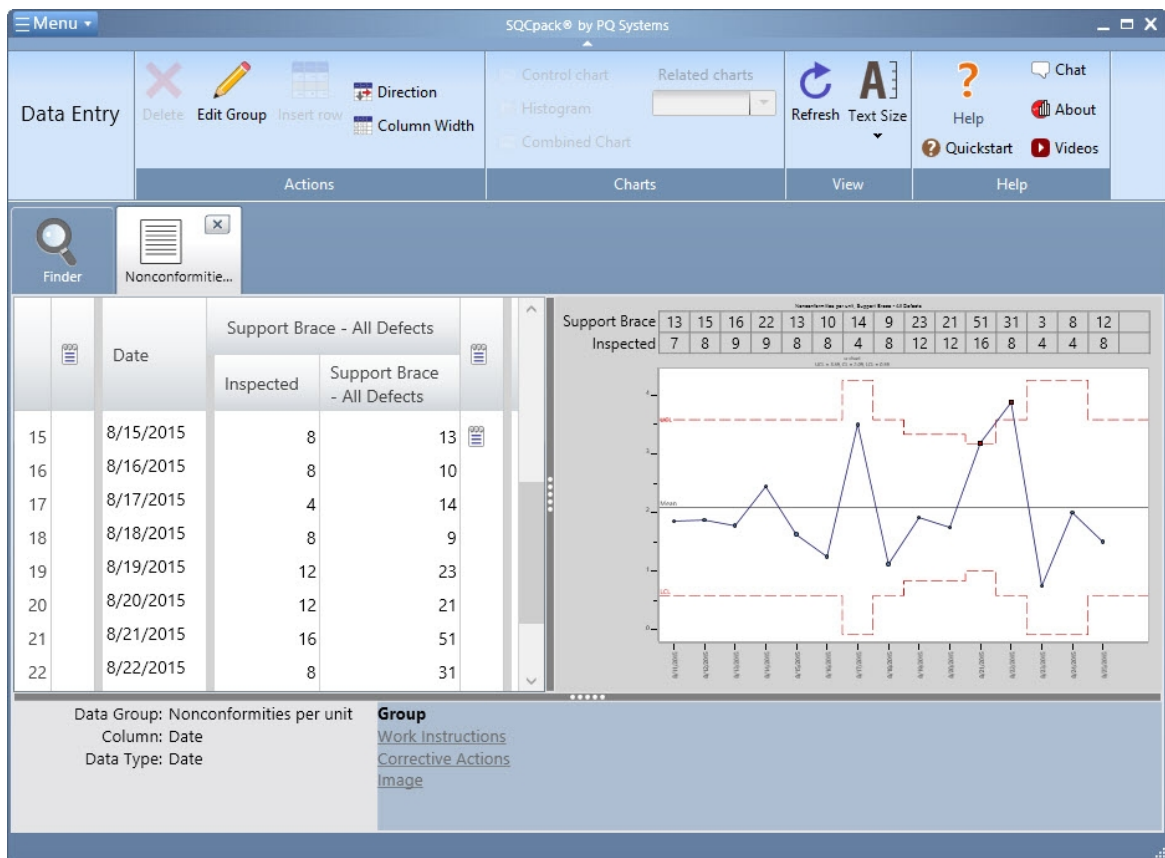
A data group is a named collection of related data columns. It is the primary SQCpack entity used for **entering data**. The data entered into columns in a data group can be analyzed with SPC charts and reports. SQCpack allows you to create, modify, enter data into, and delete data groups.

A data group is defined to reflect some point of data collection in your work process or some related set of quality metrics you are tracking. Each data group may contain different numbers and types of data columns. When entering data into a data group, a spreadsheet-based data entry screen is used. The spreadsheet has columns defined by the data group.

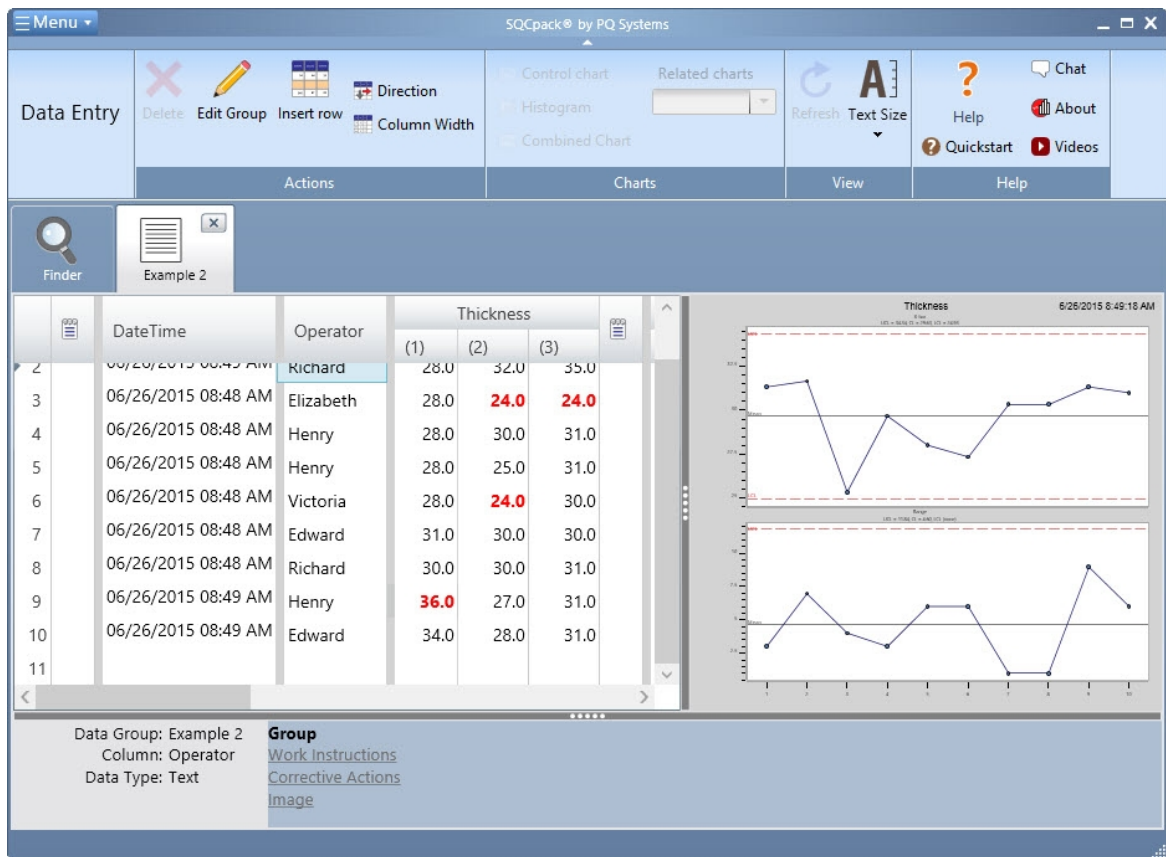
To save a new data group, you must define at least one measurement or count column.

Here are a few examples of the data entry screen for different data groups:

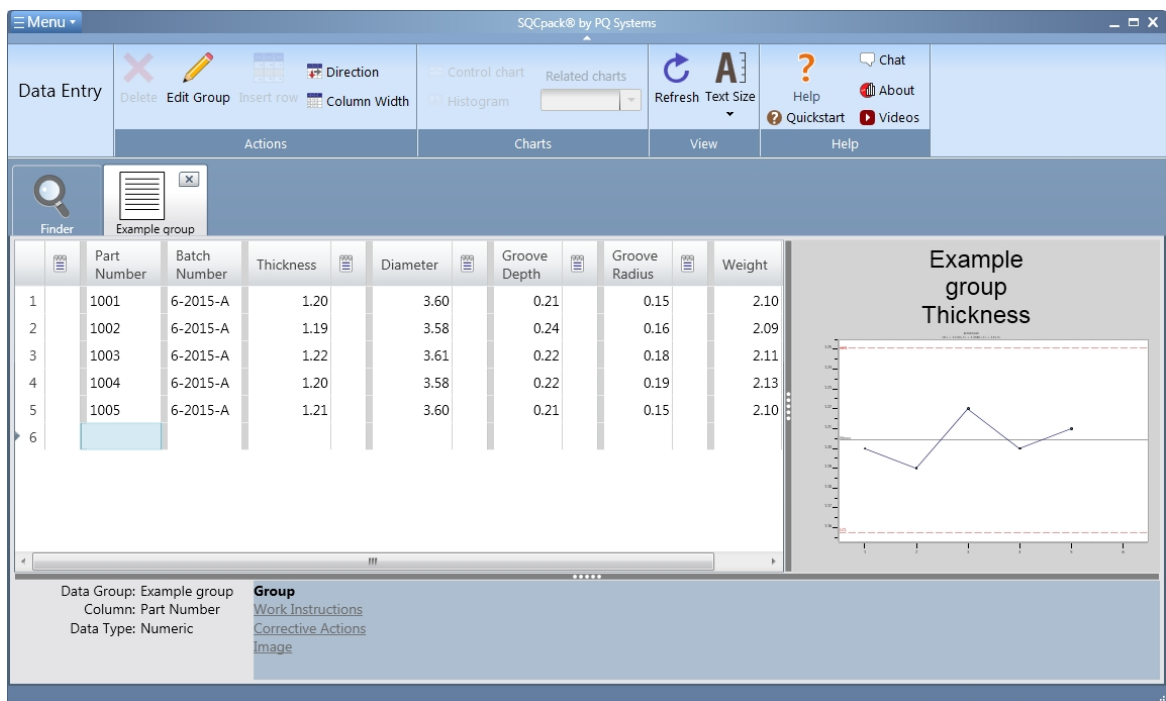
This basic group shown below is defined with two columns. The first column, an *identifier*, is used to record the date. The second column, a *count*, is used to record a count for the number of items inspected and the number of defects found.



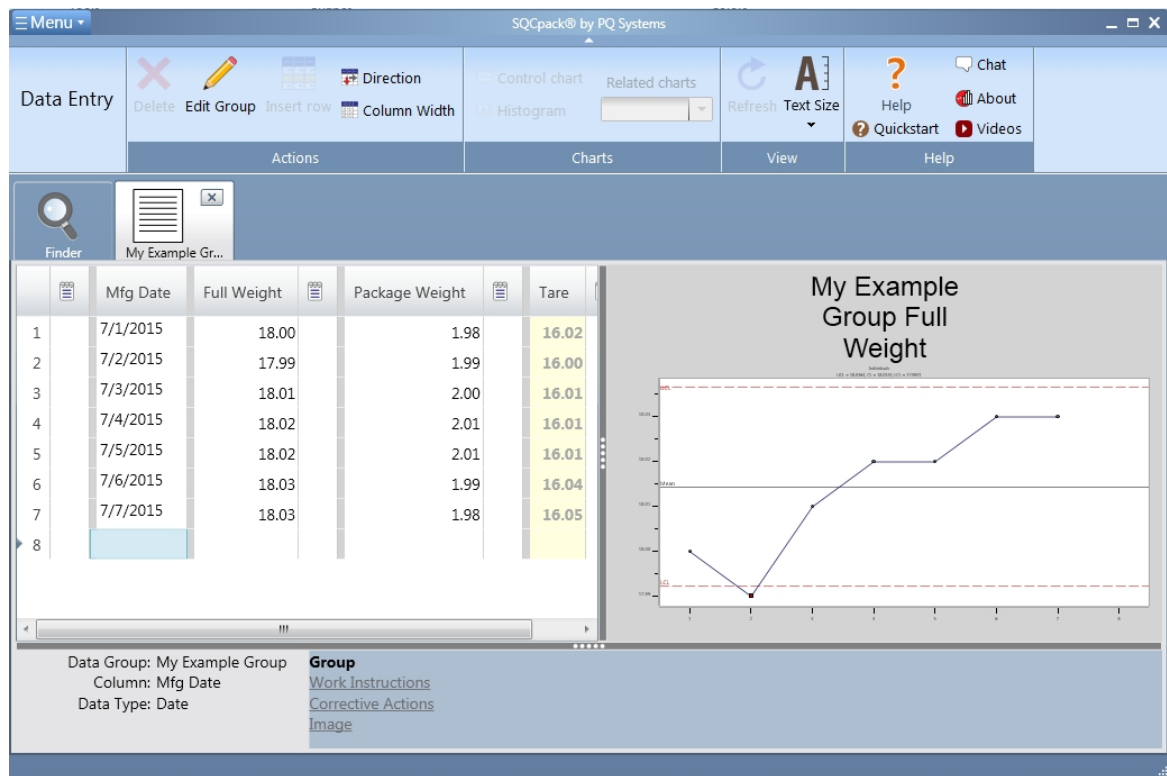
The group shown below is used to record the manufacturing date, the operator, and measurements for a metric named *Thickness*. In this case, *Thickness* is defined so that three observations are recorded for each row. A data row in this data group is sometimes called a *sample* or a *subgroup*, since three thickness values are recorded:



The group shown below is defined with two identifiers and five different measurement dimensions from a single part:



The group shown below contains two measurement columns plus a *calculated* column. The calculated column (Tare in the example) is not entered but rather calculated based on the two measurement columns:



As you can see from these examples, a data group is a flexible container for defining a set of data that you want to track, monitor, and analyze with SPC charts.

Identifiers

Identifiers (or tags) are single columns in a data group. You may have zero or more identifiers defined for a data group. Think of Identifiers as extra labels or *meta-data* that describes your measurements and counts. Typical identifiers might include Date, Operator, Customer, Batch number, Department, Machine number.

When creating a group, identifiers are defined as one of the following types:

1. **Text** – allows letters, numbers, and symbols to be recorded.
2. **Date** – allows entry of a date.
3. **DateTime** – allows entry of date plus time.
4. **Time** – allows entry of a time.

For **Text** identifiers, you may optionally assign a choice list. For example, if your identifier is for an Employee Name, you may assign the Employee Name choice list to this identifier. This allows the data entry user to select names from a drop-down list rather than typing them. This saves keystrokes and ensures consistent entries. In fact, you may define an identifier so that the entry **must match** an item in the choice list.

There is an optional **entry required** check box for each identifier. When checked, the user may not enter and leave a new row of data without entering something in this identifier field.

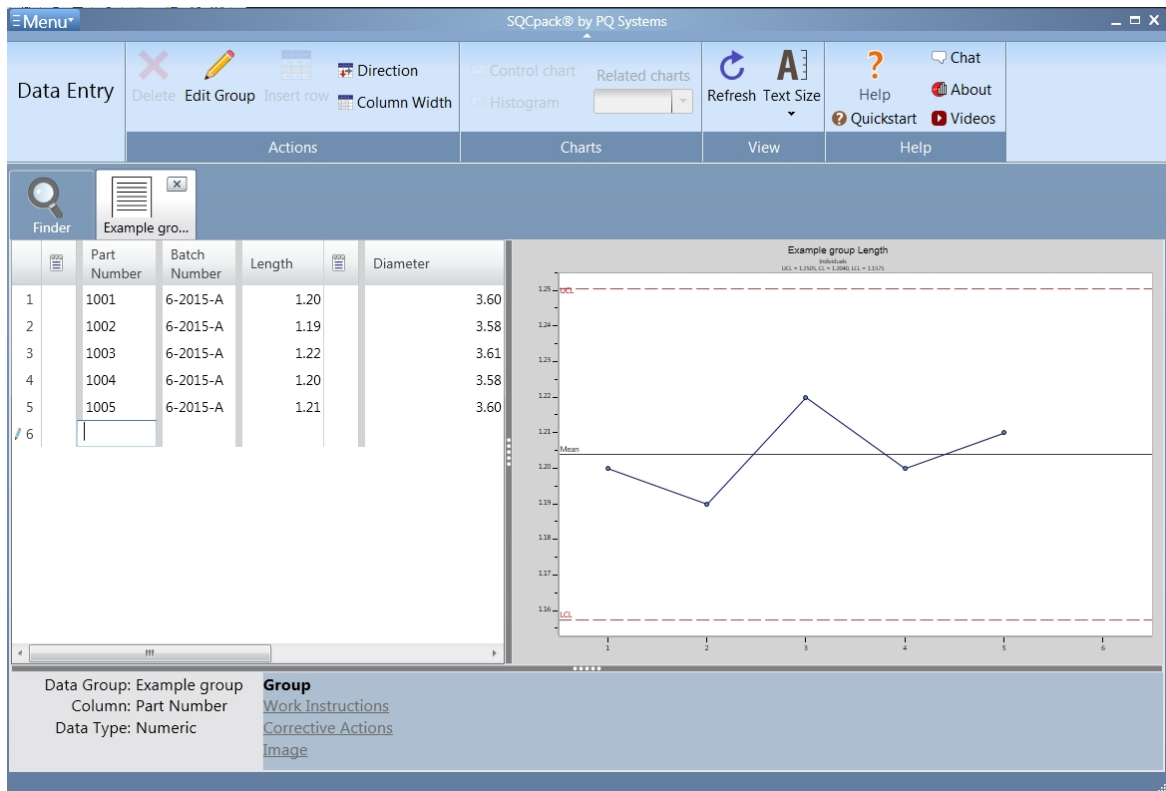
What are identifiers used for?

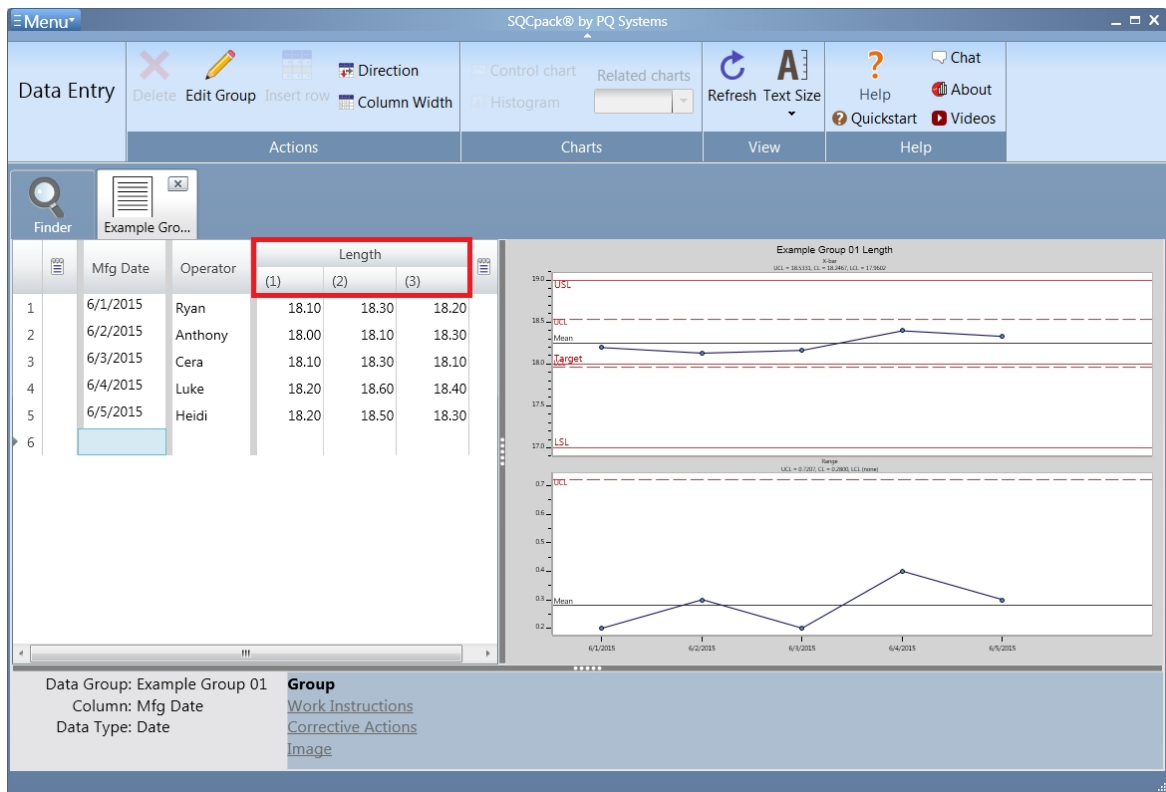
Identifiers are used for a variety of reasons. One reason is to document the data entry trail for important metrics. It may be a regulatory or customer requirement that information is tracked along with measurements. Another reason is to help stratify data when it is being analyzed. For example, imagine you are troubleshooting a quality problem. You may theorize that more errors come from a specific machine. By recording machine numbers with the measurements, you may later create charts comparing different machine numbers to test your theory.

Measurements

A data group may contain zero or more measurement columns. A measurement column has a name and several other properties that define the measurement. An important property is the **subgroup size**. This defaults to one, but you may set this from 1 to 40. The subgroup size is not the numbers of subgroups that will be entered. The number of subgroups or samples that can be entered is unlimited. The most common settings for this are 1 or 5. Measurements are used when the metric you are tracking is a dimensional value, such as diameter, length, depth, temperature, or weight.

Even though a measurement describes a single *logical column* in the group definition, when the subgroup size is larger than one, there will be one column for each value. So, a measurement named Length, where the subgroup size is set to 3, results in three *real* columns in the data table for this group. Following are two groups; one where the subgroup size is set to one and another where the subgroup size is set to three:





There are several other settings for a measurement column. Here, the measurement settings are shown:

The **specifications** are optional but they are important values to enter when you know them. Having one or both specifications is required when you want to do **alerting** for data values that are entered beyond specifications or when you want to do a capability analysis to compute values such as **Cpk** or **Ppk** on this measurement. The number of decimal places in the specs entered here will display the same way in spec limit labels (such as in certificates of analysis, data entry, or chart titles).

The **validation** option allows you to define minimum and maximum allowable values along with behavior that occurs when data is entered beyond this range. Using validation will minimize the chance of extreme data entry values from being accidentally entered.

Options under **Format** allow you to control the number of decimals and other settings that describe how the measurement looks during data entry.

Counts

A data group may contain zero or more count columns. A count column has a name and other properties that define the count. Count columns are defined by selecting a type of count chart that you plan to use for monitoring. Note that count charts are also referred to as **attributes** charts as they often refer to attributes of a product or process rather than to dimensional measurements.

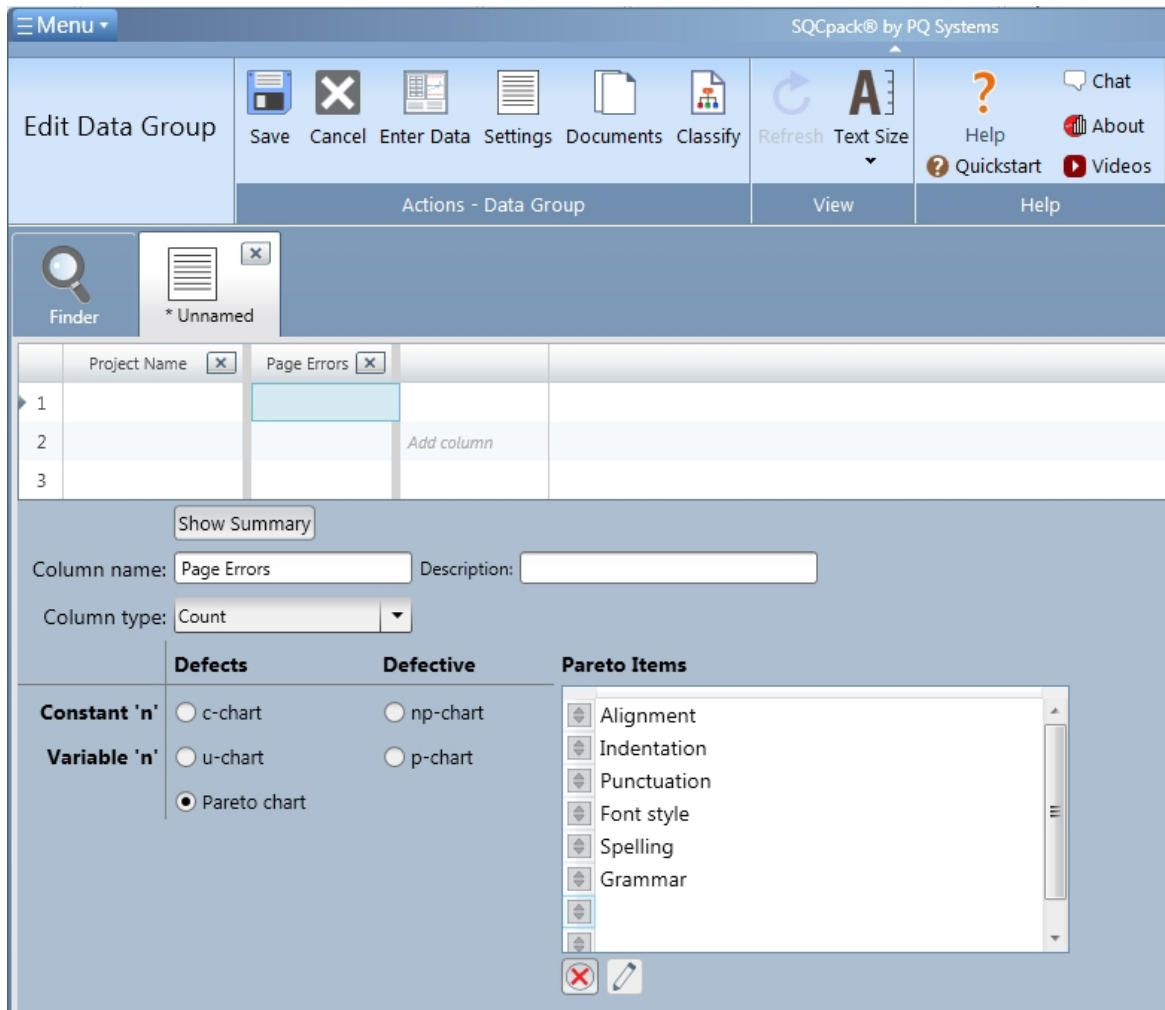
Even though a count describes a single *logical column* in the group definition, this may result in two *real* columns in the data group, depending on the type of chart selected. For example, if you select a **p-chart**,

you will typically have two columns that support the chart: a *number inspected* (or denominator) column and a *count* (or numerator) column as shown below:

The screenshot shows the 'Edit Data Group' window in SQCpack. At the top, there's a menu bar and a toolbar with icons for Save, Cancel, Enter Data, Settings, Documents, Classify, Refresh, and Text Size. Below this is a section for 'Actions - Data Group' and a 'View' button. The main area contains a 'Finder' icon and a 'Nonconformities p...' icon. A table grid is visible with columns for 'Date', 'Inspected', and 'Count'. A red box highlights the 'Support Brace - All Defects' column definition. Below the grid, there's a 'Show Summary' button and a form for defining the column. The 'Column name' is 'Support Brace - All Defects' and the 'Column type' is 'Count'. Under the 'Defective' section, the 'Pareto chart' option is selected. There are also options for 'Constant n' (c-chart, np-chart) and 'Variable n' (u-chart, p-chart, Pareto chart). A checkbox at the bottom indicates 'Each inspection uses a constant number (sample size)'.

Pareto chart

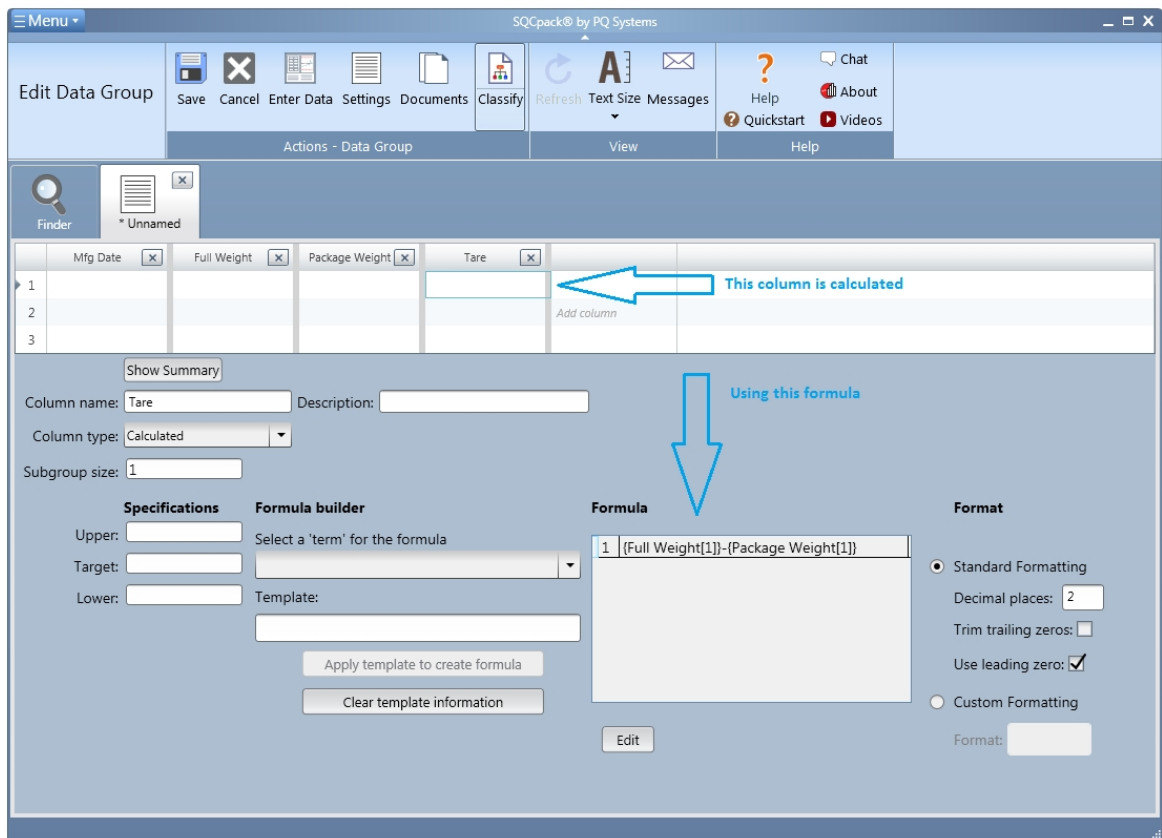
When you define a count column and select **Pareto chart** as the chart type, you must also enter *Pareto Items* that you plan to track with in this column. These are entered into the grid that appears only when you select Pareto chart. A typical application for this type of count is for tracking a list of different – but known – errors. So, the count column may be named **Page Errors**. In the Pareto Items list, you might enter items similar to the ones shown below:



Remember that even though a data group does not require any count columns, the data group requires at least one measurement or one count column before it can be saved.

Calculated columns

A group may contain zero or more **calculated** columns. A calculated column is a special type of *measurement* column that is calculated from other columns rather than directly entered during data entry. A simple example is a group that contains *Length* and *Width* measurement columns and an **Area** column that is calculated based on Length multiplied by Width. Another example is in **Tare Weight** applications where the weight of a package's contents is calculated by subtracting the package weight from the total package weight. Here is what that looks like when defining a group:



Since calculated columns are also measurement columns, they have **subgroup size** and **specifications properties**.

An important property is the subgroup size. This defaults to one, but you may set this from 1 to 40. The subgroup size is not the numbers of subgroups that will be entered. The number of subgroups or samples that can be entered is unlimited. The most common settings for this are 1 or 5.

The **specifications** are optional, but they are important values to enter when you know them. Having one or both specifications is required when you want to do **alerting** for data values that are entered beyond specifications or when you want to do a capability analysis to compute values such as **Cpk** or **Ppk** on this calculated measurement. The number of decimal places in the specs entered here will display the same way in spec limit labels (such as in certificates of analysis, data entry, or chart titles).

Additionally, calculated columns have formulas, one for each observation. So, if subgroup size is 1, there will be one formula. For a subgroup size of three, there will be three formulas. When defining a calculated column, user interface tools help you create a column based on different terms that are available from other columns defined in the group.

Spaces can be used in a formula to improve readability, as shown in the examples below.

The following symbols can be used in a formula:

| | | |
|---|----------------|--|
| + | Addition | Example: {MeasurementA[1]} + {MeasurementB[1]} |
| - | Subtraction | Example: {MeasurementA[1]} - {MeasurementB[1]} |
| * | Multiplication | Example: {MeasurementA[1]} * {MeasurementB[1]} |
| / | Division | Example: {MeasurementA[1]} / {MeasurementB[1]} |

| | | |
|-----|-------------|---|
| () | Parenthesis | Example: (({DimA[1]} + {DimA[2]}) / {BaseA[1]}) |
|-----|-------------|---|

Formulas that use specification values

Some customers like to create a calculated column that is the difference between the target specification value and the observation value for a measurement column. For example, if the measurement column is named *Width*, the calculated column formula would be:

```
TARGET_SPEC({Width}) - {Width[1]}
```

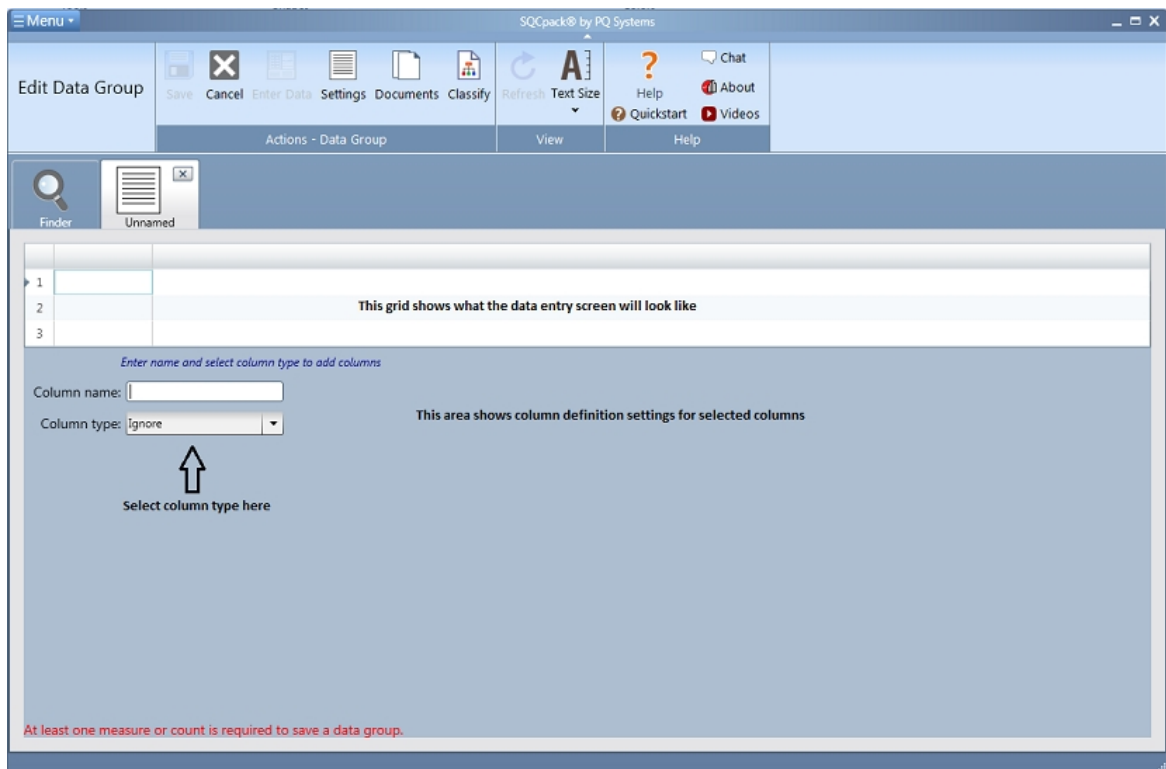
A calculated formula can have a term that refers to the upper, target, or lower specification value of a measurement column. In the example formula shown above, the target specification value for the measurement column named *Width* is used.

IMPORTANT NOTE: SQCpack allows a measurement column to have multiple [specifications rows](#) that are associated with the measurement column. When the formula for a calculated column is evaluated to produce a numeric value, the specification value used in the formula is always gotten from the [default specifications row](#). For example, if the *Width* measurement column has a target specification value of 10.0 for rows 1-99, and a target specification value of 10.2 for rows 100 and above, every time the calculated formula shown above is evaluated, it will always evaluate `TARGET_SPEC({Width})` to have a value of 10.2, even when the row number of the subgroup being evaluated is 1.

Creating a data group

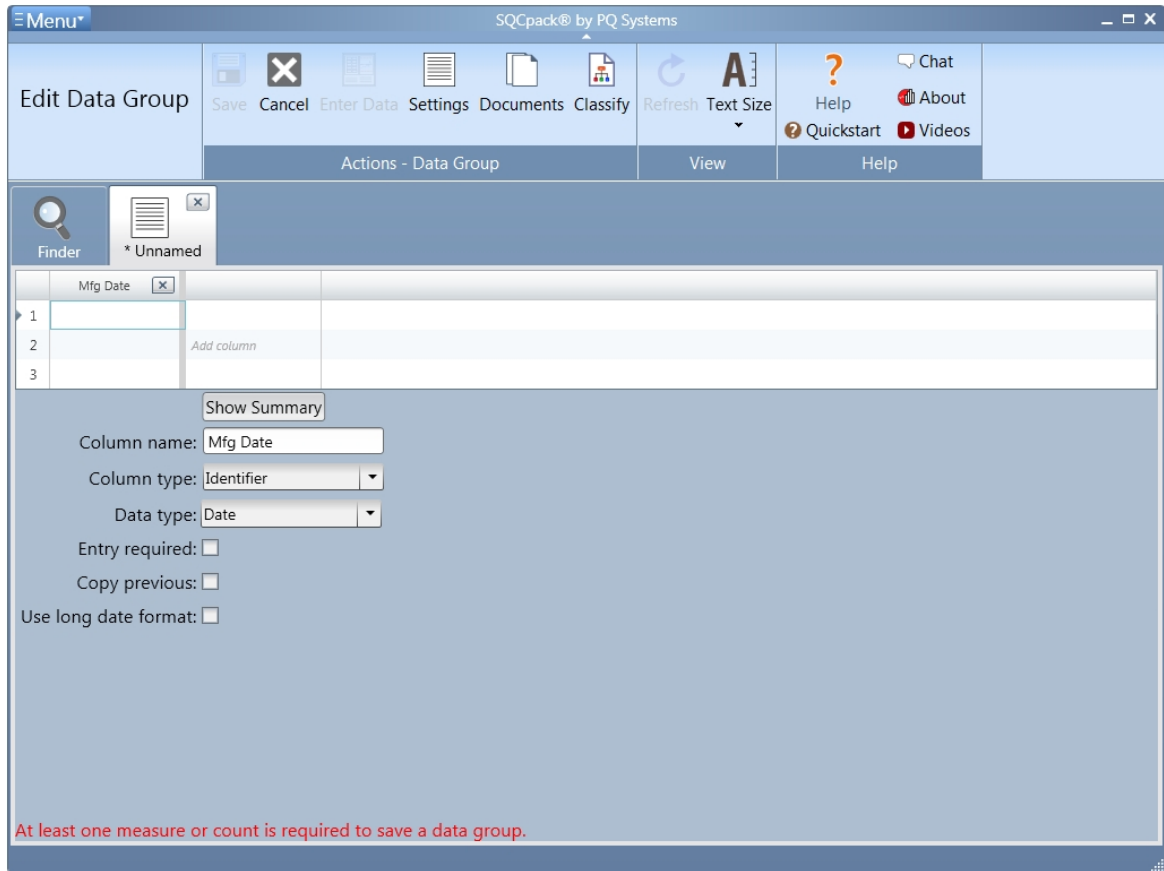
Walk through the steps below. Do these two or three times and you will know how to create a data group in SQCpack. You will create a fake data group made up of columns that expose you to each of the column types with different column settings.

From the navigation menu, select **Data Groups**. In the ribbon bar, click on the **New** button. This will open a new tab in the work area where the data group will be created.



At the top of the work area, you will see a data grid. This is a prototype of what the data entry grid will look

like for the data group you are creating. This grid is used to click on different columns. When you click on a column in this grid, the area below the grid will show settings for that column. To add a new column to the grid, click on the blank column immediately to the right of any columns you have already defined.



In the drop-down list for **Column type**, select **Identifier**. Next, select **Date** in the drop-down list for **Data type**. Next, enter *Mfg Date* into the **Column name** text box. This is the first column in the new group. The grid above reflects this one column.

Next, click in grid, in the blank column to the right of *Mfg Date*. Notice that the area below the grid changed, showing that we are ready to set up this new column. Now, click back on the *Mfg Date* column. Notice the area below the grid changed again, showing the settings for our *Mfg Date* column. While you are here, check the box named **Entry Required**. This means that during data entry, the user **must** enter a value for *Mfg Date* in each row of data. There is also an option to copy the value from the previous row. The last checkbox will use the long date format (or time if that was the **Data type** you selected), this is based on what your computer settings long date and time format is set to.

Next, click in the grid, in the blank column to the right. You are ready to set up your next column. For column type, select **Identifier**. For **Column name** type in *Employee*. Check the box for **Entry Required**.

The group now contains two identifier columns. You could add more identifiers; but next, enter a measurement. Click in the blank column to the right of *Employee*. For **Column name**, type in *Length*. For **Column type**, select *Measurement*. This displays several settings for this measurement named *Length*. Click the other two columns and watch the settings below change; then click back on this *Length* column.

Notice that **Subgroup size** defaulted to 1. This the most common setting. However, just to see what happens in the grid, type in 3 for **Subgroup size**. Notice how *Length* now shows three columns? Remember, this grid is a reflection of what the data entry grid will look like. When a subgroup size is three, there will be a column for each observation. For now, set **Subgroup size** back to 1.

Next, enter these specifications for length:

Upper: 20
 Target: 18
 Lower: 16

Specifications define a range of acceptable values for this measurement. These are typically set by your customer or your product design/engineering staff. Although these are optional, they are useful both during data entry and during data analysis. During data entry, they can be used to alert an operator that a value has exceeded specifications. During data analysis, they are required for computing statistics such as **Cpk**, **Ppk**, and **Percent out-of-spec**. Check the box **Out-of-spec warning** to warn data entry users when a value exceeds specifications. The number of decimal places in the specs entered here will display the same way in spec limit labels (such as in certificates of analysis, data entry, or chart titles

For **Validation Option**, select *Warn* from the drop-down list. This is used with the **Max value** and **Min value** just below. The *Warn* option will display a message box for the user whenever an entered value is beyond the Max or the Min value. Next, enter these values:

Max value: 30
 Min value: 10

These are normally set to a *reasonable* range of values to prevent or minimize obvious typing errors. Under **Format** are several options which affect how the numbers for *Length* will look during data entry. Until you find a reason to change these, the default settings do a good job and can be left as they are.

Next, click in the column to the right of *Length*. For **Column name**, enter *Width*. For **Column type**, select *Measurement* from the drop-down list. Leave the **Subgroup size** set to one and enter the following for the **Specifications**:

Upper: 10
 Target 9.5
 Lower 9

Check the box for **out-of-spec** warning.

Under **Validation**, select *Warn* from the drop-down list for **Option** then enter a **Max value** of 20 and a **Min value** of zero. Leave the **Format** options at their default values.

At this point, the data group contains 2 identifier columns and 2 measurement columns. Your screen should look similar to this:

Next, add a **calculated** column.

Click in the column to the right of *Width*. For **Column name** type in *Area*. For column type, select *Calculated*. You will notice a few extra settings below since this is a calculated column. Leave **subgroup size** set to 1 and leave the **specifications** empty for this column.

Under **Formula builder** select {Length} from the drop-down list named *Select a 'term' for the formula*. This puts {Length} in the **Template** box below. Next, type in the asterisk * character, after {Length} in the **Template** box. The asterisk here means multiply.

Next, select {Width} from the drop-down list above. This inserts {Width} to the template. So far, all you have is a template for the formula. Next, click the **Apply template to create formula** button. This puts the *real* formula, in the grid to the right

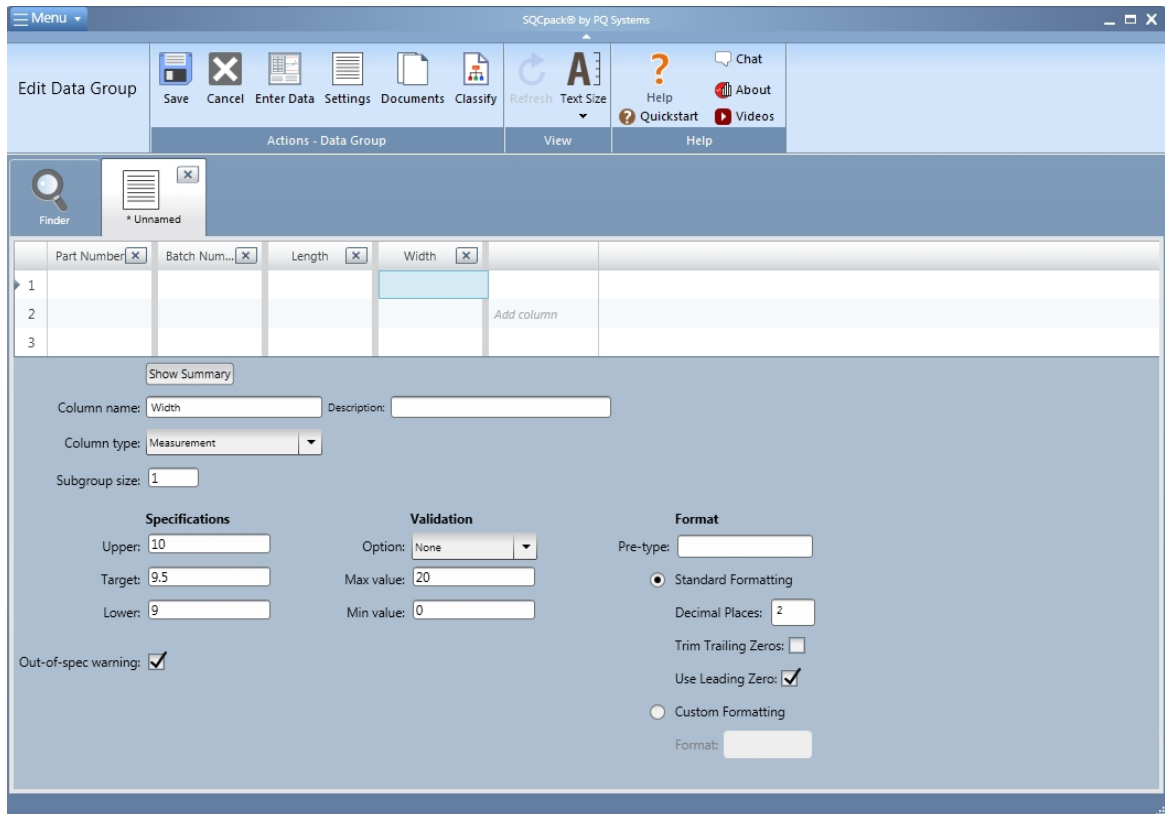
Your formula section should look similar to this:

In this case, both Length and Width have a subgroup size equal to one and Area has a subgroup size of one. All you need is a single formula. When the subgroup size is larger, you will have a formula for each observation. At this point, you are finished defining the **Area** column, which is a calculated column based on Length and Width.

Next, click in the column to the right of Area and add a new column. For **Column name** enter *Defects*. From the **Column type** drop-down list, select *Count*. From the radio buttons for chart type, select the **Pareto** chart. This will display a **Pareto items** grid. Enter the following into the grid:

Dent
Scratch
Nick

By setting up a count column this way, two charts will be available. One is a **c-chart** that will show how the count of **Defects** is changing over time. The other is a Pareto chart comparing the types of defects in a ranked bar chart. Your screen will look similar to this:



At this point, you are finished defining this group and are ready to save it. Click the **X** button in the upper right of the tab containing this data group definition. The software will prompt to save this group (answer yes) and it will ask for a group name, enter *My first data group*. When it asks if you want to enter data, answer with **No**.

Next, you will see the list of all data groups, and this new data group will appear in the list. Click once to select this new group, then click on **Enter Data** in the ribbon bar. This will open the group for data entry. Since no data has been entered, the view looks a little sparse. However, after you enter some data, it will be more obvious what the data entry screen is about. For now, close the data entry tab by clicking on the **X**.

When you create a new data group, **charts get created for you automatically**. For each measurement column in the group, there will be one control chart and one histogram chart created. These will be named *Default control chart* and *Default histogram*. For each count chart, there will be one control chart created named *Default control chart*. If the count is a **Pareto count**, there will also be a Pareto chart created, named *Default Pareto chart*. To see these charts for the newly created group, select **Charts** from the navigation menu or click on the **Charts** radio button in the Finder tab.

Since you have not yet entered data, these charts are not very interesting. However, SQCpack creates them automatically so that as soon as you have data, you can begin thinking about it **visually**. At any time, you may manually create additional charts based on data in this group. The *default* charts help you to get

started.

To make changes to this data group, select it in the Finder list, then click the **Edit** button in the ribbon bar. For example, you can drag the *Width* column so that it comes before *Length*. When you close the group, answer **Yes** to save your changes.

Other group settings

You have given our new group a name and defined the columns; however, there are other settings that can be saved with a group. To learn about these, use the **Edit** button to open this group for changes.

In the ribbon bar, click the **Settings** button. This will display a dialog where you can specify the following information for the data group:

- Description
- Data entry configuration
- Data Device
- Choice list for assignable causes
- Choice list for notes
- Choice list for corrective actions

To see these choices, click the expand button next to **Details**.

The **Description** shows in the list of all groups, so it can be helpful in sorting and searching the list to make a data group easier to find.

All groups specify a **Data entry configuration**. By default, when you create the group, it uses a Data entry configuration named *Default*. A data entry configuration is a named collection of settings that affect how this data group behaves during a data entry session. See the topic section [Customizing the data entry experience](#) to learn more about this.

If you have a simple measurement device attached to your computer, for example a weighing scale or a digital micrometer, you may define this as a data device that SQCpack knows about. This is done by selecting **Data Devices** from the navigation menu. If you want to use a data device with this group, select it from the **Data Device** drop-down list on this settings form. This allows data from the device to flow into the SQCpack data entry screen when using this group.

You may specify three different choice lists that help the data entry user. These choice lists are defined by selecting **Choice Lists** from the navigation menu. While editing the settings for this data group, select each choice list from its drop-down list. These are optional but helpful during data entry. Click OK when finish with the **Settings** dialog. Any changes you made will be saved when the group is saved.

Next, click on the **Documents** button in the ribbon bar. This will display a dialog where you specify documents to use with this group. You may define three different types of documents both for the group itself **and** for each measurement, count, or calculated column in the group. These are typically reference documents used by data entry operators. The document can be a link to an external document, a URL address, or entered directly into SQCpack. The document types are:

- Work instructions
- Corrective actions
- Image

The **Work instructions** document can be used to help the data entry operators know what to do when entering data for this group.

The **Corrective actions** document can be used to describe responses to various problems that may occur (in the business process) when entering data for this group.

The **Image** document is a visual that can help data entry users know about the context of working with this

data group. This may be picture of the product being produced or a diagram showing a product and the dimension that should be measured.

These documents may be previewed both in this dialog **and** by the data entry user entering data into this group.

Tip: Ensure that documents you refer to within a group are both visible and accessible to users on other PCs in your network. For example, if you refer to a document on your local disk drive, users on the other side of the plant will not be able to preview this document during data entry.

Click **OK** once your document settings are complete. Any changes you made will be saved when the data group is saved.

Next, click on the **Classify** button in the ribbon bar. This will display a dialog where you can classify this group as belonging to one or more divisions and one or more categories. **Divisions** help segregate data so that users within one Division primarily see data specific to their Division. **Categories** allows you to group together data groups that are related in some way. For example, you might categorize groups into either a Ford or GM category if these are two of your customers. Both of these features help make the relevant groups easier to find for users.

Select the Division and Categories that apply to this group. Note that you can always do this later if you have not yet defined your Divisions or Categories. Click OK to close this dialog. Any changes you made will be saved when the group is saved.

You now know the steps required to create and customize a data group. You might delete the group and go through the steps again just for practice, so that your muscles start to remember how to do this. Keep in mind that as you create a data group, it should align with a set of related metrics that you want to collect and monitor for quality improvement, regulatory, or auditing reasons. Each group can be different and is likely to have a different set of columns to meet varying needs.

Reference - Creating and customizing charts

This is a reference section that contains topics related to creating and customizing charts in SQCpack.

Supported chart types - overview

SQCpack supports several chart types that fall into these general categories:

- [Measurement control chart – for individual values](#)
- [Measurement control chart – for subgroup values](#)
- [Distributions and capability analysis](#)
- [Court or classification \(attribute\) control charts](#)
- [Rare event control charts](#)
- [Pareto charts](#)
- [Line charts](#)
- [Specialized measurement charts](#)

The chart types available in each category are described on the following pages.

A word on control charts (in general)

Many of the chart types in SQCpack are **control charts**. Depending on the type of data you are collecting, your approach to sampling, and your objectives in using the chart, you will select a different type of control chart. However, regardless of type, **all control charts** share a common approach to understanding data.

Control charts are designed to help to understand and reduce variation in a process over time. More specifically, they are designed to minimize **two common mistakes**:

1. Adjusting a process when it would be better to leave it alone.
2. Not adjusting a process when an adjustment is likely required.

Control charts help to predict how a process will behave. If a reasonable number of data points all show as **in-control** on a control chart, you can make a **really useful prediction** about your process:

Unless the process is changed in some way, it will continue to produce results centered on this mean and varying within these limits.

If the control chart shows data points that are outside the limits or trends, or runs above or below the mean, this still allows you to make a useful prediction about your process:

This process is not stable. It is not predictable. Unless something is changed, we cannot be certain about the mean or the dispersion of data resulting from this process.

This **predictive** nature of control charts and their ability to minimize the mistakes described above are what makes them such valuable business tools.

Measurement control chart – for individual values

The following chart types are supported in this category:

- Individuals chart
- Individuals / moving range chart
- Moving range chart

Individuals chart

This chart type is used with subgroups containing a single observation. Each data point plotted on the chart is a single measurement value. This chart shows an indication of central tendency--where the chart data is centered.

Individuals / moving range chart

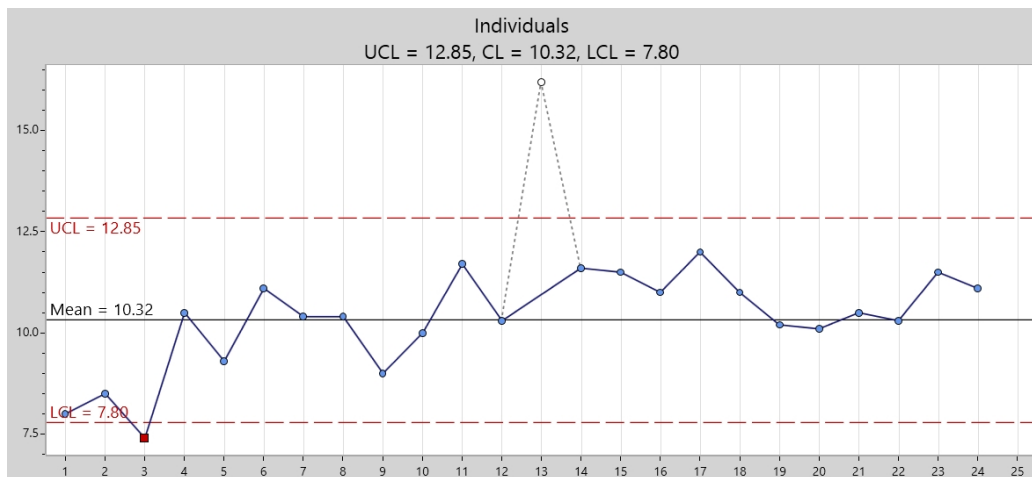
This a combination of two charts. The top chart is an Individuals control chart. The bottom chart is a Moving range control chart. The Moving range chart creates range values to plot by finding differences between consecutive data values.

Moving range chart

Rarely used alone, each point on this chart represents a range value calculated by differences between consecutive data values. This chart shows an indication of dispersion, or how the chart data is spread out.

When to use these charts:

1. When you want to see if your process is stable and predictable;
2. When you want to see how planned change affects a process;
3. When the time order of the data values is preserved;
4. When you have collected data in subgroups of one – one value at a time.



Measurement control chart – for subgroup values

The following chart types are supported in this category:

- ☐ X-bar chart
- ☐ X-bar / Range chart
- ☐ X-bar / Sigma chart
- ☐ Range chart
- ☐ Sigma chart
- ☐ Median chart

X-bar chart

This chart type is used for subgroup data, where each subgroup is made up of two or more values. Points plotted on this chart are the average (X-bar) of the subgroup data. This chart shows an indication of central tendency, or where the charted data is centered.

X-bar / range chart

It is common to use this combination of two charts to create a picture of a process over time. The X-bar chart is shown on top and the range chart is shown on the bottom. The X-bar chart shows central tendency over time, while the range chart shows dispersion over time. Points on the range chart come from the difference between the minimum and maximum value in each subgroup.

X-bar / Sigma chart

When the subgroups contain ten or more values, it is common to use a Sigma chart in place of the range chart. Here the X-bar chart shows an indication of central tendency over time and the Sigma chart shows an indication of dispersion. Sigma can be a better indicator of dispersion than range when the subgroup size is large.

Range chart

Rarely used alone, the range chart plots values that represent the range of data within a subgroup. It reflects the maximum value minus the minimum value. This control chart is used to monitor dispersion in a process.

Sigma chart

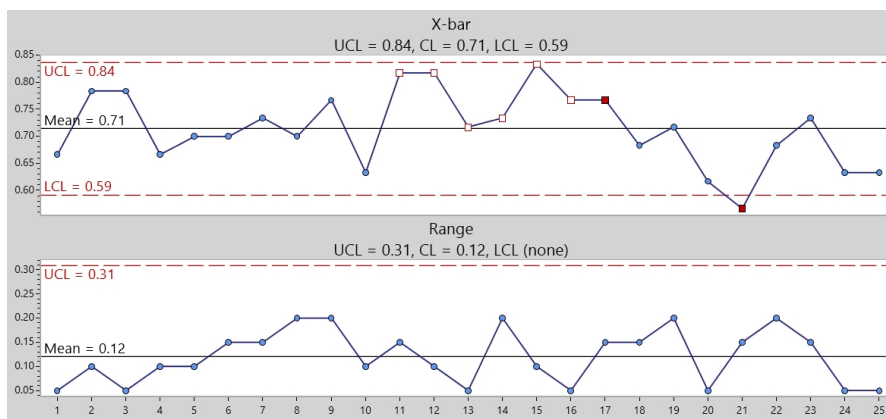
This chart is also rarely used alone. It plots values representing the sigma of data within a subgroup. The control chart is used to monitor dispersion in a process where the subgroup size is large, commonly 10 or larger.

Median chart

A median chart is a type of control chart. Control charts are used to help understand and reduce variation and assess the central tendency of the process over time. Each plotted value on a median chart represents the median of a subgroup of data. If the subgroup contains an even number of values, the median is the mean of the two 'middle' values. The subgroup (sometimes called a sample) must contain two or more measured values. To create a median chart, the data source must include two or more numeric columns that can be treated as measurements. Alternatively, a single column can be selected and then 'grouped' into sub-grouped values.

When to use these charts:

1. When you want to see if your process is stable and predictable;
2. When you want to see how planned change affects a process;
3. When the time order of the data values is preserved;
4. When you have collected data in subgroups of two or more.



Distributions and capability analysis

The following chart types are supported in this category:

- ☐ Histogram
- ☐ Capability analysis
- ☐ Normal probability plot
- ☐ Capability summary
- ☐ Six-Way Analysis

Histogram

A histogram is a bar chart that shows how data is distributed. The bars give a visual indication of central location (mean), width of spread (range or sigma) and shape. Histograms are traditionally displayed with some collection of statistics. These are often called descriptive statistics, as they describe the population of data being charted.

Capability analysis

Capability is not a chart type in its own right. Instead, capability analysis statistics such as **Cpk** or **Ppk** are commonly shown along with a histogram to better understand the data set that is being studied. Capability analysis is used to compare output from a process to the *desired* output of the process, as defined by specification(s). These specifications might be customer requirements or design/engineering requirements.

Normal probability plot

A normal probability plot is used to visualize the distribution of a set of data and to compare it to a given distribution. Additionally, various statistics describing the results of the analysis may be included with the chart. To create a probability plot, the data source must include one or more columns of numeric data that can be treated as measurements.

Capability summary

A Capability summary chart shows the process spread using both the within-subgroup variation and the overall variation, compared to the specification spread. If the process spread is greater than the specification spread, this means the variation (standard deviation) is too large and should be reduced to improve the **Cpk** and **Ppk** statistics. Additionally, the process average can be visually compared to the target specification to easily see how far off target the process is running and if the process average is greater than or less than the target specification.

SQCpack Six-Way Analysis™

A Six-Way Analysis chart is a combination of six charts shown in a six pane rectangle.

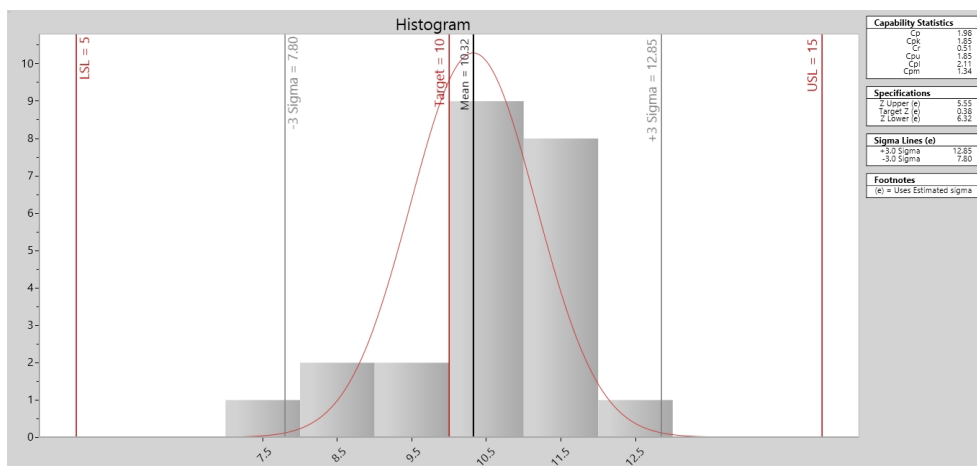
These charts include:

- Individuals or X-bar chart
- Moving range or Range chart
- Run or Median chart
- Histogram (without statistics)
- Normal probability plot
- Capability summary

See [SQCpack Six-Way Analysis™](#)

When to use these charts:

1. When you want to visualize the central location, spread, and shape of a data set;
2. When the process is stable and you want to predict future behavior;
3. When you want to study the capability of some process to meet customer requirements.



Count or classification (attribute) control charts

The following chart types are supported in this category:

- p-chart
- p-chart (p-prime chart)
- u-chart

- u-chart (u-prime chart)
- np-chart
- np-chart (np-prime chart)
- c-chart
- c-chart (c-prime chart)

Note - each of these charts has a standard version and a 'prime' version. When you see p-chart, read this as a p-prime chart. The prime charts are special case implementations of their standard versions. The prime charts are used when there is evidence of over dispersion in the data. Over dispersion can adversely affect how control limits are calculated. For the prime charts, the raw data is put through a transformation before control limits are computed. This makes the control limits model the variation in the underlying process more accurately when over dispersion is present.

p-chart, p-chart

Values plotted on a p-chart represent a proportion. Instead of using the actual count of non-conforming units, p-charts use a proportion of the non-conforming items. When the number of items inspected (the denominator) changes by more than 25 percent from the average number inspected, special calculations are needed for the control limits.

u-chart, u-chart

A u-chart shows process changes over time by looking at the number of nonconformities produced by the process. The plotted values represent a ratio. The subgroup size can vary, so control limits can adjust to reflect this, just as p-charts do.

np-chart, np-chart

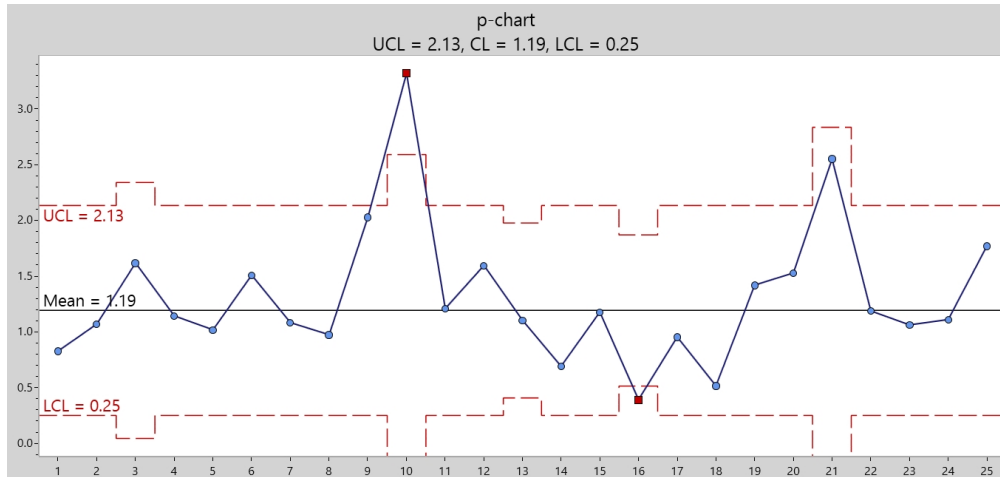
An np-chart is an attributes (count) chart used with data collected in subgroups that are the same size. The np-chart shows how the process changes over time measured by how the number of nonconforming units changes over time. The attribute being studied is expressed as yes/no or pass/fail. An example is the number of incomplete accident reports in a constant daily sample of 5 accident reports.

c-chart, c-chart

A c-chart is an attributes (count) chart used with data collected in subgroups that are considered to be a size of one. The c-chart shows how the process changes over time measured by how the number of nonconforming units changes over time. The attribute being studied is expressed as yes/no or pass/fail. An example is the number of incomplete accident reports each day.

When to use classification (attributes) control charts:

1. When you want to see if your process is stable and predictable;
2. When you want to see how a planned change affects the process;
3. When the data you are examining represents counts of some type;
4. When the time order of the data is preserved.



Rare event control charts

The following chart types are supported in this category:

- g-chart
- t-chart

g-chart

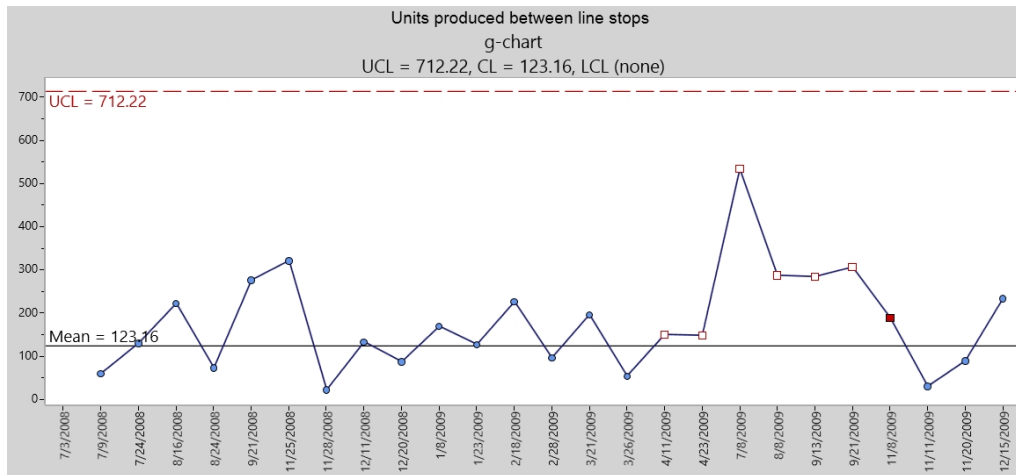
The g-chart creates a picture of a process over time. Each point represents some number of units that have been produced between occurrences of some relatively rare event. For example, in a production setting, where parts are produced daily, occasional power outages may occur. A g-chart might be used to look at the number of units (product) produced between power outages. The units produced might be almost anything, such as the number of invoices produced or the number of customers served between events. A traditional control chart is not usable in these situations, due to the low amount of data. The g-chart control limit calculations are different, in order to account for this type of data.

t-chart

The t-chart creates a picture of a process over time. The units being plotted are time values. Each point on the chart represents an amount of time that has passed since the last occurrence of some rare event. The time units might be hours, days, weeks, months, etc. For example, a chart might plot the number of days between infection outbreaks. A traditional plot of this data would contain many points plotted as zero with an occasional point plotted at one. The benefit of a t-chart is that it allows you to visualize this type of data in control chart form using standard control chart interpretation. The formulas for t-chart control charts are different, in order to account for this type of data.

When to use these charts:

1. When you want to see if the process is stable and predictable;
2. When you want to see how planned changes affect the process;
3. When you are tracking data based on relatively rare occurrences.



Pareto charts

The following chart types are supported in this category:

- ☐ Pareto bar
- ☐ Pareto column
- ☐ Pareto bar (multi-pane)
- ☐ Pareto column (multi-pane)
- ☐ Pareto stacked bar
- ☐ Pareto stacked column

All Pareto charts are bar charts. The bars are usually ranked and may be oriented horizontally (as bars) or vertically (as columns). Pareto charts are often used to visualize data sets where the data falls into different categories. Pareto charts are named for Vilfredo Pareto, who is credited with first describing the Pareto principle, also known as the 80/20 rule.

Pareto bar, Pareto column

These are both ranked bar charts. The ranking is usually from highest to lowest. Data for these charts will typically contain some combination of **categories** and **counts**. These charts are often used to screen data to see where further analysis might be beneficial. For example, in a customer complaints scenario, it is useful to visualize the complaints in this form in order to see the most important complaints to address first.

Pareto bar, Pareto column (multi-pane versions)

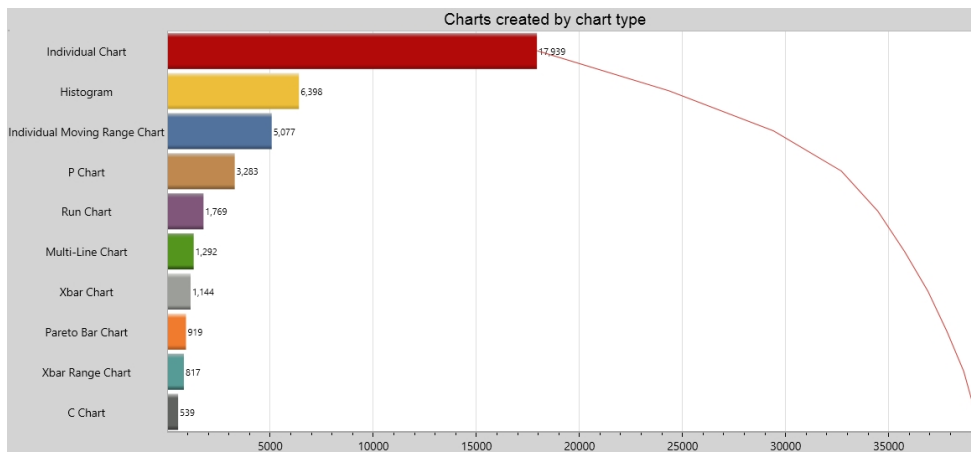
The bars within a Pareto chart will change over time. For example, the customer complaints in January will break down differently than the customer complaints in February. To visualize these changes, the multi-pane Pareto charts allow you to define a *grouping*. Depending on your data, this may create two or more panes that are shown together in the plot area.

Pareto bar, Pareto column (stacked versions)

The bars in a Pareto chart will change over time. For example, the customer complaints in January will break down differently than the customer complaints in February. To visualize these changes, stacked versions of Pareto charts allow you to define a *grouping*. Depending on your data, this will show different categories for each grouping, stacked within the bar. For example, the January bar may contain three colors, each representing a different type of customer complaint.

When to use these charts:

Use Pareto charts when you need to visualize or rank category and count based data.



Line charts

The following chart types are supported in this category:

- Run chart
- Multi-line charts

Run chart

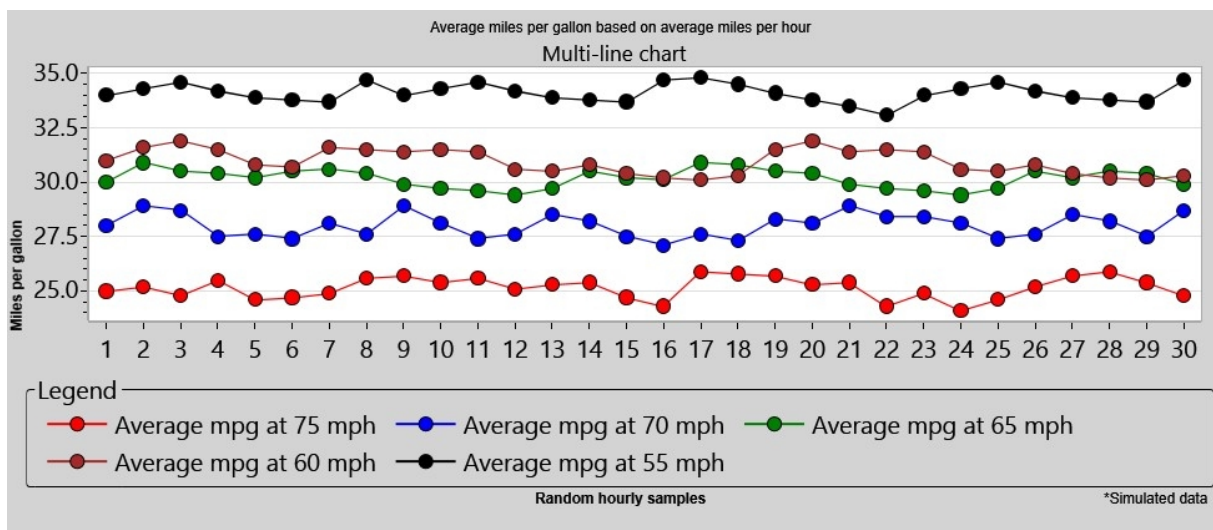
A run chart is a simple, single line chart, plotting data values. Typically, the data series being charted is a time-ordered data series.

Multi-line chart

A multi-line chart plots two or more single lines. Each line represents a data series, which is typically time ordered.

When to use these charts:

Use line charts to create simple visualizations of how data is changing over time. Line charts are often helpful in screening many different variables to see which ones warrant more detailed analysis, possibly using control charts. They can also be helpful in *progress against goal* scenarios where a fixed line is added to the chart set at some goal and the actual data line is compared against the goal.



Specialized measurement charts

The following chart types are supported in this category:

- Sum chart

- Average chart
- Box and Whisker chart
- Scatter diagram

Sum chart

The sum chart is a control chart. It is a variation on the measurement control chart for individual values. Rather than plotting a raw data value or an average, this chart plots a sum of a set of values. For example, rather than plotting the average number of customers served in a given month, you may want to plot the total number of customers served. Since this number can vary from month to month, the number of data points used to create the sum will vary. To create this chart, you typically define a grouping column, such as date, and request to group by month.

Average chart

The average chart is a control chart. It is a variation on the measurement control chart for individual values. Unlike the X-bar chart where data is organized in equal subgroup sizes, an average chart allows you to display an average value from unequal size subgroups. Rather than plotting a raw data value, this chart plots an average of what can be a varying number of values. Think of it as plotting averages as if they were individual values. To create a chart like this, you typically define a grouping column, such as date, and request to group by month.

Box and Whisker chart

The Box and Whisker chart allows you to visualize many aspects of a data set in a single chart. While in a Box and Whisker chart, you can see the central tendency (mean), the central location (median), the dispersion (range), the minimum, maximum, 25th percentile, and 75th percentile. Additionally, you see **all** of this for each “point” being plotted. In this case, “point” is misleading because each point looks like a box (a vertical rectangle) with lines extended from each end (the whiskers.)

Scatter diagram

The scatter diagram plots two variables. One is defined as the **dependent** variable, the other as the **independent** variable. The data is displayed as a collection of points. The points are plotted such that one variable determines the X position (horizontal) and the other variable determines the Y position (vertical.) A scatter diagram helps to visualize possible correlations between two variables. Note that the diagram does not evaluate *causation*; it does not suggest that one variable *causes* the other variable to change. It *might* suggest that when one variable changes, changes in the other variable are *correlated*. Optionally, the scatter diagram allows the addition of a **line of best fit** which can help to understand the correlation between the two variables.

Cusum chart

The Cusum chart is a control chart that is able to detect gradual shifts in the process that it is charting. It can evaluate individual values or subgroup values (in which case the analysis is performed on the average of the subgroup). A wedge-shaped pattern is applied to each point on the chart. If any other point falls outside the wedge shape, then that determines that the process is not in control. The data value that is plotted is derived from a target, consisting of the cumulative sum of the signed difference from that target. The wedge shape is constructed using three factors: amount of concern (expressed in number of standard deviations), Producer risk and Consumer risk (both between 1 percent & 5 percent).

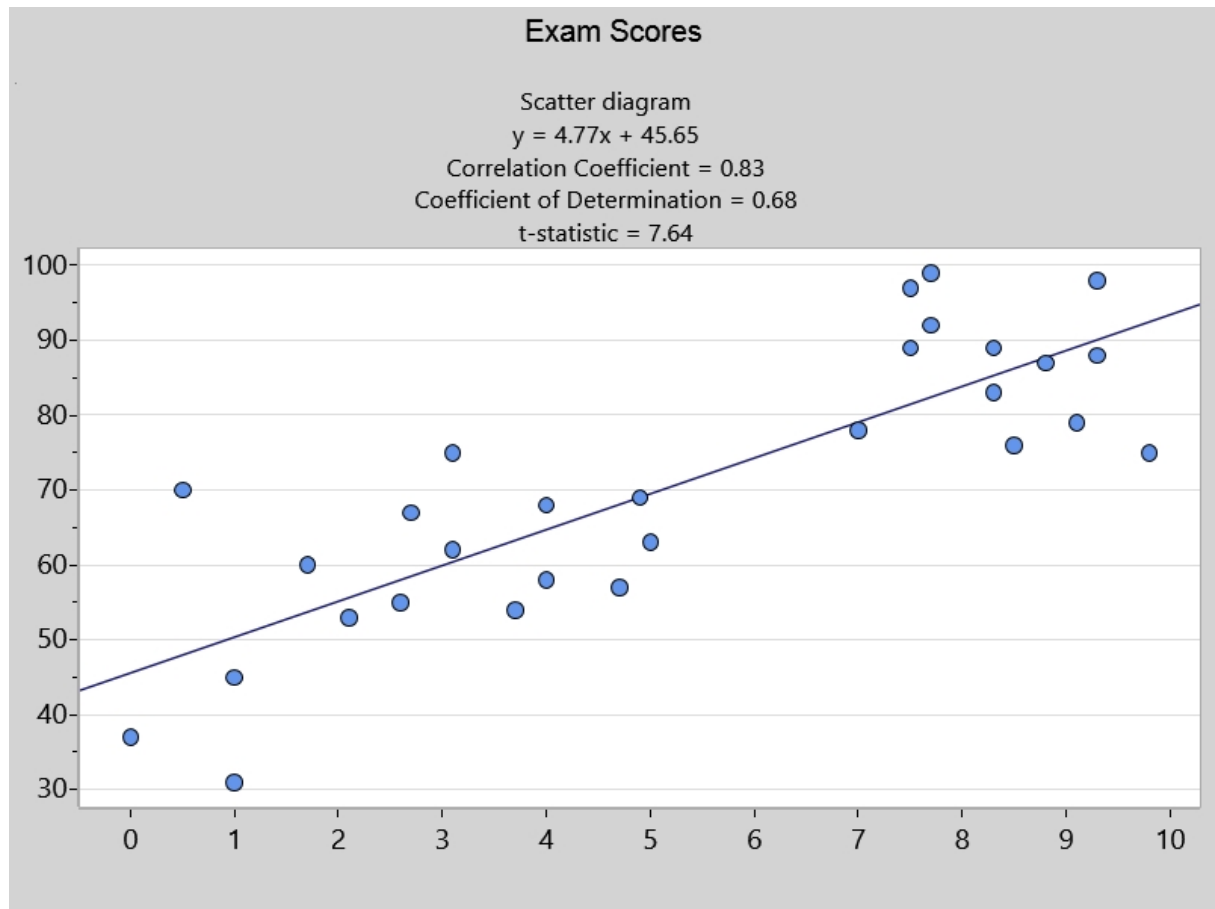
EWMA (Exponentially Weighted Moving Average) chart

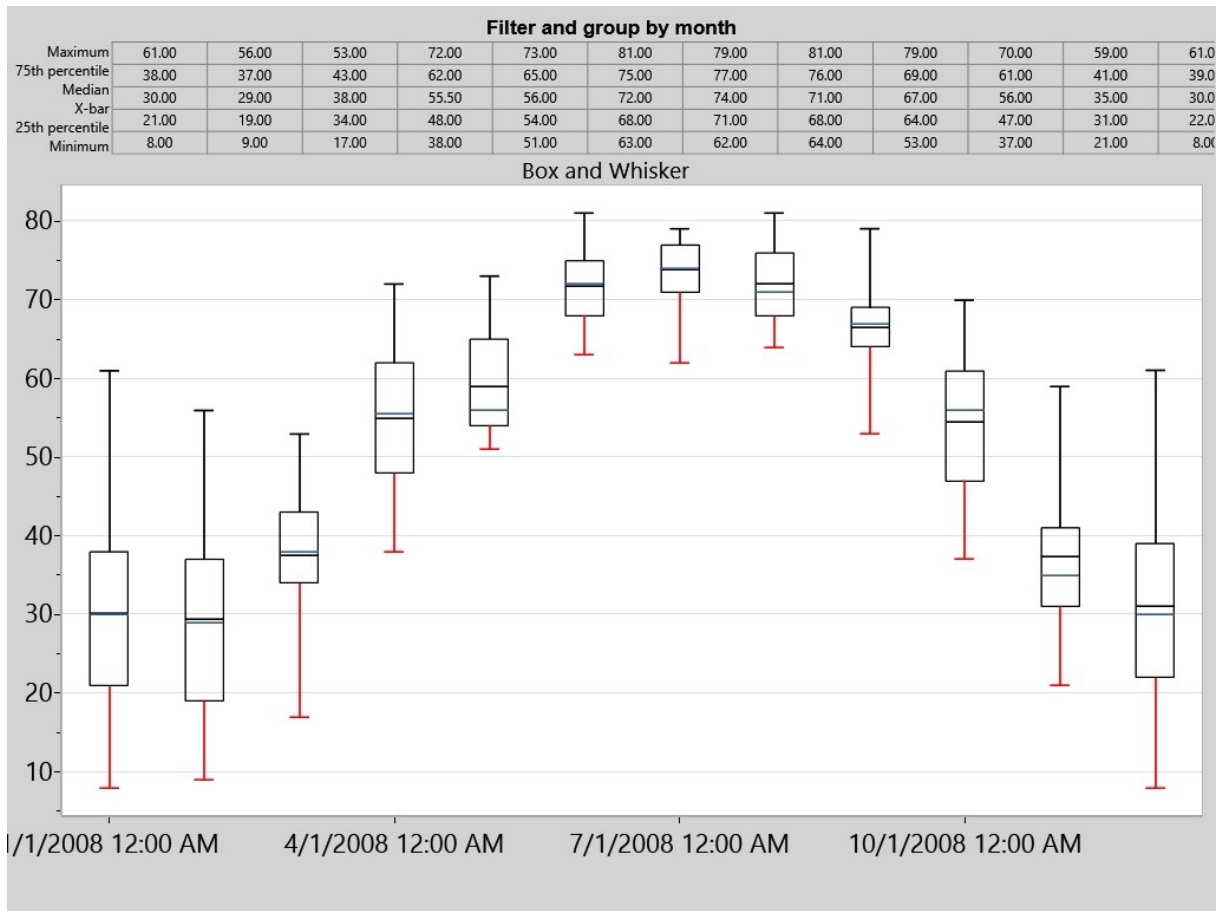
The EWMA, or exponentially-weighted moving average chart, is a control chart that is able to quickly detect a shift (or drift) in the process. The values that are plotted are derived from a target value. Each data value is calculated using a weighting factor that gives more or less control to each observed value, and less or more control to all previous values. This is called a Lambda factor, typically between 0.2 and 0.3. Control limits are used to determine whether the process is in control or not.

When to use these charts:

These specialized charts are often used for initial exploration of a data set to help understand a “big picture” before delving into more details with the other chart types in SQCpack. They are also useful in presentation and /or training sessions to explain how data from a process behaves and how this looks in visual form.

Both the Cusum chart and the EWMA chart are able to detect gradual shifts early in the process that each is charting. Since they detect such a shift earlier than Shewhart control charts, they are generally used early in the analysis of a particular process.





SQCpack Six-Way Analysis™

Six-Way Analysis is a combination of six charts shown in a six-pane rectangle.

| | |
|------------------------------------|--------------------------------|
| Individuals or X-bar chart | Histogram |
| Moving range or range chart | Normal probability plot |
| Run chart or Median chart | Capability summary |

Individuals chart

This chart shows an indication of central tendency, where the subgroup size consists of a single observation.

See [Measurement control chart – for individual values](#)

X-bar chart

This chart shows an indication of central tendency, where the subgroup size is made up of more than one observation per sample.

See [Measurement control chart – for subgroup values](#)

Moving range chart

This chart shows the variability between one observation and the next.

See [Measurement control chart – for individual values](#)

Range chart

This chart show the variability of data within a sample.

See [Measurement control chart – for subgroup values](#)

Run chart

This chart is used to show visually how data is changing over time.

See [Line charts](#)

Median chart

Each plotted point represents the median value. This is used when the subgroup size is made up of more than one observation per sample.

See [Measurement control chart – for subgroup values](#)

Histogram

This chart shows how data is distributed by giving a visual representation of a central location, spread, and shape.

See [Distributions and capability analysis](#)

Normal probability plot

A normal probability plot is used to visualize the way data is plotted against a diagonal line to see how it compares to a given distribution, such as the normal.

See [Distributions and capability analysis](#)

Capability summary

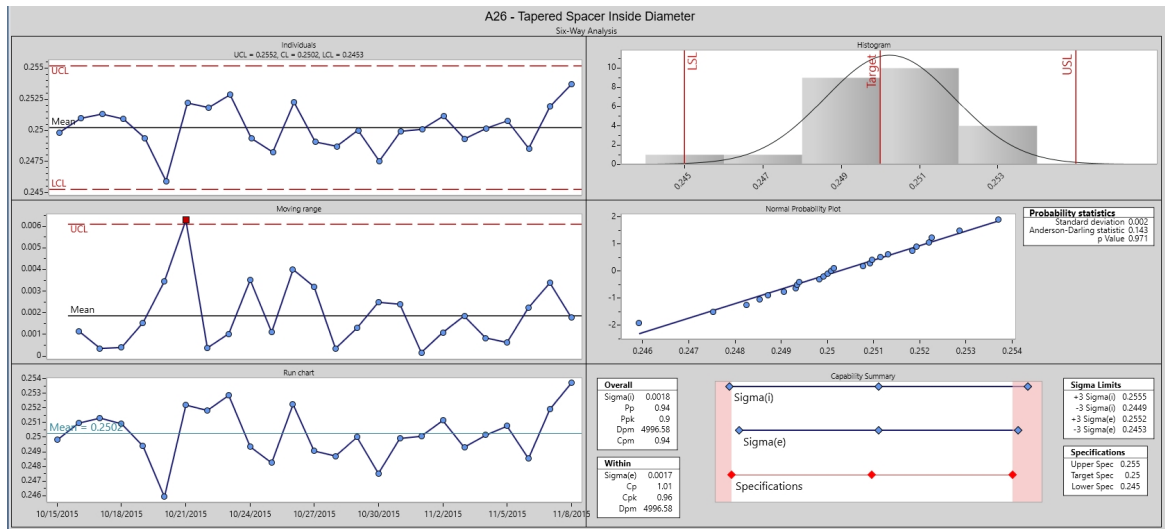
A capability summary chart shows the process spread using both the within subgroup variation and the overall variation compared to the specification spread.

See [Distributions and capability analysis](#)

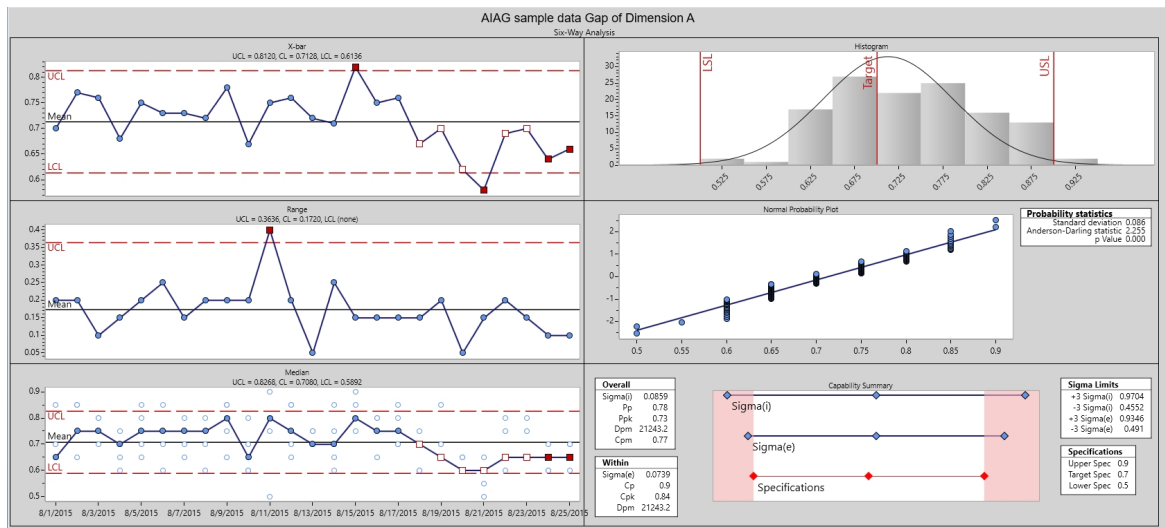
When to use these charts:

The purpose is to provide one display that answers questions related to process stability, central tendency, short and long term variability, recent measurements, and distribution and normality of data. It offers a visual interpretation of process spread compared to allowable spread.

Below is a sample chart when subgroup size is one



Below is a sample chart when subgroup size is more than one



The new chart wizard

Many charts that you see in SQCPack are created automatically. When you create a new data group, charts are automatically created for each measurement, count, and calculated column in the data group. These charts are considered “default” charts. You may also create your own charts. To do this, you will use the **chart wizard**.

The chart wizard breaks the process into three easy-to-follow steps:

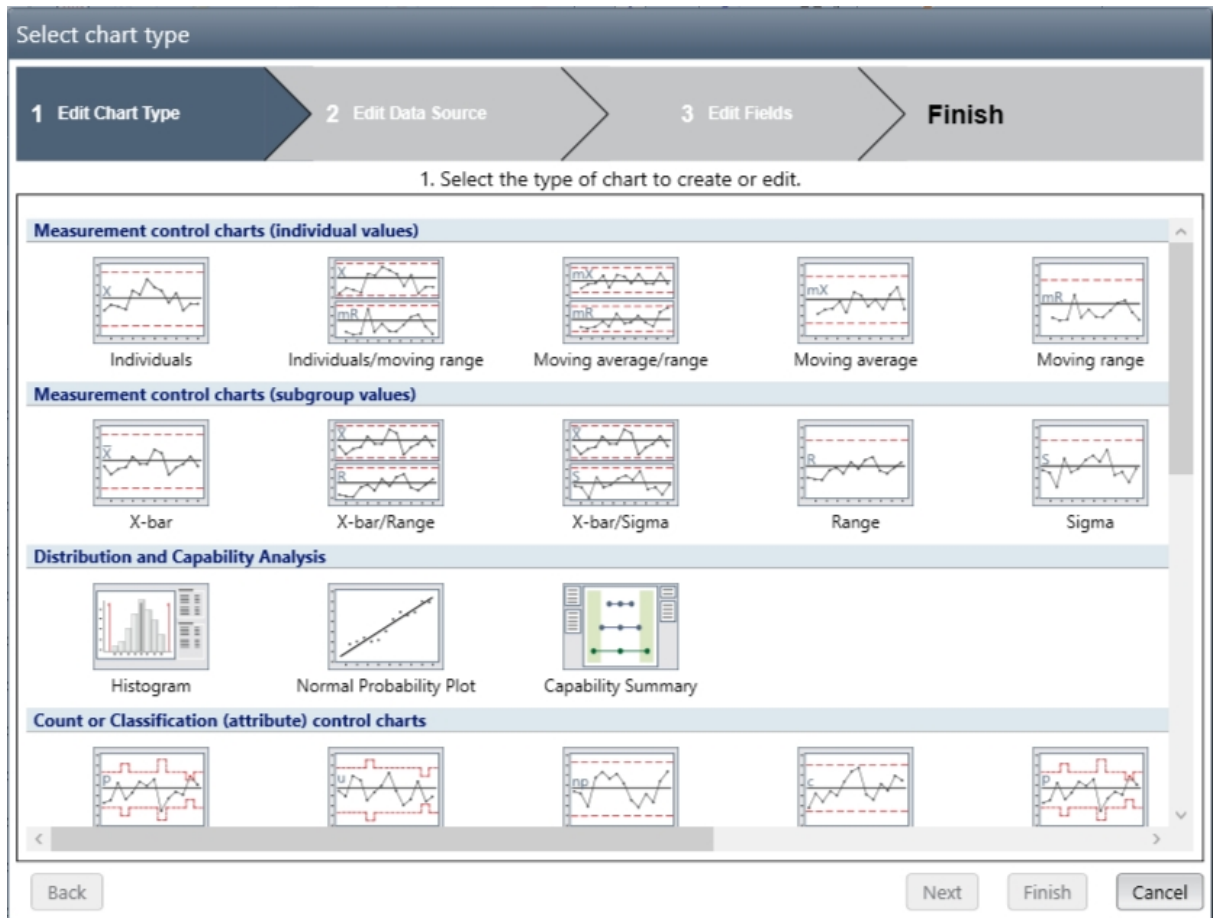
1. Select the chart type
2. Specify the data source
3. Describe how to use the data columns

Once a chart has been created with the wizard, many other chart settings may be customized using the standard chart editing process and the edit panels that appear to the right of any chart when it is being edited.

Step 1 - Select the chart type

To create a new chart by using the wizard, start by selecting **Charts** from the navigation menu.

This will display the wizard, which will be on step #1 where you select the chart type, as shown below.



Click on the chart type you want, then click on the **Next** button which takes you to [Step 2 - Specify the data source](#).

For help with selecting the appropriate chart type, see the chart type descriptions in [Supported chart types](#).

Step 2 - Specify the data source

In step #2 of the chart wizard you describe where the chart will get the data that will be charted.

First, use the combo box for **Data Source** to select your data source. The following options are supported:

- SQCpack data
- Microsoft Excel
- Microsoft Access
- SQL Server
- SQL Server via Connection String
- ODBC provider
- ADO; OLE DB provider

The dialog for step #2 reconfigures itself after you select a **Data Source**.

Chart using internal SQCpack data

The dialog that results when you select **SQCpack data** is shown below. This is used when charting from data that is stored in an SQCpack data group.

The screenshot shows a multi-step dialog box for creating a chart. The top navigation bar has three steps: '1 Edit Chart Type' (completed), '2 Edit Data Source' (current step), and '3 Edit Fields' (completed). The 'Finish' button is highlighted in orange. Below the navigation bar, the instruction '2. Select the data type, location, and contents to use for this chart.' is displayed. The main area contains three dropdown menus: 'Data Source' set to 'SQCpack® data', 'Group' set to 'AIAG sample data', and 'Characteristic' with a dropdown menu open showing options: 'Gap of Dimension A' (selected), 'Acid Concentration - %', 'Gap of Dimension A', and 'All characteristics'. At the bottom are 'Back', 'Next', 'Finish', and 'Cancel' buttons.

If the data you want to chart is in an SQCpack data group (as shown above), you will select **SQCpack data**. This may be your most common choice for data source. Then select the data **Group** and **Characteristic** from the drop-down boxes.

Chart using data from an external data source

Several dialogs are used to tell SQCpack how to find and fetch data from a data source is outside of the SQCpack database.

When your data lives outside of SQCpack, select one of the non-SQCpack options for **Data Source**, as shown in the examples below. Depending on the option you select, additional properties will be displayed that you must provide before continuing.

1 Edit Chart Type 2 Edit Data Source 3 Edit Fields Finish

2. Select the data type, location, and contents to use for this chart.

Data Source:
Microsoft Excel and CSV

Data file:
D:\CustomerData\Excel\All Swimming Data.xlsx Browse

☒ Worksheets ☐ Custom Query

Select worksheet:
'All Swimming Data\$'

Back Next Finish Cancel

Microsoft Excel and CSV - As shown above, for this type of data source you must provide the path to the Excel data file you wish to use and the worksheet (within the Excel file) that contains the data you wish to chart.

Worksheets - Select Worksheets when you want to fetch data from a single worksheet. The data in the worksheet is treated as if it were a table in a database.

Custom Query - Select Custom Query if you want to enter a SQL SELECT statement that will be used to fetch the data. This option gives you a great deal of flexibility and power, but requires that you understand the proper syntax for creating a SELECT statement. For more information see [Using a custom query](#).

SQL Server - To fetch data from a SQL Server database, you must provide a server name, database name.

Tables, Views and Procedures - If you intend to fetch data from a table, view, or stored procedure then select the appropriate table/view/procedure name from the drop-down list. For a table or a view, if the 2nd step of the chart wizard specifies to display the *Last n* subgroups on the chart, SQCpack versions after 7.0.17100.1 automatically attempt to optimize the database query to only fetch the data needed to draw the chart (as opposed to fetching all the data and using only the last rows for the chart). This automatic optimization is called *Smart LastN Queries*.

Custom Query - Select Custom Query if you want to enter a SQL SELECT statement that will be used to fetch the data. This option gives you a great deal of flexibility and power, but requires that you understand the proper syntax for creating a SELECT statement. For more information see [Using a custom query](#).

Using Oracle - For an ODBC or ADO; OLE DB type of data source this checkbox should be selected when the data source is an Oracle database. SQCpack has to handle some aspects of using an Oracle database differently. Click the **Customize** button to edit the method used to transform a text date value into an Oracle date value.

For more details about using each of the data source options available in the **Data Source** drop-down, see [Appendix D: Charting external data sources](#).

Once you have selected a data source and filled in settings specific to that data source, click on the **Next** button to move to [Step 3 - Describe how to use the data columns](#).

Using input parameters with a stored procedure

When the data source is a stored procedure that requires input parameters, the **Edit Input Parameters**

button is visible as shown below:

☒ Tables, Views and Procedures ☐ Custom Query

Table/View/Procedure

dbo.SP_LotsOData_1999

Edit Input Parameters

Click the **Edit Input Parameters** button to open the following window. Enter the desired parameter value in the **Value** column.

| Name | Value |
|------------|------------|
| Start Date | 2000-01-15 |
| End Date | 2000-03-15 |
| | |

OK Cancel

Step 3 - Describe how to use the data columns

On step #3 of the chart wizard you specify which data columns to use and how to treat each data column.

You also specify how to order the data and optionally how to apply sampling to the data.

The grid at the top of the form is used to set a **Treat As** option for the data columns that will be used by the chart. When you are making a chart from SQCpack data, this grid will often be filled in automatically. However, when you are charting external data, it is your job to set a **Treat As** option for each column. This is done by selecting a **Treat As** option from the combo box in the grid.

The **Layout preference** dropdown list allows you to arrange the data columns in several different layouts. Use the one you like best.

1 Edit Chart Type → 2 Edit Data Source → 3 Edit Fields → Finish

3. Select which columns from the data source to use and how the chart should use each column.

Layout preference: Horizontal - wrap ☐ Only show columns used by the chart

| | | | | | | |
|--|----------------------------------|--------------------------------|--|------------------------------------|--|--|
| Row number Identifier Row number | Row cause Ignore Row cause | Row note Ignore Row note | Row action Ignore Row action | Operator Identifier Operator | DateTime Identifier DateTime | Extrusion Line HSL Identifier Extrusion Line HSL |
| Lot No(1) Measurement Lot No(1) | Lot No - cause Cause Cause | Lot No - note Note Note | Lot No - action Ignore Lot No - action | Data(1) Ignore Data(1) | Data - cause Ignore Data - cause | Data - note Ignore Data - note |

Selected columns: Row number, Operator, DateTime, Extrusion Line HSL, Lot No(1), Cause, Note

Data used: View Data
25 rows returned (does not include Sampling)

Order by: Row number

Sampling: None (No sampling defined)

Filtering: Edit the Filter ☐ Apply the filter (filter not defined)

Rows to use: Last n values , where n = 25

Back Next Finish Cancel

In the example shown above, the **Treat As** options have been setup for an individuals chart.

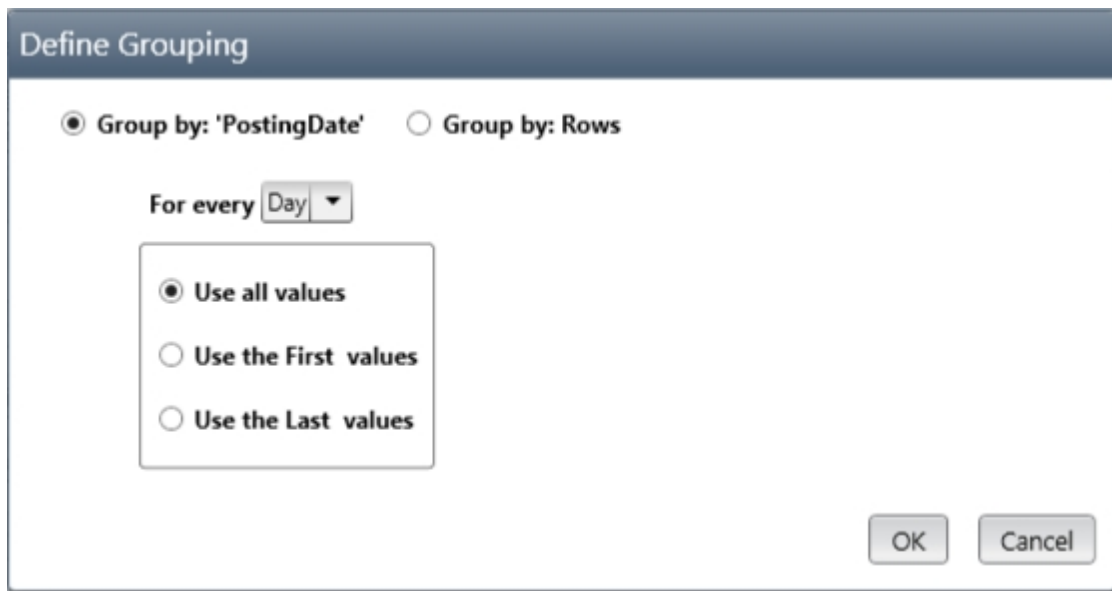
Once you have set the **Treat As** options along with any other applicable properties, click on the **Finish** button. This will display your new chart in a new tab in the work area.

Order by - It is very important to specify an appropriate **Order by** column as explained in the topic [The ORDER BY column](#). When the data source uses a [custom query](#) to fetch the data, the **Order by** column can be specified in the [Compose a Custom Query](#) window on step 2 of the chart wizard (where it is called the *attachment* column), or here on step 3 of the chart wizard.

The **Grouping/Sampling** drop-down allows you to choose from these options:

- **None** - no sampling occurs.
- **Grouping** - click the **Define Grouping** button to setup the grouping options, as shown below. The grouping option is only present for some chart types, such as Sum and Average.
- **Sampling** - click the **Define Sampling** button to setup the sampling options, as shown below.

Grouping



Define Grouping

☒ Group by: 'PostingDate' ☐ Group by: Rows

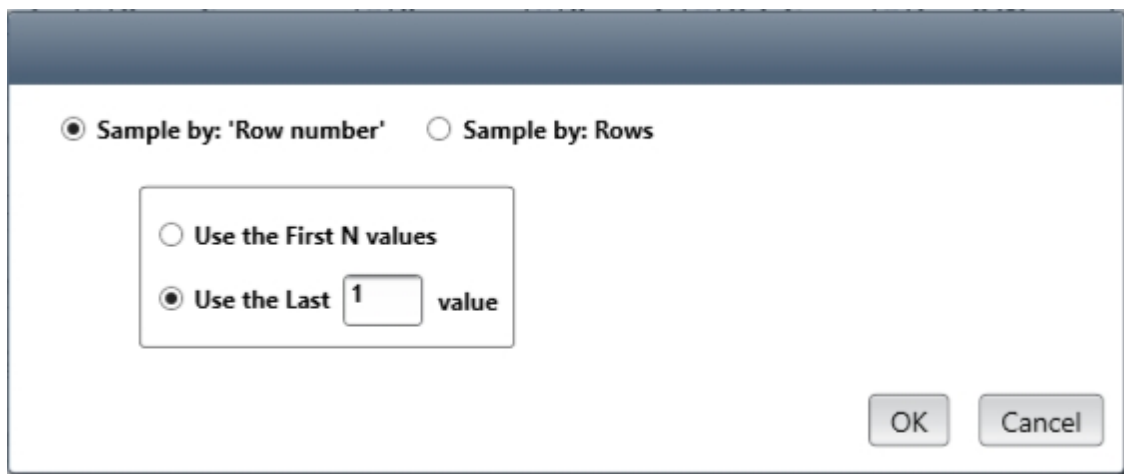
For every Day ▾

☒ Use all values
☐ Use the First values
☐ Use the Last values

Group by: 'ColumnName' - Select this option (as shown above) to group together all the observations in the time period specified by **For every** to form a single subgroup.

Group by: Rows - Select this option (as shown above) to group together all the observations in a contiguous set of rows to form a single subgroup.

Sampling



☒ Sample by: 'Row number' ☐ Sample by: Rows

☐ Use the First N values
☒ Use the Last 1 value

Sample by 'Row number' - Select this option (as shown above) to include a subset of the data rows on the chart. For example, take every 100 rows include only the last 2 rows out of the 100 on the chart. Do this again and again in 100 row increments.

☐ Sample by: 'Row number' ☒ Sample by: Rows

For every rows

☐ Use the First N values
☒ Use the Last values

Sample by Rows - Select this option (as shown above) to form one subgroup by *grouping* the observations (data values) from multiple rows. For example, take every 100 rows and form a subgroup by grouping all of the observations from the last 2 rows out of the 100 rows.

Click **Edit the Filter** to open the filtering dialog that allows you to define conditions for which rows to include in the chart. See [Chart filters](#) for more information on filtering.

The **Rows to use** option allows you to select from the following choices. This is somewhat like filtering, in that you can select to chart a subset of the available data rows. The **Rows to use** option is applied *after* any filtering specified by **Edit the Filter** has been applied. It is also applied after consolidating multiple rows of data into a single subgroup, such as doing a sum chart grouped by week.

- ☐ **All** - all of the data rows are used on the chart.
- ☐ **First n** - only the first N data rows are used on the chart.
- ☐ **Last n** - only the last N data rows are used on the chart.

Considerations for large data sets

Many charts use the "Last N" option for **Rows to use**. In versions of SQCpack prior to 7.0.17100.1 all of the data rows (for external data) were transferred from the data source to SQCpack, then SQCpack used the last N of those rows for the chart. Versions of SQCpack after 7.0.17100.1 attempt to execute a [smart LastN query](#) that fetches only the last number of rows you are interested in. If the *smart LastN query* does not succeed, then SQCpack fetches all of the data rows and uses the last 25 of them on the chart. If the N in "Last N" or "First N" is larger than around 5,000, SQCpack may still become unresponsive while it processes the large number of data points on the chart.

If you choose **All** for **Rows to use**, and the data source contains more than around 5,000 rows, SQCpack will very likely become unresponsive, perhaps for a long time depending on the number of rows in the data source, and may eventually run out of memory. That's because SQCpack fetches all of the data rows into your computer's memory, then tries to draw a chart using all of the data rows.

For *internal* data (i.e. data stored in an SQCpack data group), you don't have to worry about large data sets used with **First N** or **Last N**. Since the data is owned by SQCpack, it knows how to fetch only the needed rows out of the available data rows.

Treat As options for step #3 of the chart wizard

Both the **Treat As** options - and the rules for what **Treat As** columns are required vary, based on the type of chart you are creating. For example, when creating an Individuals chart, one column must be treated as a measurement. Another example is that when creating a c-chart, one column must be treated as a count. Following is a list of all the **Treat As** options you might encounter with a brief description.

List of Treat As options

Ignore – tells SQCpack to ignore this column.

Identifier – tells SQCpack to use this column as an identifier (or a tag). Identifiers can be used for filtering and for labeling the x-axis on control charts.

Measurement – tells SQCpack to treat this column as a measurement. Used for measurement control charts, histograms, and run charts. Individuals control charts require one measurement column. Control charts of subgroup data, like X-bar, require two or more measurement columns.

Count (Numerator) – tells SQCpack to treat this column as a count. This is used for count or attributes control charts such as c-chart, p-chart, np-chart, and u-chart. The count Treat As option can also be used when creating a Pareto chart.

Inspected (Denominator) – tells SQCpack to treat this column as the number inspected for count charts such as the p-chart, u-chart, and np chart.

Ratio – tells SQCpack to treat this column as a Ratio. Some of the attributes control charts compute a ratio from two columns. Use this Treat As option when your data source has already done this calculation and the result is in one column.

Percent – tells SQCpack to treat this column as a Percent. Some of the attributes control charts compute a percentage from two different columns. Use this Treat As option when your data source has already done this calculation and the result is in one column.

Data 1 – Data 20 - use this Treat As option to specify up to twenty different data lines when creating a multi-line chart.

Upper spec - tells SQCpack to treat this column as providing the *upper* specification value for each subgroup (or data point) on the chart. See Note 1 below.

Target spec - tells SQCpack to treat this column as providing the *target* specification value for each subgroup (or data point) on the chart. See Note 1 below.

Lower spec - tells SQCpack to treat this column as providing the *lower* specification value for each subgroup (or data point) on the chart. See Note 1 below.

Categories – tells SQCpack that this column defines different categories for use in Pareto charts. Note that this can be a text column, where each unique text string found in the column becomes a category (or bar) for your Pareto chart.

Note – tells SQCpack that this column contains notes that are meaningful in the context of the chart that is being defined.

Cause – tells SQCpack that this column contains assignable causes, usually text. For control charts, when a cause column is used, if **any** text is found in this column, that row will be *caused-out*, meaning that the data for that row will not impact calculations and the data point itself will have a different (dimmed) look on the control chart.

Corrective action – tells SQCpack that this column contains corrective actions that may have been made related to the data that is being charted. It has no impact on calculations.

Remember, the options you have for **Treat As** vary, depending on the type of chart you are creating.

NOTE 1: If specification values are provided by the data, i.e. some columns are treated as *Upper spec*, *Target spec*, or *Lower spec*, then the [Specifications edit panel](#) for the chart must have *Specs source* set to *Mapped data fields* in order for the chart to fetch specification values from the input data.

Editing the properties of a chart

Once you have used the wizard to create and save a chart, there are many chart properties that can be changed to customize the appearance of the chart. To do this, you will work in the chart editing process. This section will start with an overview of the full editing process work flow at a high level. After that, it will describe how to customize specific types of chart settings.

Start the chart editing process by selecting **Charts** from the navigation menu; this displays the list of all charts. If you have not yet created any charts, please follow the steps in one of these topics before you begin this section to create at least one chart:

[Create a chart from SQCpack data,](#)

[Create a chart using data external to SQCpack](#)

Select one chart by clicking on it in your list of charts. For this topic, select a single chart rather than any multi-chart, chart group, or StatBoard you might have in the list.

In the ribbon bar, click the **Edit** button. This will both display the chart **and** put the chart into edit mode. It will be shown in a new tab in the work area. Whenever you are looking at a chart in SQCpack, it is in one of two modes: 1) edit mode; or 2) display mode. Click on the **X** in this chart tab to close the chart. Next, we look at a different way to start the chart editing process.

In the list of charts, click one chart to select it. This time, in the ribbon bar, click the **Display** button. This will display the chart in a new tab in the work area. This chart is in display mode, while the previous chart was in edit mode. Next, if you want to edit this chart, click the **Edit** button in the ribbon bar.

Key point: Whenever you are viewing a chart, it is in one of two modes: 1) edit mode; or 2) display mode. When you want to make changes to the chart, use the **Edit** button to put the chart into edit mode. When you are finished making changes, use the **Exit Edit** button to put the chart back in display mode.

You will notice that a chart looks different when it is in edit mode. Below, the same chart is shown first in display mode and then in edit mode:

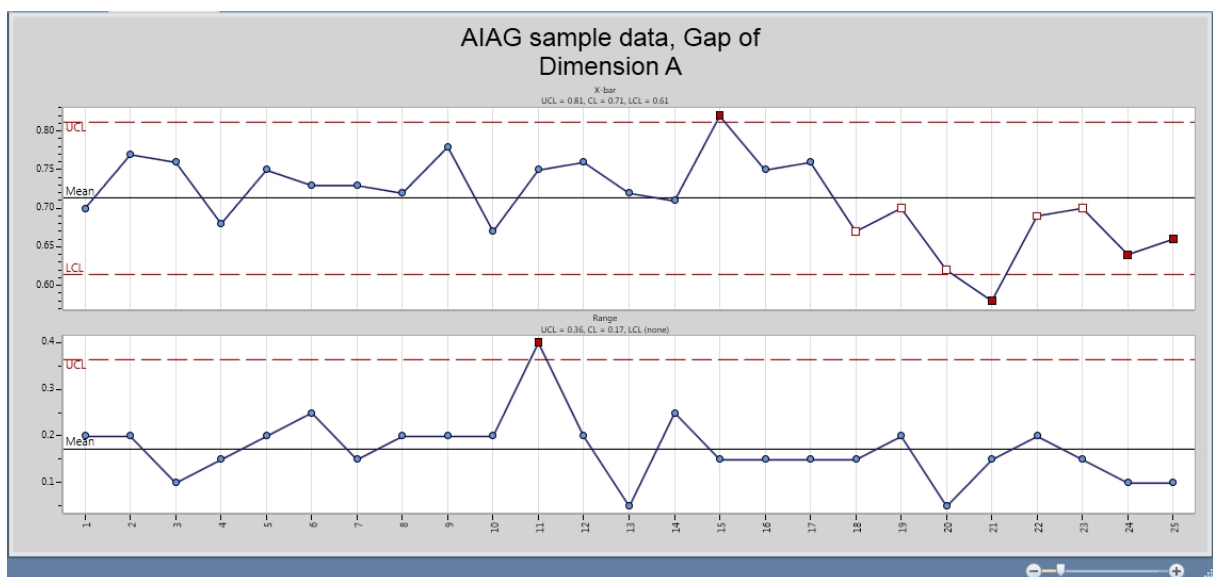
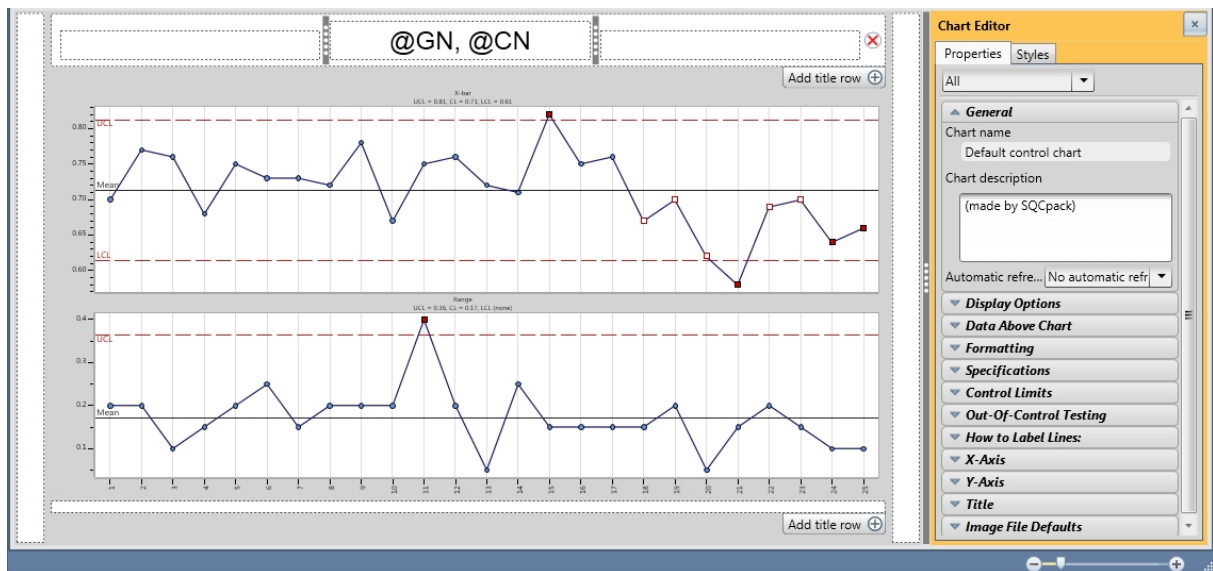


Chart in display mode.



Same chart in edit mode.

Edit panels

When a chart is in edit mode, you will see the **Chart Editor** to the right of the chart. This is a panel with two tabs: one for **Properties** and one for **Styles**. Within each tab is a series of edit panels. Each edit panel has a name such as **General**, **Display Options**, **Formatting**, etc. Each edit panel may be expanded or collapsed. Use the little triangle to the left of the name to expand or collapse that edit panel. In each edit panel are settings that affect the chart. As you make changes to these settings, the chart is refreshed to reflect these changes.

The chart has a tab above the chart area that contains a small image of the chart, an **X** (which is the **close** button), and the name of the chart. This name is often abbreviated. If the mouse pointer rests on the chart name, the full name will be displayed. Whenever you make a change to a chart, the chart becomes **dirty**. This just means that something has changed since the chart was last saved. When a chart is dirty, its name will be preceded by the **asterisk *** character.

Another difference when a chart is in edit mode is that the chart titles, on all four sides of the chart, become larger and allow you to enter titles and set their format.

High level steps in the chart editing process

1. Select **Charts** from the navigation menu.
2. Find and select the chart to edit.
3. Click the **Edit** button in the ribbon bar.
4. Make changes in the chart editor, editing panels on the right.
5. Make changes to the titles all around the chart.
6. Click the **Exit Edit** button to put the chart back in display mode.
7. Click the **Save** button to save any changes you made.
8. Click the **X** button in the chart tab to close the chart.

Chart editing details

When you are editing a chart, the chart editor is shown to the right of the chart. It contains two tabs. Most of the changes you make will be on the **Properties** tab. If you want to change overall colors and styles for the

chart, use the **Styles** tab.

Note - depending on the **type** of chart you are editing, the list of edit panels will vary. Additionally, settings within an edit panel may change from one chart type to another.

General edit panel

1. Chart Name

- The name is the name the chart will be saved as and what will display in the finder.
- Avoid using special characters such as: \ / : * ? " < > | because these characters are not allowed as part of a Windows file name. The chart name is used as part of the file name when a chart is saved as an image file.

2. Chart Description

- The description is an optional field where you can put in a short description of the chart to help identify it or to add some useful information.

3. Automatic refresh

- Automatic refresh allows you to have the chart automatically refresh while it is displayed. When refreshed, SQCpack will retrieve the latest data from the data source so that the chart always remains up to date.

Display options edit panel (control chart)

1. Sigma zones

- The areas ± 1 sigma, ± 2 sigma, and ± 3 sigma from the mean are colored.
- The default colors are green, yellow, and red respectively.

2. Sigma lines

- This option labels and draws a line at ± 1 sigma and ± 2 sigma from the mean.

3. Horizontal grid lines

- This option draws a horizontal line across the chart at every interval on the y-axis.

4. Vertical grid lines

- This option draws a vertical line on the chart at every interval on the x-axis.

5. Show data value at each point

- This option places a small label containing the observation near the data point.

6. How to Label Lines

- This option allows you to specify how lines such as Mean, UCL, LCL, Sigma lines, etc. are labeled. You can choose to put the name, the value, both, or neither on the chart.

7. Multiplier

- This option lets you multiply all of your data by a power of ten up to 1,000,000.
- This option is available only on u-charts.

8. Show legend

- This option allows you to show a legend for a multi-line chart and stacked Pareto charts.

Display options edit panel (x-bar/median chart)

1. Sigma zones

- The areas ± 1 sigma, ± 2 sigma, and ± 3 sigma from the mean are colored.
- The default colors are green, yellow, and red respectively.

2. Sigma lines

- This option labels and draws a line at ± 1 sigma and ± 2 sigma from the mean.

3. Horizontal grid lines

- This option draws a horizontal line across the chart at every interval on the y-axis.
- 4. **Vertical grid lines**
 - This option draws a vertical line on the chart at every interval on the x-axis.
- 5. **Show data value at each point**
 - This option places a small label containing the observation near the data point.
- 6. **Draw observation points**
 - This option allows you to choose whether or not to display observation points on x-bar or median charts.

Display options edit panel (histogram)

1. **Draw distribution curve**
 - This option draws a curve for the distribution of your data. Your choices are always, never, and if it fits the data (determined by the chi-square test).
2. **Assume distribution is**
 - This option tells SQCpack how to treat your data. You can select normal or non-normal, depending on how your data looks.
3. **Horizontal grid lines**
 - This option draws a horizontal line across the chart at every interval on the y-axis.

Display options edit panel (Pareto chart)

1. **Count missing category as blank**
 - If the category contains an empty column, include this as a category named "blank"
2. **Total count above chart**
 - Includes a total count, all bars, above the plot area
3. **Categories?**
 - Leave as is – leaves the category names as found in data source
 - Abbreviate – shortens category names to preserve space on the chart
 - Truncate – truncates category names to length specified
 - Wrap – forces category names to be wrapped to additional lines if needed
 - Show ellipses – puts ellipses character at end of truncated category names
4. **Alignment**
 - Aligns category names left, center, or right in their space
5. **Show percent axis**
 - Changes x-axis from its default to count, to percentages
6. **Minimum number of bars**
 - Allow users to specify a minimum number of bars. Affects bar width.
7. **Spacing between bars**
 - Allows user to increase or decrease space between each bar
8. **Order bars**
 - Do not order – leaves data in order is it retrieved
 - Counts ascending / descending – orders bars by count
 - Categories ascending / descending – orders bars alphabetically by category names
9. **Limit bars**
 - Do not limit – attempts to display every bar found in data
 - Number of bars – limits to number of bars specified by user
 - Percentage – limits to percentage of bars specified by user

- Total cost – limits bars based on total cost – when category cost available
10. **Show other bar**
- Toggles showing an 'other' bar when bars have been limited
 - Show count labels – toggles showing count on each bar
 - Show percent labels – toggles showing percent on each bar
 - Draw grid lines – toggles drawing grid lines in the plot area
 - Draw cumulative line – toggles drawing a cumulative line with the bars

Data above chart edit panel (control and line charts)

1. **Identifiers** – check each identifier to include in grid above chart
2. **Data Values** – check each data value to include in grid above chart
3. **Subgroup Statistics** – check each statistic to include in grid above chart

Note – when your chart displays a large number of data points, the data grid above the chart can become quite crowded, making the data difficult to read. Data above the chart is best used when the number of data points being charted is fewer than 50 samples.

Formatting edit panel

1. **Number of decimals** (various) - specify how many decimals to use for displayed calculations.

Specifications edit panel (control charts and histograms)

1. **Specs source** - specifies where the specification values come from:
 - **This chart** - use the specifications set stored in the chart definition.
 - **The characteristic** - use the specifications set provided by the characteristic that is being charted. In this case the specifications set can come from the characteristic definition itself, or the characteristic can specify that the specifications set come from a common specifications set.
 - **Mapped data fields** - specification values are provided by the data source via columns that are treated as Upper spec, Target spec, or Lower spec in the [3rd step of the chart wizard](#).
 - **Common specs** - use the specifications set provided by the specified common specifications set.
2. **Common specs** - when the Specs source is set to Common specs, this field specifies the name of the common specifications set that will be used by the chart.
3. **Apply-from column** - specifies the Identifier column used to provide the Apply from key value that specifies which specifications row is used by each data point on the chart.
4. **Edit specs** - click to open a dialog that allows you to edit the specifications set used by the chart.
5. **View specs** - click to open a dialog that allows you to view (but not modify), the specifications set used by the chart.
6. **Upper specification** – the upper specification value from the last specifications row of the specifications set used by the chart.
7. **Draw spec line (Upper)** – toggles the display of the upper specification line on the chart.
8. **Target specification** – the target specification value from the last specifications row of the specifications set used by the chart.
9. **Draw spec line (Target)** – toggles the display of the target specification line on the chart.
10. **Lower specification** – the lower specification value from the last specifications row of the specifications set used by the chart.
11. **Draw spec line (Lower)** – toggles the display of the lower specification line on the chart.
12. **Show specs as chart title** - toggles display of specifications above the chart.

See [Reference - Specifications](#) and [Specifications and charts](#) for more information about specifications sets, specifications rows, and how SQCpack provides specification values for use by a chart.

Control limits edit panel (all control charts)

1. Limits to use

- **Temporary** calculates limits based on all the data in the chart. As new data is added or the chart is changed, the control limits will be continually re-computed. Temporary is the default setting. See [Control charts and temporary control limits](#) for a discussion of why temporary limits are generally not recommended.
- **Calculated** will use the limits that you have computed (which can be seen directly below this section in the edit panel).
- **None** will apply no control limits to the chart.

2. Screen for excessive variation

- This option removes moving range values that are initially above the UCL (upper control limit) from the control limit calculations.

3. Hide negative limits

- This option removes limits that are negative and should be used for processes that cannot have negative values. You could consider 0 as the LCL (lower control limit) for this case.

4. Percent change before adjustment

- This option allows you to specify how much the data must change from the average number inspected before the limits are adjusted. Therefore, if the average number inspected is 100 and this value is set at 25, then the control limits would not adjust until the denominator is below 75 or above 125. This option is available only to p-charts and u-charts.

Out-of-control tests edit panel (all control charts)

1. Perform out-of-control tests

- This checkbox allows you to tell SQCpack whether or not to mark points as out-of-control based on the selected tests.

2. Tests to use

- This option allows you to specify the out-of-control test being used on this chart. You can view the test's parameters by clicking the show link.
- Refer to General Settings – [Out-of-control tests](#) to customize test rules.

X-axis edit panel (control charts)

1. Label using column

- This option allows you to choose which identifier is placed along the x-axis. You can also choose Row numbers, simply integers from 1 to n, or none, which displays nothing on the x-axis.

2. Format as

- This option is used when the identifier is a date or a numeric field, and it allows you to change the format in SQCpack without changing the field in your data source.

3. Rotate labels

- This slider lets to change the orientation of the labels from horizontal to vertical, or any increment of 15 degrees between the two.

X-axis edit panel (histograms)

1. Where to label cells

- Check this box to define custom histogram cells
 - Select to change whether the value labels app on the left, middle, or right of cell

2. Specify custom cells

- Check this box to define custom histogram cells
 - Starting value – lowest value, where to start leftmost histogram cell
 - Cell interval – width of each cell
 - Number of cells – how many bars to display on histogram
- 3. **Display cell values**
 - Toggles display of cell values in statistics panel
- 4. **Rotate labels**
 - Slider to change the angle of the x-axis labels below the histogram

Y-axis edit panel (control charts)

1. **Use custom scale**
 - Check this box to define custom histogram cells
 - When checked, specify these for applicable chart types:
 - Minimum – value to start y-axis (at the bottom)
 - Maximum – value to end y-axis (at the top)
 - Increment – distance between major ticks on y-axis

Title edit panel (all chart types)

1. **Show chart type as title** – toggles chart type name displayed above plot area

Other lines edit panel (histograms)

1. **1, 2, 3, 4, N sigma lines** – toggle showing these lines at mean \pm
2. **Sigma line stats** – toggle showing the sigma line statistics
3. **Mean line, Medan line** – toggle showing these lines on the histogram
4. **How to label other lines** – check Name and/or Value to display this information on the Other Lines added to the chart

Descriptive statistics edit panel (histograms)

This edit panel contains several checkboxes. Each one toggles the display of a statistic in the statistics panel to the right of a histogram chart.

Subgroup statistics edit panel (histograms)

This edit panel contains a few checkboxes. Each one toggles the display of a subgroup statistic in the statistics panel to the right of a histogram chart.

Capability statistics / Performance statistics edit panel (histograms)

These edit panels contains several checkboxes. Each one toggles the display of a capability or performance statistic in the statistics panel to the right of a histogram chart. These statistics are used with capability analysis.

Capability analysis is a set of statistical calculations performed on a set of data in order to determine the capability of the system. The capability of the system refers to the ability of that system to perform with respect to its specification limits. A system is said to be capable if it is producing 100 percent within specification limits.

SQCpack offers the following capability indices. Please refer to <http://www.pqsystems.com/qualityadvisor/> for a detailed description of each index and what you can learn from it. You can also refer to [Appendix A](#) for the formulas. SQCpack capability indices include:

| | | |
|-----|-----|-----|
| Cp | Cpm | Pp |
| Cpk | Cpu | Ppk |
| Cr | Cpl | Pr |

When do you use capability analysis?

Use capability analysis:

- When the system is stable;
- When the individual values of the variables data are normally distributed;
 - If the system does not follow the normal distribution, you may want to choose "assume the distribution is non-normal" when creating a histogram in SQCpack.
- When you want to know how the system performs in relation to the specification limits.

Z-Values edit panel (histograms)

1. **Z-upper** – toggles display of the Z-upper statistic
2. **Z-target** – toggles display of the Z-target statistic
3. **Z-lower** – toggles the display of the Z-lower statistic

Out-of-spec edit panel (histograms)

1. **Actual out-of-spec** – toggles display of the actual out-of-spec statistic
2. **Theoretical out-of-spec** – toggles the display of the theoretical out-of-spec statistic

Custom parameters edit panel (histograms)

1. **Statistics are based on:**
 - a. Capability – use estimated sigma in capability calculations
 - b. Performance – use actual sigma in capability calculations

Image file defaults edit panel (all chart types)

1. **Image type** – select image file format when saving chart as image file
2. **Width** – set default width of image when saving chart as image file
3. **Height** – set default height of image when saving chart as image file
4. **How to name images** – check any combination of Data Group Name, Characteristic Name, and Chart Name to select what information appears in the name of the image file

The ORDER BY column

The **Order by** column is important for multiple reasons. It is very important to specify an appropriate **Order by** column.

The **Order by** column is also called the *attachment* column because SQCpack uses the value from this column to attach data annotations, control limits, and extra lines to data points (i.e. subgroups) on the chart.

Restrictions when no Order by column is specified - When no **Order by** column (i.e. *attachment* column) is specified, SQCpack does not allow a data annotation to be created. Also, control limits and extra lines can be created, but they are attached to relative subgroup numbers (the first data point on the chart is relative subgroup number 1, the second is 2, and so on).

The **Order by** column is used, depending on the type of data source, as explained below.

- **SQCpack data** - For data in an SQCpack data group, the **Order by** determines the order in which the data will appear on the chart. If you do not specify an **Order by** column, then the database engine is free to arrange your data in any order (which is a bad idea). SQCpack data is always shown in **Row number** order in the data editor, so most of the time you will want your chart to also be in **Row number** order. The **Order by** column that you specify is also used as the *attachment* column, as explained below.
- **Table** - The **Order by** that you specify *determines* the order in which the data will be fetched from the database table and appear on the chart. If you do not specify an **Order by** column, then the database engine is free to arrange your data in any order (which is a bad idea). The **Order by** column that you specify is also used as the *attachment* column, as explained below.
- **View** - The **Order by** that you specify *determines* the order in which the data will be fetched from the database view and appear on the chart. If you do not specify an **Order by** column, then the database engine is free to arrange your data in any order (which is a bad idea). The **Order by** column that you specify is also used as the *attachment* column, as explained below.
- **Custom query** - The order of the data on the chart is determined by the ORDER BY clause of the SELECT statement in the custom query. If you do not specify an ORDER BY clause in the SELECT statement, then the database engine is free to arrange your data in any order (which is a bad idea). SQCpack will warn you if no ORDER BY clause is detected. The *attachment* column that is specified in the *Compose a Custom Query* window on the 2nd step of the chart wizard is called the **Order by** column in the 3rd step of the chart wizard. The importance of the *attachment* column is explained below.
- **Stored procedure** - The order of the data on the chart is determined by the ORDER BY clause of the SELECT statement in the stored procedure. If you do not specify an ORDER BY clause in the SELECT statement, then the database engine is free to arrange your data in any order (which is a bad idea). SQCpack cannot warn you if the stored procedure does not specify an ORDER BY clause. The **Order by** column that is specified on the 3rd step of the chart wizard is used by SQCpack to specify which column to use as the *attachment* column. The importance of the *attachment* column is explained below.

Importance of the Order by column for *attachment* purposes - Chart entities such as extra lines, control limits, and data annotations can be *attached* to subgroups (i.e. data points) on a chart. Each of these entities use the *attachment* point(s) established by the *attachment* column as follows:

- **Control limits** - The *attachment* points allow a *control limit* to remember the beginning and ending subgroups the control limit was calculated over.
- **Extra lines** - The *attachment* points allow an *extra line* to remember the beginning and ending subgroups the extra line is attached to. As new data is added, this allows the extra line to scroll to the left on the chart in order to remain attached to the appropriate subgroups.
- **Data annotations** - The *attachment* point allows a *data annotation* to remember which subgroup the annotation is attached to. As new data is added, this allows the annotation to scroll to the left on the chart in order to remain attached to the appropriate subgroup.

Order by column values must be unique - SQCpack assumes that the values in the **Order by** column (i.e. *attachment* column) are unique. If the values are *not* unique, the following undesirable situations can occur:

- **Inaccurate attachment points** - Let's assume that the *attachment* column is the same as the **Order by** column. And let's assume you have 25 subgroups on a chart, and relative subgroups 5 through 10 all have the same **Order by** value, i.e. the **Order by** values for the entire chart are not unique. You add an extra line from relative subgroup 7 to relative subgroup 15 on the chart. The next time you display the chart you notice that the extra line goes from relative subgroup 5 to relative subgroup 15 on the chart. That is because when SQCpack searches for the left edge

of the extra line it uses the *first* subgroup with a matching attachment value. Non-unique attachment values will cause entries like control limits, extra lines, and attachments to be positioned incorrectly on the chart.

- **Unpredictable data order** - Let's assume that of the 25 subgroups on a chart, 10 of those subgroups have the same **Order by** value, i.e. the **Order by** values for the entire chart are not unique. Each time chart data is fetched from the database, the database engine may arrange those 10 subgroups in a different order (because they all have the same **Order by** value). If you are doing out-of-control testing, run rules will be evaluated differently when the order of the subgroups is different.

Attachment column values must be ascending for a custom query or a stored procedure - SQCpack assumes that the values in the *attachment* column are in ascending order. If the values are *not* ascending, SQCpack will be unable to correctly position an attached control limit, extra line, or data annotation on the chart. In the case of a custom query or stored procedure, the underlying ORDER BY clause in the SELECT statement establishes the order of the data, thus it is possible for the SELECT statement to order the data in descending order. In short, don't specify *descending* sort order in a custom query or stored procedure since it will confuse SQCpack.

Chart annotations

When viewing or editing any chart, you may add text annotations in the plot area. These allow you to explain or comment upon things of interest in the chart.

Annotations are added either by using the **Annotation** button in the ribbon bar or by selecting **Add Annotation** from the context menu, which is displayed when you right click on a chart.

Annotations are made up of the text you type, along with a box surrounding the text, and an annotation may contain an arrow pointing to something on the chart. You may move the annotation box by dragging it from one of its borders. You may also position the arrow by dragging it from the arrow tip. The arrow is attached to the center of the box, but the line is not visible within the box.

Two ways to attach annotations

Annotations may be added so they move with the data or so they are in a fixed position in the plot area. When you add an annotation that moves with the data, think of it as being attached to a data point. If, for example, something happened on January 15. You add an annotation to describe it. As the chart scrolls when new data is added, you want this annotation to “stick” to this data point. In order to use annotations that “stick” to data, your chart must specify an *Order by* column, which is defined in the *Edit fields* section of the chart wizard. The *Order by* column will typically be an identifier that is unique for each row, such as a date or date/time field.

Chart filters

Chart filtering allows you to establish criteria that either blocks a data row from being used on the chart, or allows a data row to pass through the filter and be used on the chart.

In step 3 of the chart wizard if you click the **Edit the Filter** button the following dialog appears. The same dialog is also available via the **Edit Filter** ribbon button that is available when viewing a chart.

In the example shown above no filter conditions have yet been added.

Click one of the four "add a condition" buttons at the top to add a new condition to the filter definition.

- **Condition** - For example, use only data rows where the Operator column value contains **Fred**.
- **Date within** - For example, use only data rows where the DateTime column value **is within this week**.
- **Clause** - Include a WHERE expression from a SQL SELECT statement. ([Using the SQL clause filter item](#))
- **NULL test** - Test whether the value in the specified column **IS NULL** or **IS NOT NULL**.
- **Range** - Test whether the value falls within the specified upper and lower bounds.

Apply the filter - Select to enable the filter to be used on the chart.

The **Rows to use** information is the same as is specified on [step 3 of the chart wizard](#) - it is duplicated here for convenience.

Row count shows the number of data rows that currently pass through the filter.

View Data - click to view the data that passes through the filter definition.

As shown above, you should not put any delimiters required by the database engine around the value in the right column. When the SQL for the WHERE clause is generated, any delimiters needed by the database engine will be added to the value. For instance, SQL Server requires that a date constant be delimited with single quotes, which results in '2015-04-15'.

When entering a date constant, it is usually best to use the ISO 8601 format of YYYY-MM-DD, since most database engines recognize this format.

See the following topics for more information on using filters:

[Date macros in a filter item](#)

[The LIKE operator](#)

[Using the SQL clause filter item](#)

[Using a Generic Filter](#)

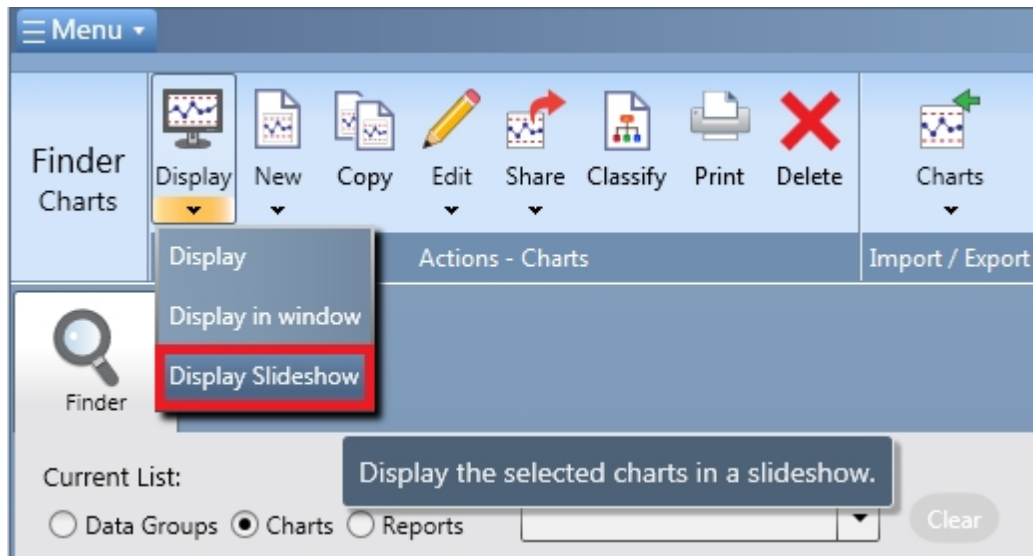
Chart slideshows

Chart slideshows

To display a slideshow of charts:

1. From the Charts Finder, select all charts to be used in the slideshow.
2. Select the drop-down triangle under the **Display** button in the Actions – Charts ribbon bar or right-click on any chart and select **Display Slideshow**.
 - If you select **Display**, you can also edit the chart.

- If you select **Display in window**, the chart will open in a separate window.
- If you select **Display Slideshow**, the chart displays in Slideshow mode.



If you have an automatic advance interval in use, SQCpack will automatically advance to the next chart in the list and continue to advance in a cyclical pattern for all selected charts. To define the interval select "General Settings" (Alt-P) in the navigation menu, then select the "Settings" tab.

The screenshot shows the 'Settings' tab in the SQCpack software interface. The 'Miscellaneous' section includes an 'Images folder' field and checkboxes for 'Show horizontal grid lines in data entry' and 'Alternate row colors in data entry'. The 'Alerting' section includes a checkbox for 'Use master alert service' and a section for 'Alerting and Temporary Limits' with radio buttons for 'Allow alert items to be based on charts with temporary control limits' (selected) and 'Do not allow alert items to be based on charts with temporary control limits'. The 'Slideshow' section includes a text field for 'Slideshow auto advance interval in seconds' with the value '10'. The 'Messages' section includes a checked checkbox for 'Play sound notification when new mail arrives'.

While viewing a Slideshow, navigation and interaction can be done as follows:

- Hold your mouse over the bottom center area of the slideshow window to bring the navigation panel into view.





- You can pause the Slideshow, select previous, or next charts by selecting the appropriate icon in the navigation panel at the bottom of the displayed chart. The  button will allow you to edit the current chart. Pressing the  button, ESC key, or the red X at the top right of the window will exit the Slideshow.
- Pressing Page Down or the right arrow key advances to the next chart.
- Pressing Page Up or the left arrow key advances to the previous chart.

Chart styles

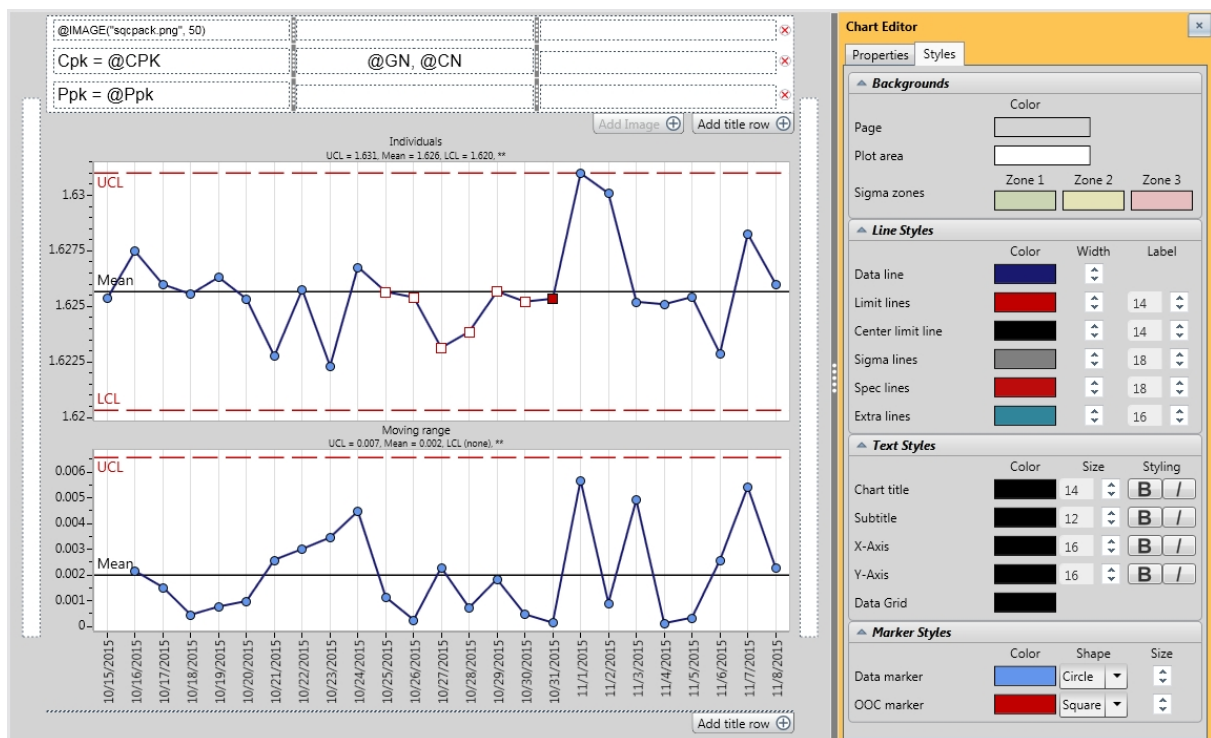
All chart types may be customized to change various colors and styles. To learn about styles, follow the steps below.

Select **Charts** from the navigation menu.

Click to select one single chart in the charts list.

In the ribbon bar, click the **Edit** button. This will display the chart in edit mode.

In the **Chart Editor** to the right of the chart, click on the **Styles** tab (near top of chart editor, shown in the red rectangle below).



Within the **Styles** tab are several edit panels. The number of edit panels for chart style will vary, depending

on the type of chart you are editing. Use these edit panels to adjust different visual properties of the chart being edited. Some of the things you can customize are listed below:

- Data line color and width
- Control limit line color, width, and label text size
- Extra line color, width, and label text size
- Sigma line color, width, and label text size
- Spec line color, width, and label text size
- Sigma zones background colors

- Page background color
- Plot area background color

- Chart title color and font size
- X-axis label color and font size
- Y-axis label color and font size

- Data marker color and size

- Out-of-control data marker color and size

- Histogram bar color

Note that chart titles above and below the chart may be edited individually for font, font size, color, style, and alignment.

Chart titles

When a chart is in edit mode, you may enter titles above, below, to the left of, and to the right of the chart plot area. The text for these titles is entered directly into the title boxes on the chart, even for the vertical titles on the left and the right.

For titles above the chart and titles below the chart, you must **add title rows**. To add a title above or below the chart, click on the **Add title row** button. To remove a title row above or below the chart, click on the **remove title** button, which looks like an X inside a circle.

Titles above and below the chart may contain three columns. These allow you to enter a left, center, and right title in each title row. The space allocated for these three columns may be adjusted by **dragging** the vertical splitter bars between these columns.

While you are typing into a title box, a special edit panel for formatting chart titles becomes visible to the right of the chart (in the chart edit panel section.) This edit panel allows you to set things such as Font Name, Font Size, Font Style, and alignment for each title. To use these buttons, first **select all the text** for a given title. As you change things in the title edit panel, your titles will be formatted.

While you are in edit mode, chart titles will not appear exactly as they do when you exit edit mode. The titles are formatted as closely as possible to what you have applied. The size of your window and the space available can affect the title appearance. Titles appear larger while you are editing them, as they are “actual size.”

Within any chart title, you may embed a **title substitution code**. For example, if you put **@D** into a chart title, when the chart is rendered the **@D** will be replaced with the current Date. The full list of available title substitution codes can be found in [Chart title codes](#).

Note that chart titles above and below the chart may be editing individually for font, font size, color, style, and alignment.

How to add an image to a chart title with the Add image + button

How to add an image to a chat title:

1. From the Finder, click a chart.
 - Click **Edit** in the Actions – Charts ribbon bar or right-click on the chart and select **Edit**.
2. Select a column for the image.
 - Titles above and below the chart may contain three columns. These allow you to enter a left, center, and right title in each title row. The space allocated for these three columns may be adjusted by dragging the vertical splitter bars between these columns.
 - Click the left, center, or right title in a title row, and click the *Add Image +* button. If a title row does not exist, first add a title row using the *Add title row +* button.



- A dialog will appear to allow you to browse to an image file.
- Once selected, the desired width of the displayed image is specified as a percentage of the chart width, by default it is 15.



- Click Ok.
3. Save and exit to view your changes.
 - Click Save in the *Actions – Charts* ribbon bar and then click *Exit edit*.

Chart thumbnails

When you display a chart, SQCpack will generate an updated thumbnail of the chart and update the thumbnail in the chart tab and in the Finder list of charts.

In the Finder charts list, you can select one or more charts and press Ctrl-Shift-T to refresh the thumbnails for the selected charts. If no charts are selected, then all the charts in the Finder list will have their thumbnails updated.

Thumbnails are generated by an SQCpack utility program in the background, so you can close SQCpack and any thumbnails that still need updating will be updated in the background.

You can use the Windows task scheduler to generate chart thumbnails at night so that in the morning, your

thumbnails are up-to-date. See the [/THUMBNAIL command](#).

Using a custom query

You can use a Custom Query to fetch data for a chart in step 2 of the chart wizard, as shown below.

The screenshot shows the 'Edit Data Source' dialog box, which is part of a three-step wizard. The steps are: 1. Edit Chart Type (completed), 2. Edit Data Source (current step), and 3. Edit Fields (completed). The 'Finish' button is highlighted in yellow. Below the progress bar, the instruction reads: '2. Select the data type, location, and contents to use for this chart.'

The dialog box contains the following fields and options:

- Data Source:** A dropdown menu set to 'SQL Server'.
- Server name:** A dropdown menu set to 'DEVSERVER', with 'Refresh' and 'Test Connection' buttons to its right.
- Log on to the server:** Two radio buttons: 'Use Windows Authentication' (selected) and 'Use SQL Server Authentication'.
- Connect to a database:** A section with the text 'Select or enter a database name:' and a dropdown menu set to 'DemoData'.
- Tables, Views and Procedures:** A radio button that is unselected.
- Custom Query:** A radio button that is selected.
- Custom Query:** A button labeled 'Edit the custom query' is highlighted with a red rectangle.

At the bottom of the dialog box are three buttons: 'Back', 'Next', and 'Finish'.



In order to create a custom query you must have knowledge of how to write a SQL SELECT statement that is compatible with the database engine where the data resides.

Edit the custom query - When you click this button the *Compose a Custom Query* window opens (as shown below), and allows you to edit the custom query that will fetch the data for the chart.

Compose a Custom Query

```
SELECT COUNT(Operator) As OperatorCount, Operator
FROM dbo.LotsOData {{WHERE_FILTER}}
GROUP BY Operator
ORDER BY Operator
```

☒ **Allow for annotations, extra lines, and control limits**

Attachment column that best represents the query's data order: Operator  

Allow for data annotations, extra lines, and control limits - Select this to specify the *attachment* column that best relates to the order of the data in the custom query SELECT statement. When SQCpack has an *attachment* column it is able to attach control limits, extra lines, and data annotations to data points (i.e. subgroups) on the chart. When no *attachment* column is available, SQCpack does not allow a data annotation to be created. Also, control limits and extra lines can be created, but they are attached to relative subgroup numbers (the first data point on the chart is relative subgroup number 1, the second is 2, and so on).

Attachment column that best represents the query's data order - The ORDER BY clause in the custom query is what actually establishes the order of the data returned by the database engine. The *attachment* column provides a value that is used to horizontally attach control limits, extra lines, and data annotations to data points on the chart. The *attachment* column *must* provide values that are in ascending order, and optimally the values are unique.

If the SELECT statement has an ORDER BY clause that specifies a single column, e.g. "ORDER BY Column1", then Column1 is typically specified as the *attachment* column.

If the ORDER BY clause specifies more than one column, e.g. "ORDER BY Column1, Column2, Column3", you could specify Column1 as the *attachment* column, but that probably means that multiple data points will have the same *attachment* column value (see the discussion about **Inaccurate attachment points** here [The ORDER BY column](#)). If there is a column that is unique and ascending you may be able to use it as the *attachment* column. If no column meets that criteria, you might be able to create a calculated column that meets the criteria.



- Click the refresh button to refresh the list of columns that may be selected for the **Order by** dropdown list.

Validate Custom Query - The custom query will be submitted to the database engine to verify that the engine can execute the query. If an SQCpack filter is defined for this chart, and one of the filter macros (explained below) is contained in the custom query, the filter expression will replace the filter macro in the query before it is submitted to the database engine for validation.

Validate and Continue - The custom query will be validated, as explained for the *Validate Custom Query* button. If the query is valid, the *Compose a Custom Query* window will close and the custom query will be used to fetch data for the chart.

Using a chart filter with a custom query

If you want to allow use of a chart filter with the custom query, you must put a `{{WHERE_FILTER}}`, `{{OR_FILTER}}`, or `{{AND_FILTER}}` macro at the appropriate place in your SELECT statement. You can insert the macro manually-by typing, or you can position the cursor at the location in the SELECT statement where you wish to insert the macro and press the appropriate *Insert* button.

Insert `{{WHERE_FILTER}}` - When you click this button, the `{{WHERE_FILTER}}` macro will be inserted into the query at the current cursor position. When the query is executed, the `{{WHERE_FILTER}}` macro will be replaced with a WHERE clause like "WHERE ([Operator] LIKE 'S%')". When the filter is disabled or contains no filter criteria, the macro will expand to nothing.

Insert `{{AND_FILTER}}` - When you click this button, the `{{AND_FILTER}}` macro will be inserted into the query at the current cursor position. When the query is executed, the `{{AND_FILTER}}` macro will be replaced with a clause like "AND ([Operator] LIKE 'S%')". When the filter is disabled or contains no filter criteria, the macro will expand to nothing. You should use the `{{AND_FILTER}}` macro when your SELECT statement already has a WHERE clause and you want to logically **AND** the existing WHERE clause with the clause that results from expanding the filter criteria.

Insert `{{OR_FILTER}}` - When you click this button, the `{{OR_FILTER}}` macro will be inserted into the query at the current cursor position. When the query is executed, the `{{OR_FILTER}}` macro will be replaced with a clause like "OR ([Operator] LIKE 'S%')". When the filter is disabled or contains no filter criteria, the macro will expand to nothing. You should use the `{{OR_FILTER}}` macro when your SELECT statement already has a WHERE clause and you want to logically **OR** the existing WHERE clause with the clause that results from expanding the filter criteria.

In the example shown below, the `{{WHERE_FILTER}}` macro has been placed after the FROM clause.

```
SELECT COUNT(Operator) As OperatorCount, Operator
FROM dbo.LotsOData {{WHERE_FILTER}}
GROUP BY Operator
ORDER BY Operator
```

When the filter is disabled, or when the filter contains no filter criteria, the filter macro will expand to nothing, and the SELECT statement (shown in the screenshot above) that is passed to the database engine looks like:

```
SELECT COUNT(Operator) As OperatorCount, Operator
FROM dbo.LotsOData
GROUP BY Operator
ORDER BY Operator
```

If the filter is enabled and contains the filter condition "Operator *Is like* S%", the filter macro expands to **WHERE ([Operator] LIKE 'S%')**, and the select statement that is passed to the database engine looks like:

```
SELECT COUNT(Operator) As OperatorCount, Operator
FROM dbo.LotsOData WHERE ([Operator] LIKE 'S%')
GROUP BY Operator
ORDER BY Operator
```

In some cases, as when multiple SELECT statements are joined together with a UNION clause, you may

have to use the appropriate filter macro in each SELECT statement.

Alerting - If a chart that uses a custom query is used as the reference chart for an alert item, one of the filter macros **must** be present in the query. This is because the filter mechanism is used by the Alerting Service to fetch only data where the *Order by* column is greater than the highest *Order by* value evaluated so far. It is unlikely that using the `{{OR_FILTER}}` macro would be appropriate for alerting. Also, you should not use a chart as an alerting reference chart if the chart uses a custom query that limits the rows fetched to see only the most recent rows, such as a query that fetches the *Last N* rows, or only rows that are within the last N time units. You can use a custom query chart as an alerting reference chart when a *Smart LastN Query* is used as discussed below.

Last N queries - In the 3rd step of the chart wizard, and on the *Edit Filter* dialog, you can set *Rows to use* to **Last n**. When a custom query is used, and **Last n** is specified, SQCpack may attempt to optimize the database query in order to fetch only the rows needed to draw the chart. For more information, see the topic: [Last N queries](#)

Using custom input parameters in a custom query

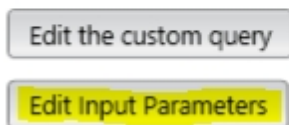
You may embed one or more *custom input parameters* of the form `{{ParameterName}}` in the SELECT statement of the custom query, as shown below.

```
SELECT Length, Width
FROM dbo.MyDataTable
WHERE TheDate >= '{{Start Date}}' AND TheDate <= '{{End Date}}'
ORDER BY TheDate
```

In the SELECT statement above two *custom input parameters* are defined: `{{Start Date}}` and `{{End Date}}`

☐ Tables, Views and Procedures ☒ Custom Query

Custom Query



When one or more *custom input parameters* are present in the custom query, the **Edit Input Parameters** button is displayed as shown above.

| Name | Value |
|------------|------------|
| Start Date | 2000-01-15 |
| End Date | 2000-03-15 |
| | |

When the **Edit Input Parameters** button is clicked the grid shown above appears to allow you to enter values for the *custom input parameters* that are specified in the custom query.

When the chart is rendered the *custom input parameters* are replaced with their values, and the SELECT statement that is passed to the database engine looks like this:

```
SELECT Length, Width
FROM dbo.MyDataTable
WHERE TheDate >= '2000-01-15' AND TheDate <= '2000-03-15'
ORDER BY TheDate
```

Note that *any* portion of the SELECT statement can use a *custom input parameter*. In the example below the table name is specified by the **{{Table Name}}** *custom input parameter*.

```
SELECT Length, Width
FROM dbo.{{Table Name}}
ORDER BY TheDate
```

Last N queries

Last N queries - In the 3rd step of the chart wizard, and on the *Edit Filter* dialog, you can set *Rows to use* to **Last n**. In version of SQCpack prior to 7.0.17100.1, the query that fetched data for the chart actually fetched **all** of the available data, and then displayed the last N subgroups on the chart. In versions of SQCpack after 7.0.17100.1 the query to fetch the data for the chart has been optimized to only fetch the data needed for the chart. This query optimization for *Last n* queries is called **Smart LastN Queries**.

- If you used a custom query similar to the one shown below to perform a Last N query, you no longer need to do that. Our recommendation is to simplify your custom query and remove the nested query so that you just fetch the needed data - and let SQCpack deal with optimizing the query for Last N.

```
SELECT * FROM (SELECT TOP 25 * FROM Table {{WHERE_FILTER}} ORDER BY
DateTime DESC) Q1 ORDER BY DateTime
```

- In order for *Smart LastN Queries* to work properly, the *Order By* column specified in the 3rd step of the chart wizard **must** be set to the column that your data should be ordered by. If your

custom query specifies a multi-level ORDER BY clause, and the data will not be in the correct order if a multi-level ORDER BY is not used, then you must use the "**(NO-LASTN-QUERY)**" flag in your custom query as explained below. In that case, you will probably want to use your own *Last N* custom query. This is an example of a multi-level ORDER BY clause:

```
SELECT * FROM Table {{WHERE_FILTER}} ORDER BY DateTime, Operator, Machine
```

- SQCpack will not perform a *Smart LastN Query* if any of the following phrases are present in the custom query. This is done so that SQCpack doesn't attempt to optimize a query that has already been written for *Last N* operation.
 - **TOP NN** - If the custom query contains a TOP clause like "SELECT TOP 25 * FROM..." we make the assumption that the query is already doing a Last N type of query.
 - **ROWNUM <= NN** - If the 2nd step of the chart wizard specifies that an Oracle database is being used, and the custom query contains "ROWNUM <= NN" or "ROWNUM < NN", we make the assumption that the query is already doing an Oracle Last N type of query.
- SQCpack will not perform a *Smart LastN Query* if the chart definition specifies either *Grouping* or *Sampling* in the 3rd step of the chart wizard.
- Some custom queries may not work properly after SQCpack applies the *Smart LastN Query*. If the optimized query fails, then SQCpack falls back on the "fetch all the data that passes through the filter and use the last N subgroups" approach.

If you want to force SQCpack to not attempt a *Smart LastN Query*, simply put the "**(NO-LASTN-QUERY)**" flag anywhere in the custom query. We typically put it at the front or the end of the custom query. The "**(NO-LASTN-QUERY)**" will be removed from the query before it is passed to the database engine for execution.

```
SELECT * FROM Table {{WHERE_FILTER}} ORDER BY DateTime (NO-LASTN-QUERY)
```

Extra lines on charts

For control charts and line charts, you have options to add additional lines to the chart. Here are the options available:

Fixed line – draw a line across the chart at a fixed y-axis value. This is sometimes used to represent a goal to compare your actual data to.

Mean line – draw a line across the chart at the mean.

Median line – draw a line across the chart at the median.

Trend line – Calculate a line of best fit (simple regression) and display this on the chart.

For combination charts such as X-bar and Range, specify which chart when adding one of these extra lines.

If you have **dragged** across the chart to **select** a subset of the data points, when you add these lines to a chart, the line will be applied only to data points contained in your highlighted selection.

All lines are added to charts using the **Add line** button in the ribbon bar while viewing a chart. Each line added to a chart will create one edit panel visible when the chart is in edit mode. These options are also available in the context menu displayed when you right-click on a chart.

As shown below, the styles of these extra lines can be controlled individually in the **Chart Editor Properties** panel by clicking the arrow next to the extra line's name.

'My Fixed Line' over all the data

| | Color | Width | Label |
|--|--|-------|-------|
| Line and Label | | 11 | 16 |
| Fixed Line at . . . | | 51 | |
| <input type="text" value="My Fixed Line"/> | | | |

How to label the line

| | |
|-------|--------------------------------------|
| Name | <input checked="" type="checkbox"/> |
| Value | <input checked="" type="checkbox"/> |
| Chart | <input type="checkbox"/> Individuals |

'My Mean Line' over all the data

| | Color | Width | Label |
|---|--|-------|-------|
| Line and Label | | 2 | 36 |
| Mean line: | | | |
| <input type="text" value="My Mean Line"/> | | | |

How to label the line

| | |
|-------|--------------------------------------|
| Name | <input checked="" type="checkbox"/> |
| Value | <input checked="" type="checkbox"/> |
| Chart | <input type="checkbox"/> Individuals |

You can also customize the default values of extra lines by using [Chart styles](#).

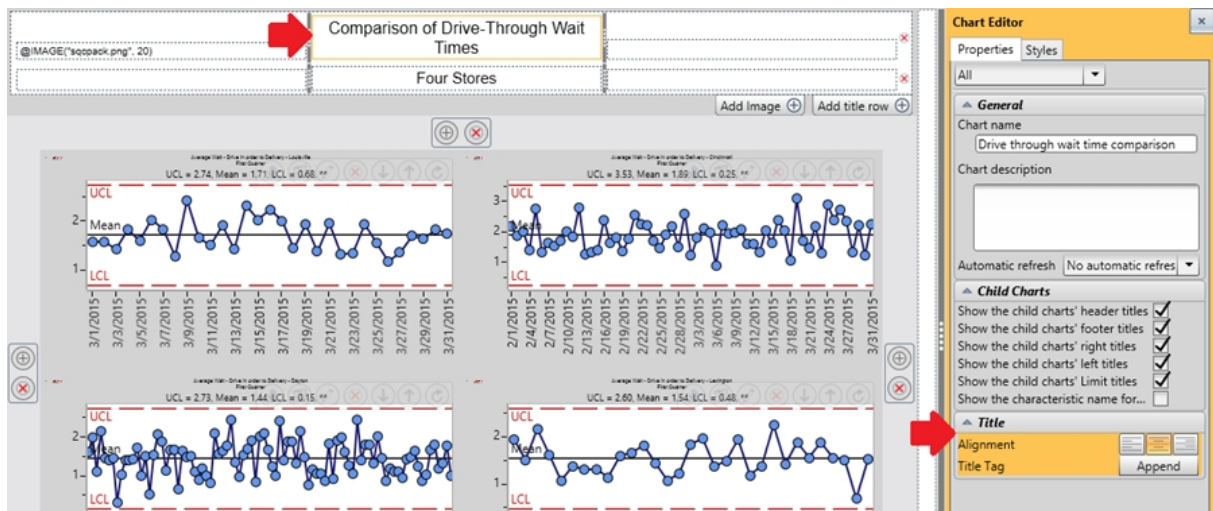
Working with multiple charts

SQCpack allows you to create multicharts, chart groups, and StatBoards. Each of these is a container for multiple charts. These show up in your chart list like any other chart; however, when you click the **Edit** button or the **Display** button, these look different and behave in slightly different ways compared to single charts.

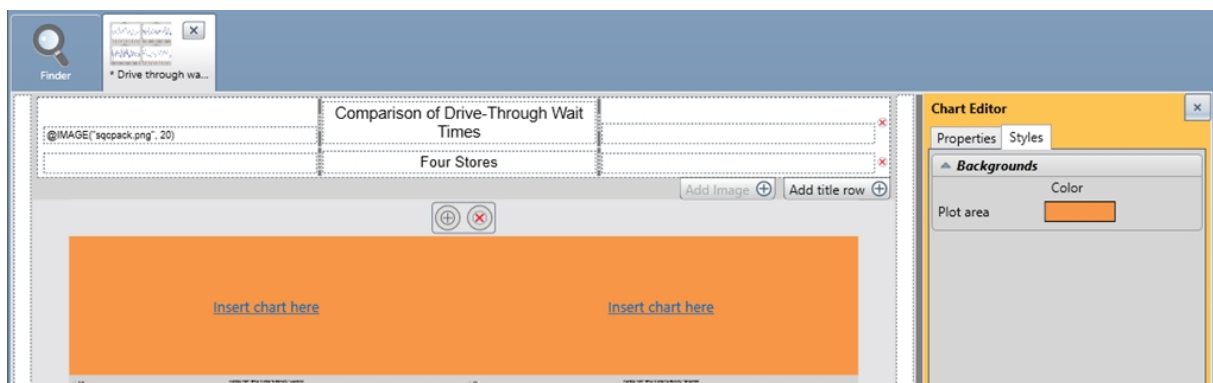
Multi-chart

A multi-chart allows you to display or print a chart that contains multiple individual charts. For example, you might define a multi-chart that includes four of your most important charts. The multi-chart can be displayed in a tab or window, or it can be printed on a single page.

A multi-chart will appear in one of two modes: 1) display mode; or 2) edit mode. This behavior is the same as for single charts. For example, to the right of the multi-chart in the **Chart Editor**, you will see the edit panels that allow you to change **Properties** of the multi-chart, such as name, description, and automatic refresh settings. The **Title** section will contain settings for whichever title section is currently selected, including text alignment and [Chart title codes](#).



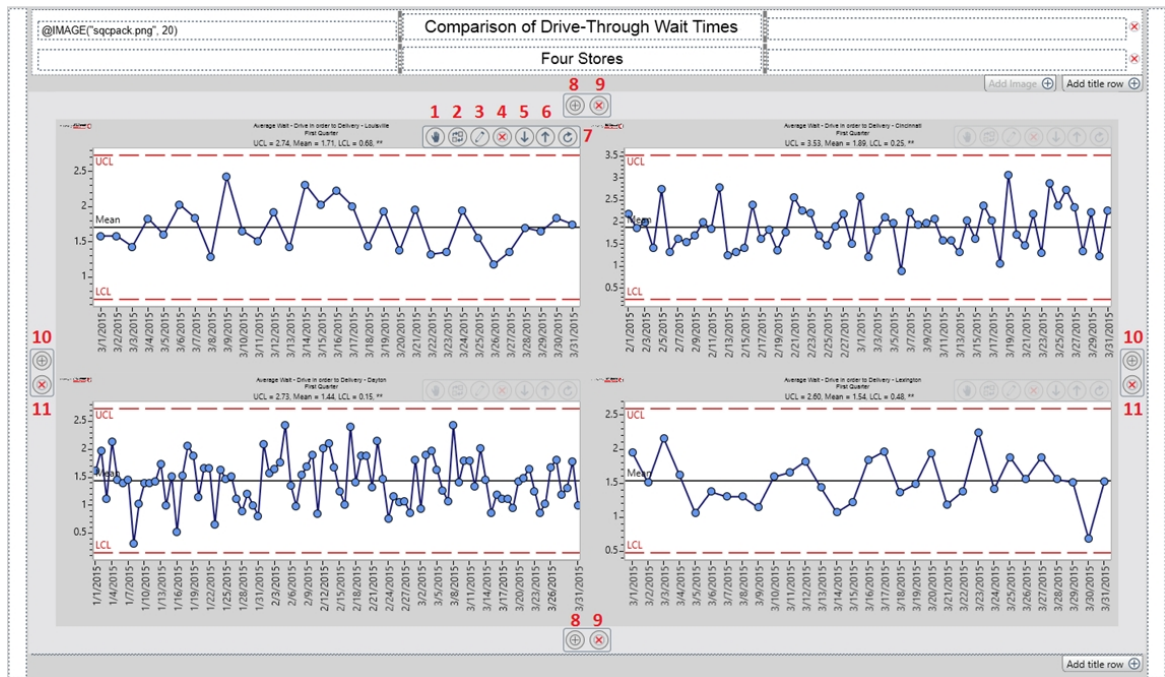
The **Styles** tab of the **Chart Editor** can be used to change the background color of the printable multi-chart area.




However, when a multi-chart is in edit mode, additional options are available within the chart area that allow you to do these operations:

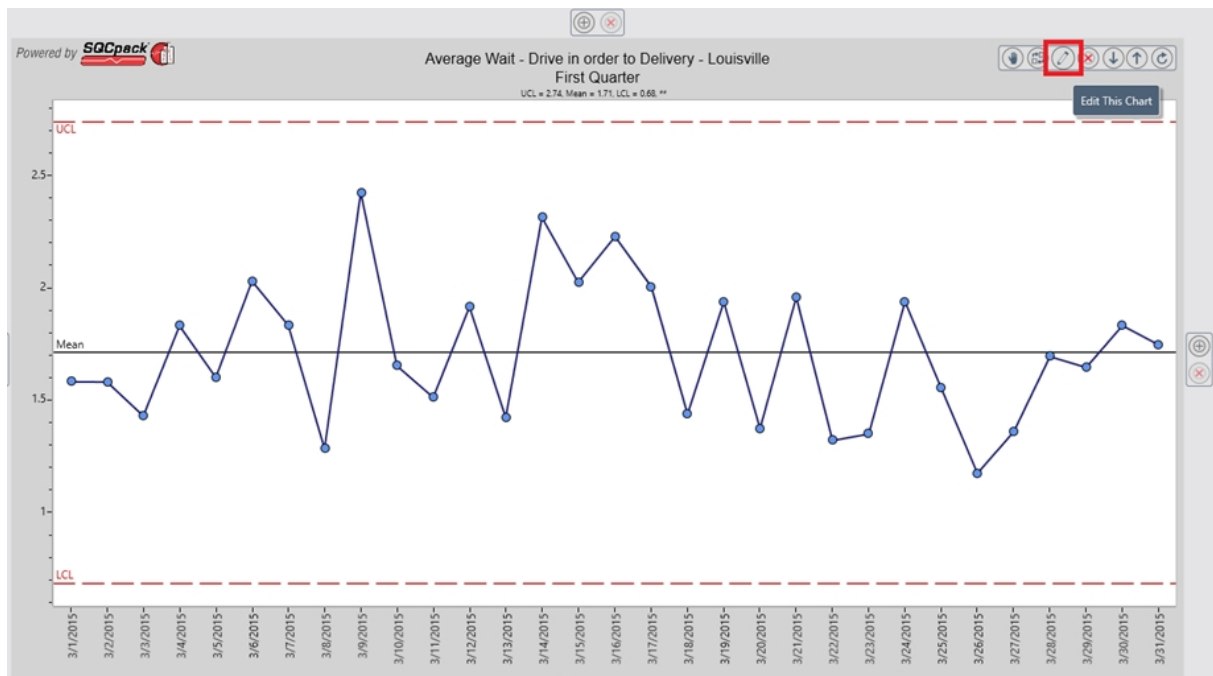
1. Move the child chart to a different position in the page (grab the hand and **drag** it)
2. Replace the child chart with another chart
3. Edit the child chart
4. Remove the child chart from the page
5. Decrease the child chart s scale
6. Increase the child chart s scale
7. Refresh just this child chart
8. Add a row to the grid layout to make room for additional charts
9. Remove a row from the grid layout
10. Add a column to the grid layout to make room for additional charts
11. Remove a column from the grid layout

In the image below the buttons for these operations are numbered in red:



To edit a child chart in a new tab:

1. From the Finder, click a Multi-chart.
 - Click **Edit** in the *Actions* ribbon bar or right-click on the chart and select **Edit**.
2. Select a child chart that you want to edit.
 - Hold your mouse over one of the child charts and select the  icon from the edit panel above the chart.



- The selected chart will open in a new tab in edit mode.
3. Save your changes to the selected chart and close.
 - When you have finished editing, click **Save** in the *Actions* ribbon bar to apply your

changes.

- Close the tab by pressing the X in the top right corner of the tab.

Using a generic filter with a multi-chart

Click the **Edit filter** toolbar button while a multi-chart is displayed to open the **Edit Generic Filter** dialog shown above.

The filter criteria and/or the 'Rows to use' criteria you define in the *Generic Filter* can be applied to all the child charts in the multi-chart.

See [Using a Generic Filter](#) for more information.

Chart group

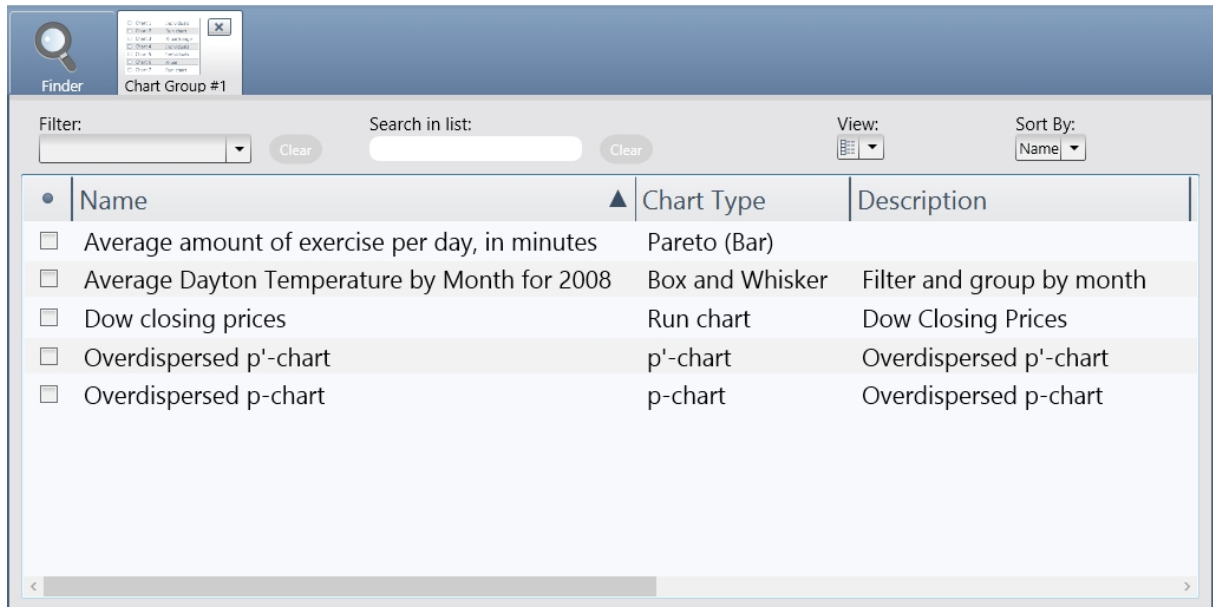
A chart group is a named container for a list of other charts. Creating a chart group allows you to work with a collection of charts in a batch. For example, you may have a weekly quality meeting where you discuss charts on your ten most important quality metrics. Rather than print each chart separately, if you put them into a chart group, you can print the group with a single command, saving you time navigating in the software.

When you *display* a chart group, all you see is a **new tab** containing a list of charts; the charts that are contained in this chart group. Like other charts, a chart group can be in one of two modes: 1) display mode; and 2) edit mode.

In edit mode, the edit panel for name and description is visible to the right. In display mode, you will see only the list of charts. Buttons in the ribbon bar allow you to add and remove charts from the chart group.

Note – A chart group looks a lot like the list of charts in Finder; however, it is always shown with its own tab like any other chart.

Here is a chart group shown in edit mode:



StatBoard

A StatBoard is a specialized type of chart group. Remember, that a chart group is just a named collection of charts. This describes a StatBoard as well. However, a StatBoard has additional features that allow you to evaluate, rank, and visualize the charts based on statistics and criteria that you specify. A StatBoard allows you to consume information easily, at a glance, about a list of charts. The process for creating a StatBoard is almost the same as creating a chart group or a multi-chart.

When you display a StatBoard, you will see a visual list of chart images; one for each chart defined in the StatBoard. As with the other charts, it may be in one of two modes: 1) display mode or 2) edit mode.

In edit mode, the edit panels are visible to the right. As with all charts, one of the edit panels is named **General** and this is where you set the name, description, and refresh setting for the StatBoard. Additionally, there are several edit panels where you define the **rules** for how this StatBoard will be evaluated and ranked.

In display mode, you see only the list of charts. Buttons in the ribbon bar allow you to add and remove charts from the StatBoard.

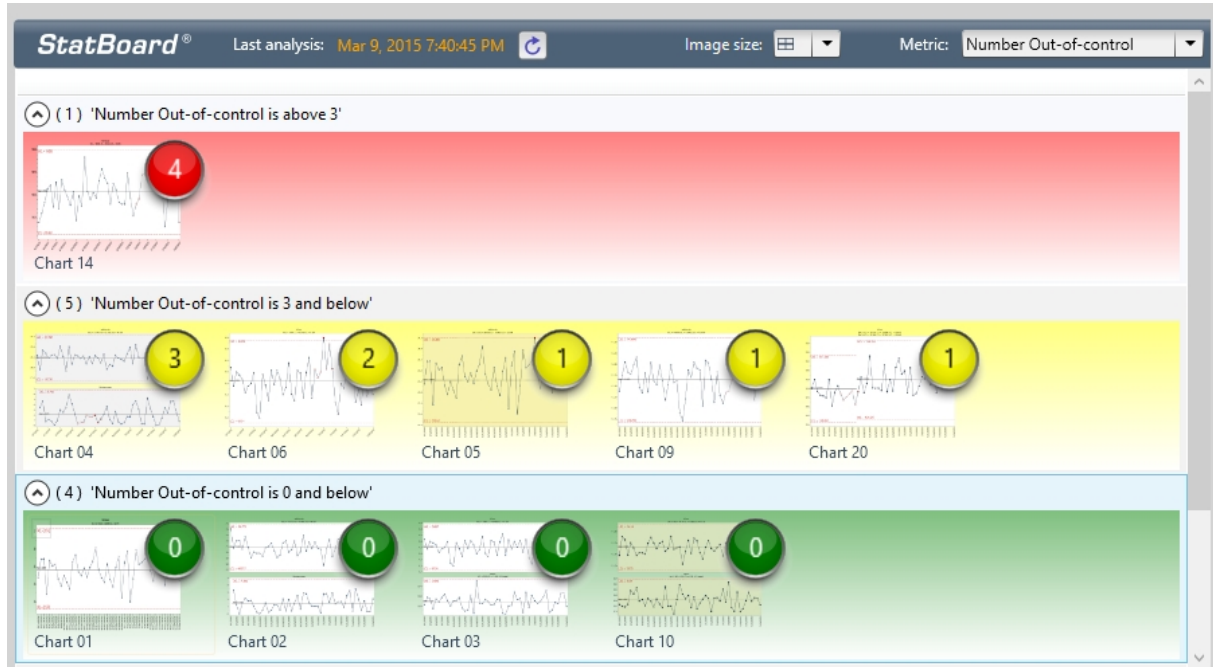
For StatBoards, another thing to be considered is, have the charts been analyzed? When you first display a StatBoard, the charts are not automatically analyzed. When you click the **Refresh** button, the charts will be analyzed and ranked. Once this occurs, the charts are separated into three categories and color coded with red, yellow, or green. The charts in red and possibly yellow, currently have a signal that may need your attention. The charts in green do not. This ranking is based on the currently selected **Metric**. The following **ranking metrics** are available:

- Number out-of-control
- Percent out-of-control
- Number out-of-spec
- Percent out-of-spec
- Cpk
- Ppk

To determine if a chart falls into the red, yellow, or green category, the StatBoard uses the rules defined in

the edit panel. You will notice that for each ranking metric above, there is a different set of ranking rules. The default rules that get applied automatically when you create a StatBoard, are reasonable for many scenarios. However, if you find that you are getting too many or too few charts in any of the color categories, you may customize these rules on a per StatBoard basis.

Use a StatBoard when you need to evaluate many charts easily and see at a glance which charts may require attention. This approach can expand the bandwidth of charts you are able to keep track of effectively.



StatBoard in display mode showing results of an analysis.

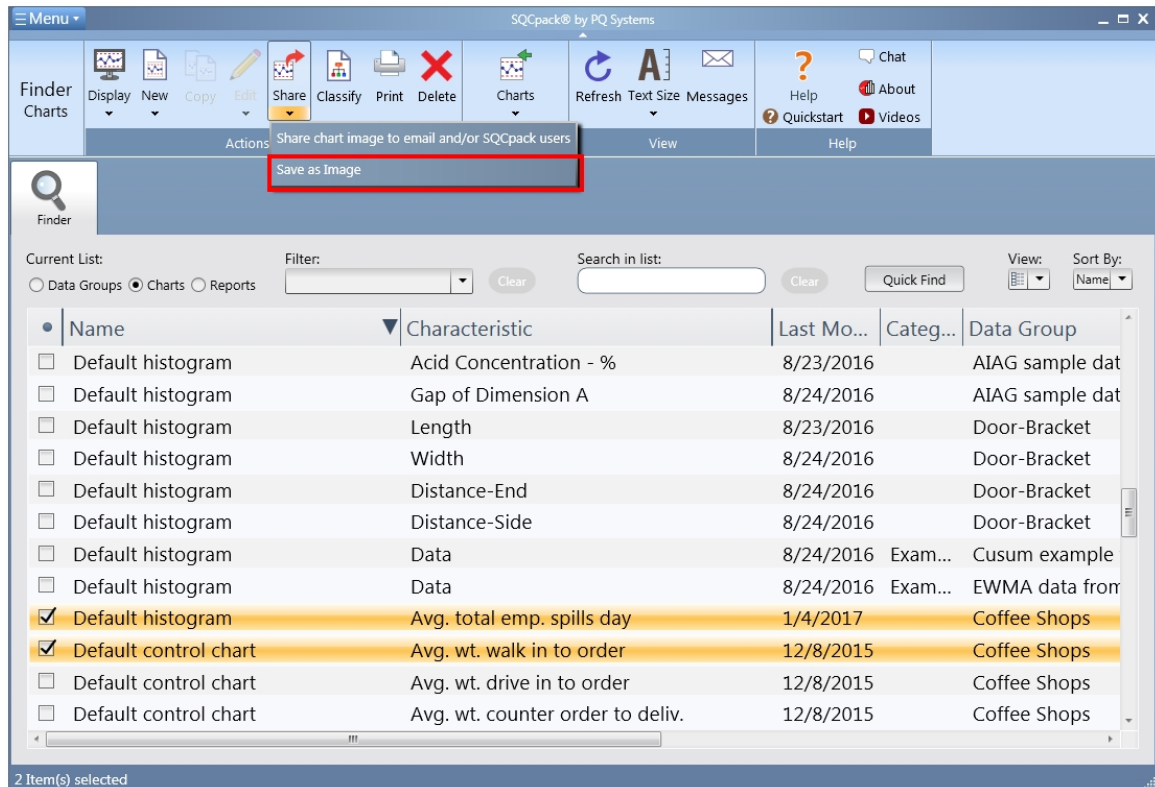


The same StatBoard in edit mode.

Saving charts as image files

A chart can be saved as an image file from the charts Finder tab, or from a displayed chart.

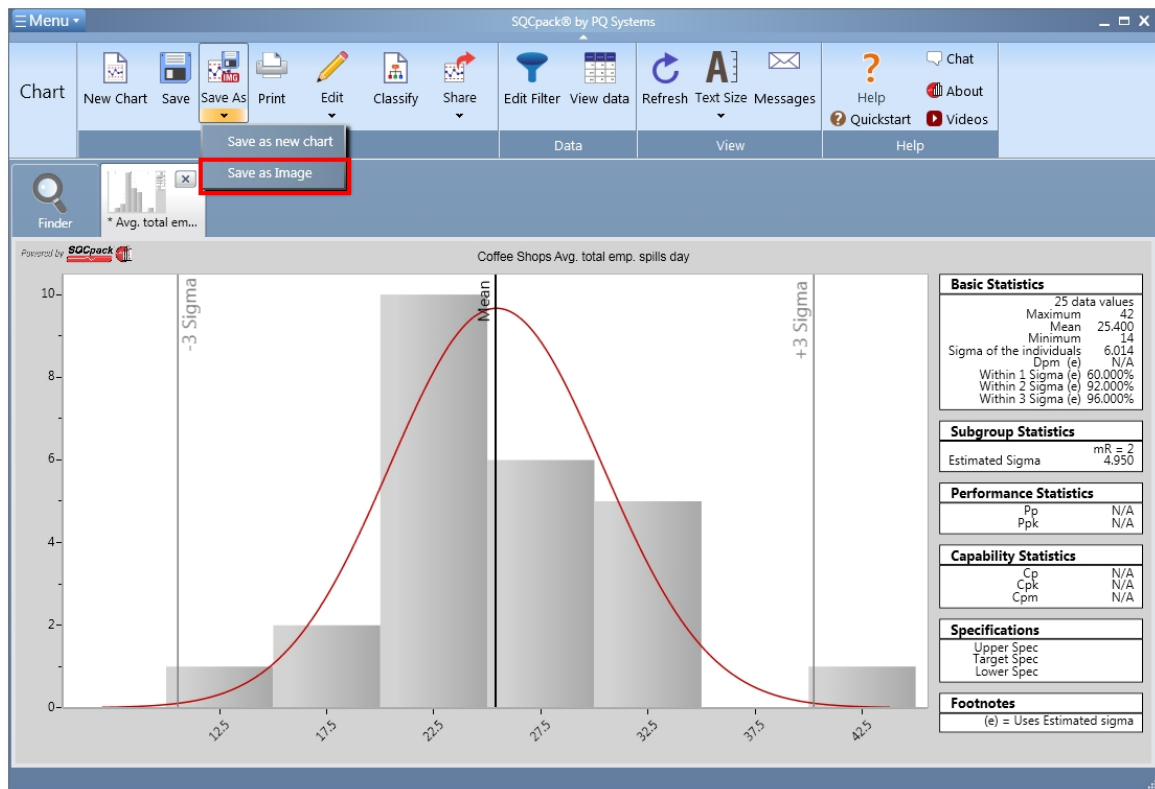
Saving as image from the Finder tab



Select one or more charts and click the **Save as Image** button in the ribbon bar. Alternatively, you can right-click on the charts and select **Save as Image** from the context menu.

The **Save as image** dialog that appears is [described below](#).

Saving a displayed chart as image



While viewing a displayed chart, click the **Save as Image** button in the ribbon bar.

The **Save as image** dialog that appears next is described next.

The Save as Image dialog

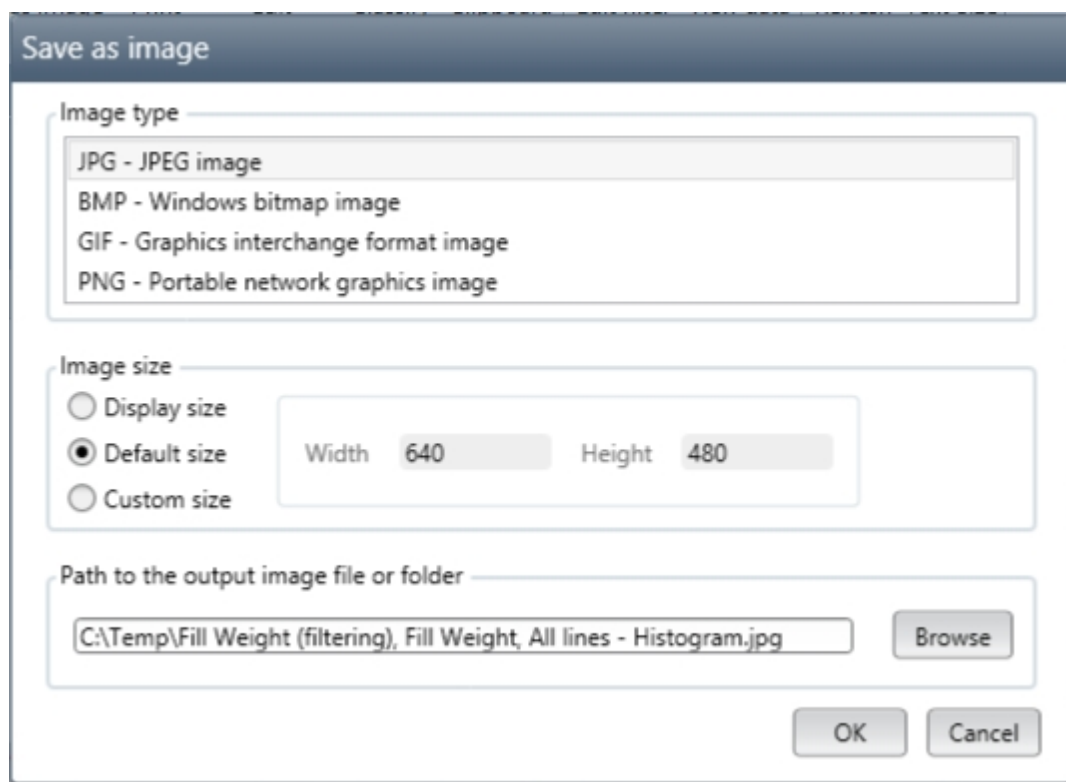


Image type - Select the type of image file you want to create.

Image size - Select the desired size (in pixels) of the resulting image.

Path to the output image file or folder - This choice appears when saving a single chart as image. If only a folder path is provided the image filename will be supplied by SQCpack.

Path to the folder where the images will be saved - This choice appears when saving multiple charts as image. Enter the path to the folder where the image files will be created.

Control charts and temporary control limits

Why using temporary control limits with out-of-control testing is not recommended

Using temporary control limits on a control chart is generally not recommended once enough data exists. This also applies to alerting, since a control chart is used to define how out-of-control testing is performed on an alert item.

If you are only doing out-of-spec testing this warning does not apply (because spec testing does not use control limits).

In the following discussion, a metric is defined as a process parameter that is being watched to determine if the underlying process has changed in a statistically significant manner. For internal data, a characteristic (such as Acidity or WaitTime) in a data group is a metric. For charts that use external data, the metric is defined by the data that is being fetched for charting, such as Diameter1.

Statistical Process Control (SPC) analysis involves the metric you are interested in, a control chart (such as an x-bar and range chart), a set of control limits, and one or more out-of-control test rules. For each data point that is plotted on the control chart the data value is evaluated using the control limits and the out-of-control test rules. If a data point fails one or more test rules, the point is said to be "out-of-control". An out-of-control data point on a control chart indicates that the underlying process at that point is statistically different from the process that existed when the control limits were calculated. The out-of-control data point is a statistical *signal* that indicates a change in the process that someone may be interested in understanding.

The control limits used for SPC analysis, i.e., out-of-control analysis, are important because they represent the process at a time in the past when the process was in-control. The SPC analysis shown on a control chart, or performed by the Alerting system, is constantly asking the question, "Does the current data point indicate a significant statistical difference when compared to the process that existed when the control limits were calculated?" If the answer is yes, it represents a *signal* that one can investigate in order to understand what the process is currently doing and perhaps take action to correct an unwanted process change.

Since a control chart is comparing each data point to the process parameters as they existed when the control limits were calculated, the validity and/or usefulness of the control chart depends to a large extent on whether an appropriate set of control limits is used in the analysis. SPC makes the assumption that a person who understands the process chooses a point in time when the process was stable and in-control to calculate the control limits that are being used for analysis. This is why temporary control limits are not recommended, because a knowledgeable person has not picked a point in the past when the process was in-control to calculate the control limits. Instead, with temporary limits, the control limits are calculated over the data currently displayed on the chart, and thus are likely to be inappropriate to use in evaluating whether a process change has occurred.

In SQCpack, temporary control limits are calculated differently, depending on whether a chart is being displayed, or an alerting analysis is being performed. The difference is explained below.

Temporary control limits on a control chart - When temporary control limits are used on a control chart, the temporary limits are computed using all the subgroups covered by the chart. For instance, if the chart is set up to display the Last 35 subgroups, then the temporary control limits are calculated using the Last 35 subgroups shown on the chart. If the chart is set up to use the last month of data, and that results in 325

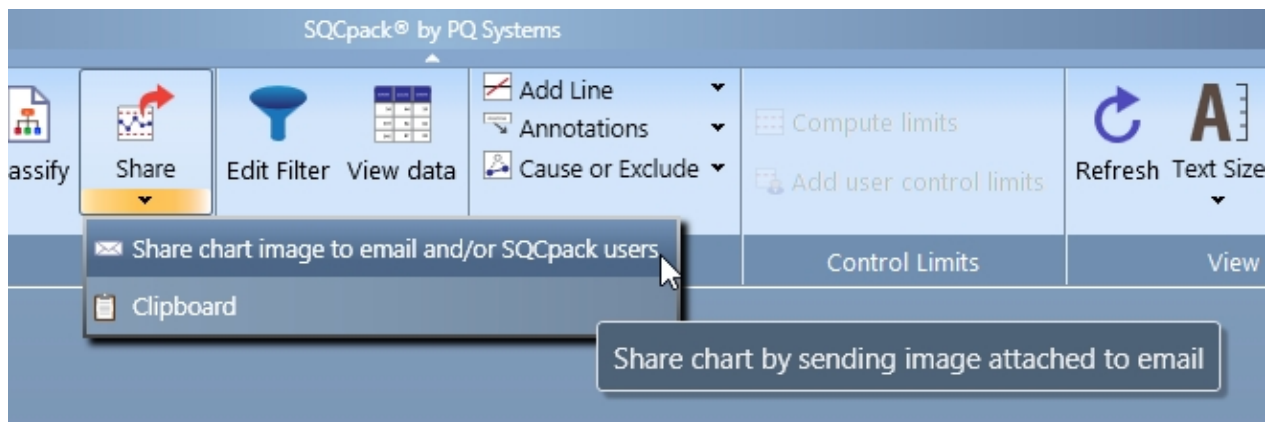
subgroups of data, then the temporary control limits are calculated over those 325 subgroups.

Temporary control limits used in alerting - When temporary control limits are used in the context of alerting, a *sliding* window of subgroups is used to calculate a new set of control limits for *each* data point (i.e. subgroup) that is analyzed. The width of the sliding window, in subgroups, is specified in *General Settings > Settings > Alerting*. The sliding window that is used to calculate the temporary control limits consists of the prior N-1 subgroups (or fewer if N-1 prior subgroups don't exist), *plus* the current data point that is to be analyzed. If the number of subgroups that exist in the sliding window are insufficient to calculate control limits, then the current data point will not be out-of-control, because no temporary control limits exist to perform an out-of-control analysis for the current data point. If sufficient subgroups exist in the sliding window so that a set of temporary control limits can be calculated, the current data point will be evaluated for out-of-control using the currently calculated set of temporary limits.

Different results when using temporary control limits - It is important to understand that the out-of-control signals shown on a control chart that uses temporary control limits may be different from the out-of-control signals that result from an alerting analysis that uses temporary control limits. In the case of the control chart, each data point on the chart is evaluated using the *same* temporary control limit values that were calculated using all the subgroups on the chart. But in the alerting analysis case, each data point is evaluated using a *different* set of temporary control limits, i.e., a set of limits that was calculated using a sliding window of N subgroups. The difference in out-of-control signal results between the two temporary control limit calculation methods could cause confusion. For this reason, we recommend that computed control limits be used in the alerting chart.

Sharing charts to e-mail and SQCpack users

When a chart is displayed in a tab, or when one or more charts are selected in Charts Finder, you can share an image of the chart with other users via email or via an SQCpack message.



To send the chart image(s) as an email or an SQCpack message, click on the lower edge of the **Share** ribbon button, then select **Share chart image to email and/or SQCpack users** as shown above.

Share chart image to email and/or SQCpack users

Send

SQCpack recipients: admin;

Email recipients: bob@MyCompanyDomain.com; ted@MyCompanyDomain.com

From: DoNotReply@MyCompanyDomain.com

Subject: SQCpack user (admin) shared a chart with you

Default control chart Default control chart

Note that the Length and Width characteristics are both within specifications and in-control for the last 24 hours.

Data group name - Test 01
Characteristic name - Length
Chart name - Default control chart

Data group name - Test 01
Characteristic name - Width
Chart name - Default control chart

Cancel

The **Share chart image to email and/or SQCpack users** window will open, similar to the one shown above. In the example above, two default control charts were selected in Charts Finder, so the message has two chart image attachments, each one named *Default control chart*.

SQCpack recipients - In order to send the message along with the chart attachments to one or more SQCpack users (via the SQCpack messaging system), click the **SQCpack recipients** button and select one or more SQCpack users.

Email recipients - In order to send the message along with the chart attachments to one or more email addresses, enter one or more email addresses in the **Email recipients** field. Separate multiple email addresses with the semicolon character.

From - If you are sending the message to one or more email recipients, enter a valid email address in the **From** field. Some email servers require that this address have the same domain as the recipient address. For instance, if your company's domain is MyCompanyDomain.com, and you are sending to bob@MyCompanyDomain.com, then the sender must be someone in MyCompanyDomain.com, e.g. DoNotReply@MyCompanyDomain.com. Even if the message is only sent to SQCpack recipients, it is good to specify a valid **From** email address.

Subject - Enter an appropriate subject line for this message.

Message Text - You can edit the message text as appropriate.

Send - Click the **Send** button in order to send it to the specified recipients.

If SQCpack does not deliver messages to email recipients, the mail server settings may need to be adjusted. See [Email tab](#) under General settings.

Reference - Specifications

SQCpack's paradigm for dealing with specification values is based on one or more *specifications rows* that are contained within a *specifications set* that can be *common* (shared) or not. The specification values contained in a *specifications set* can be used with an alert, report, chart, measurement characteristic, or

calculated characteristic.

Common Specifications Set - A *specifications set* that has a name and can be used (or shared) in multiple places is known as a *Common Specifications Set*. SQCpack allows you to create and manage as many *Common Specifications Sets* as you need. A *Common Specifications Set* can be used with multiple charts, measurement characteristics, or calculated characteristics.

Specific Specifications Set - An specific *specifications set* is used to store specifications that exist solely for use with a specific chart, measurement characteristic, or calculated characteristic. In this case, the *specifications set* doesn't have a name because it is always used by and stored with one specific chart or one specific characteristic.

Specifications row

Typically when we think about specifications we think about up to three numbers: *Upper*, *Target*, and *Lower* specification values. SQCpack remembers the number of decimal places you enter for each specification value.

| Apply from: | Target: | (+ / -) | Upper: | Lower: |
|-------------|---------|-----------|--------|--------|
| | 10 | 0.02 | 10.02 | 9.98 |

In SQCpack, the three specification numbers are stored in a *specifications row*, as shown above.

Apply from - The *Apply from* field contains either a date or a number that determines the conditions under which the *Upper*, *Target*, and *Lower* specification values in a *specifications row* will be applied to a subgroup or a data point. For instance, an *Apply from* value of 06/01/2016 (in mm/dd/yyyy format) only applies to subgroups or data points that have a date identifier value of 06/01/2016 or higher.

Blank Apply from field - A *specifications row* with a blank *Apply from* field (as shown above) applies to *all* of the subgroups or data points being analyzed or charted. The only time a blank *Apply from* field is allowed is when only one *specifications row* exists in a *specifications set*.

(+ / -) - This field contains the specifications tolerance value. If you enter a value in this field then SQCpack will automatically calculate symmetrical *Upper* and *Lower* specification values for you. If your specifications are not symmetrical from the target, or only one specification exists, leave this field blank and enter your *Upper* and/or *Lower* specification values.

Default specifications row - In some contexts, such as when evaluating a calculated column formula, the concept of the default specifications row is important to understand. When a *specifications set* only contains one *specifications row*, that single row is always the default specifications row. When a *specifications set* contains more than one *specifications row*, the default specifications row for a specifications set based on a **numeric** *Apply from* identifier is the row with the highest *Apply from* value. For a specifications set based on a **date** *Apply from* identifier, the default specifications row is the row that applies to the current date and time (which will be the last row unless you have defined *specifications rows* with *Apply from* values that are in the future).

Specifications set (Common or Specific)

A *specifications set* consists of one or more *specifications rows*. A *specifications set* can contain as many *specifications rows* as are needed.

Apply from column name - A *specifications set* must know which identifier column will be used to decide which *specifications row* to use for a given subgroup or data point. Typically the *Apply from column* is a Date or DateTime identifier and the *specifications rows* record how the specifications changed over time. If the data source does not have a Date or DateTime identifier, a numeric identifier column, or the Row Number, can be used instead of a Date or DateTime identifier.

| Apply from: | Target: | (+ / -) | Upper: | Lower: |
|-------------|---------|-----------|--------|--------|
| 06/01/2016 | 10.00 | 0.02 | 10.02 | 9.98 |
| 04/15/2017 | 10.000 | 0.019 | 10.019 | 9.981 |

The *specifications set* shown above consists of two *specifications rows* that get their key value from a Date or DateTime identifier column. The first row applies to subgroups or data points that have a date identifier value greater than or equal to 06/01/2016 (in mm/dd/yyyy format) and less than 04/15/2017. The second row applies to subgroups or data points that have a date identifier value greater than or equal to 04/15/2017 (in mm/dd/yyyy format).

When the *Apply from* value specified for a *specifications row* contains only date information with no time information, such as "04/15/2017", it is assumed that the time portion is midnight, i.e. "04/15/2017 00:00:00".

Edit Specifications

Name

Specs for Area

Description

Data type for Apply From:

Date

| Apply from: | Target: | (+ / -) | Upper: | Lower: | |
|-------------|---------|-----------|--------|--------|--|
| 06/01/2016 | 10.00 | 0.02 | 10.02 | 9.98 | |
| 04/15/2017 | 10.000 | 0.019 | 10.019 | 9.981 | |

Add

OK

Cancel

The *specifications set* shown in the dialog above has a *Name* and thus it is a *Common Specifications Set*. It contains two *specifications rows* that are selected based upon the value from a Date or DateTime identifier column.

Name - The name by which the *Common Specifications Set* is known.

Description - Text to provide a description of each *Common Specifications Set*.

Data type for Apply From - Select either *Date* or *Number*. This defines the type of information that can be entered in the *Apply from* field of the *specifications rows*. A "Date" *Apply from* data type can only be used in conjunction with a Date or DateTime identifier. A "Number" *Apply from* data type can only be used in conjunction with a Numeric identifier, or with the Row Number for data that is stored in a data group.

Specifications and charts

SQCpack charts use specification information to determine if a data point is out-of-spec, and to calculate statistics like Cpk.

Sources of specifications for a chart

The specifications used by a chart can come from one of the following sources:

1. **Specifications from the chart definition** - Specifications can be stored with the chart definition. In this case the *specifications set* is stored as part of the chart itself, and is used exclusively by the chart that contains the *specifications set*.
2. **Specifications from the characteristic** - Specifications can be provided by the measurement or calculated characteristic that is being charted (only for charts using data in an SQCpack data group). The characteristic can store the *specifications set* as part of the characteristic definition, or the characteristic can specify to use a *Common Specifications Set*.
3. **Specifications from a Common Specifications Set** - Specifications can be provided to the chart by a *Common Specifications Set*. In this case, the chart definition specifies the name of the *Common Specifications Set* that will provide the specification values used by the chart.
4. **Specifications from the data** - Specifications can be provided from the chart's data source. This is sometimes done by joining a table containing the chart's data with a table containing specifications information, with the result being a data source that contains a column for the upper, target, and lower specification values. The SQL join between the chart data and the specifications data can be accomplished by a database view, or by a custom query defined in the chart definition. The 3rd step of the chart wizard allows you to map the upper, target, and lower specification columns to provide the specification values to use for each subgroup (or data point) on the chart. See

How specification values are gotten from the data

Let's assume that we have a chart that fetches data from an Excel worksheet like this:

| BatchNumber | UpperSpec | TargetSpec | LowerSpec | Observation | Effective Specs (Upper, Target, Lower) |
|-------------|-----------|------------|-----------|-------------|--|
| 100 | 26.0 | | 24.0 | 24.90 | (26.0, , 24.0) |
| 101 | 26.0 | 25.0 | 24.0 | 23.95 | (26.0, 25.0, 24.0) |
| 102 | | | | 25.32 | (26.0, 25.0, 24.0) |
| 103 | 26.3 | 25.3 | 24.3 | 24.94 | (26.3, 25.3, 24.3) |
| 104 | 26.35 | | | 23.78 | (26.35, 25.3, 24.3) |
| 105 | | 25.35 | | 25.22 | (26.35, 25.35, 24.3) |
| 106 | | | | 24.93 | (26.35, 25.35, 24.3) |
| 107 | | | | 24.84 | (26.35, 25.35, 24.3) |

In the third step of the chart wizard the **UpperSpec** column is mapped as *Upper spec*, the **TargetSpec** column is mapped as *Target spec*, and the **LowerSpec** column is mapped as *Lower spec*. The **Observation** column is mapped as a *Measurement*. The **BatchNumber** column is mapped as an *Identifier*. The *Order by* column is set to **BatchNumber**.

As subgroups (i.e. data points) are evaluated on the chart, the rule for getting specification values from the data is as follows. The current subgroup gets the specification value (upper, target, or lower) from the current row if the specification value for the current row exists. If the specification value for the current row is missing, then the effective specification value from the prior row will be used.

For the 100 row, the effective specifications are upper=26.0, target=missing, lower=24.0. The target is missing because the target value is missing in the 100 row, and there are no prior rows to provide the target value.

For the 101 row, the effective specifications are upper=26.0, target=25.0, lower=24.0. The 101 row provides all three specification values.

For the 102 row, the effective specifications are upper=26.0, target=25.0, lower=24.0. The 102 row provides none of the specification values, so the effective specification values from the prior row are used.

For the 103 row, the effective specifications are upper=26.3, target=25.3, lower=24.3. The 103 row provides all three of the specification values.

For the 104 row, the effective specifications are upper=26.35, target=25.3, lower=24.3. The 104 row provides only the upper spec value of 26.35. The effective target and lower spec values from the prior row are used for this row.

For the 105 row, the effective specifications are upper=26.35, target=25.35, lower=24.3. The 105 row provides only the target specification value, so the effective upper and lower specification values from the prior row are used.

For the 106 row, the effective specifications are upper=26.35, target=25.35, lower=24.3. The 106 row provides none of the specification values, so the effective specification values from the prior row are used.

For the 107 row, the effective specifications are upper=26.35, target=25.35, lower=24.3. The 107 row provides none of the specification values, so the effective specification values from the prior row are used.

Which specifications row is used to calculate statistics like Cpk?

Many of the statistics associated with charts, such as Cpk, are calculated based upon **one** row of *upper* / *target* / *lower* specification values. These calculated statistic values can be displayed as part of a chart title, or in the statistic panels of the chart.

The data for a chart can be associated with more than one set of *upper* / *target* / *lower* specifications rows. In that case, the *upper* / *target* / *lower* specification values from the row with the highest *apply from* value is the row that is used for statistical calculations that depend upon specifications. We refer to this *upper* / *target* / *lower* specifications row as the *statistic specs* for the chart.

For example, let's assume the following *specifications rows* are defined in the *specifications set* used by a histogram chart:

| Apply from (YYYY-MM-DD) | Upper | Target | Lower |
|-------------------------|-------|--------|-------|
| 2011-12-01 | 26.0 | 25.0 | 24.0 |
| 2012-06-15 | 26.1 | 25.1 | 24.1 |
| 2012-10-01 | 26.2 | 25.2 | 24.2 |

| | | | |
|------------|------|------|---|
| 2015-09-01 | 26.3 | 25.3 | 2 |
| | | | 4 |
| | | | 3 |

Let's assume the histogram chart has a filter that selects data between 2012-01-01 and 2012-09-30. Two specifications rows, the one for 2011-12-01 and the one for 2012-06-15 are associated with the chart's data. The *statistic specs*, i.e. the specs used to calculate statistics, are the specification values from the 2012-06-15 specifications row, because of the two rows used by the chart, that's the row with the highest *apply from* value.

Specifications and characteristics

An SQCpack measurement or calculated characteristic can specify to use specifications that are provided by either of the following sources:

1. Specifications can be stored as part of a measurement or calculated characteristic. The characteristic stores the *specifications set* within the characteristic definition. This is an example of a *Specific Specifications Set*.
2. The measurement or calculated characteristic can refer to a *Common Specifications Set*. This allows one *Common Specifications Set* to provide the same specification values to multiple charts and characteristics.

Reference - Filters

Filtering allows you to establish criteria that either blocks a data row from being used, or allows a data row to pass through the filter and be used.

Filtering is used for charts, reports, export data, print data, and certificate of analysis.

[Chart filters](#)

[Date macros in a filter item](#)

[Using the LIKE operator in a filter condition](#)

[Using the SQL clause filter item](#)

[Using a Generic Filter](#)

Date macros in a filter item

Date macros in a filter

The following date macros can be used in place of a date/time constant when using **Condition** or **Range**: You cannot use a date macro in a **Clause** expression.

- @Today [+/- N]
- @ThisWeek [+/- N]
- @ThisMonth [+/- N]
- @ThisQuarter [+/- N]
- @ThisYear [+/- N]

By default, the output date format is ISO 8601, which is an agreed upon standard for representing dates as YYYY-MM-DD. If the filter is used with a database engine that does not understand the ISO 8601 date

format, you can specify the output format with the optional (date format) argument, such as,

@ThisYear-1 (mm/dd/yyyy)

The date macro evaluates to the **starting** date of the specified date range. For example, if today is 15-April-2015 then @ThisYear evaluates to 2015-01-01.

An offset like "+/- N" can optionally be specified. For example, if today is 15-April-2015 then @ThisYear-1 evaluates to 2014-01-01 and @ThisYear+10 evaluates to 2025-01-01.

In the example shown above, the filter selects only the rows of data having a DateTime value that falls within the *prior two years*.

When specifying the starting and ending edges of a date range, such as the prior two years in this example, the starting edge of the range should use the "Is greater than or equal to" operator and the ending edge of the range should use "Is less than" with a date macro that evaluates to one day past the desired range of data. For the example shown above this results in the following WHERE clause if today is 15-April-2015 then:

```
WHERE (([DateTime] >= '2013-01-01') AND ([DateTime] < '2015-01-01'))
```

When the date range covers exactly one date macro time-period, it is simpler to use the "Is equal to" operator as explained next.

Using "Is equal to" with a date macro

When the "*Is equal to*" operator is used with a date macro, as shown above, the resulting WHERE clause inclusively covers the specified time-period.

The **DateTime "Is equal to" @ThisYear-1** filter expression show above results in this WHERE clause when the current year is 2015:

```
WHERE (([DateTime] >= '2014-01-01') AND ([DateTime] < '2015-01-01'))
```

The **DateTime "Is equal to" @Today-1** filter expression results in this WHERE clause when the current date is 15-Jan-2015:

```
WHERE (([DateTime] >= '2015-01-14') AND ([DateTime] < '2015-01-15'))
```

The "*Is equal to*" operator can be used with any of the date macros.

See also:

[Chart filters](#)

[Using the LIKE operator in a filter condition](#)

[Using a Generic Filter](#)

Using the LIKE operator in a filter condition

Using the LIKE operator in a filter condition

The **Is like** operator can be specified for a filter condition, as shown above.

For SQCpack data and other data that is stored in **Microsoft SQL Server**, the following rules apply when using the **Is like** operator.

The matching value (**Ryan%** in the example above) specifies the text *pattern* to search for.

| Wildcard character | Description | Example |
|--------------------|--|---|
| % | Matches any string of zero or more characters. | "Ryan%" matches "Ryan Smith" and "Ryan Jones". "%flaw%" matches any text that contains "flaw". |
| _ (underscore) | Matches any single character. | "Machine_" matches "Machine1" and "Machine2". "Machine__" matches "Machine25" or "Machine99". |
| [] | Matches any single character within the specified range ([a-f]) or set ([abcdef]). | "[C-P]arsen" matches "Carsen" or "Darsen" or "Parsen", etc. "[CP]arsen" matches only "Carsen" or "Parsen". |
| [^] | Matches any single character not within the specified range ([^a-f]) or set ([^abcdef]). | "Jo[^\b]%" matches "Joe" or "Jock" but not "Job" or "Jobe". |

For external data that is stored in Microsoft Excel or Microsoft Access, the following rules apply when using the **Is like** operator.

| Wildcard character | Description | Example |
|--------------------|--|---|
| * | Matches any string of zero or more characters. | "Ryan*" matches "Ryan Smith" and "Ryan Jones". "*flaw*" matches any text that contains "flaw". |

| | | |
|---|-----------------------------------|--|
| ? | Matches any single character. | "Machine?" matches "MachineA" and "MachineB". "Machine??" matches "Machine25". |
| # | Matches any single numeric digit. | "Machine#" matches "Machine4" and "Machine9". "Machine##" matches "Machine25" or "Machine99". |

See also:

[Chart filters](#)

[Date macros in a filter item](#)

Using the SQL clause filter item

In the example shown, the **Clause** button was used to add a SQL clause to the filter. You can enter any valid SQL WHERE clause expression.

For data stored in SQCpack data groups, the actual column names used in the database are not human friendly to look at.

To make the SQL clause easier to read and work with, you can use the human friendly display column name instead of the actual column name. For a chart filter, the display column name is the one shown in the **Display name** row in the **Edit Fields** step of the chart wizard. For non-chart filters the display name is the name shown in the **Column name** field of the **Edit Data Group** dialog.

To use the display column name, you must enclose the display column name in *double brackets* like this:

[[Operator Name]]

When the filter is used to fetch data, the human friendly display column name will be translated into the actual column name.

In the example shown above the expression:

[[Operator Name]] = 'Bob' OR [[Operator Name]] = 'Steve'

Will be changed into the following (using actual column names) when data is fetched from the data source:

[I_3160998c-ac26-442f-8c0f-a48200678884] = 'Bob' OR [I_3160998c-ac26-442f-8c0f-a48200678884] = 'Steve'

Using a Generic Filter

A *Generic Filter* is a type of filter that is defined at the parent level and is applied to all the children of the parent.

A *Generic Filter* can be used with these types of entities:

- Multi-charts
- Reports - The generic filter is called the **All** filter in Reports. The **All** filter dialog looks somewhat different from the *Generic Filter* dialog shown below.

The *Generic Filter* dialog shown above opens when you click the **Edit filter** toolbar button while a multi-chart is displayed.

The remainder of this topic discusses using a *Generic Filter* in the context of a multi-chart.

The filter criteria and/or the '**Rows to use**' criteria you define in the *Generic Filter* can be applied to all the child charts in the multi-chart as follows:

- The *Generic Filter* is applied to each child chart's filter only if **Apply the filter** is selected.
- The *Generic Filter* is applied to the child chart's filter as follows. If the *Generic Filter* contains a **Clause** filter item, or if the column name of any filter condition row matches a data source column, then the *Generic Filter* will be applied. When the *Generic Filter* is applied, all existing filter condition rows in the child chart's filter are deleted. If the column name specified in a filter condition row of the *Generic Filter* matches a column that exists in the child chart's data source, then that filter condition row is applied to the child chart's filter. In other words, the matching rows of the *Generic Filter* completely replace the filter criteria rows in the child chart's filter.
- The *Generic Filter* is *not* applied to the child chart's filter if the *Generic Filter* does not contain any filter condition rows.
- When **Apply 'Rows to use' to all children** is selected, the **Rows to use** criteria defined in the *Generic Filter* will be applied to each child chart.

You can use the buttons at the top of the dialog to add different types of filter criteria:

1. **Condition** – Allows you to add a filtering condition. Here are some examples:
 - a. Operator *is equal to* Sam
 - b. MfgDate *is greater than* 08/01/2015
2. **Date within** – Allows you to include a specific date range for data to include; for example:
 - a. MfgDate *is within* this month
 - b. MfgDate *is within* prior N years (when **Inclusive** is selected, the date range includes the current year)
3. **Clause** – This is disabled in a *Generic Filter* that is used in a Multi-chart. It is allowed in the **All** filter of a report.
4. **NULL test** – Allows you to add a test for NULL or NOT NULL. For example:
 - a. Operator *IS NOT NULL*
 - b. Operator *IS NULL*
5. **Range** – Allows you to add a test for data within a range. For example:
 - a. Width is between 33.1 and 44.1 (inclusive or not-inclusive)
 - b. Mfg Date is between 08/01/2014 and 08/01/2015 (inclusive or not-inclusive)

When defining a *Generic Filter*, you can select **{First Date Identifier}** or **{First Time Identifier}** from the drop-down list of columns.

- **{First Date Identifier}** - This will select the first **DateTime** identifier in the chart's columns. If no **DateTime** identifier is available, the first **Date** identifier will be selected. If no **Date** identifier is available, the filter condition row will not be applied to the child chart. *First* in this case is determined by the column order shown in the 3rd step (Data fields) of the chart wizard.
- **{First Time Identifier}** - This will select the first **Time** identifier in the chart's columns. If no **Time** identifier is available, the filter condition row will not be applied to the child chart. *First* in this case is determined by the column order shown the 3rd step (Data fields) of the chart wizard.

See also:

[Reference - Filters](#)

[Date macros in a filter item](#)

[Using the LIKE operator in a filter condition](#)

Reference – The data entry process

Quality results data is entered into SQCpack by using a **data group** to **enter data**. A data group is a collection of related columns. For example, one data group may consist of *Date*, *Part Number*, and *Outside Diameter*. In this example, *Date* and *Part Number* are identifiers and *Outside Diameter* is a measurement. You create data groups that reflect your data collection needs for different work flows or for different operations within your organization. You may have many different data groups and each one may contain a different collection of related columns. [Instructions for creating a data group](#).

To begin data entry, select **Data Groups** from the SQCpack navigation menu.

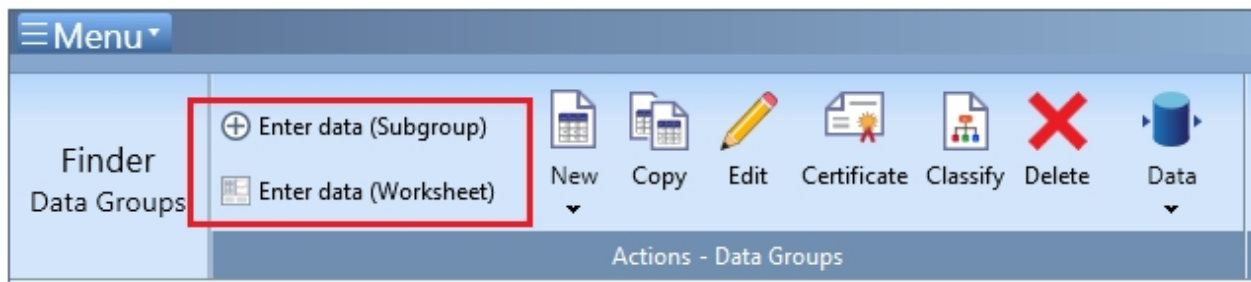
Once the Finder is showing the list of data groups, click on one group to select it. Next, click one of the **Enter data** buttons from the ribbon bar.

Next: [Two data entry options](#)

Two data entry options

You may select from two different options for entering data:

- Enter data (Subgroups)
- Enter data (Worksheet)

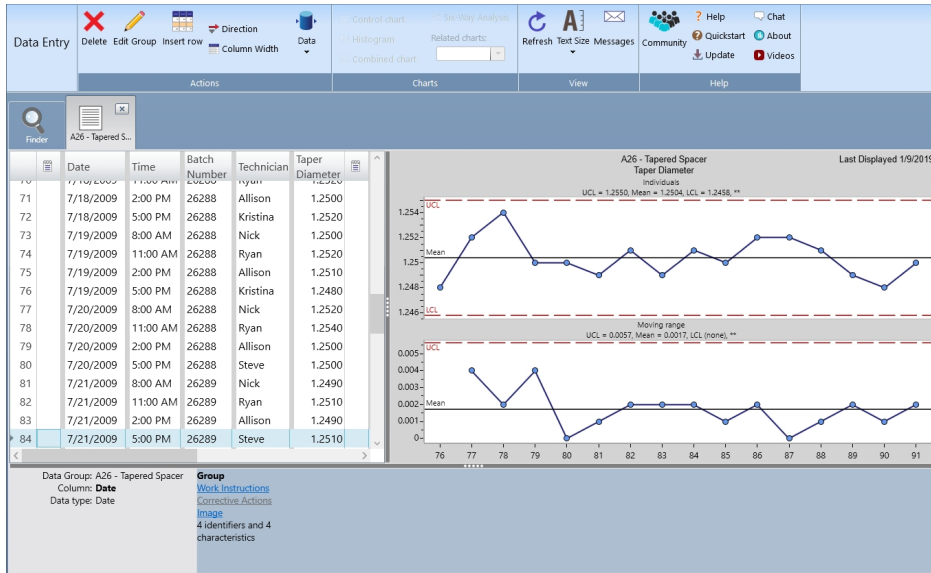


Both options accomplish the same task which is adding new data to a data group. Which one you select is often a matter of user preference. If you are unsure, try both options and decide which one works best for you. One rule of thumb is that if your data group contains 8 or more columns, the **Subgroup** option may be best. For groups made up of only a few columns, the **Worksheet** option may be best. The **Subgroup** option allows the user to focus on a single value at a time while the **Worksheet** option allows the user to move around. The **Subgroup** option has a *Details Pane* on the left side of the screen. This pane is only for showing the user's progress as they add data to a sample, not for entering data. Users will enter data in the top right pane. If you focus on fast typing, the **Subgroup** option may be best for you.

When you open a data group for data entry it will be shown in a new tab in the Finder. This allows you to have multiple groups open for data entry.

Worksheet

Subgroup



For **both** options, the data entry experience can be further customized using settings in a **data entry configuration**. Each data group refers to a data entry configuration. [Instructions for data entry configuration](#).

[Entering data via Subgroup](#)

[Entering data via Worksheet](#)

Enter data with Subgroup data entry

The Subgroup data editor is designed to be simple and fast. We hope you enjoy using it.

[The Subgroup data entry screen](#)

[Entering data in the Subgroup editor](#)

[Notes on using the Subgroup editor](#)

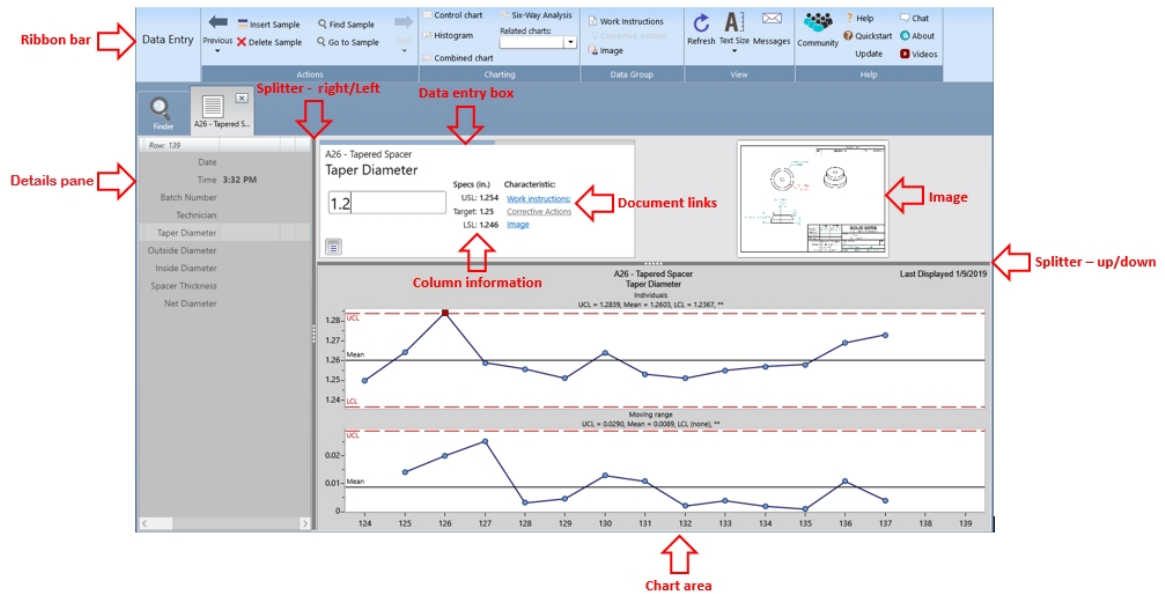
The Subgroup data entry screen

Parts of the Subgroup data entry screen

The subgroup data entry screen is composed of the sections and controls listed below:

1. [Details pane](#) (left side)
2. [Data entry box](#) (top right side)
3. [Row information area](#) (inside the data entry box)
4. [Document links area](#) (inside data entry box, far right side)
5. [Image viewing area](#) (top right side, next to data entry box)
6. [Chart area](#) (bottom right side)
7. [Vertical splitter](#)
8. [Horizontal splitter](#)
9. [Ribbon bar](#) (present throughout SQCpack)

These sections are shown below for a data group where no data has been entered



Details pane

The details pane contains rows and columns in a familiar spreadsheet arrangement. This is where all data entry is shown and where users will navigate. Navigation can be done with the keyboard, the mouse, and/or the buttons in the ribbon bar. New data is entered in the data entry box to the right of the details pane. Users will enter data in the space provided and press enter. The navigation will move on to the next item in the grid. After all data has been entered, the details pane will save the data and move on to the next sample. When more rows or columns exist than the space allows, the details pane will show scroll bars on the right and across the bottom of grid.

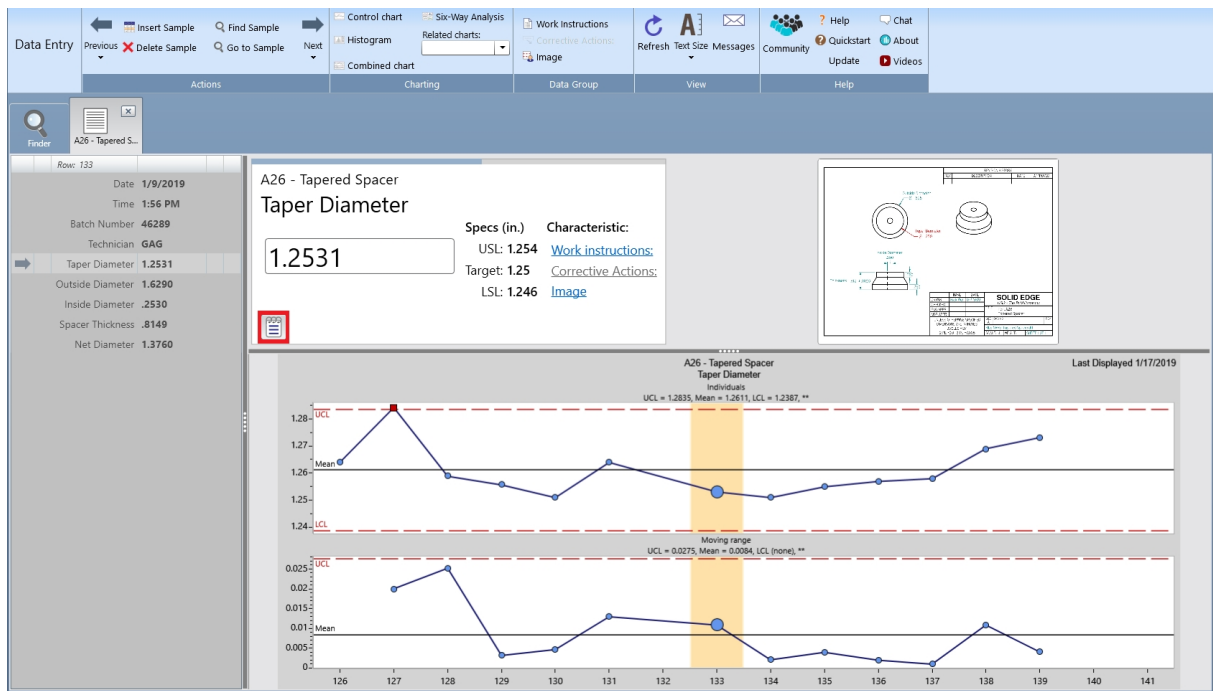
In the details pane, the column widths may be adjusted for the major group columns. This is done by dragging the appropriate column divider in the header row of the grid. If your identifier names or characteristic names are long, you may wish to make these columns wider.

The first column in the details pane contains an arrow pointing to the current characteristic. When you select a characteristic, the arrow will move to that position and will be highlighted. When the data entry item has been changed, the data entry box will update with new characteristic information. The next column will display **additional text information** for that characteristic (more detailed description below). The third column is the characteristic captions and the header of this column displays the current sample (or row) number. The fourth column contains the value that has been entered in the data entry box for each characteristic. The next column will display when the value that was entered for that characteristic is invalid. The last column will display when the characteristic is *Out-of-Control*.

There are three types of **additional text information** that can be applied in the sample:

1. Assignable cause
2. Notes
3. Corrective action

These three can be applied to any characteristic within the sample. If the characteristic type is an identifier, the **additional text information** will apply to the whole sample. Otherwise, the **additional text information** will apply to just that characteristic but users will have an option to create a **Cause**, **Note**, and/or **Action** that will apply to all characteristics in that sample. To add **additional text information**, click the notebook button inside the **Data entry box** shown here:

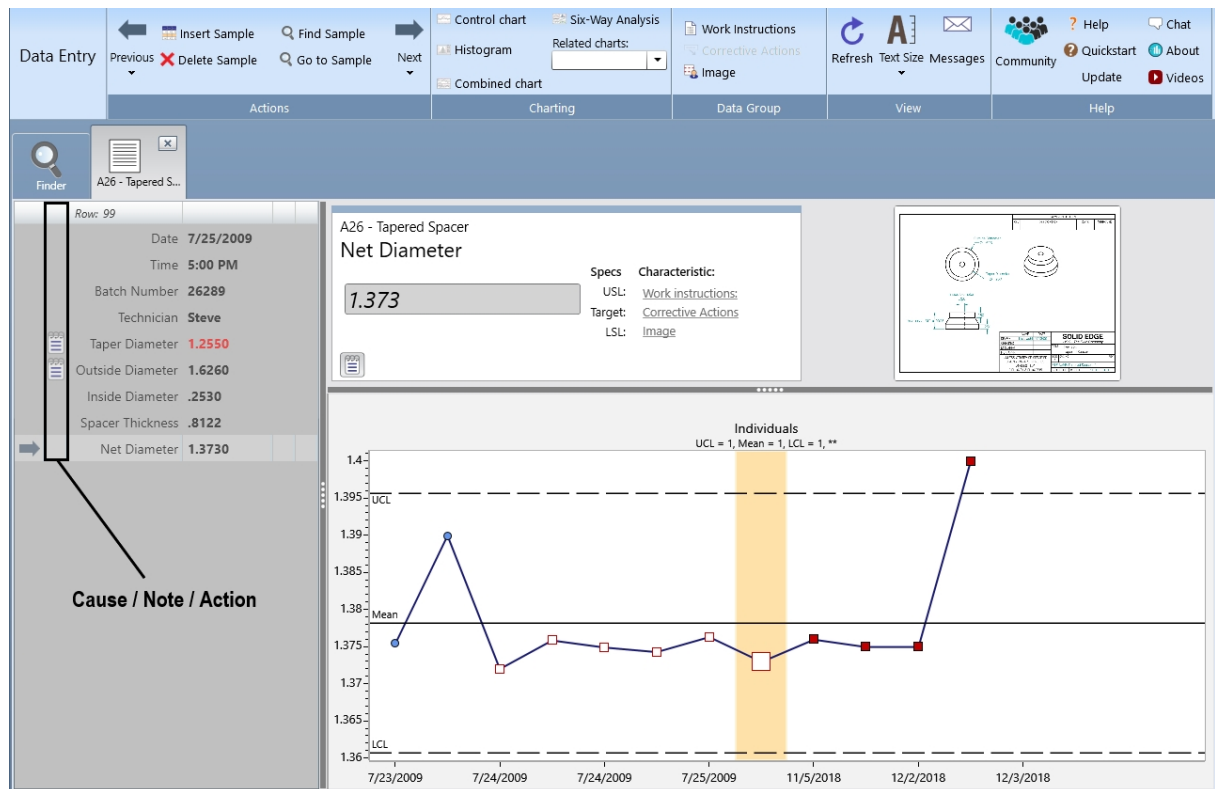


When you click this button, the **additional text information** dialog is displayed. Here you can enter a **Cause**, **Note**, and/or **Action** for that characteristic. Depending on the characteristic type, you will get one of two dialogs. One dialog is for the whole sample, while the other dialog is for that specific characteristic. The dialogs will show any existing text that has already been entered and it will allow you to enter new text. Enter your text, or select from a combo box if provided, then click the **OK** button to save it. Here is what the different dialogs look like depending on the characteristic type:

Cause, Note, Action for whole sample

Cause, Note, Action for specific characteristic

After you add **additional text information**, a notebook icon will appear in the second column of the **details pane** as shown here:



Assignable causes

An assignable cause is entered when some known condition may have caused the data to be unusual. For example, in some production settings, when changing from one product to another, measurements will be incorrect during the transition. In this case, the data entry operator might enter an assignable cause that says **changing product**. This will remove the row of data from calculations so that charts based on this data are not distorted by the anomaly. When an assignable cause has been entered, a visual indicator will appear in the *additional text* column.

Notes

Notes may be any process knowledge that a process worker feels worthy of recording. When some bit of learning happens about how to make the process work better, a note might be recorded. This way, future workers in the process might benefit and build upon this learning. Notes have no impact on chart calculations.

Corrective actions

When an operator detects a process problem and then takes some action to correct it, he or she may want to make a note of this in the data that is being collected. This kind of process knowledge is useful and builds up over time. It can help new workers to understand problems that have been encountered and resolved in the past. Corrective action text has no impact on chart calculations.

Data entry box

The **data entry box** is where most of the focus will be and where users will enter data. At the top of the box, there is a blue progress bar to indicate to the user their progress as they complete the sample. Inside the box, at the top, is the name of the data group. Below the data group name is the title of the current characteristic the user is entering data for. Below the title of the characteristic is a text box for the user to enter the characteristic value. In the right side of the **data entry box** is the **row information area** and the **document links area**. There is more information about these further down in this section. In the bottom left corner of the **data entry box** is the **additional text information** button that you read about above.

Image viewing area

The image viewing area is to right of the **data entry box**. If you have image files defined with your group and / or characteristics, such as CAD drawings, photographs, or diagrams, these will be displayed in this area. An image file associated with the entire data group will show when the details pane is in an identifier row. For a measurement or count row, an image file associated with these will be displayed. The image for the group will remain in all data entry rows if you have not defined images for each of the characteristics.

Note - the **image viewing area** is restricted in size. If you need to see these images in a larger view, use the image link in the **document links area** or click on the image itself. This will open the image in a window that can be sized and positioned.

Chart area

The chart area is used to display a chart relevant to the current row in the **details pane**. For example, when you are in the row for Length, a control chart for Length will be displayed. If you move to the row for Width, the control chart will be changed to display the one for Width. As you add data, the chart is refreshed to show the new data. This allows a data entry user to stay **visually aware** of what is happening in the process.

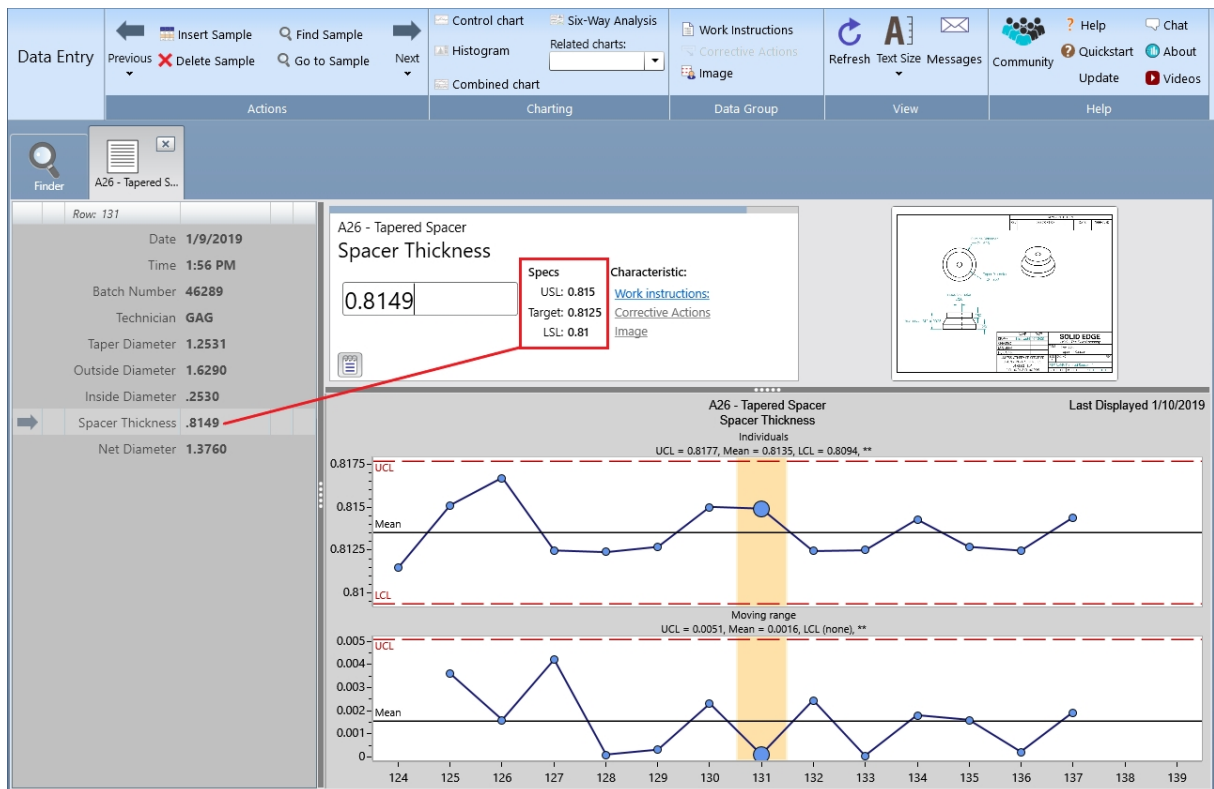
When you create a data group for each row, charts are created automatically. These are known as the **default charts**. Their name will be **Default control chart**. In most cases, this is the chart that will be used for the real-time chart during the data entry. If you want to change any settings on the chart being used during data entry, you will need to edit this chart - named **Default control chart** - for the measurement or count characteristic of concern.

The real time chart may not always be visible. When a group is open for data entry, settings from the data entry configuration may suppress the real-time chart. In this case, only the **details pane** and the information areas are visible. If the data group has lots of characteristics, there may be a delay while the chart definitions are loaded. The real time chart will become visible when the chart for that characteristic has been loaded.

To display the chart in a new tab for better viewing, or to edit, double click on the chart or right click and select **Open chart in new tab**.

Row information area

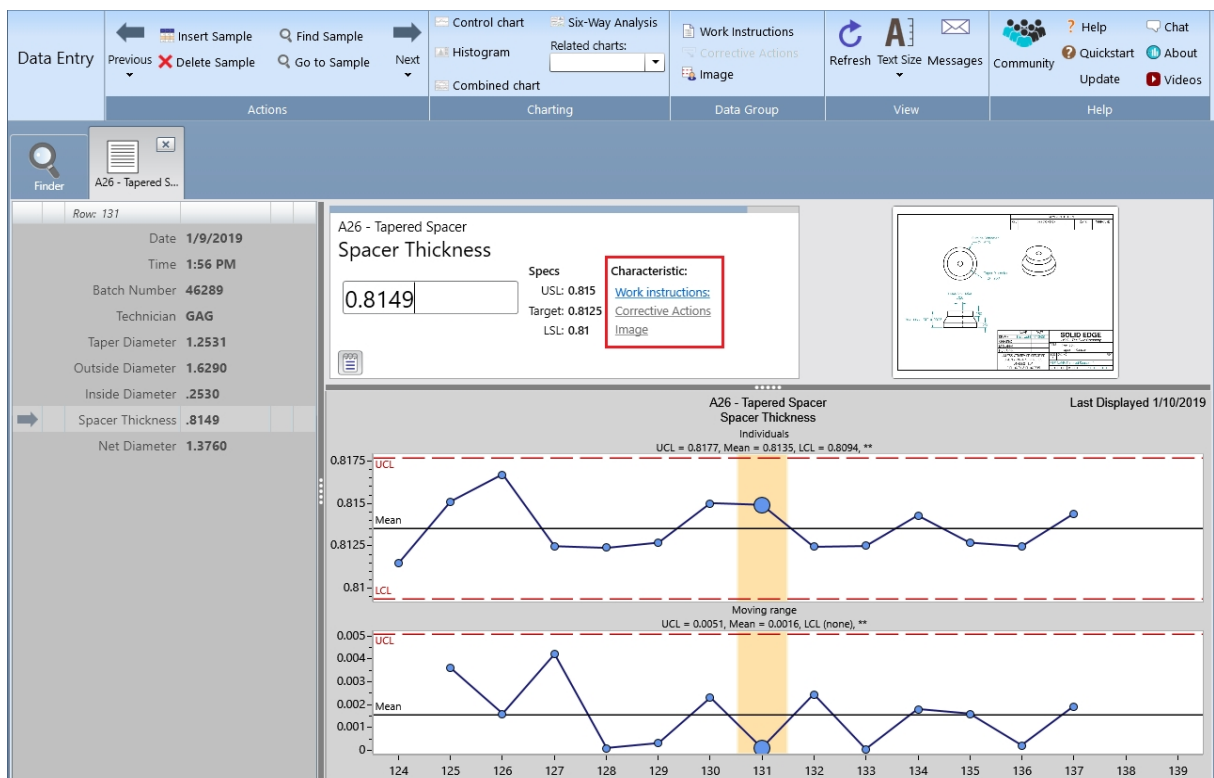
The row information is inside the **data entry box**, to the right side. It is highlighted in the image below.



As you change rows in the details pane, this area will display information relevant to the current row. When the details pane is positioned in a measurement row, information about the measurement will be displayed. For example, upper, lower, and target specifications for the measurement are shown here. The same is true for identifier columns, count columns, and calculated columns.

Document links area

The document links area is inside the **data entry box**, to the far right. It is highlighted in the image below:



Each data group may be configured with a set of documents to assist the data entry operator or process operator. These documents are specified when creating or editing the data group. There are three types of documents:

1. Work instructions
2. Corrective actions
3. Image

These documents may be specified for the entire data group and may also be set up for each characteristic in the data group. As you change rows in the **details pane**, links to these documents will update in this **document links area**. Clicking on the link will launch the document in its own window.

These windows may be positioned and sized so they are visible throughout the data entry process. If, for example, the work instructions window is open, the contents of the work instructions window will change as you move from Length to Width, to reflect the current row.

The position of these windows is retained from session to session. Once you have them arranged to your preferences, that is where they will always be displayed. To display a document, click on the appropriate link. Note that the characteristic links display documents for the current data entry row. When the **details pane** is in an identifier row, only the document links for the data group are available. Links where no documents have been specified will be disabled (dimmed).

Splitter bars

There is one horizontal and one vertical splitter bar in the data entry screen. These are thick, dark gray bars within the data entry view.

The vertical splitter can be dragged left and right to divide the screen space between the **details pane** and the **data entry box** and the **chart areas**. The horizontal splitter can be dragged up and down to divide the screen space between the **data entry box** area and the **chart area**.

Splitter bar position is retained per data group. Depending on how your group is defined, you may want to adjust these splitters to show more or less of certain parts of the data entry screen differently for different groups. These positions will be remembered and restored the next time you open this group for data entry.

Ribbon bar buttons

While you are working in the details pane, the buttons in the ribbon bar are available. The **Previous** and **Next** button are used to navigate to the previous sample or the next sample. Under the **Previous** and **Next** buttons, there are drop down arrows. When you click on one of these drop down arrows, you can choose to go to the last or first sample or find a specific sample.

To insert a new sample, first navigate to the sample where you want to create a new sample. Next, click the **Insert Sample** button in the ribbon bar. A new sample will be created *before* the current sample.

To delete a sample, first navigate to the sample that you want to delete. Next, click the **Delete Sample** button in the ribbon bar.

To find a sample(s) with a specific characteristic value, click the **Find Sample** button in the ribbon bar. Next, select which characteristic you want to search in the combo box provided. Lastly, type in the value to find and press enter. If there are more than one sample with that characteristic value, you can navigate through them using the **Previous** and **Next** button provided in the *Find Sample* box.

To go to a specific sample, click the **Go to Sample** button in the ribbon bar. Next, type in the sample you want to navigate to and press enter. To move to the previous or next sample from the current sample, press the < or > button. To navigate to the first sample, press the << button. To navigate to the last sample, press the >> button.

Colors in the details pane

For measurement rows, when specifications are defined, data that is above an upper specification or below a lower specification will appear in red. This is a visual warning for the data entry or process operator that the value entered is beyond the specifications.

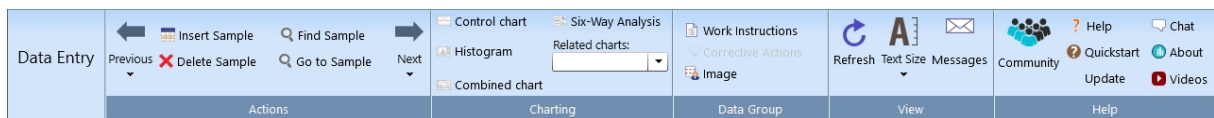
Next: [Entering data](#)

Entering data in the Subgroup editor

When a data group is open for data entry, most of the user interaction will occur in the data entry box. This is a box to the right of the details pane toward the top. Here, the data group name is shown at the top. Under the group name, the current characteristic caption is displayed. Below that is a text box where users will enter the characteristics value. For the most part, data entry follows these standard steps:

1. Enter a value
2. Press **Enter** to move to the next characteristic
3. Enter the next value
4. After entering all characteristic values, the data will save and start a new sample

Ribbon controls



Previous - Click to navigate to previous sample

Next - Click to navigate to next sample

Insert Sample - Click to insert a new sample

Delete Sample - Click to delete current sample

Find Sample - Click to search for specific characteristic values

Go to Sample - Click to search for specific sample

Control Chart - Click to display the **Default Control Chart** for the current characteristic.

Histogram - Click to display the **Default Histogram** for the current characteristic.

Combined Chart - Click to display a combination chart containing the **Default Control Chart** and **Default Histogram**.

Six-Way Analysis - Click to display a **Six-Way Analysis** chart for the current characteristic.

Related charts - Click the dropdown to display all charts that are defined for the current characteristic. Click on a chart to display it.

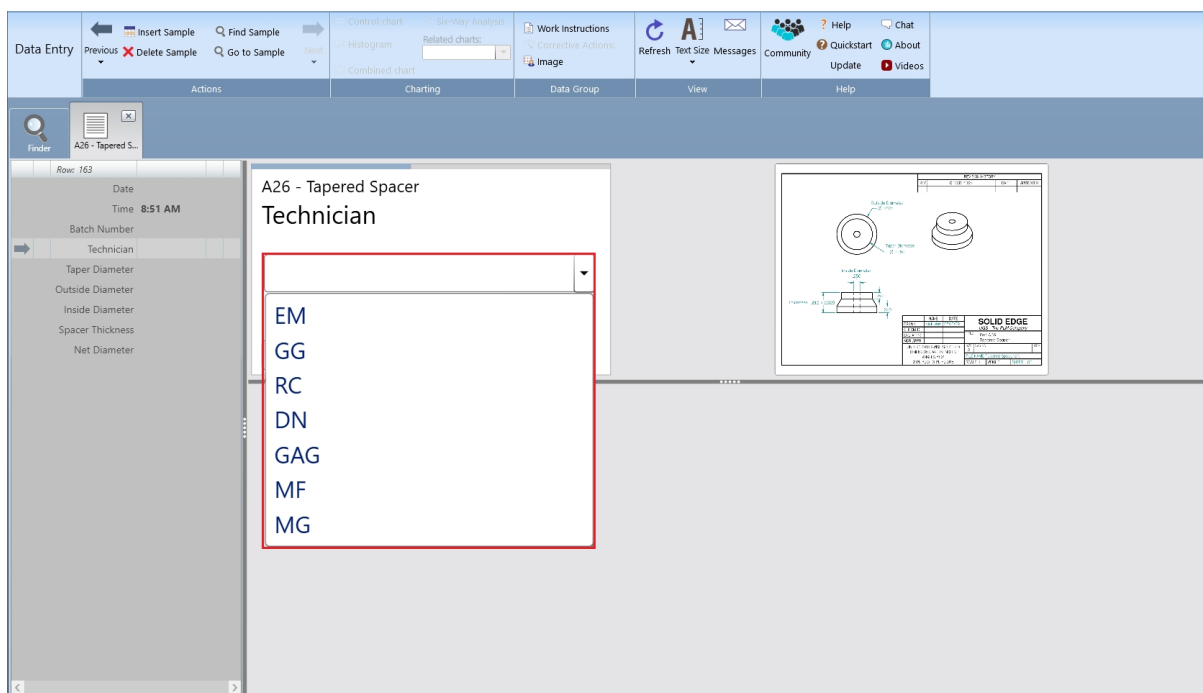
Work Instructions - Click to display work instructions for the data group

Corrective Actions - Click to display corrective actions for the data group

Image - Click to display image for the data group

Choice lists

When entering data into identifier rows, a choice list may be available in the data entry box. If so, when you arrive in the row, the data entry box will provide a drop-down arrow on the right side of the text box as shown here:



Different options allow you to use the list. Click on the arrow to drop-down the list and select an item by clicking.

Note - When a data group is defined, it may be set so that identifiers **must match** this choice list. When this is true, you will not be able to type into the cell. When this is not set, you may either type or select from the list.

An identifier row may be defined as a date and/or time. If the identifier is defined as date, you may either press **Enter** or **Tab** to insert the current date and move to the next characteristic. If the identifier is defined as time, the time will be set to the current time automatically but can be edited. To leave a blank date cell without inserting the current date, you can just use the arrow down key or use the mouse to click the next characteristic. To leave a blank time cell, you must clear out the current time then press **Enter**. The format of the displayed date and/or time is determined by the Windows local settings.

Identifier required

Identifiers may be defined such that entry is **required**. When this is true, you will not be able to leave a newly added sample until an identifier has been entered. This helps to ensure completed data entry and can make data analysis more accurate.

Copy from previous

Identifier rows may be defined in such a way that they copy their initial values from the previous sample. When this is true, the identifier may be filled in automatically each time you add a new sample. This supports the common work scenario, where a user may enter several samples that have the same exact identifier. When the identifier does need to change, it can be typed over. This is a data entry time-saving option.

Calculated rows

A data group may be defined to contain calculated rows. For example, the user may enter Length and Width and a row named Area may be calculate automatically. The data entry user can view these calculated rows, but are read-only and cannot be changed.

Editing restrictions

Each user who logs into SQCpack is acting in a certain **user role**. Depending on how the user role has been defined, the user may be restricted during data entry. For example, users may be defined such that they may enter **new** data but are restricted from editing existing data. Other users may be able to view the data in the data entry form but not allowed to make changes.

If you find yourself unable to enter or modify data on the data entry screen, it may be because of these restrictions.

Full screen awareness

As you enter data on the data entry screen, most of the focus will be on the data entry box. However, there is valuable information being stored on the chart, in the area below the chart, and possibly in separate document windows. Do not forget to look around the screen occasionally for useful information!

Next: [Customizing the data entry experience](#)

Notes on using the Subgroup editor

Entering date and time data

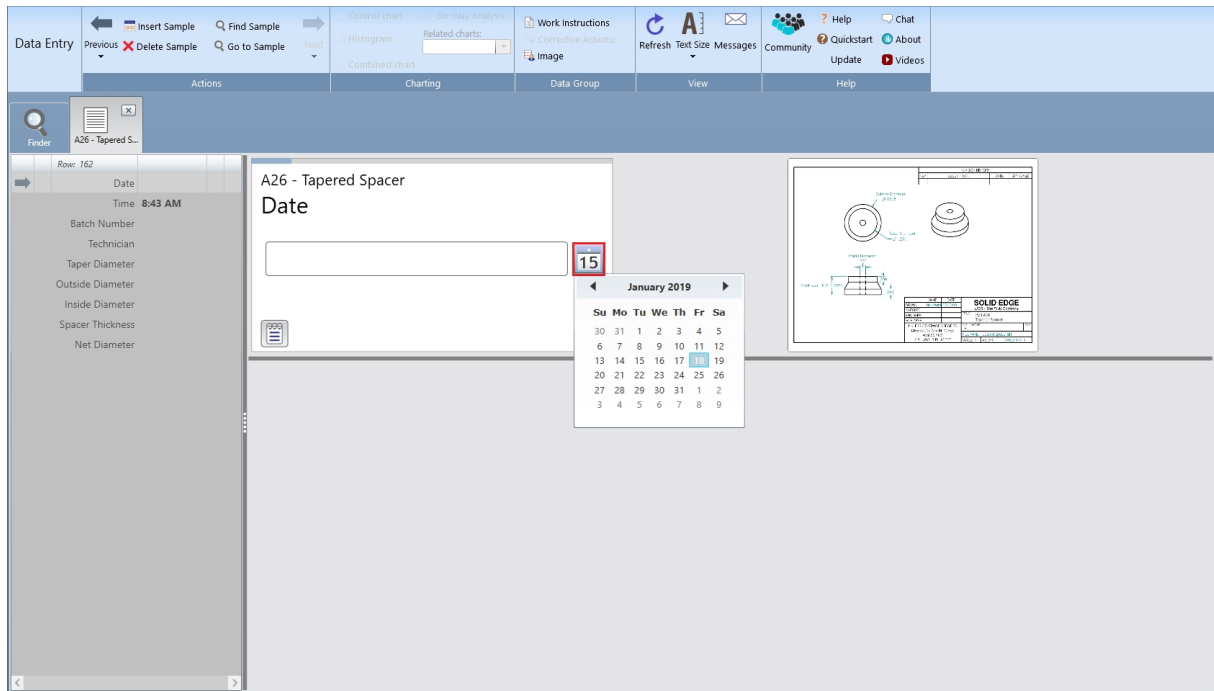
In data entry when you are entering data into an Identifier row that has a Data type of date and/or time, the following applies.

After you enter date and/or time data, the cell will display the data based on the date and time settings of the computer, regardless of how the data was entered. For example, if your computer is setup to display 24-hour time, and you enter "6 pm" the cell will display "18:00" or 18:00:00," depending on whether the Identifier is setup to show seconds.

When entering a data value numerically, you can enter the numbers separated by a space, comma, period, hyphen, or forward slash. If you enter the first three letters of the month, the software will complete the month. Also, if you do not enter a year the software will complete the date with the current year. If entering date and time, there must be a space between the two values. All the following are acceptable:

1.1.15
02 13 15
3,24,15 1600
4/8/16 2p
5-15-16 10:14aM

The date picker is available only when the Data type is date only. To open while in data entry, select the calendar (shown below).



When entering a time value, you can enter a partial time and the software will convert the partial time into a complete time as shown in the table below.

| Number of Digits | Input Data | Result |
|------------------|------------|-------------|
| 1 | 7 | 7:00 AM |
| 2 | 13 | 1:00 PM |
| 2 | 10 | 10:00 AM |
| 3 | 123 | 1:23 AM |
| 4 | 1623 | 4:23 PM |
| 4 | 0823 | 8:23 AM |
| 5 | 12232 | 12:23:02 PM |
| 6 | 122312 | 12:23:12 PM |
| 7+ | 1223123 | Invalid |

When entering AM or PM, variations such as: 'a', 'pm', 'aM' and 'Pm' are acceptable. Also, a space is not required between the digits and AM or PM. All of the following are acceptable:

11a
8:02Am
1:14:34 pM

Enter data with Worksheet data entry

The Worksheet data editor is designed to look and feel like entering data in Microsoft Excel. We hope you enjoy using it.

[The Worksheet data entry screen](#)

[Entering data in the Worksheet editor](#)

[Notes on using the Worksheet editor](#)

The Worksheet data entry screen

Parts of the data entry screen

The data entry screen is composed of the sections and controls listed below:

1. [Data entry grid](#) (left side)
2. [Chart area](#) (right side)
3. [Column information area](#) (lower left)
4. [Document links area](#) (lower center)
5. [Image viewing area](#) (lower right)
6. [Vertical splitter](#)
7. [Horizontal splitter](#)
8. [Ribbon bar](#) (present throughout SQCpack)

These sections are shown below for a data group where no data has been entered.

The screenshot shows the SQCpack interface with the following components and annotations:

- Ribbon bar:** Located at the top, containing tabs for Data Entry, Control chart, Histogram, Combined chart, Six-Way Analysis, Related charts, View, and Help.
- Data entry grid:** A table on the left side with columns: Date, Time, Acid Concentration - %, Gap (1), and Gap (2). It contains sample data for dates from 8/4/2015 to 8/13/2015.
- Chart area:** On the right side, displaying two X-bar charts for 'AIAG example data, Gap of Dimension A'. The top chart shows a mean line fluctuating around 0.75, with UCL at 0.85 and LCL at 0.65. The bottom chart shows a mean line fluctuating around 0.25, with UCL at 0.40 and LCL at 0.10.
- Column information area:** At the bottom left, showing 'Data Group: AIAG sample data', 'Column: Gap of Dimension A', 'USL: 0.9', and 'Target specification LSL: 0.5'.
- Document links area:** At the bottom center, containing links for 'Work Instructions', 'Corrective Actions', and 'Image'.
- Image viewing area:** At the bottom right, containing an 'Image' icon.
- Vertical splitter:** A red arrow points to the vertical line separating the data entry grid from the chart area.
- Horizontal splitter:** A red arrow points to the horizontal line separating the data entry grid from the column information area.

Data entry grid

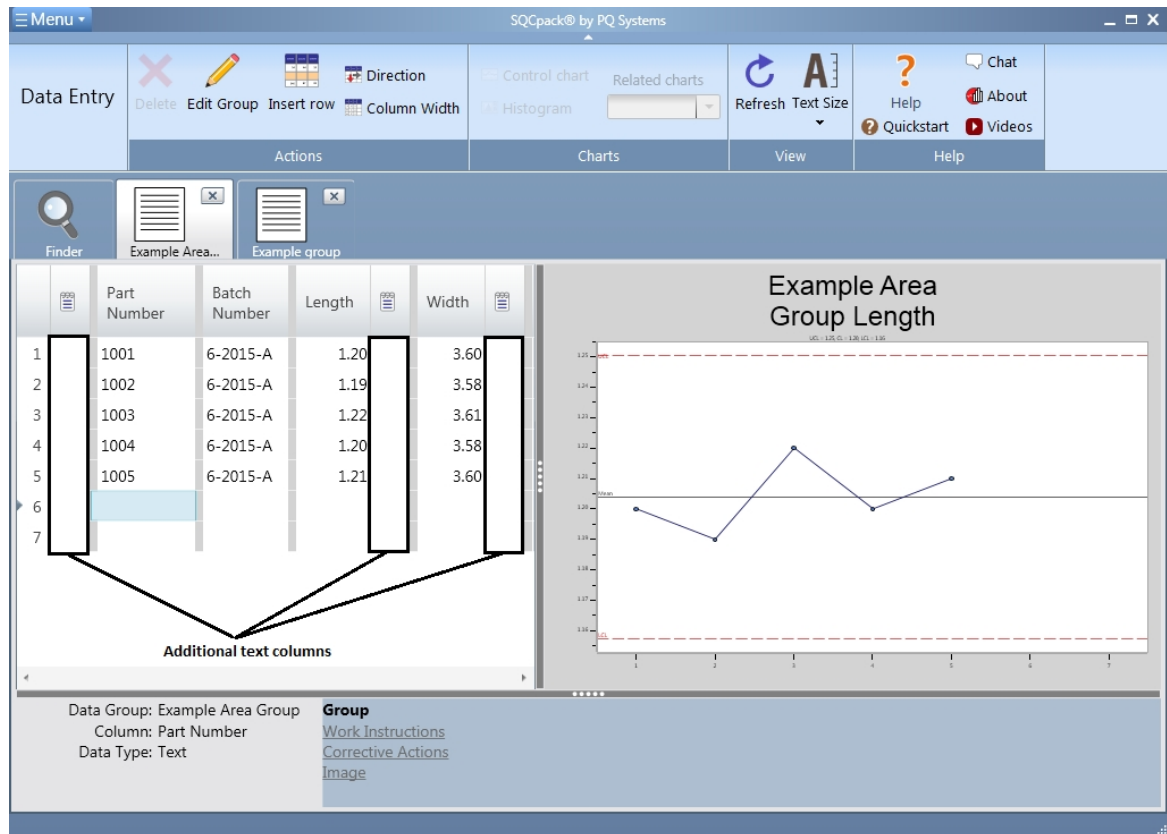
The data entry grid contains rows and columns in a familiar spreadsheet arrangement. This is where all data entry and most user interaction on this form will happen. New data is entered into rows that are appended at the bottom of the grid. Navigation within the grid can be done with the keyboard and / or the mouse. When more rows or columns exist than the space allows, the data entry grid will show scroll bars on the right and across the bottom of the grid.

In the data entry grid, the column widths may be adjusted for the major group columns. This is done by dragging the appropriate column divider in the first row (the header row) of the grid. If your identifier names or characteristic names are long, you may wish to make these columns wider. The column widths you set are stored specifically for you and are unique for each data group. This means that you can use this group with columns set the way you like them, and other users may set the column widths to their own preferences. Additionally, these widths will be different when using different groups.

The first column in the data entry grid contains row numbers. When you want to **select** an entire row, click

one of these row numbers. This will show a small triangle next to the row number and highlight that row. Holding the shift or control key down and selecting the next row allows you to select multiple rows at the same time.

In the data entry grid, you will notice extra columns. These are narrow columns. Think of these as **additional text columns**. You see one to the right of row number (the second column) and you see one to the right of each major column. For example, if your group contains both Length and Width measurements, you will see one of these columns after Length and another after Width. These extra columns are highlighted in the image below:



These columns are used to indicate that the row contains **additional text** information. There are three types of text information that might be present:

1. Assignable cause
2. Corrective action
3. Notes

Each of these may be applied either to the entire row (when entered in the second column) **or** per characteristic. If you have Length and Width measurement characteristics, you may want to enter a Note that applies only to Width. If so, use the column to the right of the Width measurement.

Assignable causes

An assignable cause is entered when some known condition may have caused the data to be unusual. For example, in some production settings, when changing from one product to another, measurements will be incorrect during the transition. In this case, the data entry operator might enter an assignable cause that says **changing product**. This will remove the row of data from calculations so that charts based on this data are not distorted by the anomaly. When an assignable cause has been entered, a visual indicator will appear in the *additional text* columns.

Corrective actions

When an operator detects a process problem and then takes some action to correct it, he or she may want to make note of this in the data that is being collected. This kind of process knowledge is useful and builds up over time. It can help new workers to understand problems that have been encountered and resolved in the past. Corrective action text has no impact on chart calculations.

Notes

Notes may be any process knowledge that a process worker feels worthy of recording. When some bit of learning happens about how to make the process work better, a note might be recorded. This way, future workers in the process might benefit and build upon this learning. Notes have no impact on chart calculations.

When you click on any **additional text** column, a dialog is displayed. It shows existing text that has already been entered and it allows you to enter new text. Enter your text, or select from a combo box, then click the **OK** button to save it. Here is what the dialog looks like:

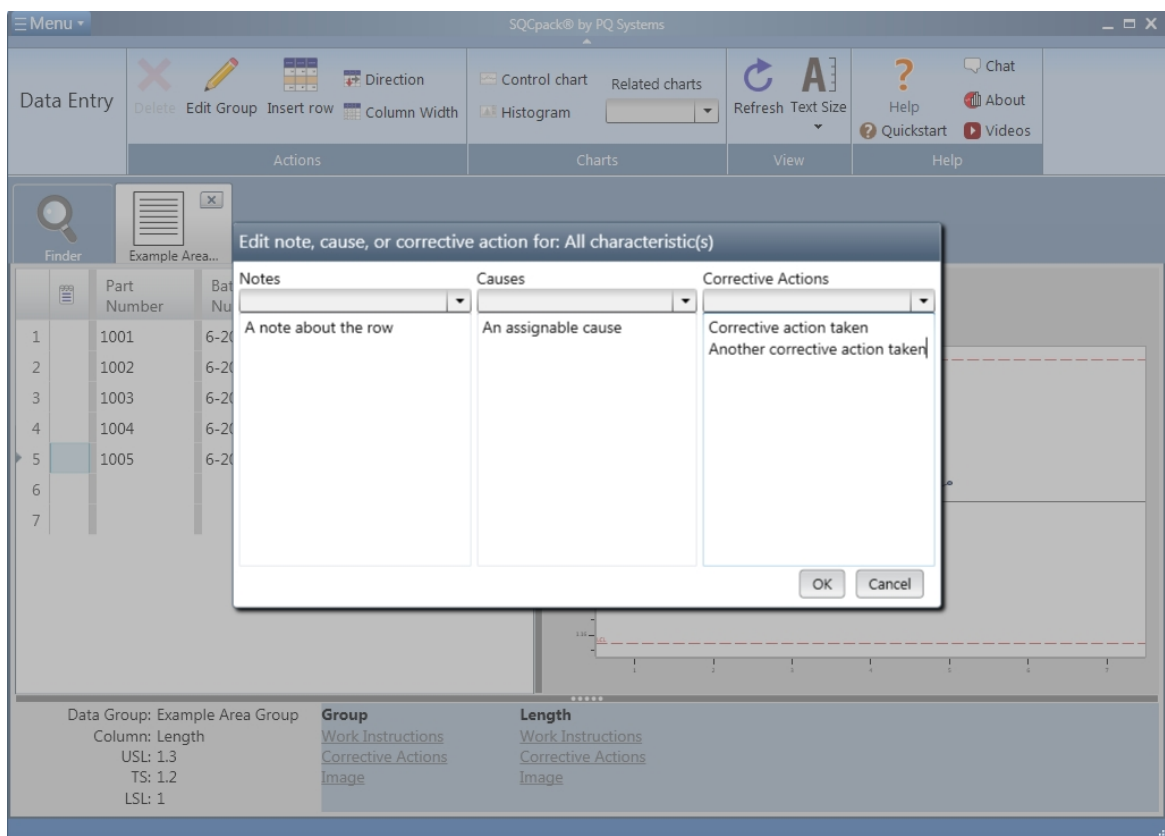


Chart area

The chart area is used to display a chart relevant to the current column in the data entry grid. For example, when you are in the column for Length, a control chart for Length will be displayed. If you move to the column for Width, the control chart will be changed to display the one for Width. As you add data in the data entry grid, the chart is refreshed to show the new data. This allows a data entry user to stay **visually aware** of what is happening in the process.

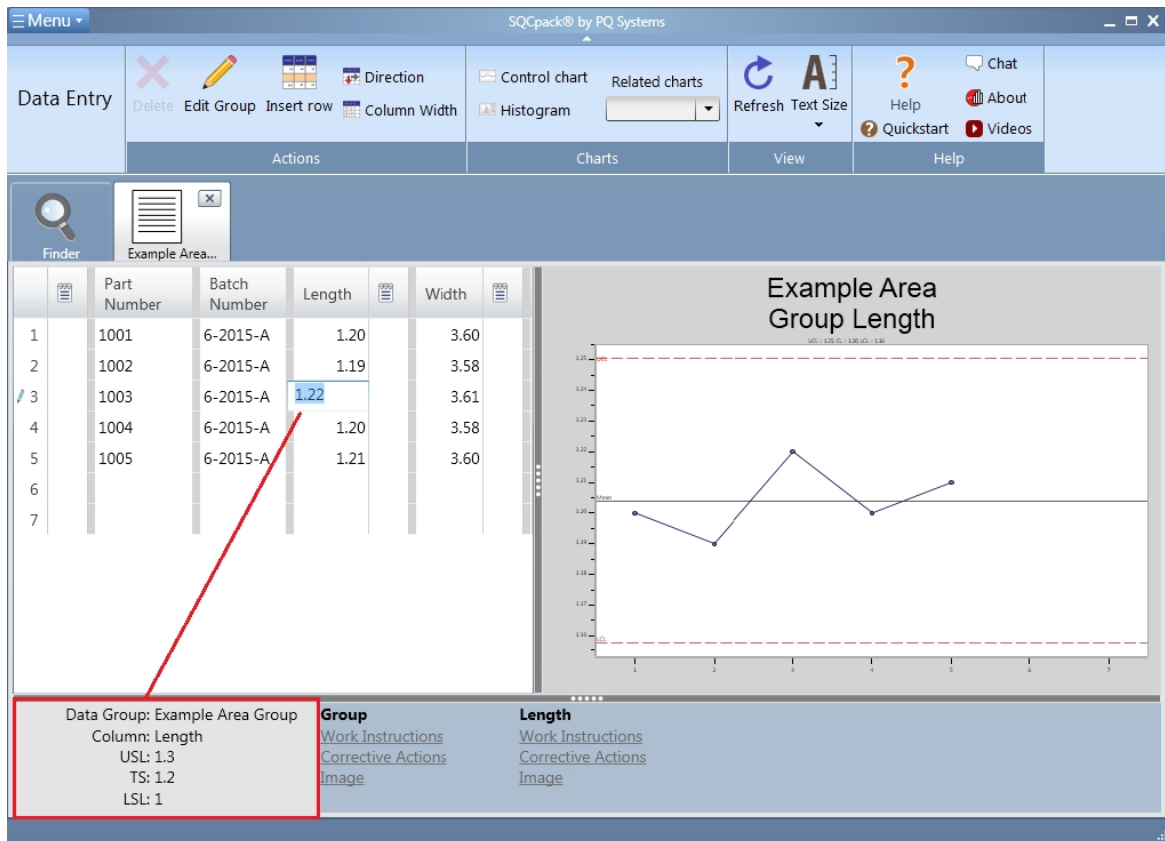
When you create a data group for each column, charts are created automatically. These are known as **the default charts**. Their name will be **Default control chart**. In most cases, this is the chart that will be used

for the real-time chart during data entry. If you want to change any settings on the chart being used during data entry, you will need to edit this chart – named **Default control chart** – for the measurement or count characteristic of concern.

The real time chart may not always be visible. When a group is open for data entry, settings from the data entry configuration may suppress the real-time chart. In this case, only the data entry grid and the information areas below are visible.

Column information area

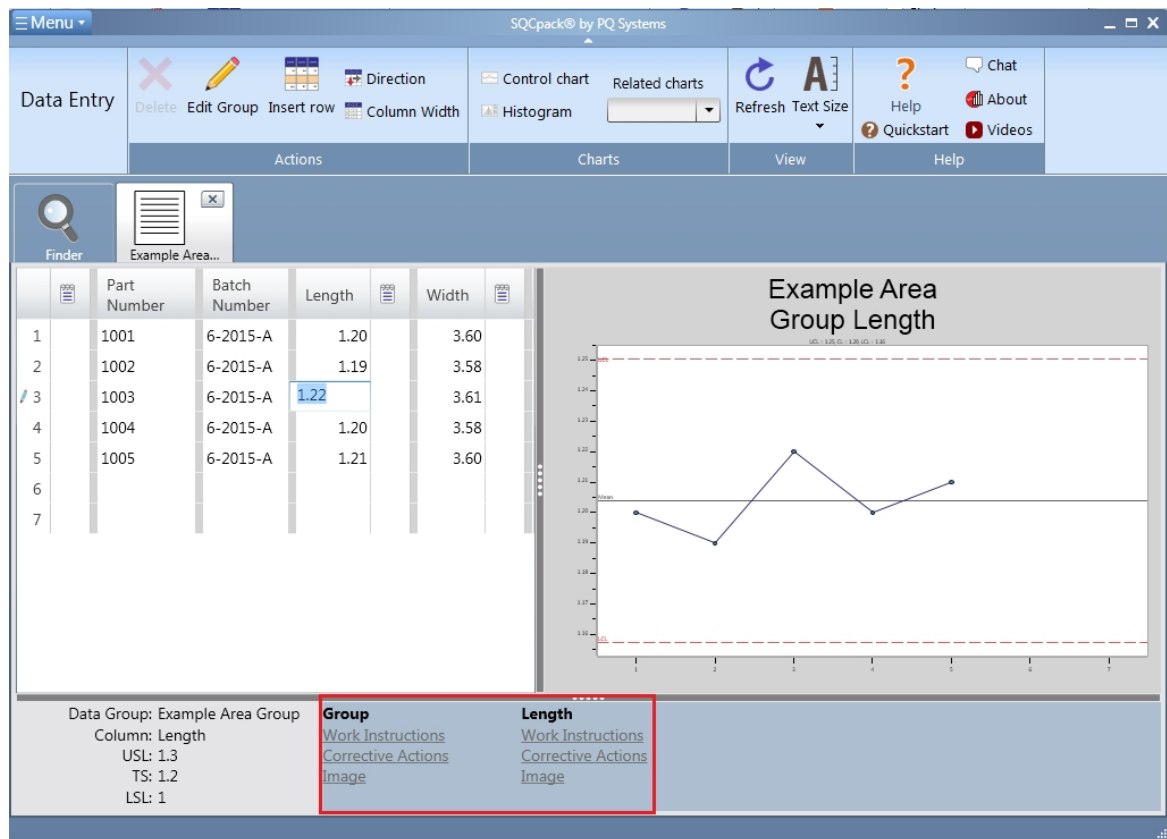
The column information area is in the lower right corner of the data entry form. It is highlighted in the image below:



As you change columns in the data entry grid, this area will display information relevant to the current column. When the data entry grid is positioned in a measurement column, information about the measurement will be displayed. For example, upper, lower, and target specifications for the measurement are shown here. The same is true for identifier columns, count columns, and calculated columns.

Document links area

The document links area is near the bottom center of the data entry form. It is highlighted in the image below:



Each data group may be configured with a set of documents to assist the data entry operator or process operator. These documents are specified when creating or editing the data group. There are three types of documents:

1. Work instructions
2. Corrective actions
3. Image

These documents may be specified for the entire data group and may also be set up for each characteristic in the data group. As you change columns in the data entry grid, links to these documents will update in this document links area. Clicking on the link will launch the document in its own window.

These windows may be positioned and sized so they are visible throughout the data entry process. If, for example, the work instructions window is open, the contents of the work instructions window will change as you move from Length to Width, to reflect the current column.

The position of these windows is retained from session to session. Once you have them arranged to your preferences, that is where they will always be displayed. To display a document, click on the appropriate link. Note that the characteristic links display documents for the current data entry column. When the data entry grid is in an identifier column, only the document links for the data group are available. Links where no documents have been specified will be disabled (dimmed.)

Image viewing area

The image viewing area is the lower right corner of the data entry form. If you have image files defined with your data group and / or characteristics, such as CAD drawings, photographs, or diagrams, these will be displayed in this area. An image file associated with the entire data group will show when the data entry grid is in an identifier column. For a measurement or count column, an image file associated with these will be displayed. The image for the group will remain in all data entry columns if you have not defined images for each of the characteristics.

Note – the image viewing area is restricted in size. If you need to see these images in a larger view, use the

image link in the document links area. This will open the image in a window that can be sized and positioned.

Splitter bars

There is one horizontal and one vertical splitter bar in the data entry screen. These are thick, dark gray bars within the data entry view.

The vertical splitter can be dragged left and right to divide the screen space between the data entry grid and the chart area. The horizontal splitter can be dragged up and down to divide the screen space between the information areas at the bottom and the data entry grid and chart above.

Splitter bar position is retained per data group. Depending on how your group is defined, you may want to adjust these splitters to show more or less of certain parts of the data entry screen differently for different groups. These positions will be remembered and restored the next time you open this group for data entry.

Ribbon bar buttons

While you are working in the data entry grid, the buttons in the ribbon bar buttons are available. For example, if you select an entire row by clicking in the first column, you can use the **Delete** button to delete the selected row. If you have multiple rows selected, you can delete all of them using the **Delete** button.

To insert a new row within existing rows of data, first select an entire row. Next, click the **Insert** button in the ribbon bar.

The **Direction** button in the ribbon bar allows you to toggle the default navigation direction. The most common setting for this is to the right. In other words, when you press **Enter** or **Tab** after entering a value, the cursor will move to the next cell to the right. At the end of the row it will move down and wrap to the first column. For some data entry scenarios, it is better for the default navigation direction to be down. Use the **Direction** button to change navigation direction. When the next direction is down and you press Enter or Tab, you will move to the cell below the current one.

The **Resize Columns** button can be used to reset all data entry grid column widths to a default size. This can be useful if the column widths get changed in a way that makes the grid difficult to work with.

Use the **Modify Group** button in the ribbon bar when you need to change some setting of the data group you are working with. For example, you may decide to add a new measurement column. Clicking this button closes the group (for data entry) but opens the edit group view, where you can add a new column. Once you are finished changing the group, click the **Enter Data** button and you will be back in the data entry view. Any changes you made will be in place.

Colors in the data entry grid

For measurement columns, when specifications are defined, data that is above an upper specification or below a lower specification will appear in red. This is a visual warning for the data entry or process operator that the value entered is beyond the specifications.

Next: [Entering data](#)

Entering data in the Worksheet editor

When a data group is open for data entry, most of the user interaction will occur in the data entry grid. This is a spreadsheet style grid that will be familiar to many users. For the most part, data entry follows the standard steps:

1. Enter a value
2. Press **Enter** to move to the next cell
3. Enter the next value

- At the end of each row, start over at the beginning of a newly added row

Data paging

The data entry grid displays data in pages of 1,000 rows. If the data group contains 1,000 rows or less, the displayed page will contain all the rows in the data group. When you open data entry, the last data page is automatically displayed. The vertical scroll bar on the data grid allows you to move within the current data page.

The following hotkeys can be used to navigate among the data pages:

Ctrl+Home - Open the first data page.

Ctrl+End - Open the last data page.

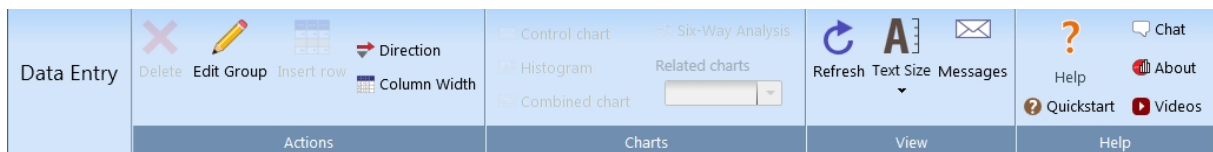
Ctrl+PgUp - Open the previous data page.

Ctrl+PgDn - Open the next data page.

Ctrl+G - Open the data page containing the specified Row Number. If possible, the data page will be centered on the specified Row Number. The specified Row Number will be the current row.

F6 - Make the currently active data entry cell become visible (for when you have scrolled away from it and want to return to it).

Ribbon controls



Delete - Click to delete the currently selected row or rows.

Edit Group - Click to leave data entry and edit the data group's definition.

Insert row - Click to insert a blank row above the current row.

Direction - Click to change the direction of movement that results when the **Enter** key is pressed in a data cell.

Column Width - Click to automatically adjust the column widths of the data entry grid.

Control Chart - Click to display the **Default Control Chart** for the current characteristic.

Histogram - Click to display the **Default Histogram** for the current characteristic.

Combined Chart - Click to display a combination chart containing the **Default Control Chart** and **Default Histogram**.

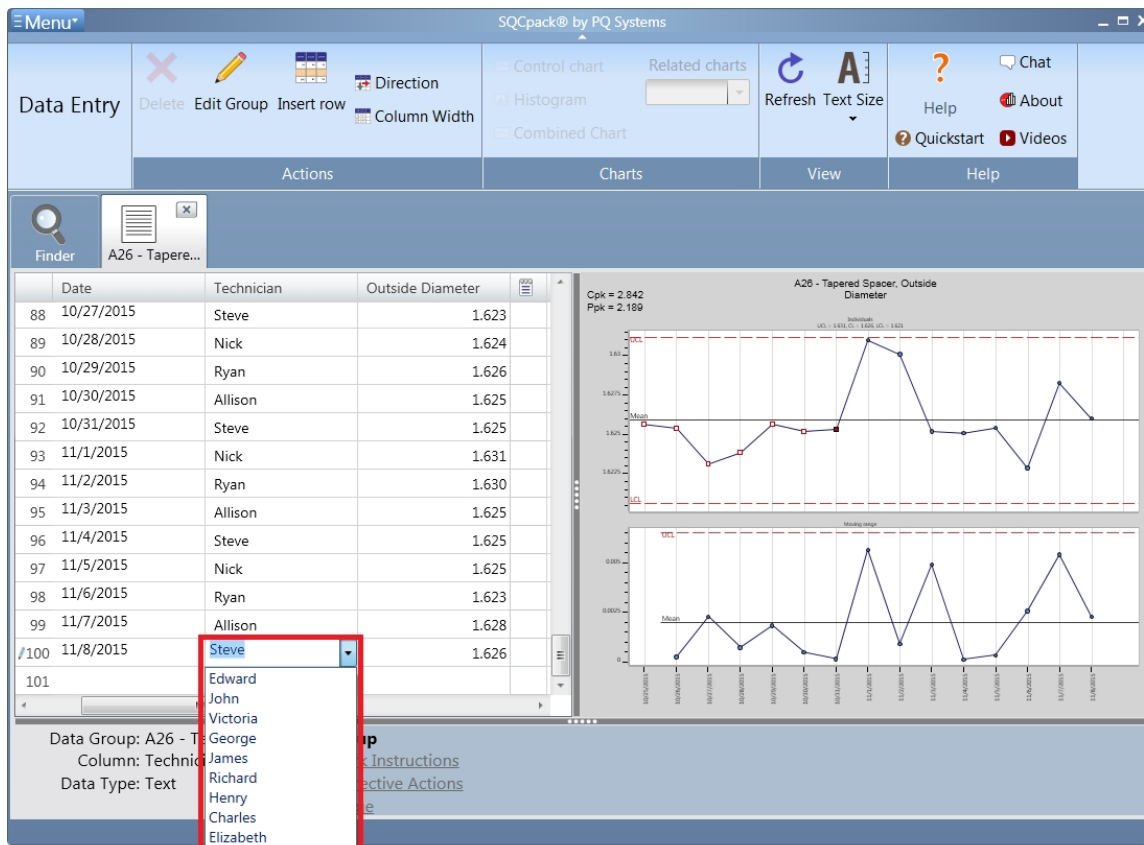
Six-Way Analysis - Click to display a Six-Way Analysis chart for the current characteristic.

Related charts - Click the dropdown to display all charts that are defined for the current characteristic. Click on a chart to display it.

Refresh - Click to refresh to data entry grid in order to see changes made by other users.

Choice lists

When entering data into identifier columns, a choice list may be available. If so, when you arrive in the column, the cell look will appear darker and a drop-down arrow will appear on the right of the cell as shown here:



Different options allow you to use this list. Click on the arrow to drop-down the list and select an item by clicking. If you prefer to keep your hands on the keyboard during data entry, use **Alt+Down** to show the drop-down using the keyboard. Alternatively, if you know the contents of the list, just type the first letter and it will either fill in automatically or show you only the items that start with that letter. These options help to ensure consistent entry of text.

Note – when a data group is defined, it may be set so that identifiers **must match** this choice list. When this is true, you will not be able to type into the cell. When this is not set, you may either type or select from the list.

An identifier column may be defined as a date and/or time. When this is true, you may either press **Enter** or **Tab** to insert the current date and/or time and move to the next cell. To leave a blank date cell without inserting the current date and/or time you can use an arrow key. The format of the displayed date and/or time is determined by the Windows locale settings.

Identifier required

Identifiers may be defined such that entry is **required**. When this is true, you will not be able to leave a newly added row until an identifier has been entered. This helps to ensure completed data entry and can make data analysis more accurate.

Copy from previous

Identifier columns may be defined in such a way that they copy their initial values from the previous row.

When this is true, the identifier may be filled in automatically each time you add a new row. This supports the common work scenario, where a user may enter several rows that have the same exact identifier. When the identifier does need to change, it can be typed over. This is a data entry time-saving option. Optionally, you can use the CTRL+D key on your keyboard to duplicate the value from the cell above.

Calculated columns

A data group may be defined to contain calculated columns. For example, the user may enter Length and Width and a column named Area may calculate automatically. The data entry user can cursor through these calculated columns, but they are read-only and will calculate their values automatically.

Editing restrictions

Each user who logs into SQCpack is acting in a certain **user role**. Depending on how the user role has been defined, the user may be restricted during data entry. For example, users may be defined such that they may enter **new** data but are restricted from editing existing data. Other users may be able to view the data in the data entry form but not allowed to make changes.

If you find yourself unable to enter or modify data on the data entry screen, it may be because of these restrictions.

Full screen awareness

As you enter data on the data entry screen, most of your focus will be in the data entry grid. However, there is valuable information being displayed on the chart, in the area below the chart, and possibly in separate document windows. Do not forget to look around the screen occasionally for useful information!

Next: [Customizing the data entry experience](#)

Notes on using the Worksheet editor

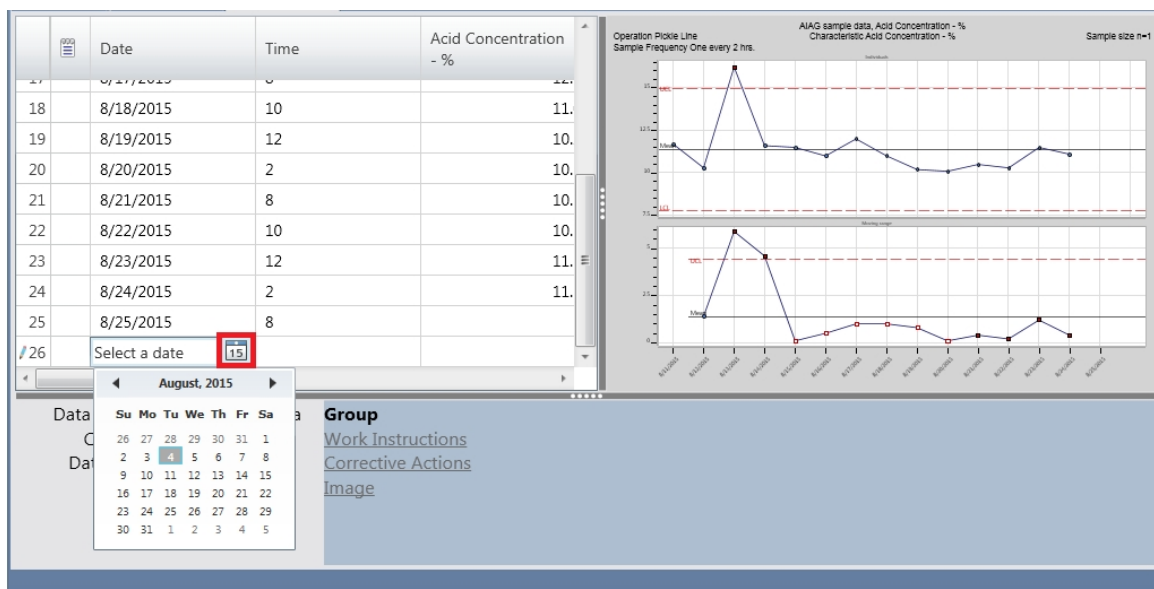
In data entry when you are entering data into an Identifier column that has a **Data type** of date and/or time, the following applies.

After you enter date and/or time data, the cell will display the data based on the date and time settings of the computer, regardless of how the data was entered. For example, if your computer is setup to display 24-hour time, and you enter "6 pm" the cell will display "18:00" or "18:00:00," depending on whether the Identifier is setup to show seconds.

When entering a date value numerically, you can enter the numbers separated by a space, comma, period, hyphen, or forward slash. If you enter the first three letters of the month the software will complete the month. Also, if you do not enter a year the software will complete the date with the current year. If entering date and time, there must be a space between the two values. All of the follow are acceptable:

1.1.15
02 13 15
3,24,15 1600
4/8/16 2p
8-15-16 10:14AM

The date picker is available only when the **Data type** is date only. To open while in data entry, select the calendar (shown below).



When entering a time value, you can enter a partial time and the software will convert the partial time into a complete time as shown in the table below.

| Number of Digits | Input Data | Result |
|------------------|------------|-------------|
| 1 | 7 | 7:00 AM |
| 2 | 13 | 1:00 PM |
| 2 | 10 | 10:00 AM |
| 3 | 123 | 1:23 AM |
| 4 | 1623 | 4:23 PM |
| 4 | 0823 | 8:23 AM |
| 5 | 12232 | 12:23:02 PM |
| 6 | 122312 | 12:23:12 PM |
| 7+ | 1223123 | Invalid |

When entering AM or PM, variations such as: 'a', 'pm', 'aM' and 'Pm' are acceptable. Also, a space is not required between the digits and AM or PM. All of the following are acceptable:

11a
8:02Am
1:14:34 pM

Customizing the data entry experience

Each data group you create will reflect work that happens and data that is collected in a specific work process. The data entry experience can be customized for each data group. For example, in one part of your organization, it may be important for the data entry user to be notified when a value is outside of a specification. In a different area, this may not be important.

Column widths

In the data entry grid, column widths may be adjusted by dragging in the header column. These widths are remembered by user for each data group. Sam might have one set of column widths, while Mary has a different set of column widths, depending on their preferences.

Splitter positions

The vertical and horizontal splitter controls (dark gray) can be dragged to adjust the space allocated to each section of the data entry grid.

Data entry configuration

Most customization for data entry is done using a **data entry configuration**. Each data group specifies a named **data entry configuration** that contains settings to customize data entry behaviors for that data group.

To see which data entry configuration a data group is using, select **Data Groups** from the navigation menu. Select a data group in the list by clicking on it. In the ribbon bar, click the **Edit** button. When the group editing dialog is displayed, click on **Settings** in the ribbon bar. This will display the group settings dialog, as shown below:

If the **Details** section is collapsed, click on the expander button next to **Details** to see all the settings for the group.

SQCpack creates the **Default** data entry configuration automatically. If you never change this when defining the data group, the **Default** data entry configuration will be used.

To create your own data entry configuration, or to change settings in a data entry configuration, follow these steps:

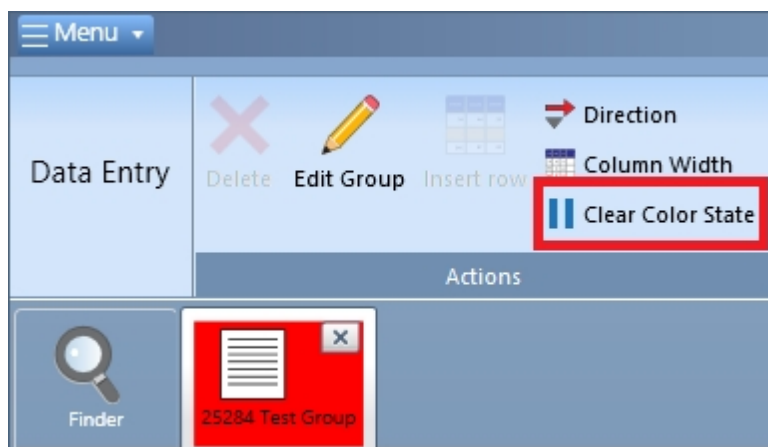
Select **Data Entry Configurations** from the navigation menu. This will display the list of all data entry configurations. Use the **New** button to create a new data entry configuration. Double-click on an existing data entry configuration, or click **Edit** in the ribbon bar, to make changes to an existing data entry configuration.

The **data entry configuration** dialog will open, as shown below:

As you can see above, many aspects of the data entry experience can be customized, as explained below.

Conditional actions

When the **Clear Color State** button is pressed, the color notification in the tab/light pole can be cleared depending on your data entry and [auditing](#) settings. User-entered “reasons” will show up in the audit trail if auditing is enabled and configured.



In your data entry configuration, you can control when this option is available and how it may be used with the **When the color notification is canceled** setting.

1. Cancel is disabled – users cannot cancel color notifications
2. Cancel with no confirmation – no reason or confirmation is required for cancellation

3. Confirm with optional reason – users may choose to enter a reason to confirm cancellation
4. Confirm with mandatory reason – users are required to enter a reason to confirm cancellation

Check the box named **Notify with color when data is out-of-spec / out-of-control** if you want the data entry color state to change when these conditions occur. Use the combo box labeled **Notify based on** to specify which conditions will be checked. The color state will appear on the data entry tab and optionally on a light pole if one is connected.

Out-of-Spec and Out-of-Control

Use these settings to customize actions that occur when some condition is met. The trigger conditions are:

1. Entered value is out-of-spec, either above the upper spec or below the lower spec;
2. Entered value triggered an out-of-control condition on the chart.

When either of these conditions happen, you can require that the user do one or both of these things:

1. Enter a note or corrective action;
2. Enter an assignable cause.

For both tasks, you can make it mandatory that the user enter the information before proceeding.

Other settings

Each setting in this section has an impact on how data entry behaves. Here are the options:

Highlight out-of-spec data in red. Check this box to have out-of-spec data appear in red text.

Display real-time chart for each data characteristic. Check this box to make the real-time chart visible during data entry. Un-check this box if you prefer that no chart be visible during data entry.

Enforce minimum width for chart. Enter a value here to prevent the real time chart from being shrank past the entered percentage.

Number of samples to display. Enter a value here to control how many of the latest data entries are displayed in the real time chart.

Selecting enter commits the data... Check this box if you want the cursor to stay in the current cell the first time you press Enter. This can be useful as it allows the chart (for this column) to update so the user can look at it before moving to the next column. When un-checked, Enter moves the cursor to the next column without giving the chart a chance to reflect the value just entered.

Font size for data entry grid. Use this to make the text size larger or smaller in the data entry grid.

Sample prompting

Check the box named **Enable sample prompting** if you want SQCpack to prompt the data entry user when it is time to enter new data. Once this box has been checked, several options to customize how this prompting works become visible.

Number of minutes between sample prompts. If you enter 30 into this box, the data entry user will be prompted to enter new data every 30 minutes.

When does new a time interval begin? Select one of options below that best meets your needs.

When sample prompting is enabled and when the user has not yet entered the data that was prompted for, three different color states are used to let the user know: Green, Yellow, and Red. These colors become visible in the software in the tab header for the data entry tab being used. Optionally, the colors can be made visible with an optional light pole attached to the computer.

Green means that it is time to enter new data (take a new sample). **Yellow** means that some amount of time has passed since the user should have entered new data. **Red** means that *too much* time has passed

since the user should have entered new data. The delays between these three warning colors are set by entering a number of minutes for each color.

When the prompt is canceled. Use this combo box to selection options for allowing (or not allowing) the user to cancel a prompt for entering new data.

Prompt using popup message. Check this box if you want a pop-up message to appear when the user should enter new data.

Prompt using light pole when sample not entered. If you have a light pole attached to the computer, check this box to use it with the colors described above. For information on configuring a light pole to use with SQCpack, see [Appendix C: Light Pole Integration](#).

Prompt user for mandatory reason when sample not entered. Check this box to require the user to enter a reason for not entering the data that was prompted for.

Send email when sample not entered. Check this box and fill in the email recipients, to have an email sent when a data entry user does not enter the data that has been prompted for. If prompting is enabled, the user can pause the prompting by selecting Pause Prompting in the ribbon. This may be necessary if there is no data to be measured when it is time for the next measurement to occur or when a user is browsing the data entry screen with no intention of adding data.

Reference - SQCpack Reports

This is a reference section that contains topics related to using reports in SQCpack.

When to use Reports

SQCpack Reports allow you to summarize statistical data from multiple data groups. Use Reports when you need to review or present summary statistical data.

Reports allows you to sort or rank data based on an important statistic. For example, you might use the capability index (**Cpk**) to rank your report results. This allows you to see data from many data groups, maybe all of your groups, ordered from best to worst, based on Cpk. Alternatively, you could rank the results based on the number of points out-of-control on a control chart.

SQCpack Reports may be previewed on screen, printed, or saved to a file in several different formats. The image below is an example of an SQCpack Report:

**Example Report
Ranked by Cpk
Lowest Cpk first**

**Ordered
by Cpk**
↓

Titles section

Statistics section

| Group | Characteristic | Mean | Cpk |
|--------------------------|--------------------------|------------|------|
| Test group 05 | Bore B-23 Diamter | 0.249 | 0.39 |
| Test group 01 | Gap width | 0.005 | 0.54 |
| Test group 02 | Connecting rod length | 565.646 | 0.84 |
| Test group 04 | Bore #2 depth | 1.05 | 0.94 |
| Test group 06 | Arsenic PPB | 30118.389 | 1.15 |
| Test group 03 | CuSO4 ppb | 100896.023 | 1.25 |
| Test group 07 | Pounds of force at break | 127.166 | 1.33 |
| Test group 07-B, 5 chars | Width - split 5 | 127.098 | 1.57 |
| Test group 07-B, 5 chars | Width - split 4 | 127.094 | 1.59 |
| Test group 07-B, 5 chars | Width - split 3 | 126.916 | 1.6 |
| Test group 07-B, 5 chars | Width - split 1 | 127.184 | 1.67 |
| Test group 07-B, 5 chars | Width - split 2 | 127.536 | 1.72 |

Creating or customizing a Report

Creating a report requires that you have defined at least one data group, preferably more, and entered data into the group(s). Reports in SQCpack are based on data entered into data groups. If you have not yet entered data into SQCpack, open the sample database to follow along in this section.

The reports list is visible in the **Finder** tab. To get started, select **Reports** from the navigation menu. This will display the list of reports currently defined. The ribbon bar contains buttons for previewing, creating, copying, editing, and deleting reports. As with other lists in SQCpack, some ribbon bar buttons are available only when you have selected an item in the list. An item that is selected shows a checkmark in the first column of the list.

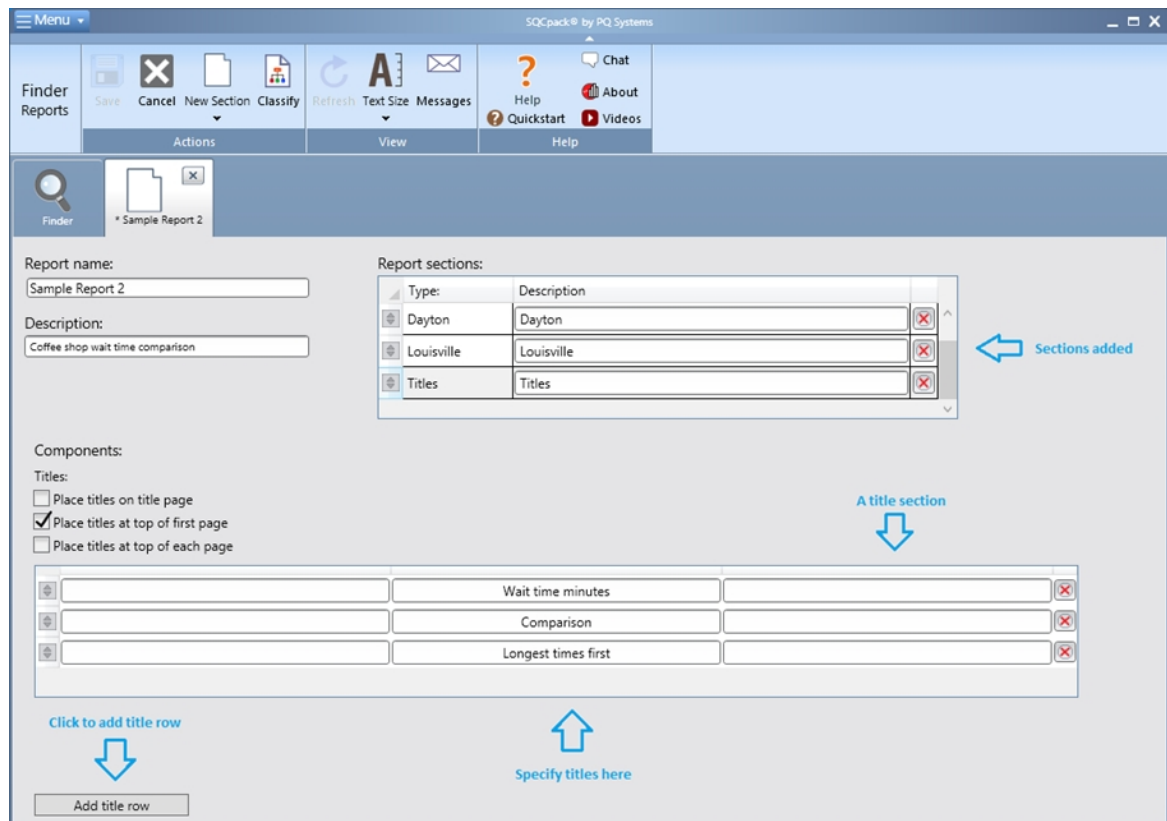
In the ribbon bar, click the **New** button to create a new report. This will open a new tab in the work area. Start by entering a name and optional description for the report.

On the left side of the work area, you will see the **Report Sections** grid. All reports are made up of one or more report sections. Each section has a type and description. To create a new section for the report, use the **New Section** button in the ribbon bar. Notice that this button has a drop-down triangle at the bottom. This allows you to create one of two types of report sections:

Titles section

Add a titles section to add one or more rows of titles within the report. A report typically has one title section. However, you may add multiple title sections if you organize your report into different groupings.

Use the **New Section / Report titles** button to add a titles section. This will show in the report sections grid as shown below:



In the image above, three title rows have been added. To delete any title row, click the red x to the right of the title row. Check the boxes above the title rows for how you want the titles applied within the report. Notice that each title row may have a left, center, and right title.

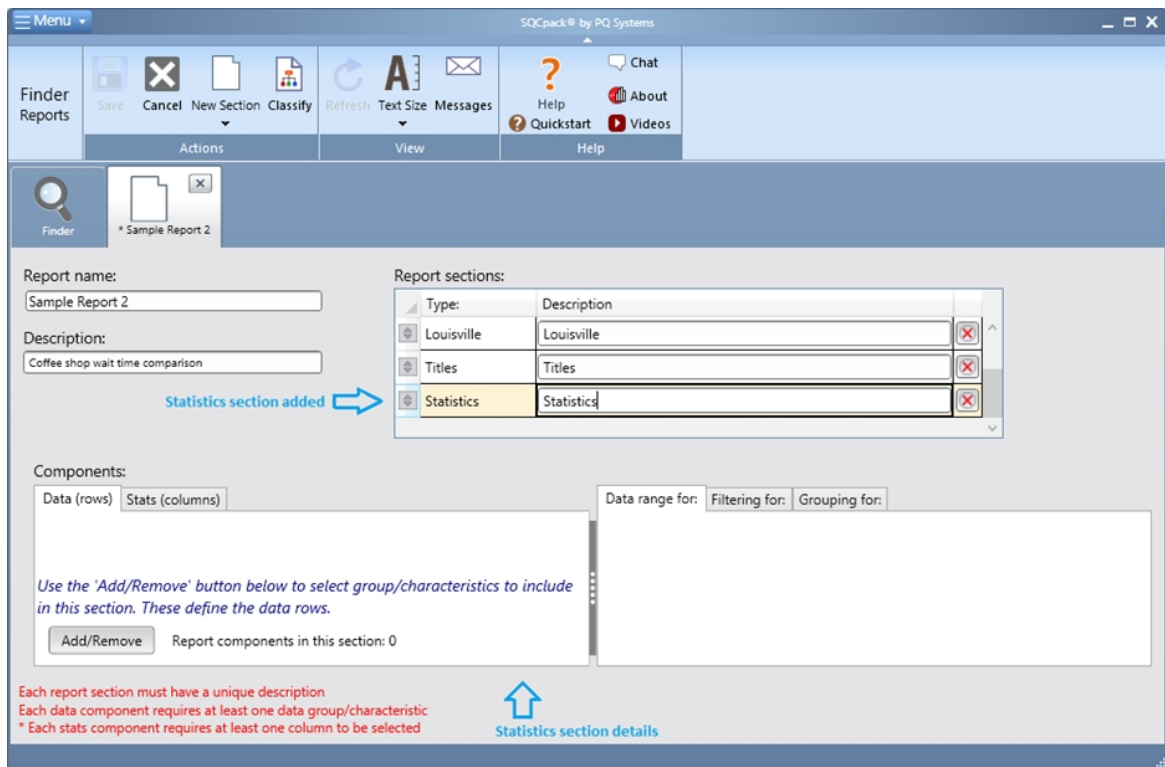
Title substitution codes

Within any report title, you may use a title substitution code. For example, if you enter **@D** within a report title, when the report is rendered or printed, it will put in the **date** in place of the **@D**. For the full list of supported codes, see [Report title codes](#).

Statistics section

Add a statistics section to add rows of data to the report that contains statistics. Each row in a statistics section will contain information from one data group / characteristic combination. For example, with a group named *Disc Plate* that contains two measurement columns *Length* and *Width*, you may have two rows of data in a statistics section; one for Length and one for Width. The columns for a statistics section are configured while defining the report. For example, you might define four columns: *Characteristic Name*, *Mean*, *Min*, *Max*.

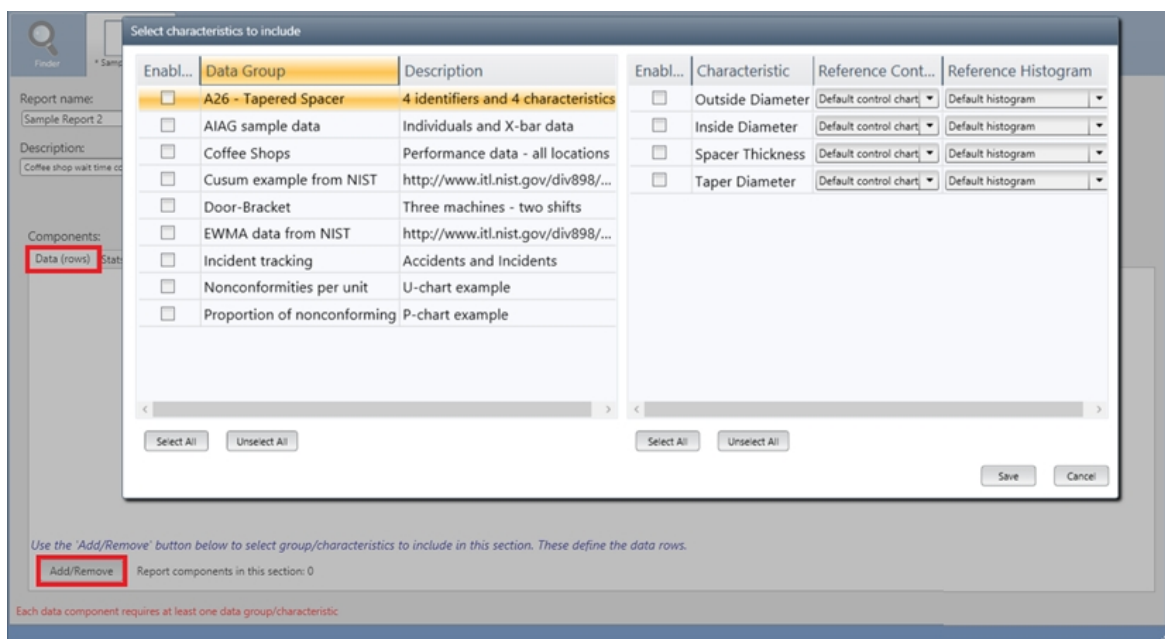
Use the **New Section / Statistics** button to add a statistics section. In the image below, the **Report Sections** grid now shows two rows, and the second row is the statistics section just added. When a statistics section has been selected, the work area to the right shows two tabs that help to define what rows and columns of data you want in the statistics section. In the image below, the statistics section is selected:



In the work area below are several tabs used to define the statistics section. The first two tabs describe the rows and columns for the section. Each row represents one metric as defined by a data group plus characteristic combination. Each column defines one piece of information for the row. For example, you might have columns for group name, characteristic name, Mean, Min, Max.

Data (rows)

On the Data (rows) tab, click the **Add** button to add rows to this section. When you click the **Add** button, you will see a list of data groups / characteristics. Check each one that you would like to include in this statistics section. If you select six items, this section will have six rows when the report is rendered. To report on all metrics in the database, use the **Select all** button. The image below shows the dialog for selecting data groups / characteristics. Of course, your names will be different.



Once you click **Save**, the Data (rows) tab will reflect the choices you made, showing the group and

characteristic names as shown below:

Stats (columns)

Click on the **Stats (columns)** tab to bring it to the front. Use this tab to select the columns you want in this section of the report. Click on the **Get me started** button to add three commonly used columns. Use the **Select Columns** button to further customize columns to appear in this section. Each column you add may be customized with up to three column headings and the number of decimals to use when formatting statistics. Below the columns area are selection options to specify how the rows in this section are ordered.

Menu

SQCpack® by PQ Systems

Finder Reports

Save Cancel New Section Classify Refresh Text Size Messages

Help Chat About Quickstart Videos

Finder

Sample Report 2

Report name: Sample Report 2

Description: Coffee shop wait time comparison

Report sections:

| Type | Description |
|------------|-------------|
| Titles | Titles |
| Dayton | Dayton |
| Louisville | Louisville |

Components:

Data (rows) Stats (columns)

Content: Characteristic name Mean

Heading1: (Dayton)

Heading2: .

Heading3: Characteristic name Mean

Decimals: 0 3

Primary Order By: Clear

Secondary Order By: Clear

☐ Suppress footnotes

Select Columns

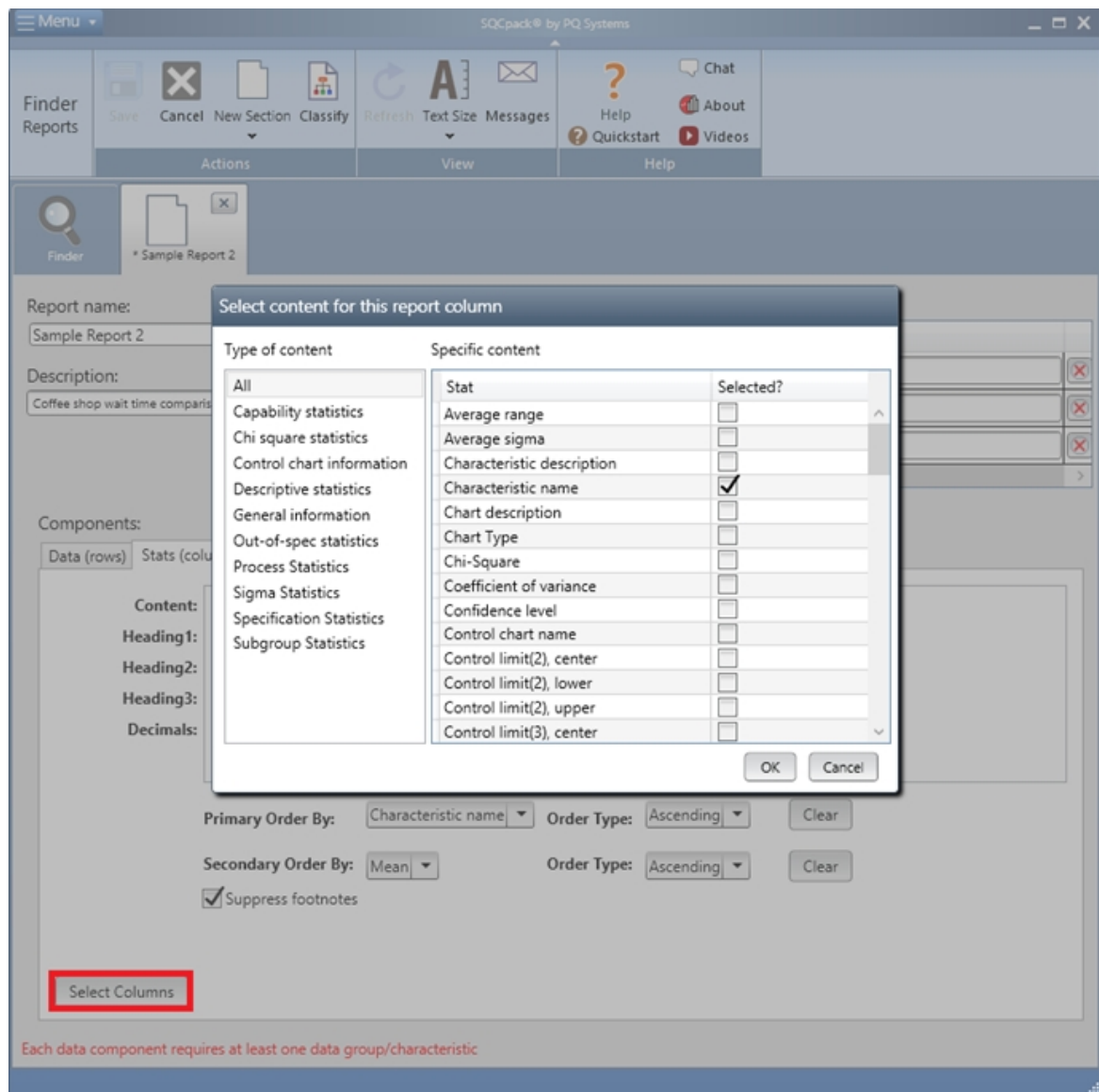
In the image above, the columns have been specified, and criteria for how the rows will be ordered have been selected.

If a selected stat column does not exist for a select data row, footnotes will be inserted into those cells in the table explaining which values are not available.

| | | | |
|-----------------------------|-------|--------|-------|
| Support Brace - All Defects | 1.957 | E1 | E2 |
| Taper Diameter | 1.251 | 0.0025 | 0.002 |
| Width | 2.029 | 0.0137 | 0.010 |

E1 = Unexpected condition: Value not available for "Average range".
 E2 = Unexpected condition: Value not available for "Average sigma".
 E3 = Unexpected condition: Value not available for "Chi-Square".
 E4 = Unexpected condition: Value not available for "Confidence level".

There are many options for columns to include. Click on the **Select Columns** button to display a dialog showing the entire list of options and select the columns you want. The dialog looks like this:



To make it easier to find the column you seek, click on a *type* in the left list. This will make the list on the right show only items of that type.

Reference control chart and reference histogram

One of the statistic columns you might select is **Number out-of-control**. Since this statistic requires a control chart to furnish control limits and out-of-control test rules, SQCpack needs to know *which* control chart to use. The same is true for statistics that may come from a histogram. For example, **Cpk** is usually

calculated in the context of a histogram.

For each row in a statistics section, there can be a reference control chart and a reference histogram. Unless you override this, the chart used will be the **Default** chart. When a data group is created, a special control chart and histogram are automatically created. These are known as the **Default control chart** and the **Default histogram**. Settings on these charts can affect the calculations that lead to these report statistics.

Reference control chart

The reference control chart is mandatory. It provides the following information:

- Control limits for statistics that depend upon control limits.
- Out-of-control (OOC) test rules.
- Other information needed to calculate statistics that are associated with the control chart.
- The *moving subgroups* value for individuals data (overrides the histogram *moving subgroups* value).
- Sampling and grouping information from the 3rd step of the chart wizard (overrides *sampling* and *grouping* defined in the histogram).

Reference histogram chart

The reference histogram chart provides information about how to calculate statistics that normally are associated with the histogram chart.

Filtering and subsetting the report data

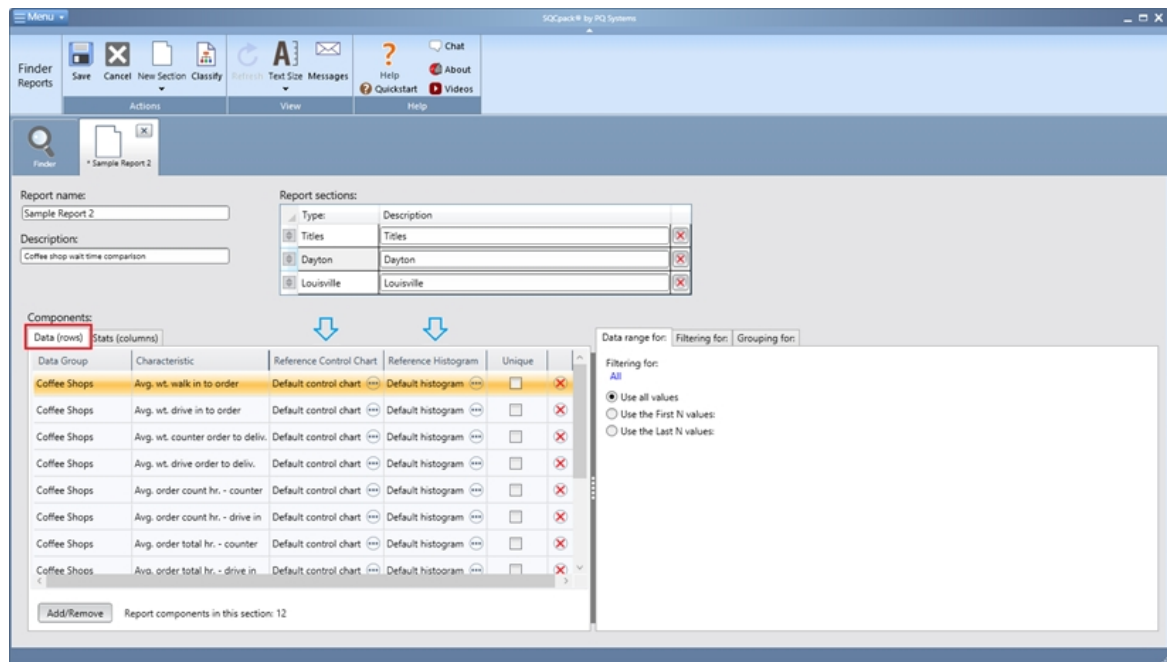
The filter defined in the report overrides the filter defined in the reference control chart and the histogram chart.

Likewise, the subset (All, First N, Last N) defined in the report overrides the subset defined in the reference control chart and the histogram chart.

These overrides occur only in the context of rendering the report. The definitions of the reference control chart and reference histogram chart **are not** changed in the database.

Selecting a different reference control chart or histogram

To use a chart *other* than the default charts, on the **Data (rows)** tab, click the button in the *Reference Control Chart* column or the button in the *Reference Histogram* column. This will allow the report to use a different chart when calculating statistics. These are highlighted in the image below:



At this point, we have addressed the first two tabs used in defining a report statistics section:

1. **Data (rows)** – defines what rows will be in the section; each row is a group / characteristic
2. **Stats (columns)** – defines what columns will be used; e.g. characteristic name, Mean, Cpk

Use the remaining three tabs as follows:

1. **Data range for** – select the specific data to use for calculating statistics.
2. **Filtering for** – set criteria for limiting data to use for calculating statistics.
3. **Grouping for** – set up groupings; for example, group into weeks or months.

Data range for (tab in report statistics section)

Options in this tab determine which data rows will be used to calculate the summary statistics shown in this section. Choose among these options:

1. Use all the value
2. Use the First N values (you get to specify N)
3. Use the Last N values (you get to specify N)

Consider the data entry screen for each data group you include in this section. Do you want the statistics to be based on all the rows you have entered? Or, more commonly used, do you want to report on the most recently added rows?

Let's say you decide to use the **Last 100 data rows**. Any report column that calculates a statistic such as the mean, the Cpk, or the number out-of-control will use the Last 100 rows of data to make this calculation.

By default, this will be applied to **all** of the rows in this section. For example, imagine the **Data (rows)** tab looks something like this:

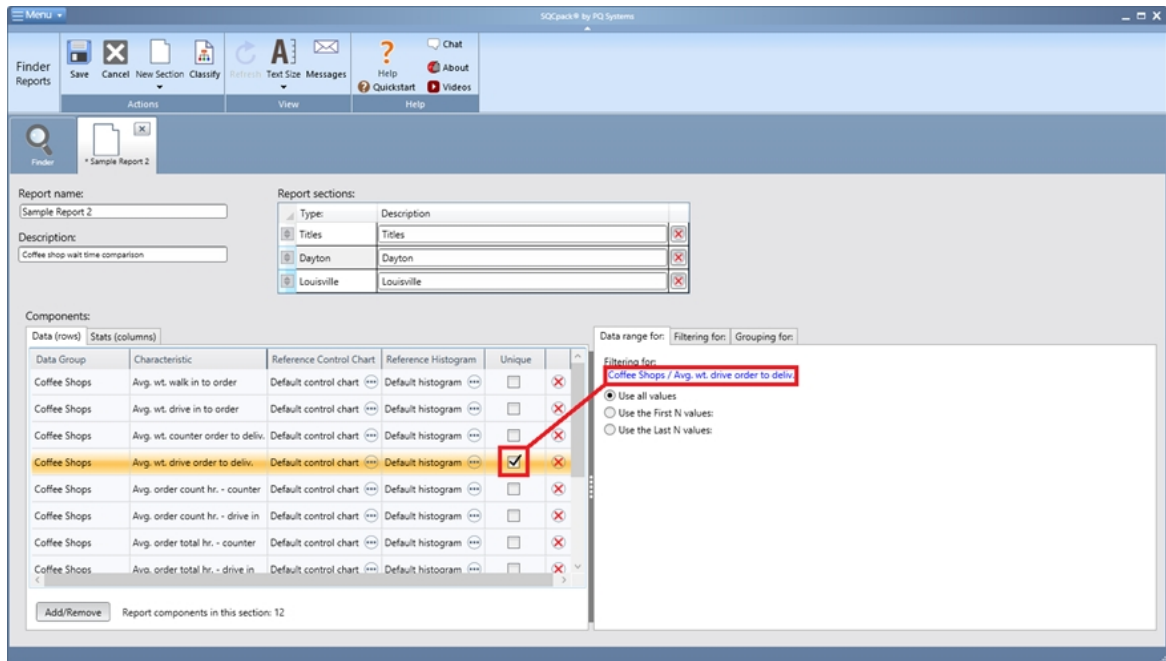
Group1, Length
Group2, Width
Group3, Height

Each of these groups has a data table. From each data table, the most recent 100 rows of data will be used.

In some cases, you may want each row to use **its own unique** data rows selection. For example:

Group1, Length, **use last 50 data rows**
 Group2, Width, **use all data rows**
 Group3, Height, **use last 75 data rows**

In this case, you must click the **Unique** column for the row in the **Data (rows)** tab – as highlighted in the image below:



Here, the selected row has its own **unique** setting for which data rows to use. As you select different rows in the Data (rows) tab, the information in the **Data range for** tab can change.
Data range for (tab in report statistics section)

Filtering (tab in report statistics section)

If you wish to include a **subset** of the data rows, as specified in a filter, use the **Filtering for** tab as shown below:

Finder Sample Report 2

Report name: Sample Report 2

Description: Coffee shop wait time comparison

Report sections:

| Type | Description |
|------------|-------------|
| Titles | Titles |
| Dayton | Dayton |
| Louisville | Louisville |

Components:

| Data Group | Characteristic | Reference Co |
|--------------|----------------------------------|---------------|
| Coffee Shops | Avg. wt. walk in to order | Default contr |
| Coffee Shops | Avg. wt. drive in to order | Default contr |
| Coffee Shops | Avg. wt. counter order to deliv. | Default contr |
| Coffee Shops | Avg. wt. drive order to deliv. | Default contr |

Data range for: Filtering for: Grouping for:

Filtering for: All

+ Condition + Date within + Clause + NULL test + Range View

Store is equal to Dayton

Add/Remove Report components in this section: 4

On the filtering tab, you can use the buttons to add different types of filter criteria. You have these options:

1. **Condition** – Allows you to add a filtering condition. Here are some examples:
 - a. Operator *is equal to* Sam
 - b. Mfg Date *is greater than* 08/01/2015
2. **Date within** – Allows you to include a specific date range for data to include; for example:
 - a. Mfg Date *is within* this month
 - b. Mfg Date *is within* prior N years (when **Inclusive** is selected, the date range includes the current year)
3. **Clause** – Allows you to enter a free form filtering clause. With this option, you must pay careful attention to column names. Here are some examples:
 - a. [[Mfg Date]] > '01/01/2014' AND [[Mfg Date]] <= '01/31/2014' (see [Using the SQL clause filter item](#))
 - b. [[Operator]] = 'Sam' OR [[Operator]] = 'Mary'
4. **NULL test** – Allows you to add a test for null or not null. For example:
 - a. Operator *IS NOT NULL*
 - b. Operator *IS NULL*
5. **Range** – Allows you to add a test for data within a range. For example:
 - a. Width is between 33.1 and 44.1 (inclusive or not-inclusive)
 - b. Mfg Date is between 08/01/2014 and 08/01/2015 (inclusive or not-inclusive)

By default, Filtering is applied to **All** of the groups / characteristics selected on the **Data (rows)** tab. However, as with the data range, the filter may be specified to be unique per group / characteristic, as shown below:

When defining an **All** filter (also called a [Generic Filter](#)) you can select **{First Date Identifier}** or **{First Time Identifier}** from the drop-down list of columns.

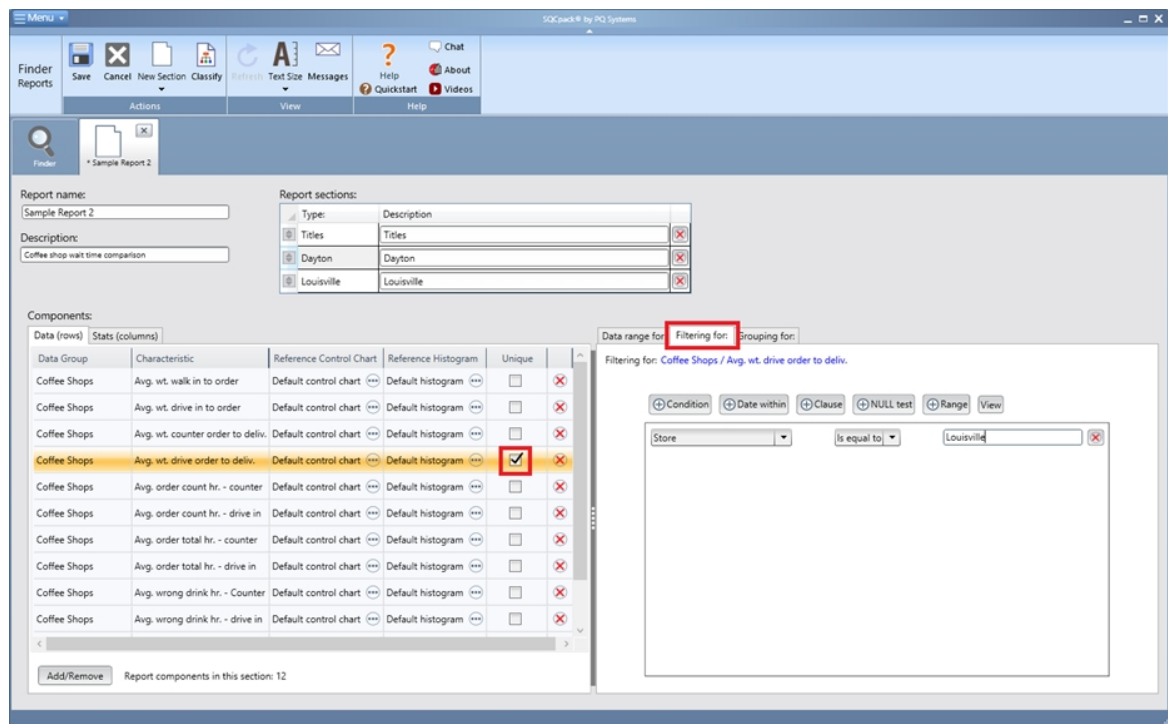
- **{First Date Identifier}** - This will select the first **DateTime** identifier in the data group. If no

DateTime identifier is available in the data group, the first **Date** identifier will be selected. If no Date identifier is available in the data group, the filter condition row will not be applied to the reference chart. *First* in this case is determined by the column order shown in Data Entry.

- **{First Time Identifier}** - This will select the first **Time** identifier in the data group. If no **Time** identifier is available in the data group, the filter condition row will not be applied to the reference chart. *First* in this case is determined by the column order shown in Data Entry.

The **All** filter is applied to the reference chart's filter as follows. If the **All** filter contains a **Clause** filter item, or if the column name of any filter condition row matches a data source column, then the **All** filter will be applied. When the **All** filter is applied, all existing filter condition rows in the reference chart's filter are deleted. If the column name specified in a filter condition row of the **All** filter matches a column that exists in the reference chart's data source, then that filter condition row is applied to the reference chart's filter. In other words, the matching rows of the **All** filter completely replace the filter criteria rows in the reference chart's filter.

The **All** filter is *not* applied to the reference chart's filter if the **All** filter does not contain any filter condition rows.



Since the **Unique** checkbox is checked for **Thickness**, the filtering on the right is applied **only** for Thickness and **not** for the other rows.

Grouping (tab in report statistics section)

When each of the groups you wish to include in your report has a **date** or **datetime** identifier, you may use **grouping**. Grouping allows you to report on different time increments. Imagine a basic report that contains this information:

Group1, Length, Mean, Min, Max
Group2, Width, Mean, Min, Max

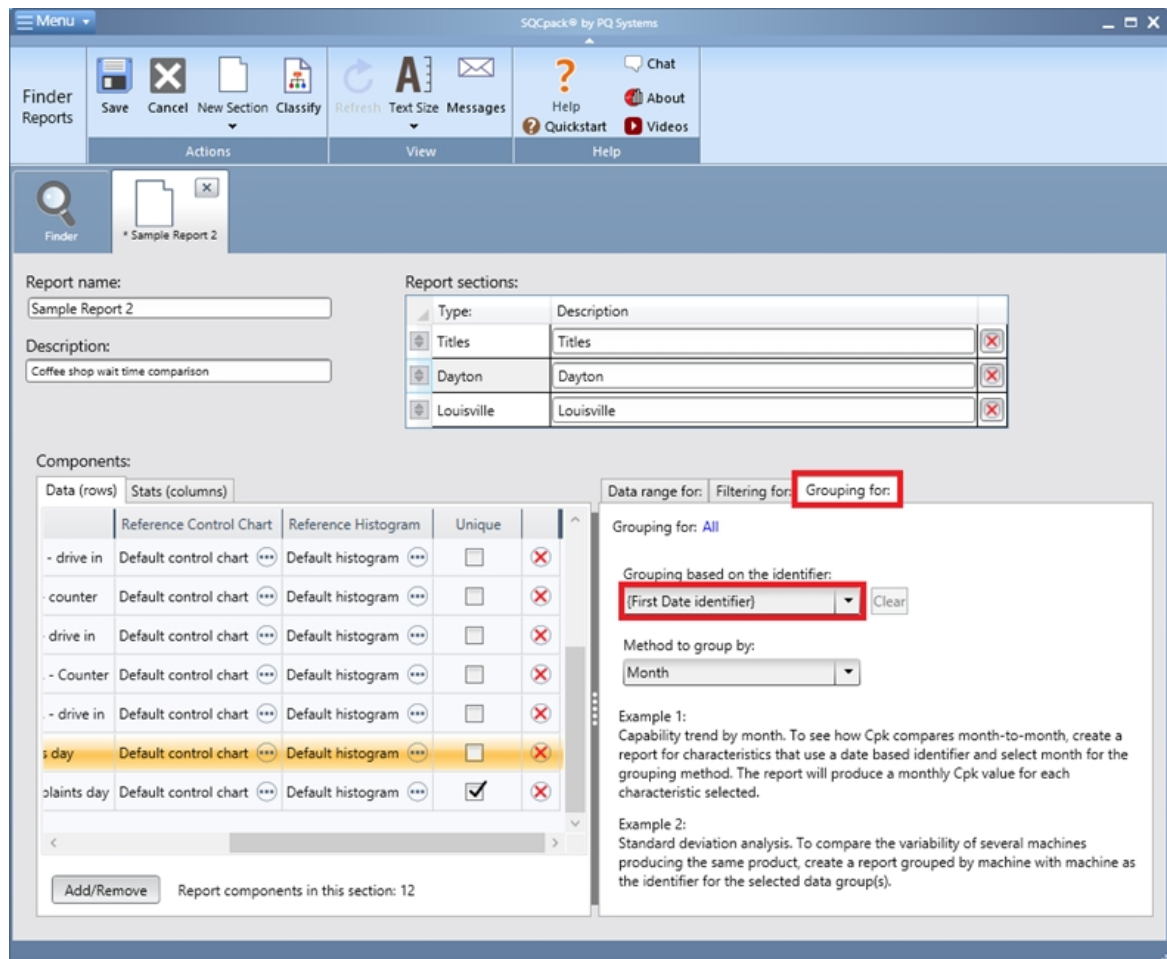
If you do not apply grouping, the final report will contain two rows: one for Group1 and one for Group2.

If you group by a date identifier and you specify to **group by month**, your report may have multiple rows for each of Group1 and Group2 as follows:

Jan 2015, Group1, Length, Mean, Min, Max
 Jan 2015, Group2, Length, Mean, Min, Max

Feb 2015, Group1, Length, Mean, Min, Max
 Feb 2015, Group2, Length, Mean, Min, Max

Grouping for (tab in report statistics section)



Grouping by the First Date Identifier

Sometimes you will want to perform grouping by date, but the data groups in the statistics section might have different names for the Date or DateTime identifier. In this case, you can select **{First Date Identifier}** from the drop-down list. The report will group on the first DateTime identifier in the data group. If no DateTime identifier is available in the data group, the first Date identifier will be selected. If no Date identifier is available in the data group, no grouping is performed. *First* in this case is determined by the column order shown in Data Entry.

Grouping by the First Time Identifier

Sometimes you want to perform grouping by time, but the data groups in the statistics section might have different names for the Time identifier. In this case, you can select **{First Time Identifier}** from the drop-down list. The report will group on the first Time identifier in the data group. If no Time identifier is available in the data group, no grouping is performed. *First* in this case is determined by the column order shown in Data Entry.

When grouping by time, please select from the **Method to group by** list only Second, Minute or Hour.

Summary for creating a new report

Select **Reports** from the navigation menu. Click the **New** button in the ribbon bar to create a new report.

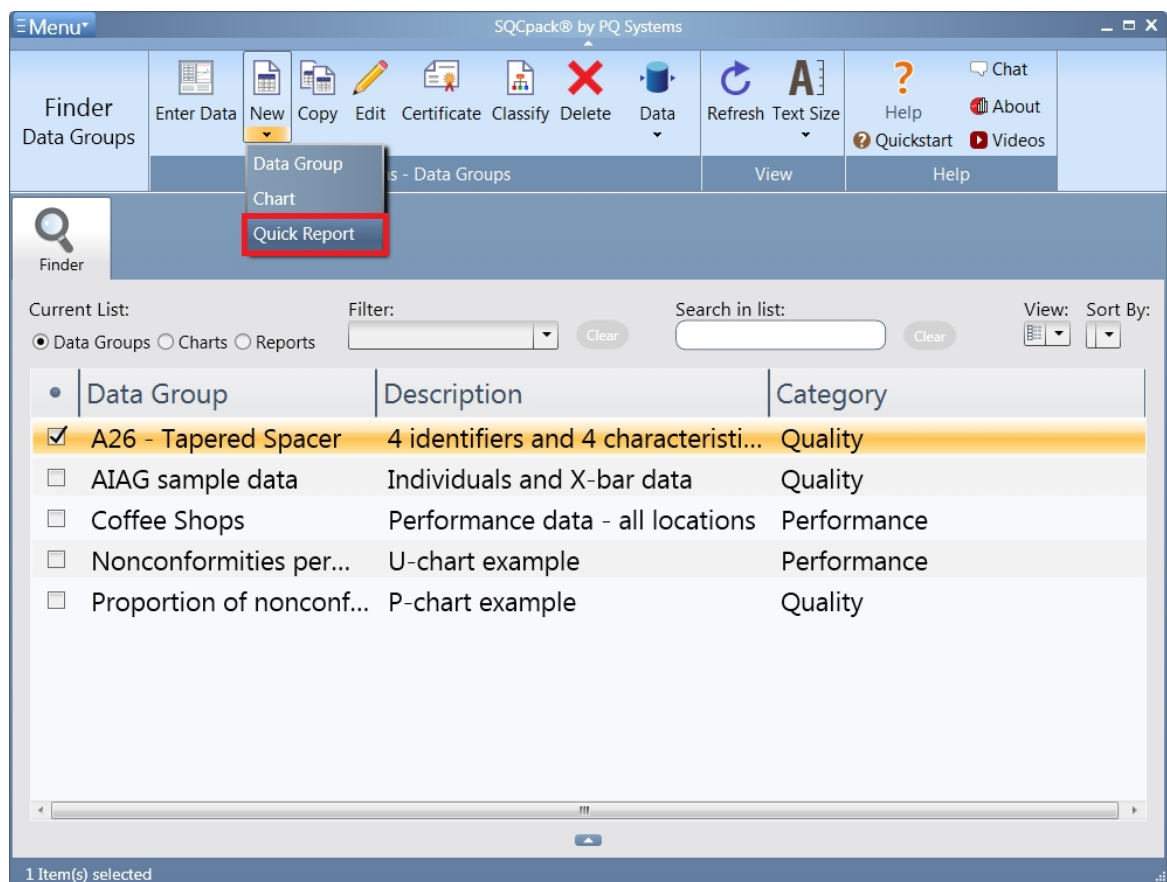
Give the report a name. Add at least one title section and one stats section to the report. In the stats section, select the groups / characteristics that will make up the data rows. Also, in the stats section, add the columns you wish to include, such as group name, mean, min, and Cpk. Click the **Save** button to save your report. It will now be visible in the list of Reports.

Creating a Quick Report

The **Quick Report** feature allows you to create a new report quickly and easily by selecting a data group from the finder window, selecting the drop down below **New** in the ribbon and clicking **Quick Report** (shown in the red rectangle below).

The new report will be added to the list of available reports in Finder.

The default columns for a new Quick Report are specified in **General Settings** under the **Quick Report** tab, for more information see [Quick Report default columns](#).

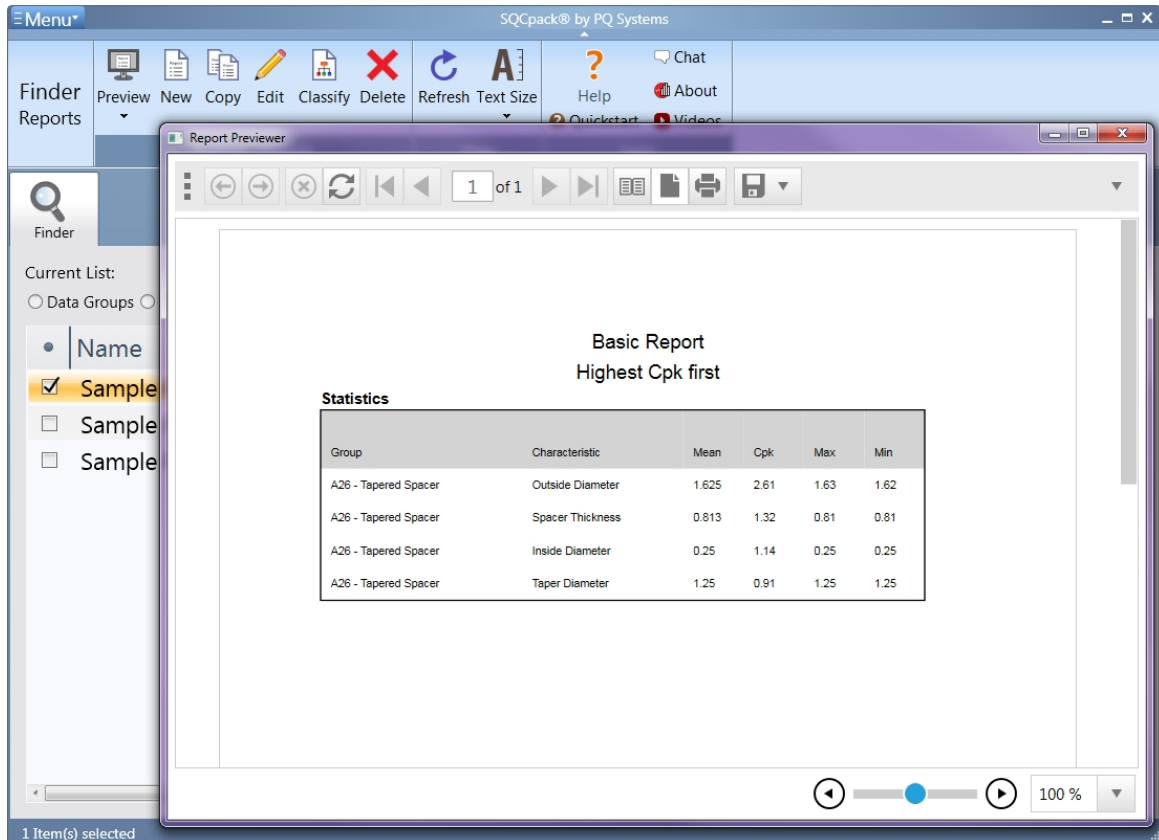




Previewing / Printing / Saving a Report


From the navigation menu, select **Reports**. If you do not see any reports in the list, you must first create a report. See [Creating or customizing a Report](#) for how to do this.

Select the report you wish to preview or print. Do this by clicking once on it in the report list. This will put a checkbox in the first column, which means the report is **selected**.

Click the **Preview** button in the ribbon bar. The results of the report will be calculated. Next, a separate window will be displayed containing the report. This is the **Report Previewer** window. An example is shown below:



Use the  button in the Report Previewer window to print the report. Use the  button to setup the properties of the printed page.

Use the  button in the Report Previewer window to toggle between *print preview* and *interactive* mode. If you are not going to print the results you may prefer *interactive* mode.

Use the  button in the Report Previewer window to save the report to a file of the selected type.

Automatically creating Reports

You can use [Command Parameters](#) to create one or more reports on a periodic basis.

For example, you might have several reports that you want to review each morning. Using the Windows Task Scheduler, you can create a scheduled task that runs each night to generate the reports. Running the reports at night is convenient when the reports take an extended time to complete.

Below is an example of how to generate all reports that begin with "Daily" as PDF files that are placed in the C:\MyReports\ folder:

Note that since the command file has the SQCX file extension you can double-click the SQCX file in Windows/File Explorer to create the reports. Or, you can drag-and-drop the SQCX file onto SQCpack.

Create the text file "SQCpack-Create-Daily-Reports.sqcX" as follows. You can put it anywhere you like.

```
; Minimize SQCpack so that it doesn't get in the way while you do other
things.
/SQCPACK MINIMIZED
```

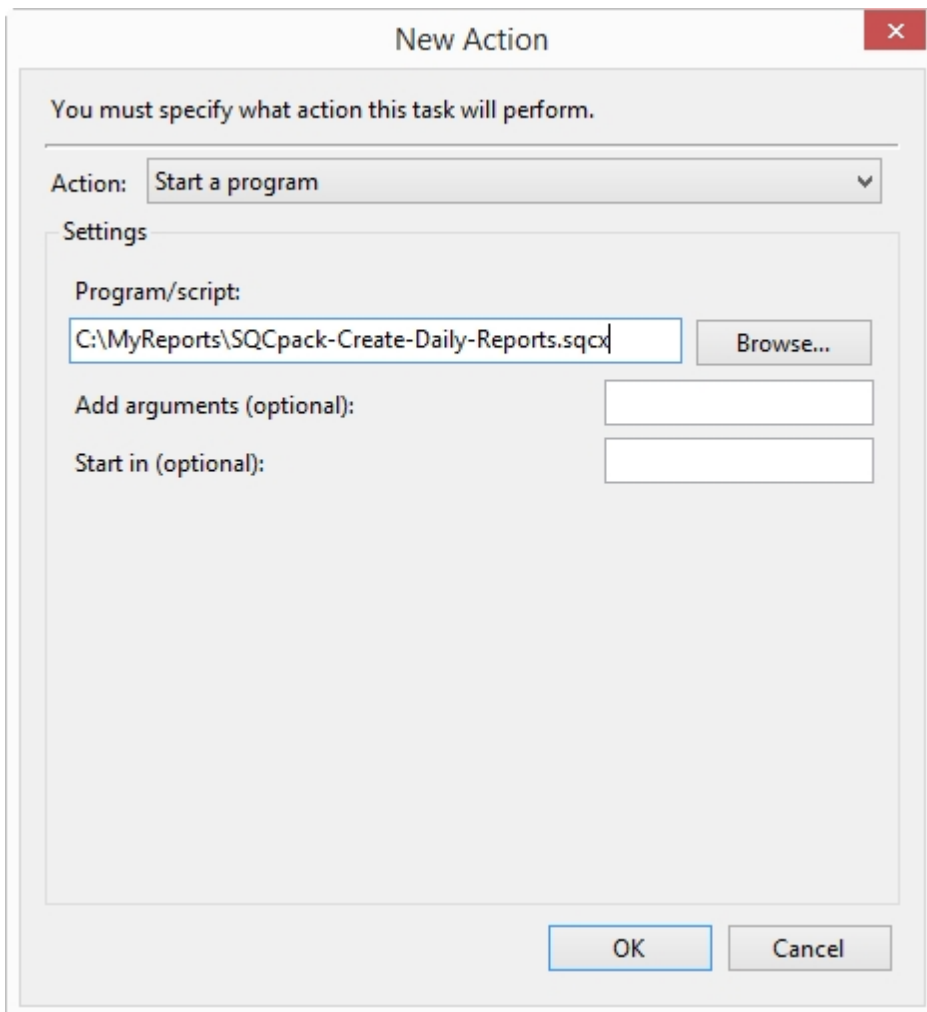
```
; Specify the output folder where the report PDF files are created.
/OUTPUT "C:\MyReports\"

; Generate the reports having a name that begins with "Daily" as PDF files in
the output folder.
/REPORT "Daily*" PDF

; Close SQCpack.
/EXIT
```

Notice the wildcard character * in "Daily*" - that is what causes all reports that begin with "Daily" to be generated.

Open Task Scheduler and set up a daily task to run the "SQCpack-Create-Daily-Reports.sqc" command file at the desired time.



Reference - Certificates of Analysis

SQCpack allows you to create a Certificate of Analysis based on the characteristics in a data group. Each Certificate of Analysis is based on a Microsoft Word template document. You can customize your template documents to present the information you need to send to your customers.

This is an example of a Certificate of Analysis that was created by SQCpack:

PQ Systems

Certificate of Analysis

| | | | |
|----------------------|---------------------------|----------------|-----------------|
| Customer: | Acme Manufacturing | PO# | 42203 |
| Product: | A26 - Tapered Spacer | | |
| Article No.: | TSA-5523 | Specification: | Standard TS-443 |
| Finish: | 00653 | Material Lot # | 1141321 |
| Data Range: | 30 days up to 15-Jun-2015 | | |
| Certificate Created: | 7/16/2015 12:08:25 | | |

This template is an example of specifying a table of characteristic information by using characteristic-specific value tags.

| Results: | Lower Specification | Upper Specification | Mean Value |
|------------------|---------------------|---------------------|-------------|
| Outside Diameter | 1.61 | 1.651 | 1.6257" |
| Inside Diameter | 0.245 | 0.255 | 0.2502" |
| Spacer Thickness | 0.81 | 0.815 | 0.8124 lbs. |
| Taper Diameter | 1.245 | 1.255 | 1.2506 |

Follow these steps to create your own Certificate of Analysis.

[Create a Certificate of Analysis](#)

[Certificate template files](#)

Create a Certificate of Analysis

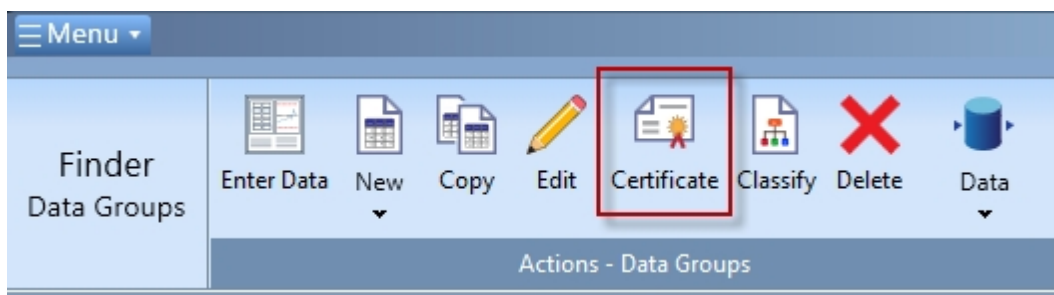
Follow these steps to create a Certificate of Analysis.

A Certificate of Analysis is based upon the characteristics and data found in the specified data group.

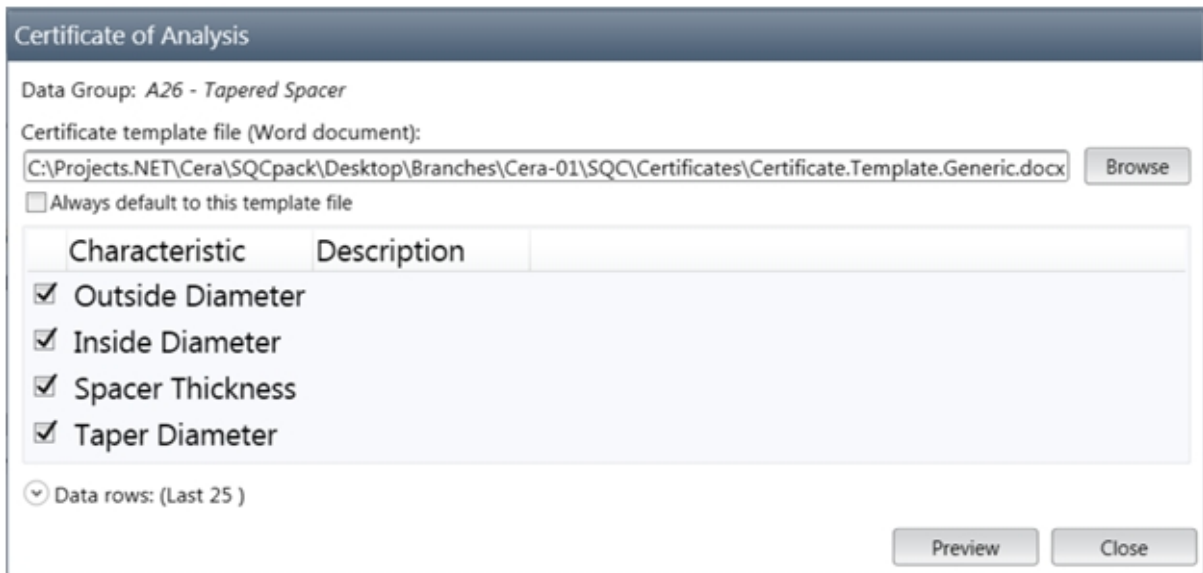
The format of the certificate is determined by the template file that you select. SQCpack comes with several examples of template files. You will probably want to create one or more template files with your own customized design. More information about creating and editing template files is available at [Certificate template files](#).

Select **Data Groups** from the navigation menu. This will display the list of available data groups.

Select the data group that you want to use as the basis for creating the Certificate of Analysis.



Click the **Certificate** button (shown above) in the ribbon to start the Certificate of Analysis generation process.



Certificate of Analysis

Data Group: *A26 - Tapered Spacer*

Certificate template file (Word document):

☐ Always default to this template file

| Characteristic | Description |
|--|-------------|
| <input checked="" type="checkbox"/> Outside Diameter | |
| <input checked="" type="checkbox"/> Inside Diameter | |
| <input checked="" type="checkbox"/> Spacer Thickness | |
| <input checked="" type="checkbox"/> Taper Diameter | |

▼ Data rows: (Last 25)

Click the **Browse** button to select the Certificate template file you want to use as the basis for the Certificate of Analysis. The template file is a Microsoft Word DOCX document that has been set up to work with SQCpack. The Microsoft Word DOC document format is not supported.

If you don't want the certificate to cover all of the characteristics in the data group, select only the characteristics you want in the certificate.

By default, the certificate will use the **Last 25** data rows to provide the data for calculating the statistics to be included in the certificate. If you want to change this, or specify filter conditions for the data rows, click on **Data rows**.



Setup optional filter criteria

☒ Inclusive

In the example shown above, all of the data rows within the last two weeks will be used for calculating the statistics that will be displayed in the certificate.

Click the **Preview** button to generate a Microsoft Word document containing the Certificate of Analysis.

Certificate Information

| Field Label | Enter Value: |
|---------------|--------------------|
| Customer | ACME Manufacturing |
| PO | 45331 |
| Article | TSA-5523 |
| Specification | Standard TS-443 |
| Finish | 00653 |
| LotNumber | 1141321 |

If the template document contains any Prompt tags, the dialog shown above will appear to allow you to enter a value for each prompt tag.

The certificate document file will be created in the temporary files folder; if you want to save the newly created Certificate of Analysis document you can use the "Save as" functionality of Microsoft Word.

If Microsoft Word is installed on the computer, the newly created Certificate of Analysis document will be opened in Word where you can print or save the certificate.

If Microsoft Word is not installed on the computer, the newly created Certificate of Analysis document will be opened in the document viewer that is built into SQCpack. Since the built-in document viewer has limited functionality compared to Microsoft Word, you should have Microsoft Word, installed on the computer where the Certificate of Analysis is created.

PQ Systems

Certificate of Analysis

| | | | |
|-----------------------------|---|-----------------------|-----------------|
| Customer: | ACME Manufacturing | PO# | 45331 |
| Product: | A26 - Tapered Spacer | | |
| Article No.: | TSA-5523 | Specification: | Standard TS-443 |
| Finish: | 00653 | Material Lot # | 1141321 |
| Data Range: | The last 25 records having Date >= 2016-12-25 AND Date < 2017-01-15 | | |
| Certificate Created: | 1/9/2017 8:45:56 AM | | |

This is an example of a Certificate of Analysis that is tailored for use with a specific data group and its characteristics (in this case the "A26 – Tapered Spacer" data group from the sample database). The CS substitution tags in the Word table below refer to specific characteristic names that exist in the "A26 – Tapered Spacer" data group.

This template is an example of specifying a table of characteristic information by using characteristic-specific value tags.

| Results: | Lower Specification | Upper Specification | Mean Value |
|------------------|---------------------|---------------------|------------|
| Outside Diameter | 1.61 | 1.651 | " |
| Inside Diameter | 0.245 | 0.255 | " |
| Spacer Thickness | 0.81 | 0.815 | lbs. |
| Taper Diameter | 1.245 | 1.255 | |

If the tags in the table above are not converted to values it is probably because this template was used with a data group other than the "A26 – Tapered Spacer" data group in the sample database.

You can make a copy of this template and customize it for your organization using your logo and words. |

The Certificate of Analysis shown above is an example of a certificate created by SQCpack.

Certificate template files

A Certificate of Analysis is simply a Microsoft Word DOCX document that has had tags such as `[[CurrentDateTime]]` replaced with the appropriate value.

Every Certificate of Analysis that you create is based upon a template document, which is simply a Microsoft Word DOCX file with custom formatting defined by you. Your custom formatting results in a Certificate of Analysis document that is specific to your organization and looks the way you desire.

| PQ Systems | | Certificate of Analysis | |
|----------------------|---------------------------|-------------------------|-----------------|
| Customer: | Acme Manufacturing | PO# | 42203 |
| Product: | A26 - Tapered Spacer | | |
| Article No.: | TSA-5523 | Specification: | Standard TS-443 |
| Finish: | 00653 | Material Lot # | 1141321 |
| Data Range: | 30 days up to 15-Jun-2015 | | |
| Certificate Created: | 7/16/2015 12:08:25 | | |

This template is an example of specifying a table of characteristic information by using characteristic-specific value tags.

| Results: | Lower Specification | Upper Specification | Mean Value |
|------------------|---------------------|---------------------|-------------|
| Outside Diameter | 1.61 | 1.651 | 1.6257" |
| Inside Diameter | 0.245 | 0.255 | 0.2502" |
| Spacer Thickness | 0.81 | 0.815 | 0.8124 lbs. |
| Taper Diameter | 1.245 | 1.255 | 1.2506 |

The Certificate of Analysis shown above is an example of a certificate created by SQCpack.

The Microsoft Word template document shown below was used to create the certificate.

| PQ Systems | | Certificate of Analysis | |
|----------------------|---------------------|-------------------------|--------------------------|
| Customer: | [[Prompt.Customer]] | PO# | [[Prompt.PO]] |
| Product: | [[DG.GroupName]] | | |
| Article No.: | [[Prompt.Article]] | Specification: | [[Prompt.Specification]] |
| Finish: | [[Prompt.Finish]] | Material Lot # | [[Prompt.LotNumber]] |
| Data Range: | [[DataRange]] | | |
| Certificate Created: | [[CurrentDateTime]] | | |

This template is an example of specifying a table of characteristic information by using characteristic-specific value tags.

| Results: | Lower Specification | Upper Specification | Mean Value |
|----------------------------------|-----------------------------|-----------------------------|-----------------------------------|
| [[CS.Outside Diameter.CharName]] | [[CS.Outside Diameter.LSL]] | [[CS.Outside Diameter.USL]] | [[CS.Outside Diameter.Mean]]" |
| [[CS. Inside Diameter.CharName]] | [[CS. Inside Diameter.LSL]] | [[CS. Inside Diameter.USL]] | [[CS. Inside Diameter.Mean]]" |
| [[CS.Spacer Thickness.CharName]] | [[CS.Spacer Thickness.LSL]] | [[CS.Spacer Thickness.USL]] | [[CS.Spacer Thickness.Mean]] lbs. |
| [[CS.Taper Diameter.CharName]] | [[CS.Taper Diameter.LSL]] | [[CS.Taper Diameter.USL]] | [[CS.Taper Diameter.Mean]] |

During the installation of SQCpack, a **Certificates** folder is created as a sub-folder of the SQCpack installation folder. That is where you will find the sample templates. You can store your custom template files in this **Certificates** folder if you like, or you might want to put them in a folder on a network share so that multiple SQCpack users have access to them. Typically, SQCpack's **Certificates** folder is located here:

32-bit Windows:

C:\Program Files (x86)\PQ Systems\SQCpack 7\Certificates\

64-bit Windows

C:\Program Files\PQ Systems\SQCpack 7\Certificates\

Statistical context

Statistics are calculated for each characteristic using the data rows that pass through the filter definition (if any). After the filtering is applied, either all the resulting data rows are used or only the last N data rows are used, depending on the subset settings.

Statistics that depend upon a control chart (such as number Out-Of-Control) will use the Default Control Chart. Statistics that depend upon a histogram will use the Default Histogram chart.

Tags

As you can see, the template looks exactly like the output certificate, except that it contains tags such as **[[CurrentDateTime]]** and **[[CS.Outside Diameter.Mean]]**. Each tag will be replaced by the actual data that is specified by the tag. Tags are always enclosed by double brackets as shown.

Tags are case-sensitive. If the case is wrong, the tag will be replaced by the value and you will see the tag in the output certificate document.

General tags

The following general tags can be used in the template document:

| General tag | Description |
|---------------------|--|
| [[CurrentDateTime]] | Used to show the date and time the certificate was created. |
| [[DataRange]] | Description of the filter and subsetting parameters in effect. |

The format of the **[[CurrentDateTime]]** tag can be specified as shown below. Use capital **M** for the month portion; 1 to 4 **M** characters are supported:

[[CurrentDateTime]:format(dd-MMMM-yyyy)]

Prompt tags

Before the certificate is created, you will be prompted to specify the value of all of the tags that begin with "Prompt", such as **[[Prompt.Customer]]** and **[[Prompt.LotNumber]]**.

Prompt tags provide a way to insert user-provided information into the certificate as it is created.

Data group tags

Tags that begin with "DG" contain information about the data group being used to create the certificate.

These are the data group tags that can be used in the template document:

| Data group tag | Description |
|------------------|------------------------------------|
| [[DG.GroupName]] | The name of the data group. |
| [[DG.GroupDesc]] | The description of the data group. |

Characteristic statistic tags

Tags that begin with "CS" contain information about a characteristic being used to create the certificate. The tags are case-sensitive.

The "NNNN" shown in the tags in the table below represents the characteristic name, such as **[[CS.Taper Diameter.Mean]]** for the mean value of the characteristic named "Taper Diameter".

The following characteristic statistic tags can be used in the template document:

| Characteristic specification tag | Description |
|----------------------------------|---|
| [[CS.NNNN.CharName]] | The name of the characteristic. |
| [[CS.NNNN.CharDesc]] | The description of the characteristic. |
| [[CS.NNNN.AvgRange]] | Average range. |
| [[CS.NNNN.AvgSigma]] | Average sigma. |
| [[CS.NNNN.CCCL]] | Control limit center line from the control chart. |
| [[CS.NNNN.CCLCL]] | Lower control limit from the control chart. |
| [[CS.NNNN.CCNumOOC]] | Number Out-Of-Control from the control chart. |
| [[CS.NNNN.CCPctOOC]] | Percent Out-Of-Control from the control chart. |
| [[CS.NNNN.CCUCL]] | Upper control limit from the control chart. |
| [[CS.NNNN.ChiSquare]] | Chi-Square value. |
| [[CS.NNNN.CoefOfVar]] | Coefficient-of-variation value. |
| [[CS.NNNN.ConfLevel]] | Confidence-level value. |
| [[CS.NNNN.CP]] | Cp value. |
| [[CS.NNNN.CPK]] | Cpk value. |
| [[CS.NNNN.CPL]] | Cpl value. |
| [[CS.NNNN.CPM]] | Cpm value. |
| [[CS.NNNN.CPU]] | Cpu value. |
| [[CS.NNNN.CR]] | Cr value. |
| [[CS.NNNN.DPM]] | Dpm value. |
| [[CS.NNNN.Kurtosis]] | Kurtosis value. |
| [[CS.NNNN.LSL]] | Lower specification value. |
| [[CS.NNNN.Max]] | Maximum value. |
| [[CS.NNNN.Mean]] | Mean value. |
| [[CS.NNNN.Median]] | Median value. |
| [[CS.NNNN.Min]] | Minimum value. |
| [[CS.NNNN.NumObs]] | Number-of-observations value. |
| [[CS.NNNN.NumSubgroups]] | Number-of-subgroups value. |
| [[CS.NNNN.PctIn1Sigma]] | Percent within 1 sigma. |
| [[CS.NNNN.PctIn2Sigma]] | Percent within 2 sigma. |
| [[CS.NNNN.PctIn3Sigma]] | Percent within 3 sigma. |
| [[CS.NNNN.PctAboveSpec]] | Percent above specifications. |
| [[CS.NNNN.PctBelowSpec]] | Percent below specifications. |
| [[CS.NNNN.PctOutOfSpec]] | Percent out-of-specifications. |
| [[CS.NNNN.PP]] | Pp value. |
| [[CS.NNNN.PPK]] | Ppk value. |
| [[CS.NNNN.PR]] | Pr value. |
| [[CS.NNNN.Range]] | Range value. |
| [[CS.NNNN.Sigma]] | Sigma value. |
| [[CS.NNNN.SigmaEst]] | Estimated sigma value. |
| [[CS.NNNN.Skewness]] | Skewness value. |
| [[CS.NNNN.TheoPctAboveSpec]] | Theoretical percent above specifications. |
| [[CS.NNNN.TheoPctBelowSpec]] | Theoretical percent below specifications. |

| | |
|------------------------------|--|
| [[CS.NNNN.TheoPctOutOfSpec]] | Theoretical percent out-of-specifications. |
| [[CS.NNNN.TS]] | Target specification value. |
| [[CS.NNNN.USL]] | Upper specification value. |
| [[CS.NNNN.ZLower]] | Z lower value. |
| [[CS.NNNN.ZTarget]] | Z target value. |
| [[CS.NNNN.ZUpper]] | Z upper value. |

Tabular statistic tags

Tags that begin with "**TS**" contain the same information that is found in the "**CS**" tags, but the characteristic name is not included in the tag.

The **TS** tags are used to produce tables of statistical data as shown in the Microsoft Word table shown below.

| Characteristic Name | Lower Spec | Upper Spec | Mean | Sigma |
|---------------------|------------|------------|-------------|--------------|
| [[TS.CharName]] | [[TS.LSL]] | [[TS.USL]] | [[TS.Mean]] | [[TS.Sigma]] |

After the certificate is created a table of values for each characteristic is output, like this:

| Characteristic Name | Lower Spec | Upper Spec | Mean | Sigma |
|---------------------|------------|------------|--------|--------|
| Spacer Thickness | 0.81 | 0.815 | 0.8124 | 0.0006 |
| Taper Diameter | 1.245 | 1.255 | 1.2506 | 0.0017 |
| Inside Diameter | 0.245 | 0.255 | 0.2502 | 0.0018 |
| Outside Diameter | 1.61 | 1.651 | 1.6257 | 0.002 |

Reference - Alerting

This is a reference section that contains topics related to the alerting features in SQCpack.

Alerting introduction

Introduction to SQCpack alerting

The job of SQCpack **Alerting** is to pay attention to data, analyze the data for out-of-control and/or out-of-spec signals, record detected signals in the database, and send messages when signals are detected. It does this work based on alert definitions that are stored in the SQCpack database.

SQCpack allows you to create, modify, and delete alert definitions. An alert definition has a name and description and defines a collection of alert items that are monitored for out-of-control and/or out-of-spec conditions. Settings in an alert definition allow you to configure an email message, SQCpack message, and/or text message notification when out-of-control and/or out-of-spec statistical signals are detected in the stream of newly arrived data. The work to monitor alert definitions is performed by a program called the Alerting Service that runs separately from SQCpack.

Each alert item is associated with a control chart. The control chart provides the following important information to the Alerting Service:

- The control chart defines the metric being analyzed. It does this by defining where to find the data for the characteristic (or metric) that is to be monitored. The data might come from a characteristic in an SQCpack data group. Or, the data might come from an external data source such as Oracle or a Microsoft Access database.
- The control chart provides the specification limits, control limits, and out-of-control test rules

- needed for analysis.
- The type of the control chart determines the type of analysis that will be performed. For instance, an x-bar chart will evaluate the mean of each subgroup for an out-of-control signal, and thus is checking for a shift in the process central tendency or mean. A range chart will evaluate the amount of variation within each subgroup and thus watches for an indication of a change in the process variation. An x-bar/range (or individuals/moving range) chart performs both types of analysis.

To access these features, select *Menu > Alerting* via the SQCpack navigation menu.

When a single-user database is used, alerting is performed by a background program managed by SQCpack. In this case the Alerting Service runs on the same computer as SQCpack.

When a multi-user database is used, alerting is performed by the Master Alerting Service (a Windows service) that typically is installed on a single computer in your organization. See [Deployment considerations for Alerting features](#)

The Alerting Service pays attention only to *active* alert definitions. You can have many alert definitions, but at any given time only a subset of these may be active. When new data is detected, the Alerting Service follows these steps:

- 1) Analyzes the new data for out-of-spec and/or out-of-control signal conditions.
- 2) Records newly detected signal conditions in log tables in the SQCpack database.
- 3) Sends signal notifications as email, SQCpack message, and/or text message to interested parties.

How alerting analyzes only new data

At the end of each evaluation, the Alerting Service remembers the highest value of the *Order by* column (called the HighestKey) that was seen during that evaluation, on a per-alert-item basis. The next time an evaluation is performed, only rows with an *Order by* value higher than the value from the prior evaluation are fetched and analyzed.

Alert entities used by SQCpack Alerting

Alert definition - An alert definition has a name and description and defines a collection of alert items that are monitored for out-of-control and/or out-of-spec signals. You can make an alert definition be active so that the Alerting Service monitors each alert item contained in the alert. Basically, you turn alerting on or off at the alert definition level. The alert definition specifies who will receive signal notification messages for signals discovered in any alert item contained in the alert definition.

Alert item - Think of an alert item as the name of the metric you want to monitor for alerting signals. The *Reference chart* you associate with an alert item does most of the work of defining what the metric is and how it will be monitored for alert signals.

Reference chart - A *reference control chart* is specified for each alert item in an alert definition. This reference chart basically specifies what metric will be watched and how that metric will be monitored. For internal data in an SQCpack data group, the chart specifies the data group name and the characteristic name that defines the metric to monitor. For external data that is stored outside of the SQCpack database, the data fetched for analysis by the chart defines the metric to monitor.

How a new alert item decides what data to evaluate

The first time a new alert item performs an alerting analysis, these rules determine what data will be considered for evaluation.

- **Rows already exist in the data source** - When the first evaluation occurs, **all existing data rows will be skipped over**, and the current highest *Order by* column value (referred to as the HighestKey) is remembered.

- **No rows exist in the data source** - When the first evaluation occurs, the HighestKey value is set to a value that will cause the evaluation of any data rows added thereafter. These are the default values that are used for the HighestKey:

Numeric column: -1
Date column: 1800-01-01
Text column: Zero length string

For a discussion of special requirements for charts used as an alerting reference chart, see: [Reference chart requirements](#)

Reference chart requirements

Reference chart - A *reference control chart* is specified for each alert item in an alert definition. This reference chart basically specifies what metric will be watched and how that metric will be monitored. For internal data in an SQCpack data group, the chart specifies the data group name and the characteristic name that defines the metric to monitor. For external data that is stored outside of the SQCpack database, the data fetched for analysis by the chart defines the metric to monitor.

Custom query requirements - If the reference chart uses a custom query to fetch the data please ensure that the following requirements are met:

- **The custom query must specify a filter macro** - If the reference chart uses a custom query, then one of the filter macros, like `{{WHERE_FILTER}}`, **must** be present in the query. This is because the filter mechanism is used by the Alerting Service to fetch data where the *Order by* column is greater than the highest *Order by* value evaluated so far. It is unlikely that using the `{{OR_FILTER}}` macro would be appropriate for alerting. See *Using a chart filter with a custom query* here: [Using a custom query](#).

```
SELECT * FROM TableName {{WHERE_FILTER}} ORDER BY order_column ASC
```

- **WHERE clause restrictions** - If the custom query specifies a WHERE clause then the `{{AND_FILTER}}` macro must also be present, as shown below. Do not refer to the *Order by* column in the **where clause**.

```
SELECT * FROM TableName WHERE where_clause {{AND_FILTER}} ORDER BY order_column ASC
```

- **"LAST N" queries** - Sometimes a chart will use a custom query that returns the Last N rows from the data source. Do not use a Last N type of custom query in a reference chart. The general form of a *Last N* custom query looks similar to the SELECT statement shown below. The inner query uses the TOP N clause to select the last N rows, but the rows are in reverse order so that TOP N fetches the last rows. The outer query establishes the desired order for the rows.

```
SELECT * FROM ( SELECT TOP 50 * FROM TableName WHERE where_clause ORDER BY
order_column DESC ) X ORDER BY order_column ASC
```

- **Recent time queries** - Sometimes a chart will use a custom query that returns only rows that have a time value that falls within a specified range of time (such as within the last N minutes). Do not use a *recent time* type of custom query in a reference chart.
- **The Order by column must be specified in the chart wizard** - The order of the data is established by the ORDER BY clause in the custom query. The *Order by* column in the 3rd step of the chart wizard **must** be set to the ORDER BY column that the custom query uses to establish the data order.
- See the *Last N queries* section of the following topic for a discussion about how SQCpack attempts to modify your custom query to perform *Smart LastN Queries*: [Using a custom query](#)

Order by column - The *Reference chart* determines the order that imposed on the input data stream. The *order of the input data is very important* because out-of-control test run rules like "7 above the mean" have meaning only when the data points (subgroups) are evaluated in the specified order. Also, calculation of moving average and moving range depends upon the data order. The chart's *Order by* column is specified in the 3rd step of the chart wizard.

The **Order by** column values **must be unique** and **not contain any null values**. Consider a stream of input data where the *Order by* column is an integer that increases by one for each new row. Let's say that on the last alerting analysis cycle the data rows up through 10 were fetched and analyzed for signals. The next time an analysis cycle is performed, the Alerting Service will ask for all data where the *Order by* column value is greater than the highest value processed so far, which is 10. So if 3 new rows have been added since the last evaluation, rows 11, 12 and 13 will be fetched and analyzed for signals on the next evaluation cycle. At the end of that analysis cycle the "highest order by value" of 13 is saved, so that on the next evaluation only new data is fetched, i.e. rows where the *Order by* value is greater than 13. If *Order by* column values are not unique, there is the possibility that the Alerting Service will skip over data rows and never analyze them for signals.

The *Order by* column values **must be ascending**. The Alerting Service fetches new data that has not yet been analyzed by asking for data rows where the *Order by* value is greater than the value from the last analysis cycle. This scheme only works when the *Order by* column values are ascending as new data rows are added.

Using a text Order by column - In general it is recommended that you **not** use a text column as the *Order by* column. That's because text of differing lengths will sort in a way that you might not expect. For instance, "1", "2", "233", "3", "4" are sorted in ascending order, but "233" falls between "2" and "3". If the text values are *all* the same length like "001", "002", "003", "004", "233" then the sort order would be correct and alerting could use the text column as the **Order by** column.

IMPORTANT: The reference control chart's *Order by* column values must be ascending and contain unique non-null values. Alerting will not work properly if this is not the case.

What to use as the reference chart's Order by column for internal SQCpack data?

Charts created for internal data (stored in a data group) by default use *Row number* as the *Order by* column. The *Order by* column is specified in the 3rd step of the chart wizard for the alert item's reference chart. If the data group doesn't have some other unique ascending identifier value, then use *Row number*. But if a different unique and ascending identifier is defined for a data group you should consider using that as the reference chart's *Order by* column. If you typically order your charts by an identifier column, like Date/Time, and this column contains unique and ascending values, then the reference chart used by alerting should also *Order by* that same column.

Resequencing - For internal data, resequencing is the reason why might you want to use a different column than *Row number*. When *Row number* is used for data order, under the covers the data table's sequence number column is actually used. Each new data row gets a sequence number that equals the prior row's sequence number plus 1024. The 1024 distance between new rows allows some room for new rows to be inserted between existing rows. After around 10 new rows have been inserted between two existing rows the entire data table must be resequenced to make room for more inserts. The resequence operation is reported to the Alerting Service and each alert item associated with the resequenced data group perform a reset operation to use the "highest order by value" in the data table. This causes the Alerting Service to ignore all existing data rows and only analyze data rows that are added after the resequence operation. While it is unlikely that any new data rows will be skipped over and ignored in this resequence scenario, it is theoretically possible if new data rows are added between when the resequence operation ends and the time when the Alerting Service performs the reset operation. Thus, if you have a Date/Time column defined in the data group, and a unique date/time value is always added to a new row, you can use the Date/Time column as the reference chart's *Order by* column.

What happens when internal data is deleted from the end of the data group's data table?

When the last data row in sequence number order is deleted from the end of a data group's data table, all alert items associated with that data group automatically perform a reset operation to use the "highest order by value" in the data table. This prevents new data rows from being skipped over because the alert item's "highest order by value" is higher than the value assigned to new rows.

What happens when external data is deleted, perhaps from the end of the data source?

If data is deleted from the external data source, it is possible that the "highest order by value" that is remembered for an alert item may need to be manually changed to a smaller value. To accomplish this you should edit the alert definition, and on the *Alert items* tab find the alert item that needs adjusting and click the key icon in that row. See **View or change the highest key for an alert item** in the topic [Alert items tab](#).

When does an alert analysis cycle occur?

For internal SQCpack data in a data group - The Alerting Service is notified immediately after new data rows are added to a data group, and an analysis cycle is started for all alert items associated with that data group. Alternatively, a polling interval can be specified in the alert definition, in which case an analysis cycle is periodically performed on all alert items on the specified time interval.

For external data - External data is data that is stored in a data source that is external to the SQCpack database, such as an Oracle database, or your ERP database. A polling interval is always used for external data so that SQCpack can discover that new data is available to be analyzed.

Create or edit an alert definition

To add or edit an alert definition, select *Alerting* from the navigation menu. Any existing alert definitions will be displayed. The list will be empty for a new database.

Click the *New* button in the ribbon to create a new alert definition. This will display the dialog for adding a new alert.

Click the *Edit* button in the ribbon to edit the currently selected alert definition.

The tabs in the dialog used to edit an alert definition are described here:

[Settings tab](#)

[Alert items tab](#)

[Message templates tab](#)

[Advanced tab](#)

Settings tab

Here is the *Settings* tab for adding or editing an alert:

Edit Alert - My Fine Alert

Settings | Alert Items | Message templates | Advanced

Name: My Fine Alert

Description: DataGroup A26 - Tapered Spacer

Alert based on: Out-of-spec and/or out-of-control

Recipients to notify:

- ☒ **SQCpack recipients**
 SQCpack message recipients, separate users with a semicolon: admin; Charlie; Bob; Ryan; ☐ Attach chart image
- ☒ **Email recipients**
 Email recipients, separate email addresses with a semicolon: BigBoss@mycompany.com; LittleBos@mycompany.com; ☐ Attach chart image
- ☒ **Text message recipients**
 Text message gateway recipients, separate recipients with a semicolon: 5555555555@txt.att.net

From address: SQCpackAlertingForMyCompany@mycompany.com

Subject: Subject for the email

☒ **Active**

Name - Specifies the name of the alert definition.

Description - Specifies the description of the alert definition.

Alert based upon - Select from one of the following choices to determine what type of signal must be detected *in order to send an alert signal message*. Both out-of-spec (OOS) and out-of-control (OOC) analysis are performed if possible during analysis of the data, and the results of both types of analysis are stored in the alerting log tables in the SQCpack database. This setting only determines which type of signal (OOS and/or OOC) must be detected in order to send an alert signal message.

- **Out-of-spec and/or out-of-control** - Send a signal message when either out-of-spec or out-of-control signal conditions are detected.
- **Out-of-spec** - Send a signal message only when out-of-spec signal conditions are detected.
- **Out-of-control** - Send a signal message only when out-of-control signal conditions are detected.

Recipients to notify - Three types of recipients may be notified when an alert signal message is sent. If none of these are selected, alert signals will be logged to the database but no notification messages will be sent to anyone.

- **SQCpack recipients** - These are people defined as users within the SQCpack user system. Clicking the *Add* button will display the list of users in the current SQCpack database. When alert signals are detected, these people will be notified via the SQCpack Messages system. Note that SQCpack messages are visible only to users who are logged into SQCpack. If an SQCpack message arrives while a user is not currently logged into SQCpack, the message will be available the next time that user logs into SQCpack.
- **Email recipients** - These are people who will be notified at their standard email address.
- **Text message recipients** - These are people who will be notified via text message to their mobile phone. Note that these messages will depart SQCpack as email messages sent to their mobile phone carrier. For example, for Version use 5554443333@vtext.com. Each of the major cell phone carriers provides a text to an SMS (text message) gateway whereby an email sent to a special email address is delivered as a text message to the specified phone number. The format of the email address is the 10-digit phone number followed by @ and the domain of the gateway. For example: 5555555555@txt.att.net would be sent to the AT&T network phone with phone number 555-555-5555. A list of popular SMS gateways can be [found here](#) or by Googling "[email to SMS gateway list](#)".

Attach chart image - Check this box to include an image of the chart as an attachment to the notification message. Note that the chart image will be created after the condition has been detected. If a user displays an SQCpack chart at a later time for the metric in question, new data may have arrived, so the displayed chart may look different from the chart image that was attached to the notification message.

From address - Enter text that will appear as the From address for email and SQCpack messages.

Subject - Enter text that will appear as the Subject for email and SQCpack messages.

Active - Check this box to activate the alert definition. Only active alert definitions are analyzed for statistical signals by the alerting service. Uncheck this box when you do not want the alert to be actively monitored for statistical signals.

Alert items tab

Click the *Alert Items* tab to select which characteristics/charts the alert will monitor for statistical signals

Edit Alert - Bob Test Alert 1

Settings Alert Items Message templates Advanced

Apply to these characteristics:

| | Data group name | Characteristic | Reference Chart | | | |
|--------------------------|----------------------|------------------------|-----------------------|---|---|--|
| <input type="checkbox"/> | A26 - Tapered Spacer | Outside Diameter | Default control chart | ✕ | ↺ | |
| <input type="checkbox"/> | AIAG sample data | Acid Concentration - % | Default control chart | ✕ | ↺ | |
| <input type="checkbox"/> | ... | External data | Exam Scores | ✕ | ↺ | |

Add alert items Validate

☐ Active Save Cancel

The **Alert Items** tab, shown above, displays the characteristics (or metrics) the alert will monitor. Each alert item is defined primarily by the reference control chart that is associated with that alert item. If the chart is for internal data, the data group name and characteristic name will be present.

Delete an alert item row - Click the red **X** button at the end of an alert item row to delete that alert item from the alert definition.

View or change the highest key for an alert item - Each active alert item keeps track of the highest *Order by* column value (referred to as the highest key) that has been evaluated. Click the **↺** key icon at the end of an alert item row to view or change the highest key value that has been evaluated (as shown below).

Alert item key manager

Highest key evaluated:
11/26/2011 10:40:00 AM

Current highest key:
11/26/2011 10:40:00 AM

Number of rows remaining to be evaluated
0

Update Cancel

Highest key evaluated - This is the highest *Order by* column value that has been evaluated. Optionally, you can enter a new highest key value. If you enter a new value, be aware that the next evaluation of this alert item will look for data that has a *higher* key value than the one you specify here. If you enter a smaller key value, you are effectively telling the Alerting Service to back up and re-evaluate data rows that have previously been evaluated. If the *Order by* column is numeric, ensure that you enter

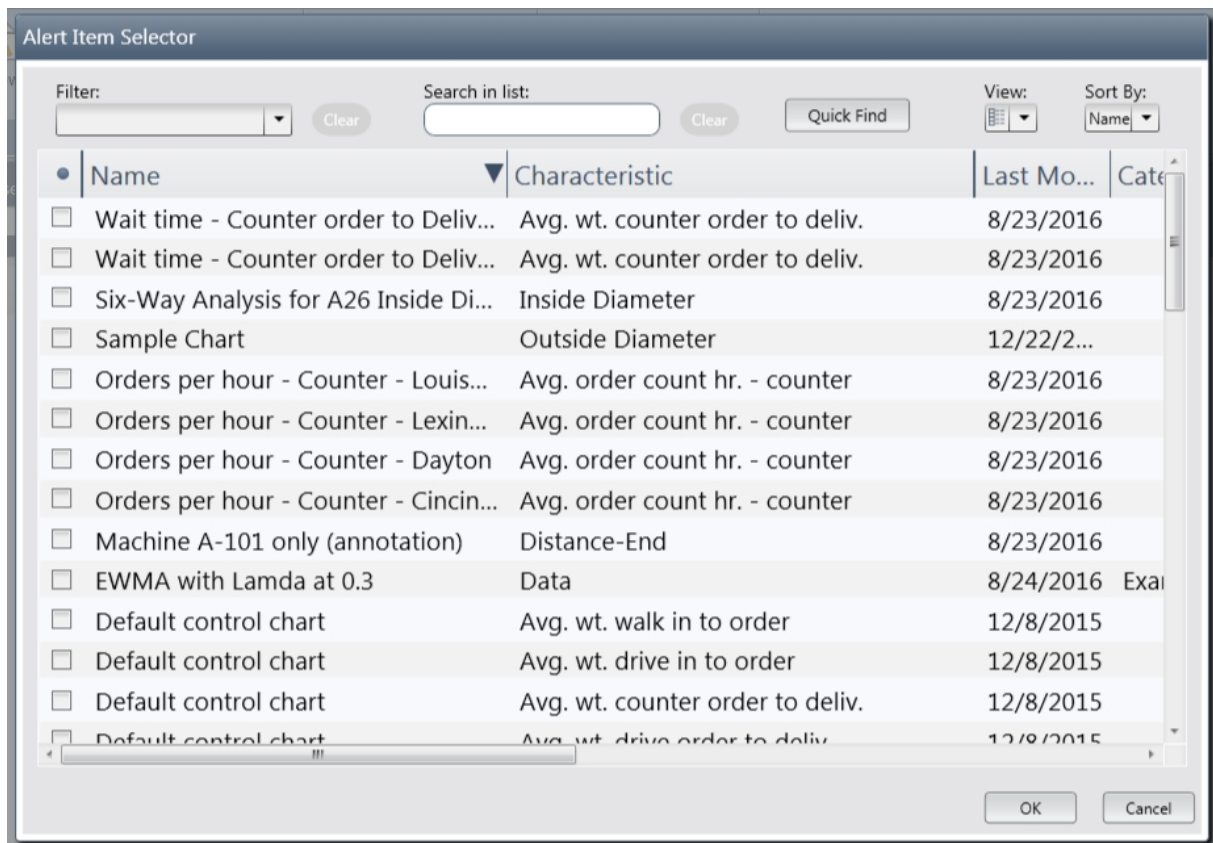
a valid number. If the *Order by* column is a date, time, or date/time column, ensure that you enter a date and/or time value that will be properly understood by the database engine used for this data. For a date, it is generally safe to enter a date in **yyyy-mm-dd** format, since that is properly interpreted by most database engines regardless of how the database engine locale is currently set. And it is generally safe to enter a date plus time value as **yyyy-mm-dd hh:mm:ss**. Also, be aware that if you enter a date such as 2017-06-20 without specifying a time, the database engine will treat that as midnight on the specified date, or 2017-06-20 00:00:00. Thus, a data row with a value of 2017-06-20 00:00:01 (one second into the day) and all rows higher than that date-time will be evaluated because all those rows have a key value greater than 2017-06-20 00:00:00.

Current highest key - This field displays the highest *Order by* column value that currently exists in the data source.

Number of rows remaining to be evaluated - This field shows how many rows of data will be evaluated based on the current **Highest key evaluated** value.

Click the **Add alert items** button to open the *Alert Item Selector* dialog shown below. Put a check by each control chart *Name* that you want to treat as an alert item. Recall that it is the selection of a control chart that effectively defines the metric to be analyzed by an alert item. See [Reference chart requirements](#) for the special requirements needed for a reference chart.

Active - Check this box to activate the alert definition. Only active alert definitions are analyzed for statistical signals by the alerting service. Uncheck this box when you do not want the alert to be actively monitored for statistical signals.



The dialog above shows the *Alert Item Selector* that is used to select the control charts (and thus the characteristics) that will be monitored for signals by this alert definition.

Check the box for each row you want to include in this alert definition. We recommend that you avoid putting a large number of alert items in one alert. See [Alerting tips and best practices](#).

Click the **Save** button when you are finished selecting control charts/characteristics, or **Cancel** to discard

your changes.

Message templates tab

Use the *Message templates* tab to define the content and format of messages that will be sent when alert conditions are detected.

This dialog allows you to specify which message templates will be used when sending alert signal notification messages. SQCpack comes with some default templates. You can create additional templates by clicking on the **Templates** ribbon button when viewing the main list of alerts. See [Alert message templates](#)

Message template - The template you select here will be used for SQCpack notification messages and email notification messages.

Text template - The template you select here will be used for text notification messages.

Click the **Preview** button to see what the message template looks like. Not that text between curly braces is a *macro* which will be replaced by information that is current when the notification message is sent. For example, {{ALERT_NAME}} will be replaced by the *name* of your alert each time a notification message is sent.

Note that you may put your own custom text in the template. For example, you may want to start the notification message with "Alert from SQCpack."

Active - Check this box to activate the alert definition. Only active alert definitions are analyzed for statistical signals by the alerting service. Uncheck this box when you do not want the alert to be actively monitored for statistical signals.

Advanced tab

Use the *Advanced* tab to further customize how the alert definition will behave.

Send alert messages only if this interval has passed since last message (minutes) -

This defines the message *latency interval* which limits how often the Alerting Service will send messages when alerting signals are detected. For example, if you set this to 30 minutes, when you get a notification message from an alert, you will not get another message from that alert for 30 minutes, even if alert signal conditions are detected during the latency period. The latency interval helps to reduce the burden of receiving an overabundance of alert messages. Leave this blank if you don't want to use a latency interval. One way to think about the value to use for the latency interval is to ask "How long after a signal occurs am I willing to wait before I learn about the next signal?" If you can live with a delay of no more than 30 minutes, then you should not have a *latency interval* greater than 30 minutes.

For SQCpack data, evaluate when new data arrives...

Select this option if you want the Alerting Service to check for signals each time **new data** arrives in an SQCpack data group. In this case, polling is not used.

For SQCpack data, evaluate based on polling settings below...

Select this option if you want to check for signals in an SQCpack data group based on the polling interval defined below. In this case, the Alert Service only checks for new data to analyze once each polling interval in minutes. The polling settings below allow you to limit when the check for new data based on polling occurs.

For external data (alert items on charts based on external data) polling settings below are always used

This setting may not be changed and is instead informational. When you are alerting based on external data flowing into systems outside of SQCpack, the only way to check for new data is via polling. The polling settings below allow you to limit when the check for new data based on polling occurs.

Polling settings

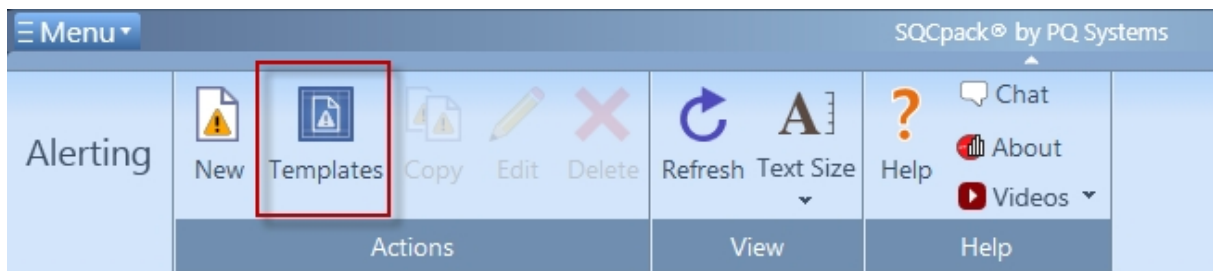
Use the properties in this section to establish the polling interval and optionally limit when polling occurs to check for new data.

Poll interval - The minimum polling interval is 15 seconds. Remember that on every polling interval the Alerting Service issues a database query for each alert item that uses polling to fetch data that has not yet been evaluated. If you have lots of active alert items, consider the potential load polling places on your database engine. One way to think about the value to use for the polling interval is to ask "How long after a signal occurs am I willing to wait before I learn about it?" If you can live with a delay of no more than 30 minutes, then you should not have a polling interval greater than 30 minutes or a message latency interval greater than 30 minutes.

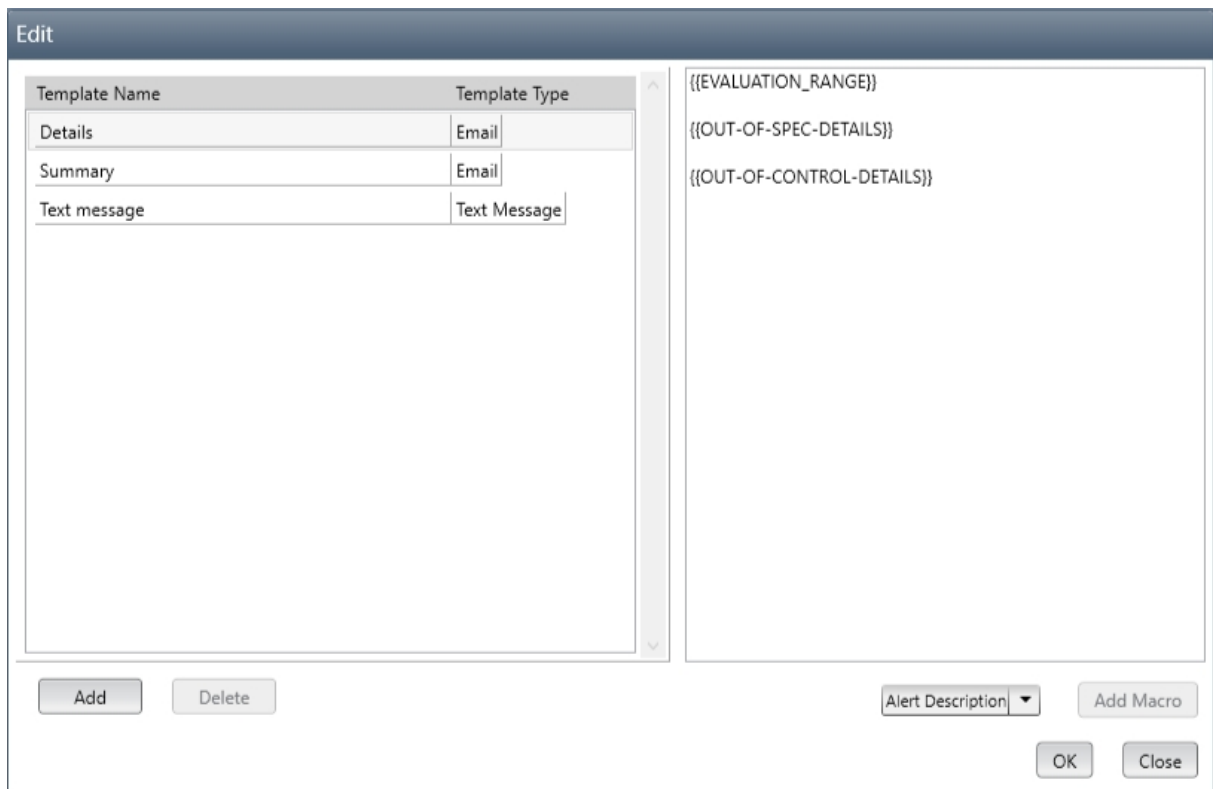
Active - Check this box to activate the alert definition. Only active alert definitions are analyzed for statistical signals by the alerting service. Uncheck this box when you do not want the alert to be actively monitored for statistical signals.

Alert message templates

To add, edit or delete alert templates, select *Alerting* from the navigation menu.



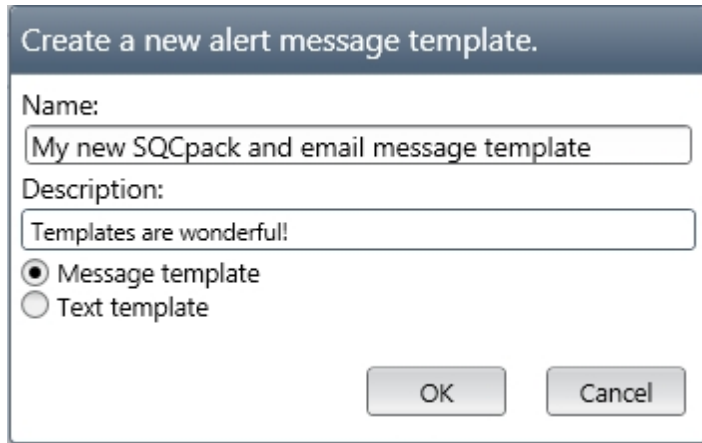
Click **Templates** in the ribbon bar, as shown above. The edit templates dialog shown below appears.



Use this dialog to add and remove alert message templates and to customize existing templates. The list on the left shows the existing templates. In the example shown above, there are three templates defined. These are the *default* templates that come with SQCpack. Note that when you are defining an alert, you will select one template from this list of templates to be used when the alert needs to send a message. The template determines the content and format of messages sent by the Alerting Service. This includes email, SQCpack messages, and text messages.

Add a new template

Click the **Add** button to create a new template.



The dialog box is titled "Create a new alert message template." It contains two text input fields: "Name:" with the value "My new SQCpack and email message template" and "Description:" with the value "Templates are wonderful!". Below these fields are two radio buttons: "Message template" (selected) and "Text template". At the bottom right are "OK" and "Cancel" buttons.

The **Create a new alert message template** appears as shown above.

Enter a template **Name** and optional **Description**.

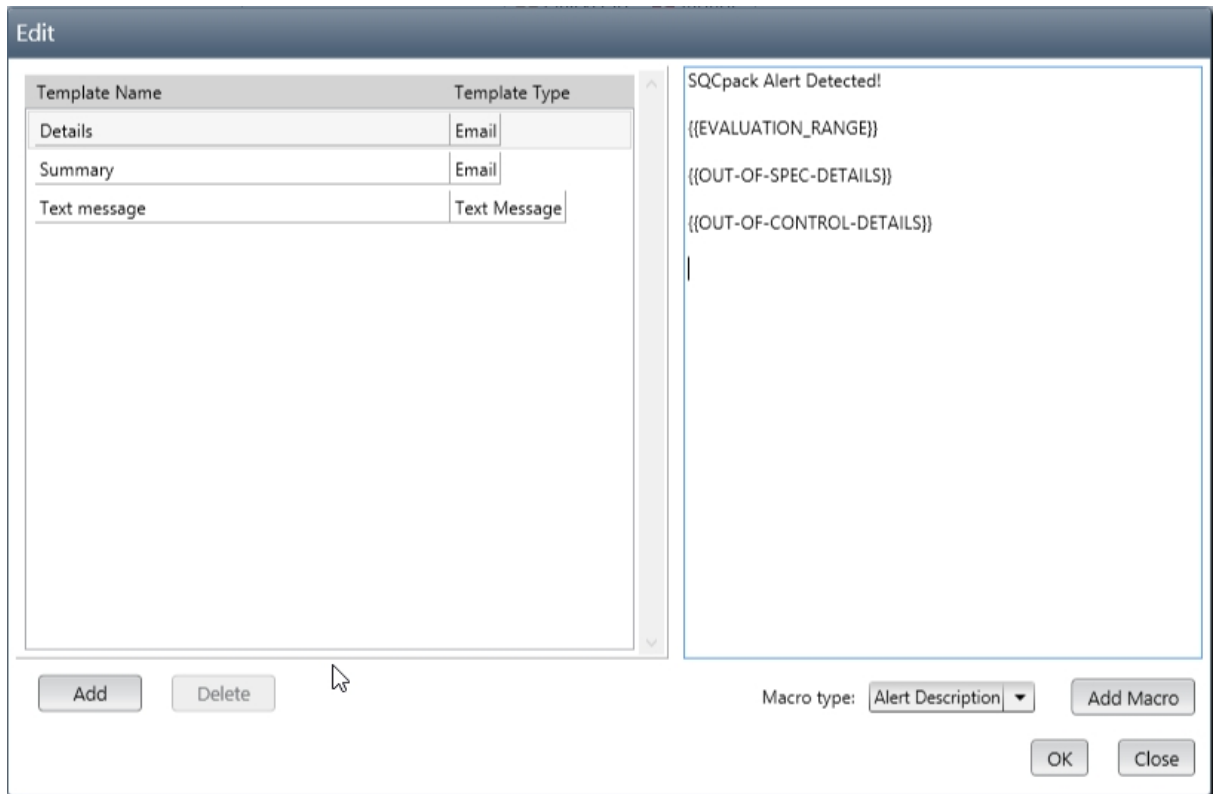
Message template - The template will be applicable to SQCpack notification messages and email notification messages.

Text template - The template will be applicable to text notification messages.

Click **OK** to save the new template, or **Cancel** to discard the new template.

Edit the alert message template text

The editor region on the right side allows you to modify the contents of the alert message template, as shown below.



Enter the changes you want to make in the editor region. As you can see in the example above, the message allows you to use alert macros in the text. When the notification message is sent, the alert macro will be replaced with the appropriate text. You can also enter your own custom text, like the "SQCpack Alert Detected!" text shown above.

To add an alert macro to the text, position the cursor where you want the macro to be inserted, select the type of macro from the **Macro type** drop-down list, then click the **Add Macro** button and the macro will be inserted at the current cursor position.

Delete an existing template

To delete an existing alert template, select the template to be deleted in the list on the left side of the dialog, then click the **Delete** button.

Alerting with SQCpack data vs. external data

An alert definition contains one or more alert items. Each alert item refers to a control chart in the SQCpack database. Charts can be based on *internal* data, i.e. contained in an SQCpack data group, or they can be based on *external* data. An example of an external data chart might be a chart in SQCpack that looks at data in your ERP or Manufacturing system. In this topic, we distinguish these charts like this:

Internal chart - a chart based on data that is stored in an SQCpack data group.

External chart - a chart based on data flowing into some data source outside of the SQCpack database.

For the alerting service, there are slightly different behaviors and technical issues for *internal charts* vs. *external charts*.

For **internal charts**, the alerting service will check for out-of-control and/or out-of-spec conditions whenever new data is entered into the SQCpack data group. This happens in these scenarios:

1. A user enters data by typing (or pasting from the clipboard) into the SQCpack data entry screen. The new row is saved to the database when the user leaves the row.
2. A user imports data from a CSV or Excel file into SQCpack data group. In this context, all of the rows will be imported and then the alerting evaluation will occur.
3. The SQCpack *Fixtures* program puts data into an SQCpack data group (this program reads data from measurement fixtures). The alerting evaluation will occur after each new data row is added to the data group's data table.
4. The SQCpack *CMM Integration* program puts data into an SQCpack data group (this program reads complex data files, often created by a CMM, and puts the data into SQCpack). The alerting evaluation will occur after each new data row is added to the data group's data table.

For **external charts**, the alerting service will check for out-of-control and out-of-spec conditions whenever a **polling interval**, as specified in the alert definition, occurs. See [this topic](#) for specifying a polling interval.

For **external charts**, at each polling interval, the alerting service will ask the question ***is there any new data?*** It will determine the answer to this question by querying the external data source to see if any new rows exist with an *Order by* column value that is higher than the last *Order by* column value evaluated. The *Order by* column is specified by the external chart definition. For this reason, any external chart definition that will be used in alerting **is required** to have an *Order by* column specified. Additionally, an *assumption* is made that this *Order by* column is **unique, ascending, and contains no null values**.

For **external charts**, permission settings for the external data source can be a source of difficulty. For example, imagine that you are running SQCpack and you create an external chart that looks at data flowing into a SQL Server database, and integrated authentication is used to authenticate with SQL Server. When you display the chart in SQCpack it works fine because *you* are running SQCpack, and *your* user credentials are sufficient to fetch the data from the database. Then you setup an alert definition based on this external chart. Also, assume that this chart is stored in a multi-user SQCpack database that is setup to use a Master Alerting Service. The Master Alerting Service runs under a Windows user account (by default the Network Service account is used; however, a different account can be used if desired). Thus, when the Master Alerting Service's user account credentials are used to authenticate with the SQL Server database, the authentication can fail. Or, assuming that the authentication succeeds, the user account can have insufficient rights to fetch the data specified by the external chart.

Alerting tips and best practices

This topic covers some tips and best practices that will help you get the most value from SQCpack alerting.

How to get started using alerting - Our recommendation is to start small and grow from there. Start with a few alert definitions that contain alert items for a few key metrics that are important to your organization. As you become more familiar with using Alerting, and the metrics you are watching are not generating more signals than you can deal with, then you can add more alert definitions and alert items.

Should I use alerting to watch a given metric? - If you intend to perform out-of-control testing and don't have a set of control limits that represent when the process behind the metric was in-control you should probably not enable alerting for that metric. If you don't understand the process well enough to be able to compute a set of control limits at a point when the process was in-control, the process is not yet ready for out-of-control alerting analysis. If charts for the metric or characteristic indicate that the process is consistently showing out-of-control signals, you likely don't need alerting to tell you the process needs attention since you are already aware of that fact. If you choose to do only out-of-specification analysis, that is usually less complicated than doing statistical process control, which requires an appropriate set of control limits, an appropriate set of out-of-control test rules, and knowledge of what to do when an out-of-

control signal is detected.

Avoid creating a storm of alert signal messages - If the process is currently in a state where lots of alerting signals are frequently occurring, you probably don't need the alerting system telling users that the metric/process needs attention by constantly sending a flood of signal messages. If your users are receiving an overabundance of alert signal messages, they may tend to ignore or delete the messages. You can temporarily turn off signal notification messages for an alert item, then later when the process is not creating so many signals, you can turn the notification messages back on.

Avoid using temporary control limits - It is recommended that you avoid using temporary control limits in the reference control chart for an alert item. For more details see [Control charts and temporary control limits](#).

How many alert definitions should I define and how many alert items should an alert contain? -

You could create a single alert definition that contained all the alert items you will ever be interested in knowing about, but you should not do that. You probably don't want to activate or deactivate all of your alert items at the same time, but if all the alert items are contained in a single alert definition then you would have to activate/deactivate them together as one group. You might want to consider creating an alert definition for each SQCpack data group. That way you can turn alerting on or off at the data group level.

Considerations for the message latency interval and polling interval - A polling interval can optionally be used for internal data and must be used for external data. A message latency interval can optionally be specified to limit how frequently signal notification messages are sent. One way to think about the value to use for polling interval and message latency is to ask "How long after a signal occurs am I willing to wait before I learn about it?" If you can live with a delay of no more than 30 minutes, for example, you should not have a polling interval greater than 30 minutes or a message latency interval greater than 30 minutes. A more frequent polling interval results in more queries by the Alerting Service to check if new data is available for analysis. You must balance computer, database, and network load caused by additional alerting queries against how long you are willing to wait to learn about signals that need your attention.

Network considerations - The computer where the Master Alerting Service is installed should have a static IP address so that SQCpack on client computers can successfully connect to the Master Alerting Service. If a firewall is used on the Master Alerting Service computer or the client computer, it must allow connections from SQCpack on the client computer to the computer where the Master Alerting Service is installed.

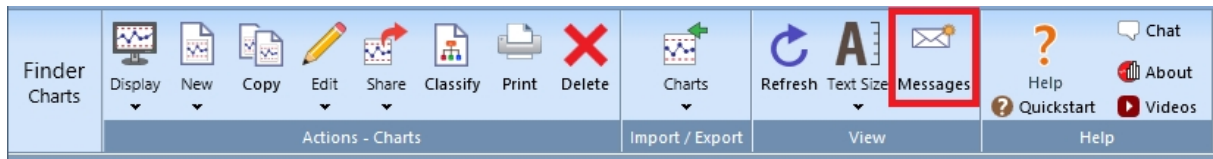
External chart works in SQCpack but not in the Alerting Service - An external chart is one that charts data from a data source that is external to the SQCpack database. If the external chart is stored in a multi-user SQCpack database, the Master Alerting Service is used to perform alerting analysis. In this case the user account used to run the Master Alerting Service probably does not have the necessary rights and/or permissions to fetch the external data. See *Setup for integrated authentication access to external data sources* in **Master-Alerting-Service-Installation.pdf**.

Requirements for the reference chart used for an alert item - There are a number of restrictions and requirements for the reference chart that is specified for each alert item in an alert definition. Please refer to this topic: [Reference chart requirements](#)

Email and text messages are not being sent by the alerting service - Settings used to send email and text messages are stored in the SQCpack database. In SQCpack, open the database containing the alert definitions that are not working. Go to the **Email** settings tab under **General Settings** (see [Email](#)), setup the properties on the dialog, and send a test email message. If you get to the point where you can successfully send email messages from within SQCpack, then usually the alerting service will also be able to successfully send email messages. If you cannot get email to work, please contact application support for assistance: [Application support](#).

Reference - Messaging

Receiving/Processing messages

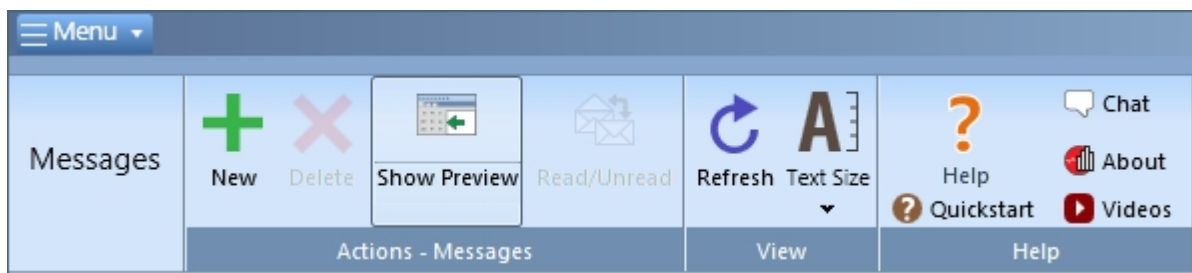


When you receive a new SQCpack message, an envelope and message count will appear in the bottom right of the screen and a gold star will appear on the envelope on the **Messages** button on the View ribbon bar. Clicking either of these will open the Messages window.

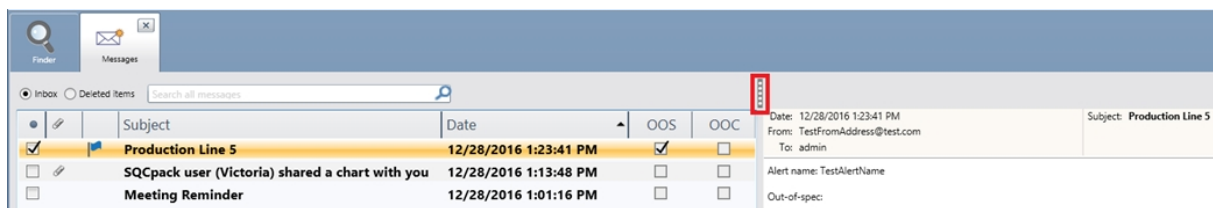
Note: A sound notification will also play when a new message is received. This sound can be disabled by clicking the **Menu** button in the top left of the screen and selecting **General Settings** (or pressing ALT+P), clicking the **Settings** tab, and unchecking **Play sound notification** when new mail arrives.

Previewing messages

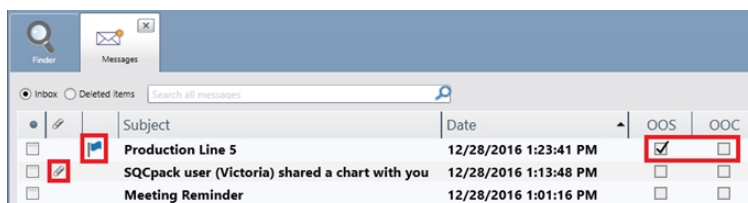
Click the **Show Preview** button in the *Actions – Messages* ribbon bar and select a message from the list.



The preview pane can be resized by clicking and dragging the pane handle. Messages can be opened and viewed in full by double-clicking them.



The presence of a **paperclip** in the attachment column indicates that the message has an attached image. Alert messages will also have a check in the **OOS** (Out-Of-Spec) or **OOC** (Out-Of-Control) columns to indicate whether the alert contains any out-of-spec or out-of-control records, respectively.



Deleting messages

Select any messages that you wish to delete and press the **Delete** button on the *Actions – Messages* ribbon bar. Alternatively, if the message was opened via double-clicking, you can click the **Delete** button at the bottom of the message.

When messages are deleted, they are moved to the *Deleted items* folder. Click the **Deleted items** button to view the contents of the *Deleted items* folder. To permanently delete a message, delete the message from the *Deleted items* folder.

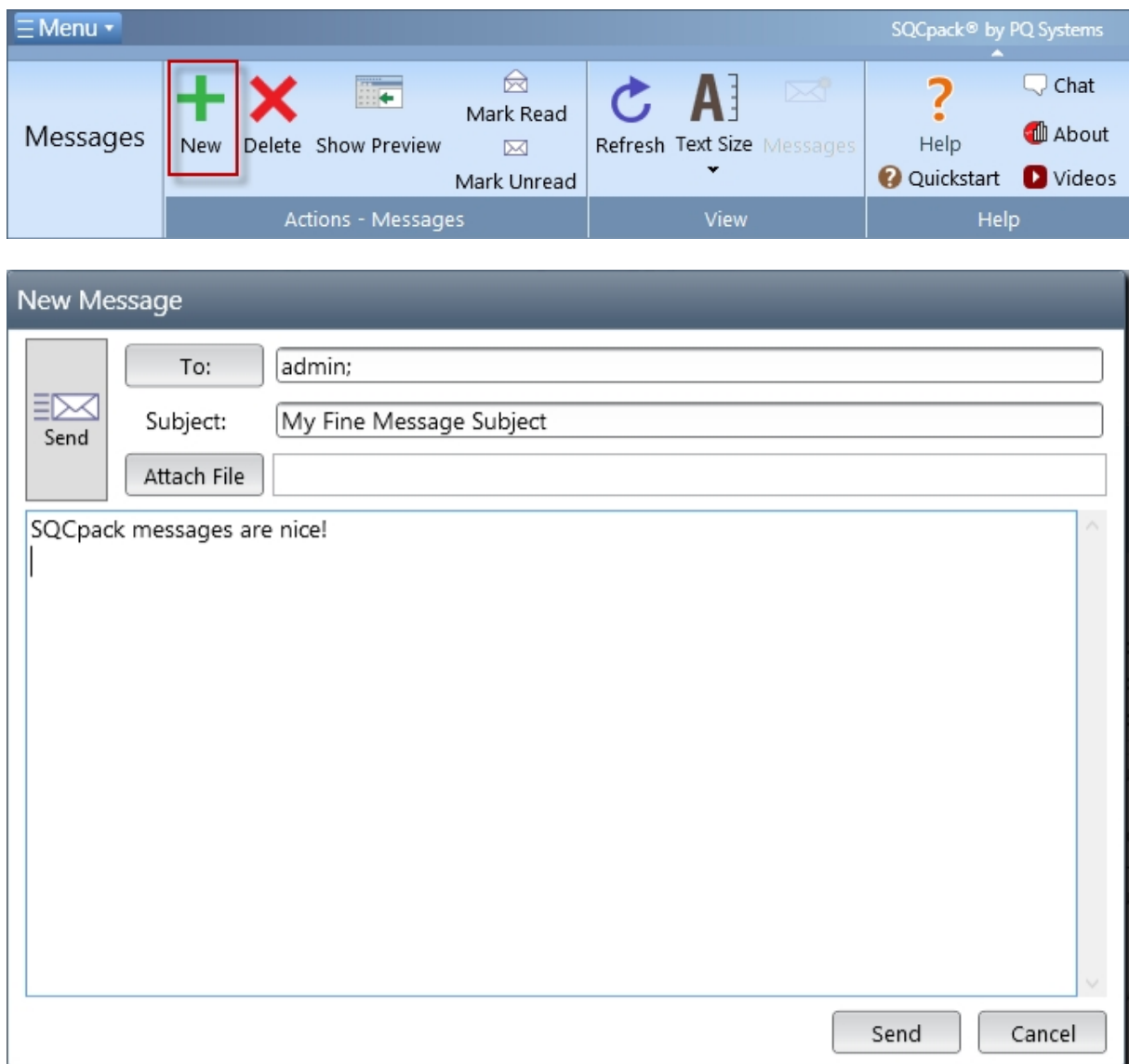
Marking messages as read/unread

To change the read/unread status of any messages, select them and press the **Mark Read / Mark Unread** button on the *Actions – Messages* ribbon bar. You can also double click a message to open it in a separate message window - which results in marking the message as *read*.

Creating an SQCpack message

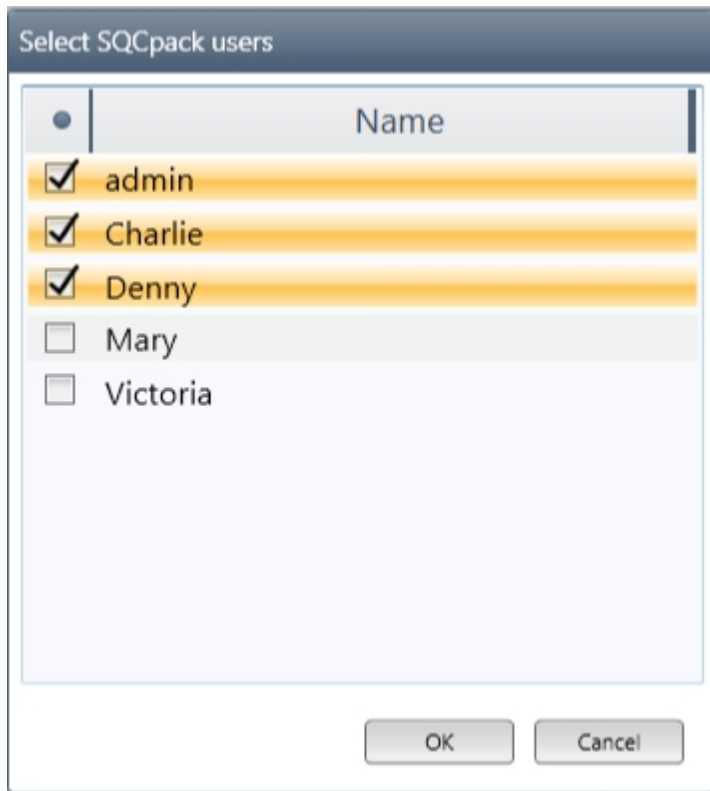
Creating messages

To create a new SQCpack message, click the **New** button in the message action ribbon.



The image shows two parts of the SQCpack interface. The top part is a ribbon bar with a 'Menu' dropdown on the left and 'SQCpack® by PQ Systems' on the right. The ribbon has three main sections: 'Messages', 'View', and 'Help'. The 'Messages' section contains buttons for 'New' (highlighted with a red box), 'Delete', 'Show Preview', 'Mark Read', and 'Mark Unread'. The 'View' section contains 'Refresh', 'Text Size', and a 'Messages' dropdown. The 'Help' section contains 'Help', 'Quickstart', 'Chat', 'About', and 'Videos'. The bottom part is a 'New Message' dialog box. It has a 'Send' button on the left. The 'To:' field contains 'admin;'. The 'Subject:' field contains 'My Fine Message Subject'. There is an 'Attach File' button and a text area with the text 'SQCpack messages are nice!'. At the bottom right of the dialog are 'Send' and 'Cancel' buttons.

To add an SQCpack recipient to the message, click the **To** button shown above.



To - Select the SQCpack users that you want to receive your message and click **OK**.

A **Subject** is required to send any SQCpack message.

An image file (JPG, PNG, GIF or BMP) can be attached to your message with the **Attach File** button. Other types of files will not be attached.

For information on generating images from charts, see [Saving charts as image files](#).

Reference - Importing data into SQCpack

This is a reference section that contains topics related to importing data into SQCpack.

If you have data in another software application and you want to bring it into SQCpack, use the Import data features. These are visible on the **Data** button in the ribbon bar when you are viewing your list of data groups.

Note – Before you import data into SQCpack, be sure to understand that SQCpack can create and manage SPC charts that get their data from external sources; that is, from data that is stored outside of SQCpack. For example, if you have data in Excel, Access, SQL Server, or Oracle, SQCpack can chart this data **without the need to import it first**. Here are some topics to explore to help you decide **if** you need to import data into SQCpack:

[The new chart wizard](#)

[Create a chart using data external to SQCpack](#)

Importing data from a CSV or Excel file into a new data group

SQCpack supports importing data from CSV (comma separated values) text files into a new data group. CSV is a standard format for storing data in text files. Since Excel can save a worksheet as a CSV file, this

makes CSV files a common way to exchange data between applications.

SQCpack also supports importing data from Excel workbook files (XLS and XLSX) into a new data group.

Importing from a CSV or Excel file to create a **new data group** can be thought of as an alternative way to create a new data group. If you have a CSV or Excel file that contains the data columns you want in your group, the file can be used to create a new group.

Start this process by clicking on **Data Groups** from the navigation menu. This will display your list of data groups. From the ribbon bar, under the **Data** button, click on the drop-down triangle and then select **Import from file (*.csv or Excel) into new group**. This displays a form where you start by selecting the data file and entering a group name. In the image below, a CSV file has been selected and a name has been entered for the data group that will be created:

Import into New Data Group

File to import (.csv or Excel):
 ...

Data group name:

Data group description:

Display **All** values
 Total rows: 20

Enter names in first row. Three measurement columns with same name, creates measurement with subgroup size of 3.
 Two columns types (one selected as Inspected, and one selected as Count) must use the same display name to create a p-chart characteristic.

| Row Treatment | Specifications | Date | Length | Width_1 | Width_2 | Width_3 | Diameter1 | Diameter2 | Diameter3 |
|------------------|----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Ignore | Identifier | Measurement | Measurement | Measurement | Measurement | Measurement | Measurement | Measurement | Measurement |
| Exclude | Specifications | Date | Length | Width_1 | Width_2 | Width_3 | Diameter1 | Diameter2 | Diameter3 |
| Upper Spec | USL | | 15.8 | 10 | | | | 33 | |
| Target | Target | | 14.8 | 9 | | | | 30 | |
| Lower Spec | LSL | | 13.8 | 8 | | | | 27 | |
| Units of measure | Units | | mm | in | | | | mm | |
| Include | | 1/1/2017 | 14.9701 | 9.01 | 9.01 | 9.01 | 30.25 | 30.25 | 30.25 |
| Include | | 1/2/2017 | 14.2195 | 9.18 | 9.18 | 9.18 | 31.02 | 31.02 | 31.02 |
| Include | | 1/3/2017 | 13.4807 | 9.23 | 9.23 | 9.23 | 28.95 | 28.95 | 28.95 |
| Include | | 1/4/2017 | 15.3919 | 9.03 | 9.03 | 9.03 | 29.01 | 29.01 | 29.01 |
| Include | | 1/5/2017 | 15.7099 | 9.04 | 9.04 | 9.04 | 30.25 | 30.25 | 31.23 |
| Include | | 1/6/2017 | 15.5721 | 9 | 9 | 9 | 31.02 | 31.02 | 31.02 |
| Include | | 1/7/2017 | 15.4385 | 9.012 | 9.012 | 9.012 | 28.95 | 28.95 | 28.95 |
| Include | | 1/8/2017 | 14.982 | 8.995 | 8.995 | 8.995 | 31.02 | 31.02 | 31.02 |
| Include | | 1/9/2017 | 14.4037 | 8.91 | 8.91 | 8.91 | 28.95 | 27.28 | 28.95 |

Exclude All Clear names Set all ignore Import Cancel

When you select a CSV or Excel data file, SQCpack makes some guesses about how to import the data. These guesses may or may not reflect how you want to import the data.

Each column in this grid reflects a column of data from your CSV or Excel file. In the first row, SQCpack guessed at the column name. However, you may type into this row to give each column a name that will be used in the data group definition.

In the second row, you see a combo box where SQCpack has guessed what type of column this will be in the data group. Select other options from these combo boxes to tell SQCpack how to treat the columns. Notice that one of your choices is *Ignore*. Use this for any column that you **do not** wish to import.

The first column of the grid allows you to select how to treat each row of data. In the example above, the first row contains column headings. Since the first row specifies to *Exclude* the row, it will not be imported. The *Exclude* option may also be used to exclude any rows that contain data that you do not want to import.

Display - This controls how many of the rows of the input CSV or Excel file will be displayed in the grid and included in the import operation.

Exclude All - When the majority of the data rows should be excluded, click *Exclude All* and then set the rows that you want to import to something other than *Exclude*.

Clear names - Click to clear all the column name fields. In the example shown above, the first row fields containing "Specifications", "Date", "Length", "Width_1", etc. would be cleared.

Set all ignore - Click to set the second row for **all** of the grid columns to *Ignore*.

Import - When everything is setup properly, click *Import* to start importing the data into a new data group.

To summarize, you do three things in this grid: 1. Name the columns in the first row; 2. Tell SQCpack how to treat each column, using combo boxes in the second row; 3. Tell SQCpack which (if any) rows to exclude during the import. Once this is finished, click the **Import** button. This will create the new group and import the data from your CSV file. When you open the group for data entry, it will contain your data.

A note about importing into a characteristic with a subgroup size greater than one

In the image below, the same CSV file was selected. However, this time each of the columns that were named starting with *Width_* were given **the same name** of *Width*.

Import into New Data Group

File to import (.csv or Excel):
E:\SQCpack\CSV Data\Import-specs.csv

Data group name:
Import-specs

Data group description:

Display **First n** values, where n = **500**

Total rows: 20

Enter names in first row. Three measurement columns with same name, creates measurement with subgroup size of 3.
Two columns types (one selected as Inspected, and one selected as Count) must use the same display name to create a p-chart characteristic.

| Row Treatment | Specifications | Date | Length | Width | Width_1 | Width_2 | Width_3 | Diameter1 | Diameter2 | Diameter3 |
|------------------|----------------|----------|---------|---------|---------|---------|-----------|-----------|-----------|-----------|
| Exclude | Specifications | Date | Length | Width_1 | Width_2 | Width_3 | Diameter1 | Diameter2 | Diameter3 | |
| Upper Spec | USL | | 15.8 | 10 | | | | 33 | | |
| Target | Target | | 14.8 | 9 | | | | 30 | | |
| Lower Spec | LSL | | 13.8 | 8 | | | | 27 | | |
| Units of measure | Units | | mm | in | | | | mm | | |
| Include | | 1/1/2017 | 14.9701 | 9.01 | 9.01 | 9.01 | 30.25 | 30.25 | 30.25 | |
| Include | | 1/2/2017 | 14.2195 | 9.18 | 9.18 | 9.18 | 31.02 | 31.02 | 31.02 | |
| Include | | 1/3/2017 | 13.4807 | 9.23 | 9.23 | 9.23 | 28.95 | 28.95 | 28.95 | |
| Include | | 1/4/2017 | 15.3919 | 9.03 | 9.03 | 9.03 | 29.01 | 29.01 | 29.01 | |
| Include | | 1/5/2017 | 15.7099 | 9.04 | 9.04 | 9.04 | 30.25 | 30.25 | 31.23 | |
| Include | | 1/6/2017 | 15.5721 | 9 | 9 | 9 | 31.02 | 31.02 | 31.02 | |
| Include | | 1/7/2017 | 15.4385 | 9.012 | 9.012 | 9.012 | 28.95 | 28.95 | 28.95 | |
| Include | | 1/8/2017 | 14.982 | 8.995 | 8.995 | 8.995 | 31.02 | 31.02 | 31.02 | |
| Include | | 1/9/2017 | 14.4037 | 8.91 | 8.91 | 8.91 | 28.95 | 27.28 | 28.95 | |

Exclude All Clear names Set all ignore Import Cancel

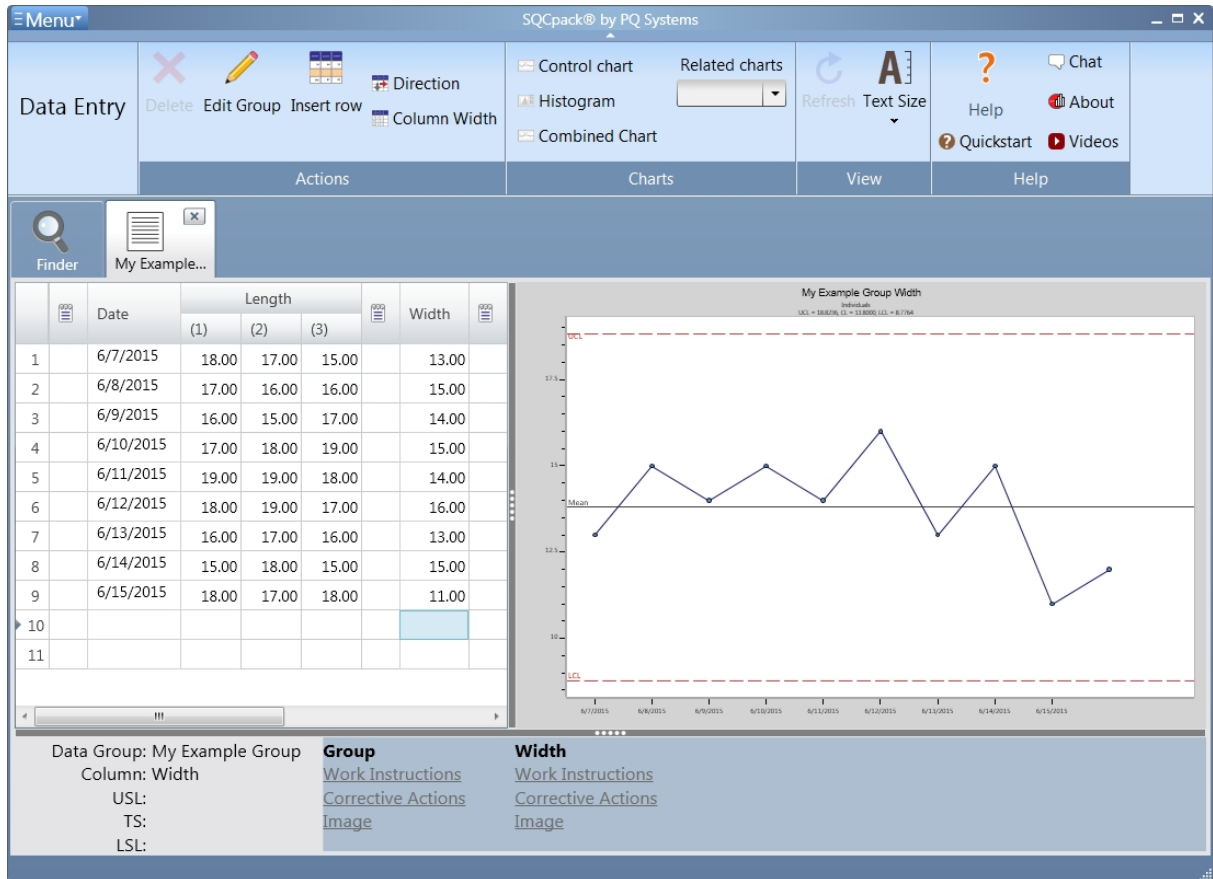
When you give multiple measurement columns the same name, SQCpack assumes that they belong to the same **measurement characteristic** and the **subgroup size** is set based on the number of columns. In the image above, SQCpack will create a data group with a *Width* measurement characteristic that has a **subgroup size of three**.

Importing data from a CSV file into an existing data group

SQCpack supports importing data from CSV (comma separated values) text files. This is a standard format for storing data in text files. Since Excel can save a worksheet as a .CSV file, this makes CSV files a common way to exchange data between applications.

When importing data into an existing group, there should be some alignment between the columns available in the data group and the columns found in the import source file. They do not have to be identical, but to be useful, some of the columns expected by the group should appear in the CSV file. Here is an example;

imagine a data group with three columns, which looks like this when being used for data entry:



The columns for the data group are: Date, Length(1), Length(2), Length(3), and Width. A CSV file with the same columns, would look like this:

```
Date,Length_1,Length_2,Length_3,Width
6/7/2015,18,17,15,13
6/8/2015,17,16,16,15
6/9/2015,16,15,17,14
6/10/2015,17,18,19,15
6/11/2015,19,19,18,14
6/12/2015,18,19,17,16
6/13/2015,16,17,16,13
6/14/2015,15,18,15,15
6/15/2015,18,17,18,11
```

This CSV file aligns exactly with the data group so it would import easily. If the columns were in a different order, they would still import. If some of the columns are missing, they would still import; however, the resulting grid (in SQCpack) will have some empty cells.

Follow these steps to import data from a CSV file into an **existing** data group:

From the navigation menu, select **Data Groups**. Click one time on the group that you wish to import into, to select the data group. One, and only one, data group should be selected. In the ribbon bar, near the bottom of the **Data** button, click on the drop-down triangle and then select **Import from text file (*.csv) into existing group**. This will display the following dialog:

The data group you are importing into will be shown. Next, click the **Browse** button to find and the select a .CSV file containing your import data. In the image below, a .CSV file has been selected. The next step is to tell SQCpack what to do with each column of data it finds in the file. In the first row of the import grid, use the combo boxes (highlighted below) to describe how to treat each import column.

Import from text file

Data group name:
Example Group

Input file:
C:\Users\MattA\Documents\DailyProduction.csv

Select the data you wish to import:

| | Identifier | Identifier | | Measurement1 | Measurement2 | Measurement3 | Measurement1: cause | | | |
|--------------------------|------------|------------|----------|--------------|--------------|--------------|---------------------|-------------|--------------|---|
| Exclude | Key | MfgDate | Operator | Length_1 | Length_2 | Length_3 | Length_Cause | Width_1 | Width_Cause | T |
| <input type="checkbox"/> | 1 | 1/1/2012 | Sam | 23.22999954 | 23.25 | 23.34000015 | | 18.76000023 | | |
| <input type="checkbox"/> | 2 | 1/4/2012 | Mary | 24.12000084 | 25.34000015 | 24.31999969 | | 18.70000076 | | |
| <input type="checkbox"/> | 3 | 1/5/2012 | Nick | 25.48999977 | 23.55999947 | 22.12999916 | | 19.22999954 | | |
| <input type="checkbox"/> | 4 | 1/6/2012 | Sally | 24.55999947 | 23.45000076 | 22.34000015 | | 18.78000069 | | |
| <input type="checkbox"/> | 5 | 1/7/2012 | Tom | 23.45000076 | 25.34000015 | 24.31999969 | | 19.04000092 | Broken blade | |
| <input type="checkbox"/> | 6 | 1/8/2012 | Sam | 22.35000038 | 22.37999916 | 22.38999939 | | 21.01000023 | | |
| <input type="checkbox"/> | 7 | 1/11/2012 | Tom | 24.31999969 | 23.34000015 | 22.20999908 | | 18.87000084 | | |
| <input type="checkbox"/> | 8 | 1/12/2012 | Sally | 23.22999954 | 23.34000015 | 23.20999908 | | 19.76000023 | | |
| <input type="checkbox"/> | 9 | 1/13/2012 | Jack | 22.37999916 | 21.34000015 | 23.87000084 | | 19.63999939 | | |
| <input type="checkbox"/> | 10 | 1/14/2012 | Susan | 21.34000015 | 22.47999954 | 24.86000061 | | 17.57999992 | | |
| <input type="checkbox"/> | 11 | 1/15/2012 | Sam | 26.25 | 26.10000038 | 26.34000015 | Power failure | 18.76000023 | | |

Selected columns may not contain duplicates.

Exclude All Import Cancel

The choice in each combo box will vary, based on the data group that you have selected as the import target. In the example shown above, the first column has been setup to import into the identifier named *Key*. You must set the combo box for each column that you want to import. Note that just because a column is present in the input file does not mean you must import it; instead, you can leave it blank or set it to *<ignore>*.

Exclude All - When the majority of the data rows should be excluded, click *Exclude All* and then uncheck the rows that you want to import.

Import - When everything is setup properly, click *Import* to start importing the data into the existing data group.

Importing data from SQCpack 6.5

SQCpack 6.5 stores data in a Microsoft Access database that uses a .SQD file extension. The new SQCpack stores data in a SQL Server database.

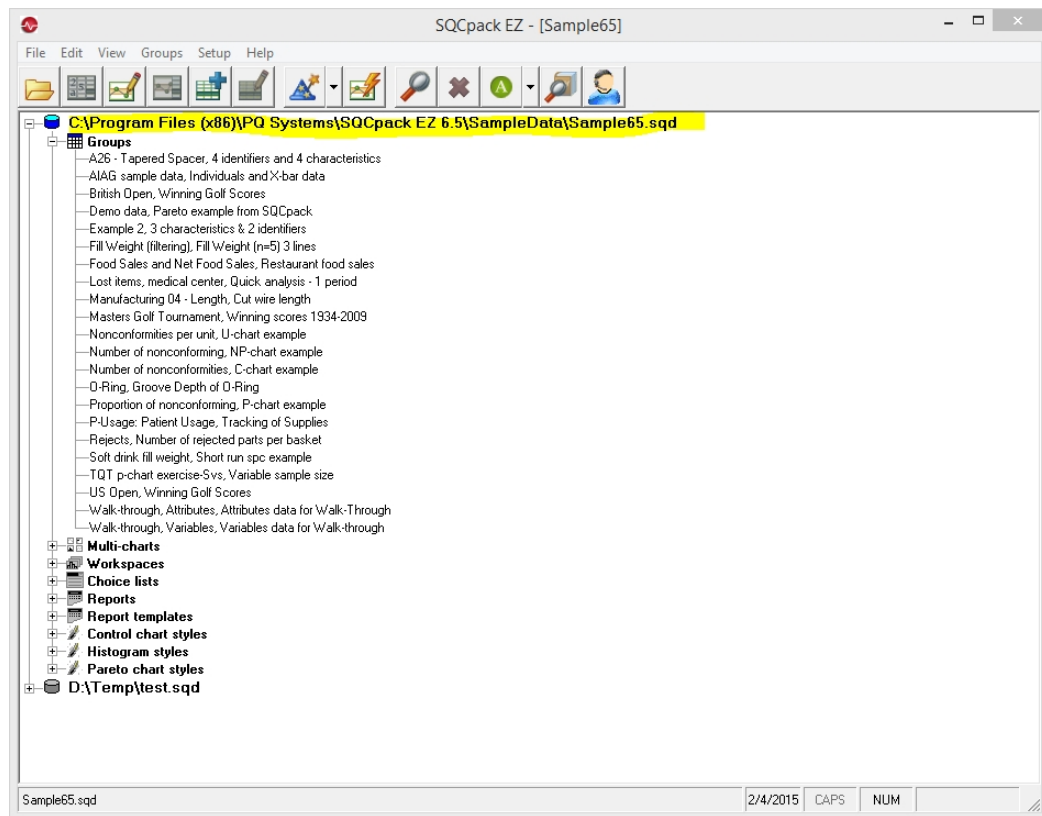
The data and charts in your SQCpack 6.5 databases may be imported, or *migrated*, into the new SQCpack. In a transition from SQCpack 6.5, some planning about how and when to do the migration should be done.

This section describes the steps for importing data from SQCpack 6.5 into the new SQCpack. Before you decide to import all of your SQCpack 6.5 data, you should become familiar with the new SQCpack. It might be a good idea to import only a few of SQCpack 6.5 data groups for learning and practice, and then import all of your SQCpack 6.5 data once your team is ready to make the full transition.

Before importing data from your SQCpack 6.5 database, you may wish to review these topics to learn about the database in the new SQCpack:

- [Why you should use a multi-user database](#)
- [Create a new database](#)
- [Setup to use a DBC file to open the database](#)

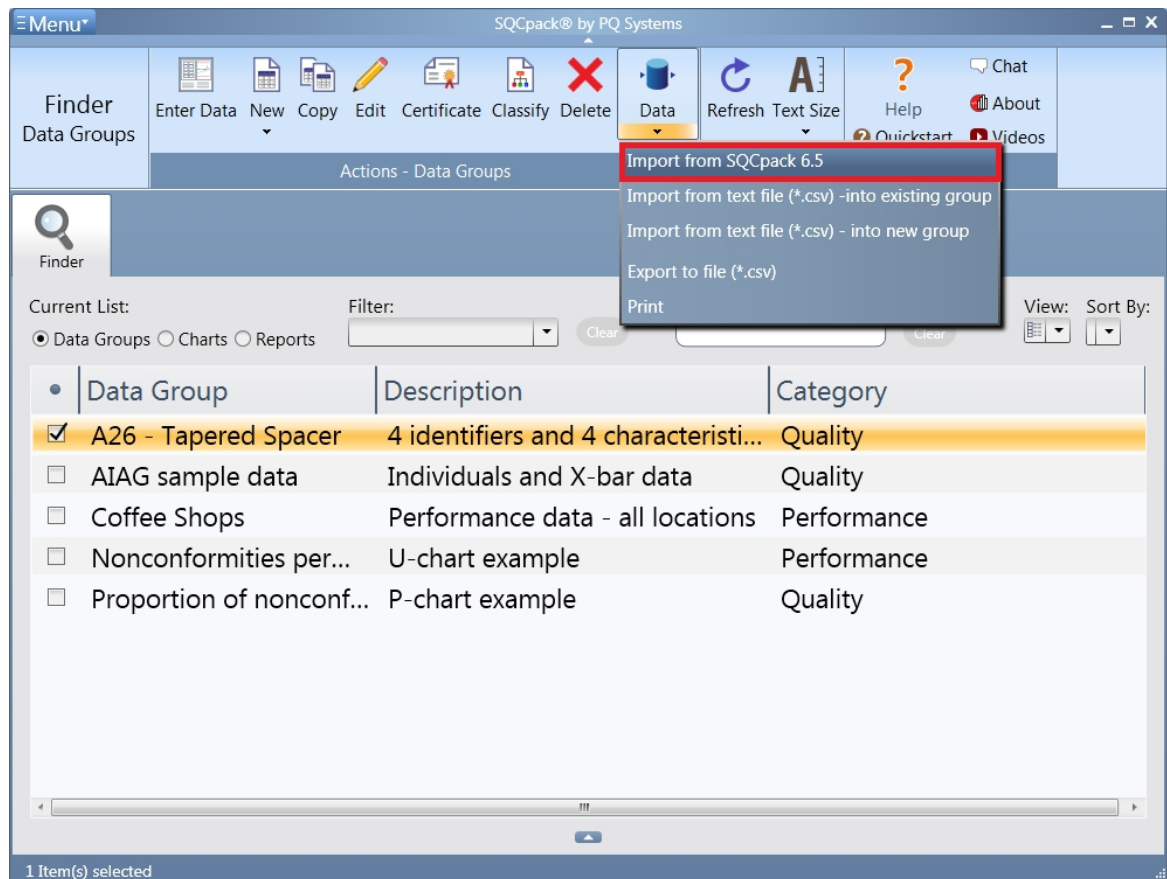
You need to know the location of your SQCpack 6.5 database before you begin the import process. To discover this location, run the SQCpack 6.5 program. The full path to the database is shown at the top of the outline on the main form. In the image below, the full path is highlighted:



Make note of this file location, since you will need it to being importing this data.

Start the **Import from SQCpack 6.5** process by selecting **Data Groups** from the navigation menu.

Near the bottom of the **Data** button in the ribbon bar, click on the drop-down triangle and then select **Import from SQCpack 6.5** as shown below:



This will display a form where you describe the SQCpack 6.5 data you wish to import – shown below:

SQCpack 6.5 database path:

Select the SQCpack 6.5 data groups to be imported:

| Selected | Data group name | Description |
|----------|-----------------|-------------|
| | | |

☐ Import Choice Lists
 ☐ Import out-of-control tests
 ☐ Import data device definitions
 ☐ Create chart thumbnails (will be slower)

Use the **Browse** button to find and select your SQCPack 6.5 database file. Remember, these have a .SQD file extension. Once you have selected a database file, all of the data groups from the SQCPack 6.5 database will be shown in a grid. Check the groups you want to import in the **Selected** column or use the **Select All** button to select all of the data groups.

Use the checkboxes below the grid to optionally import the choice lists, out-of-control tests, and device definitions contained in the SQCPack 6.5 database.

Once your choices have been made, click the **Import** button to start importing data into the new SQCpack database.

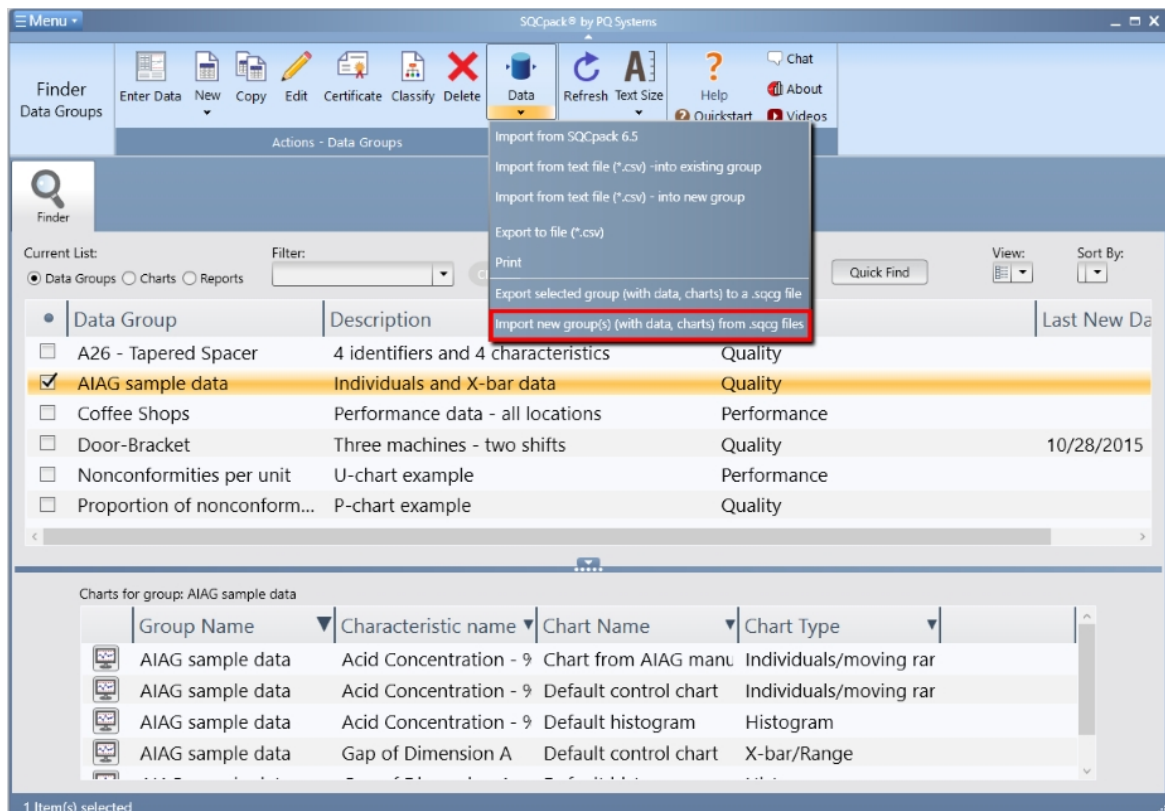
Speed while importing from SQCpack 6.5

When importing SQCpack 6.5 data, many operations occur to translate data from the old scheme into the new scheme. This can take time. As a rule of thumb, consider that each data group may take up to one minute to import. Once you plan to import all of your SQCpack data for the final transition over to the new SQCpack, be sure to plan for allowing time for the import to complete.

Note – your SQCpack 6.5 data will remain usable within SQCpack 6.5. Both SQCpack 6.5 and the new SQCpack can be installed and used on the same computer. However, once you migrate your data, it will be best, if possible, that all **new work** be done using the new SQCpack.

Importing a data group from an SQCG file

To import a data group, ensure that the correct database for the import is open in SQCpack. Then, select **Data Groups** from the navigation menu. From the ribbon, select the **Import new group(s) (with data, charts) from .sqcg files** (shown below in the red rectangle).



When importing a .SQCG file into SQCpack, you may select one or multiple files when the dialog is displayed. If you select one file, you will have the ability to give a name to the group that will be imported. If you select multiple .SQCG files, the group names will be generated automatically. For example, Group1.sqcg will create a group named **Group1**. Note that groups may always be renamed at a later time.

During the import of the .SQCG file the imported data will include:

- Data used by the data group
- Charts used by the data group
- Choice lists used by the data group
- Documents used by the data group
- Categories used by the data group

- Images used by the data group
- *Common specifications sets* used by the data group

Note - to export a data group to a .sqcg file see [Exporting a data group to an SQCG file](#)

Reference - Exporting or printing data from SQCpack

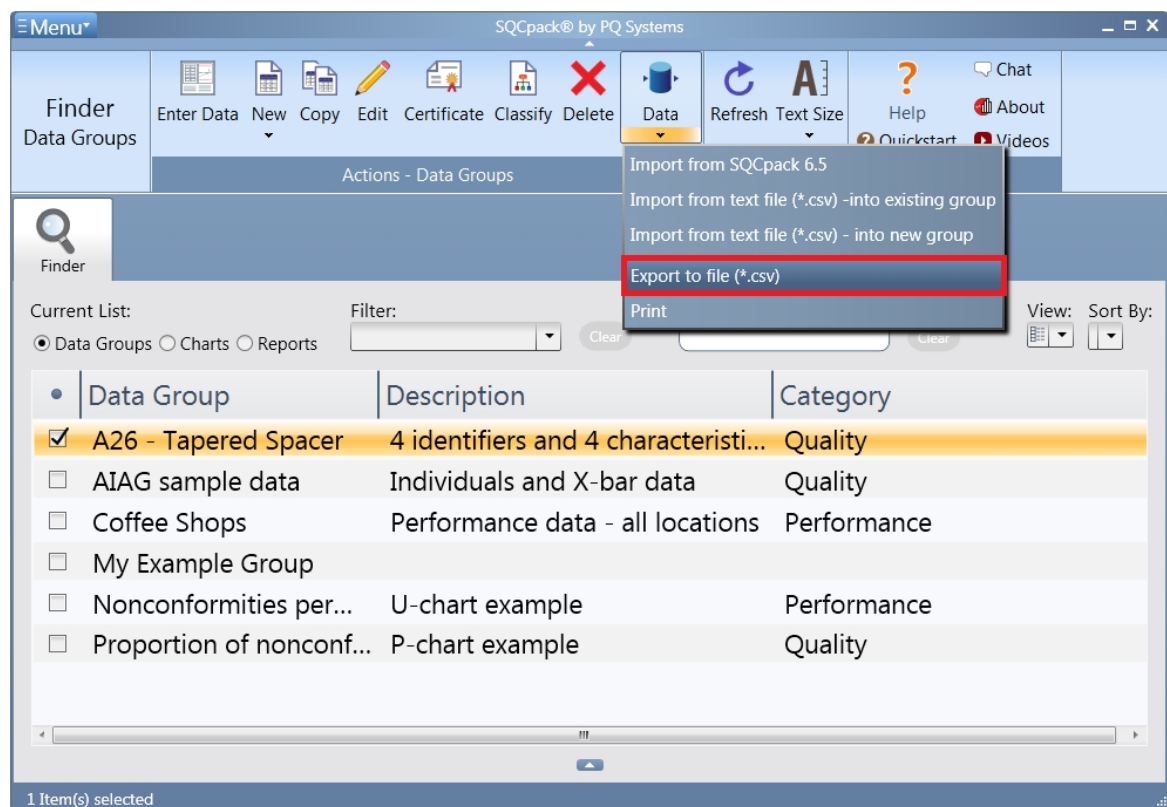
This is a reference section that contains topics related to exporting data from SQCpack.

SQCpack supports exporting data into CSV (comma separated values) text files. Since Excel can save or open a file in CSV format, this makes the CSV format a common way to exchange data between applications.

Exporting data to a CSV file

Export data refers to exporting the data rows that have been typed in during data entry into a data group. A comma separated values text file will be created. The CSV file allows you to use this SQCpack data in other applications.

Start by selecting **Data groups** from the navigation menu. Select a data group by clicking once in the list. In the ribbon bar, click on the drop-down under the **Data** button and then select **Export to text file (*.csv)** from the menu (shown below).



This will display the dialog view shown below:

Export Data

Selected group: A26 - Tapered Spacer

Output file:

C:\Users\cerao\Documents\A26 - Tapered Spacer.csv

Browse

☒ Include row for column headers
 ☐ Include Causes columns

☒ Include Identifiers
 ☐ Include Notes columns

☐ Include row numbers
 ☐ Include Corrective Action columns

▼ Data rows: (Last 25)

Select columns to export:

| | |
|--|--|
| <input checked="" type="checkbox"/> Date | |
| <input checked="" type="checkbox"/> Technician | |
| <input checked="" type="checkbox"/> Outside Diameter | |
| <input checked="" type="checkbox"/> Inside Diameter | |
| <input checked="" type="checkbox"/> Spacer Thickness | |
| <input checked="" type="checkbox"/> Taper Diameter | |

Select All

Unselect All

Export

Close

Use this form to specify what you want exported and where you want the CSV file to be saved.

An **Output file** will be specified by default. You may type or use the **Browse** button to specify a different folder or file.

Check or un-check each box to specify what you want to include in the CSV export file. By default, all of the possible columns from the data group will be selected. Uncheck any columns that you do not want to export.

You can filter the data that you want to export by selecting the expander (shown in red below). In the dialog below, the filter is set up to export only data from this year, but many other filter options are possible. You can also select how many data rows that you want to export.

For more information on filtering see [Chart filters](#).

Export Data

Selected group: *A26 - Tapered Spacer*

Output file:

☒ Include row for column headers ☐ Include Causes columns
☒ Include Identifiers ☐ Include Notes columns
☐ Include row numbers ☐ Include Corrective Action columns

☒ Data rows: (Last 25 - filtered)
☐ All samples
☒ The last n samples, n =

Setup optional filter criteria

 Is within

Select columns to export:

☒ Date

When the form reflects what you want to do, click on the **Export** button. This will create your data file, tell you how many rows have been exported, then close the export view.

Using reports to export statistics

An additional export option is available for reports you have defined. Once a report has been defined, you have options to save the output of the report in different formats when you preview the report. For example, it supports PDF, Excel, RTF (rich text format), and others. Note that rather than exporting raw data, the reports are calculating statistics and exporting the statistics.

For more information on reports, see the topic: [Creating or customizing a Report](#)

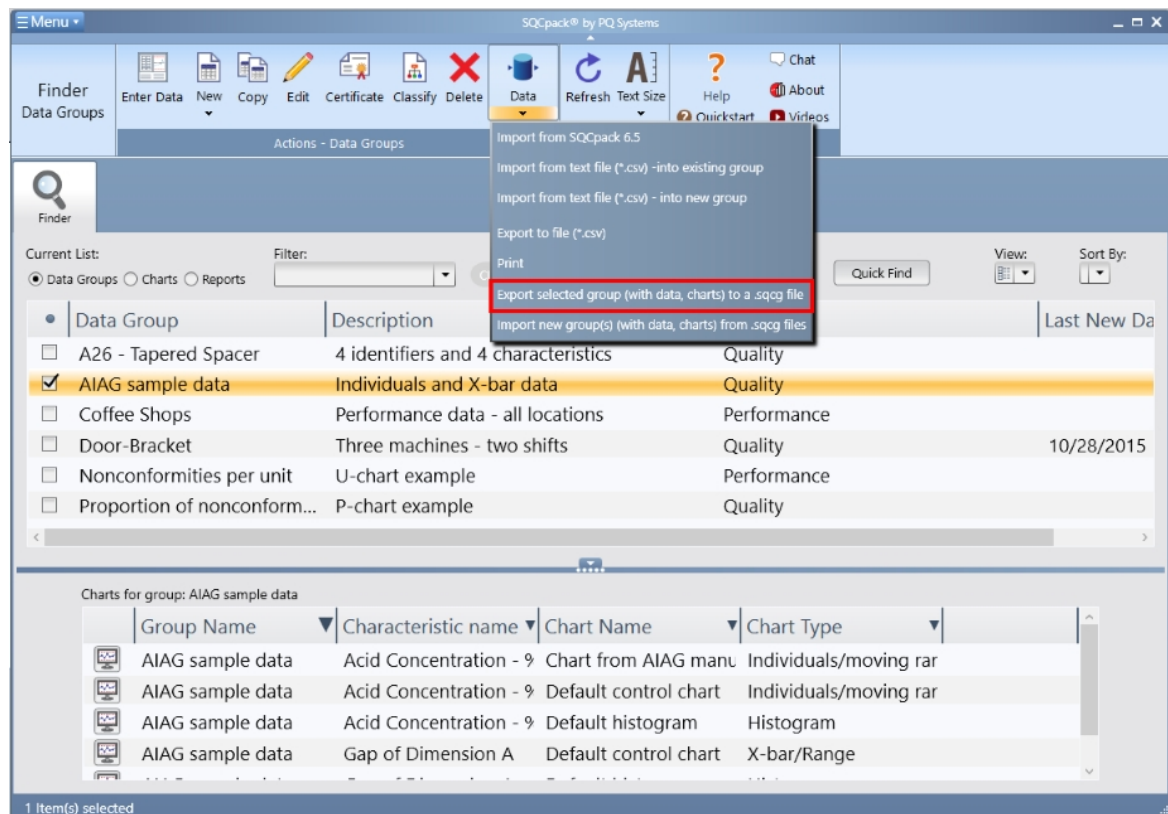
Exporting a data group to an SQCG file

A data group can be exported with all of its data to be used in another database. When a data group is exported it will be exported to a .SQCG file which will include:

- Data used by the data group
- Charts used by the data group
- Choice lists used by the data group
- Documents used by the data group

- Categories used by the data group
- Images used by the data group
- *Common specifications sets* used by the data group

Start this process by clicking on **Data Groups** from the navigation menu. Then, select the data group, or groups, that you would like to export. From the ribbon, under the drop down for data select the **Export Selected data group (with data, charts) to a .sqcg file** option (shown below in the red rectangle).



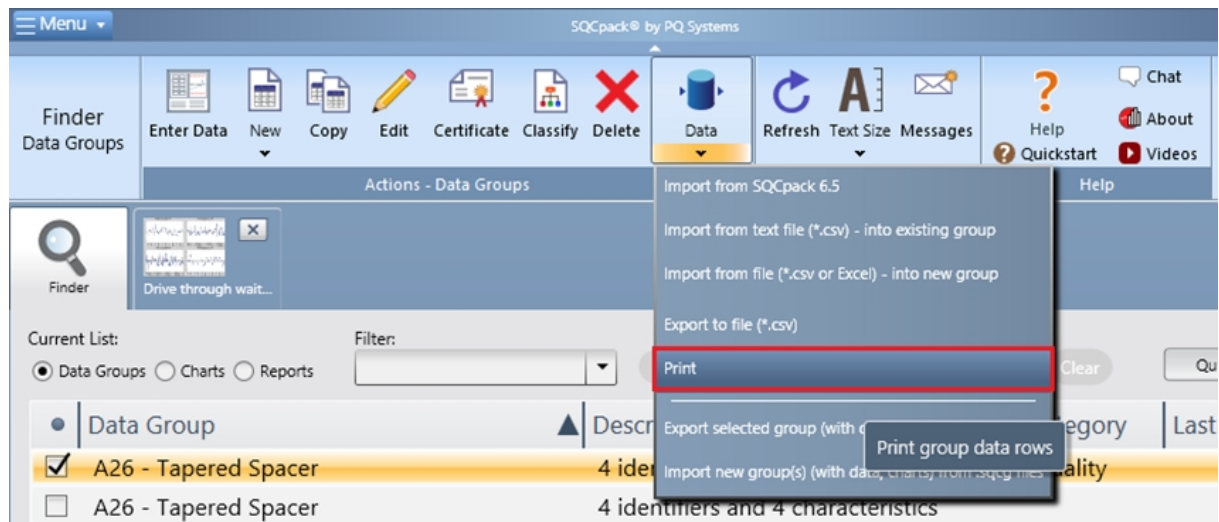
This will open a dialog to allow you to choose where the data group will be saved on your computer.

Note - to import a data group from a .sqcg file see [Importing a data group from an SQCG file](#)

Printing data

Print data refers to printing the data rows that have been typed in during data entry into a data group.

Start by selecting **Data groups** from the navigation menu. Select a data group by clicking once in the list. In the ribbon bar, click on the drop-down under the **Data** button and then select **Print** from the menu (shown below).



This will display the dialog view shown below:

Use this form to specify what you want to print.

Check or un-check each box to specify what you want to include in the printed document. By default, all of the possible columns from the data group will be selected. Uncheck any columns that you do not want to print.

You can filter the data that you want to print by selecting the expander (shown in red below). In the dialog below, the filter is set up to print data only where the technician is equal to Ryan, but many other filter options are possible. You can also select how many data rows that you want to print.

Print Data

Data Group: *A26 - Tapered Spacer*

☒ Include row for column headers
 ☐ Include Notes columns

☒ Include Identifiers
 ☐ Include Corrective Action columns

☐ Include row numbers
 ☒ Include Data Group Name

☐ Include Causes columns
 ☒ Include Data Group Description

Font Size:

☒ Data rows: (Last 25)

☐ All samples
 ☒ The last n samples, n =

Setup optional filter criteria

+ Condition

+ Date within

+ Clause

+ NULL test

+ Add range

View

Technician

Is equal to

Ryan

Select All

Unselect All

Print Preview

Print

Close

For more information on filtering see [Chart filters](#).

Print Data

Data Group: *A26 - Tapered Spacer*

☒ Include row for column headers ☐ Include Notes columns
☒ Include Identifiers ☐ Include Corrective Action columns
☐ Include row numbers ☒ Include Data Group Name
☐ Include Causes columns ☒ Include Data Group Description

Font Size:

▼ Data rows: (Last 25)

Select columns to print:

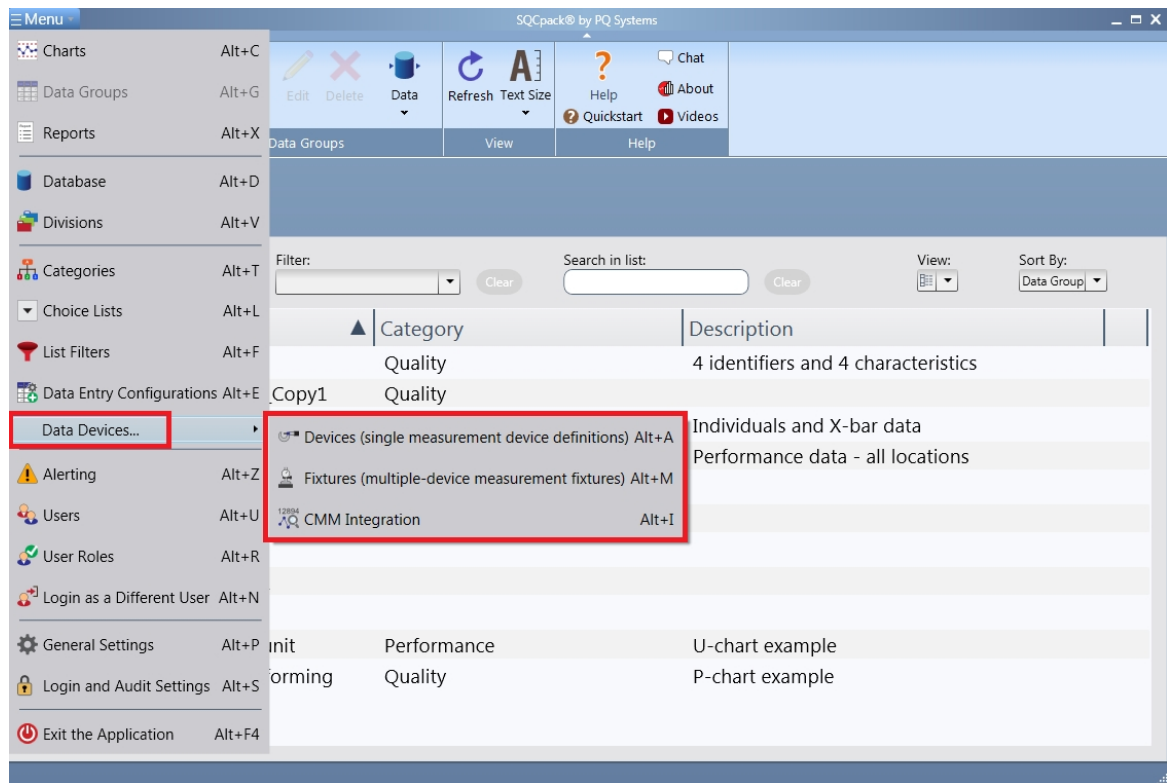
| | |
|--|--|
| <input checked="" type="checkbox"/> Date | |
| <input checked="" type="checkbox"/> Technician | |
| <input checked="" type="checkbox"/> Outside Diameter | |
| <input checked="" type="checkbox"/> Inside Diameter | |
| <input checked="" type="checkbox"/> Spacer Thickness | |
| <input checked="" type="checkbox"/> Taper Diameter | |

When the form reflects what you want to do, click on the **Print** button. This will create your data file, tell you how many rows have been printed, then close the print view. You can also click on the **Print Preview** button to preview what your document will look like before you print it.

Reference - Working with measurement devices

SQCPack supports different scenarios for integrating with your measurement devices. This overview will help you decide which one meets your needs. The following sections provide details for each scenario.

From the navigation menu, select **Data Devices**. This will display a sub-menu with three options as shown below.



The **Data Devices** menu contains the following sub-menus:

1. Devices
2. Fixtures
3. CMM Integration

Devices

This option allows you to define simple devices that may be used during data entry. The device list allows you to add, modify, and delete devices. When editing a data group, you may associate a device with the group. Use this option to support **direct input** from a **simple** data collection device while using the data entry screen for a data group. For example, a digital micrometer or a digital scale connected to the computer can input data directly to the SQCpack data entry screen, where the operator may look at the real-time chart to see if trends or problems are occurring.

Fixtures

This option launches a program that is separate from SQCpack. It allows you to move data from a more complex measuring fixture **directly** into SQCpack data groups. It **does not use** the SQCpack **data entry screen**. A fixture is one or more measuring devices, that are connected to the computer, possibly via a multiplexer, that can send readings to the computer. The Fixtures program allows you to add, edit, and delete fixture definitions. A fixture describes what devices are part of the fixture and where the data from each device should go in an SQCpack data group. A fixture is **started** and then readings are taken. After each reading, the data is sent directly to an SQCpack data group. When the user is finished, he or she **stops** the device and exits the program. This program may be launched from within SQCpack, but it can also run as a stand-alone for users who do not need to keep SQCpack running in the work area.

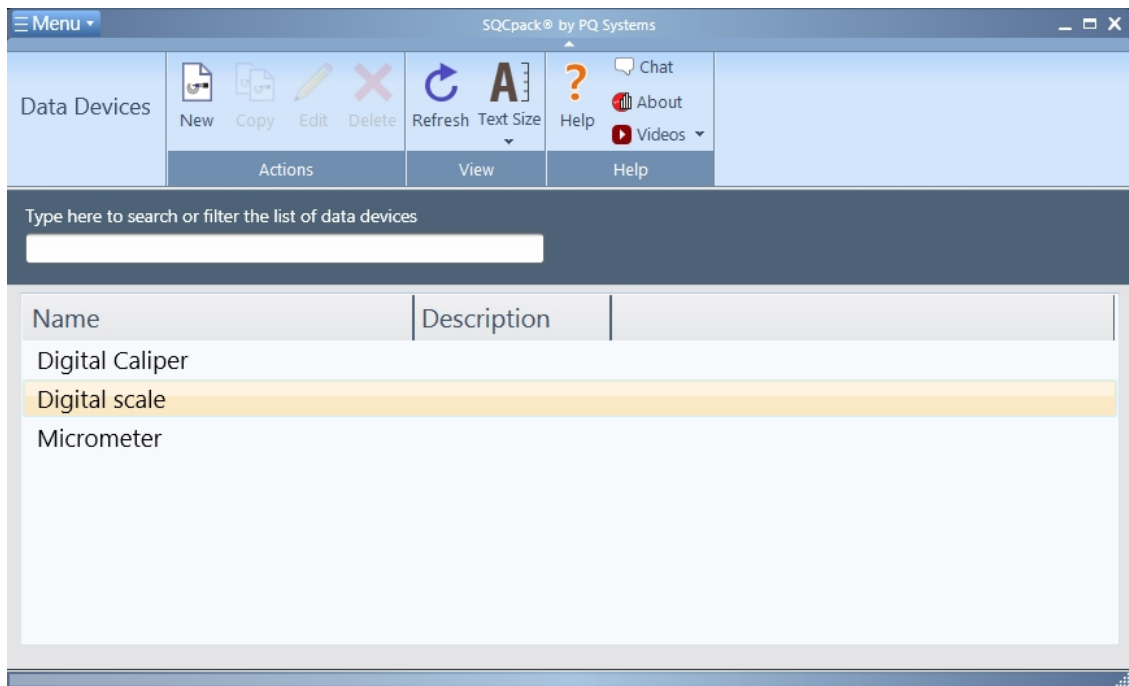
CMM Integration

This option launches a program that is separate from SQCpack. It **does not use** the SQCpack **data entry screen**. The program is designed to handle data that represents output by coordinate measuring machines and other advanced measuring devices. This is typically used to get data output from a coordinate measuring machine (CMM) into one or more SQCpack data groups. The program allows you to add, edit, and delete import configurations. These tell SQCpack how to **parse** complicated output, extract the measurements, and put them into a data group.

Simple device input during data entry

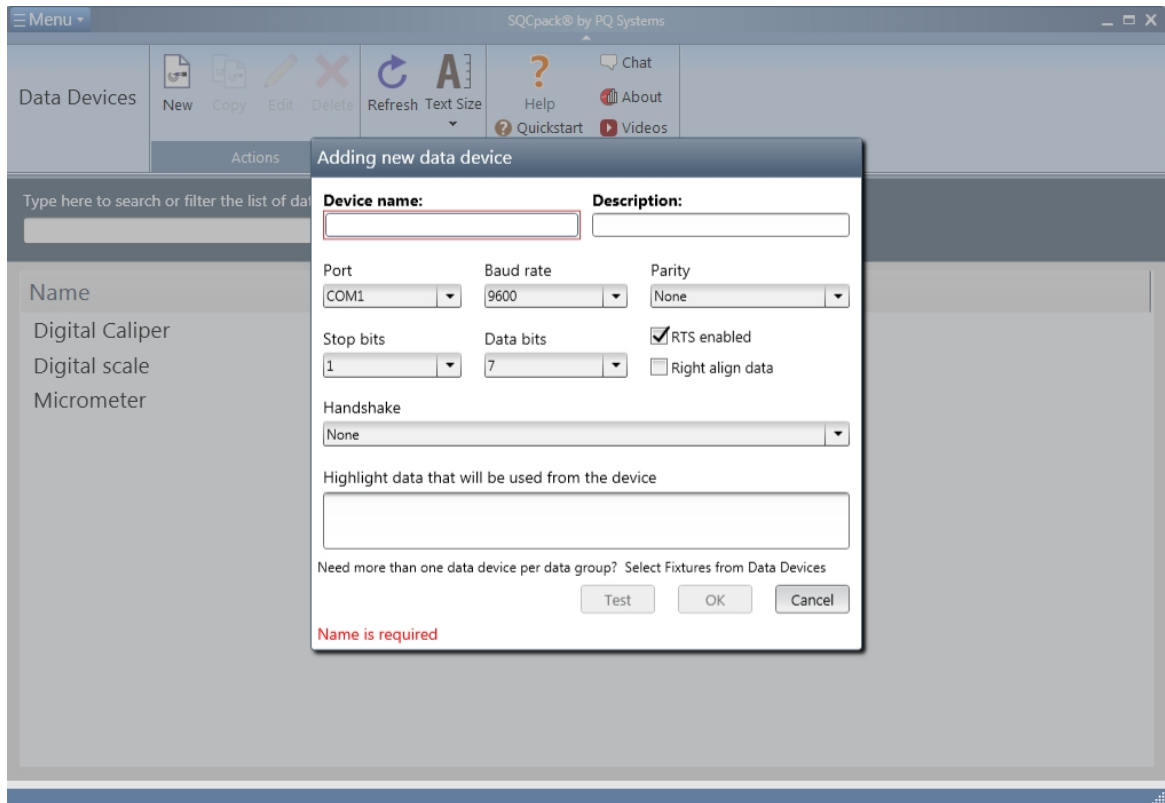
Fixtures - Getting data from device fixtures into SQCpack

From the navigation menu, select **Devices / Devices (single measurement device definitions)**. This will display your list of devices. The list may be empty if you have not yet defined a data device. Here is the list where a few devices have been defined:



The buttons in the ribbon bar allow you create a **New** device, **Copy** a device, **Edit** a device, or **Delete** a device. Each device has a name, optional description, and a collection of settings that you define.

Click on the **New** button to create a new data device. The following form will be displayed:

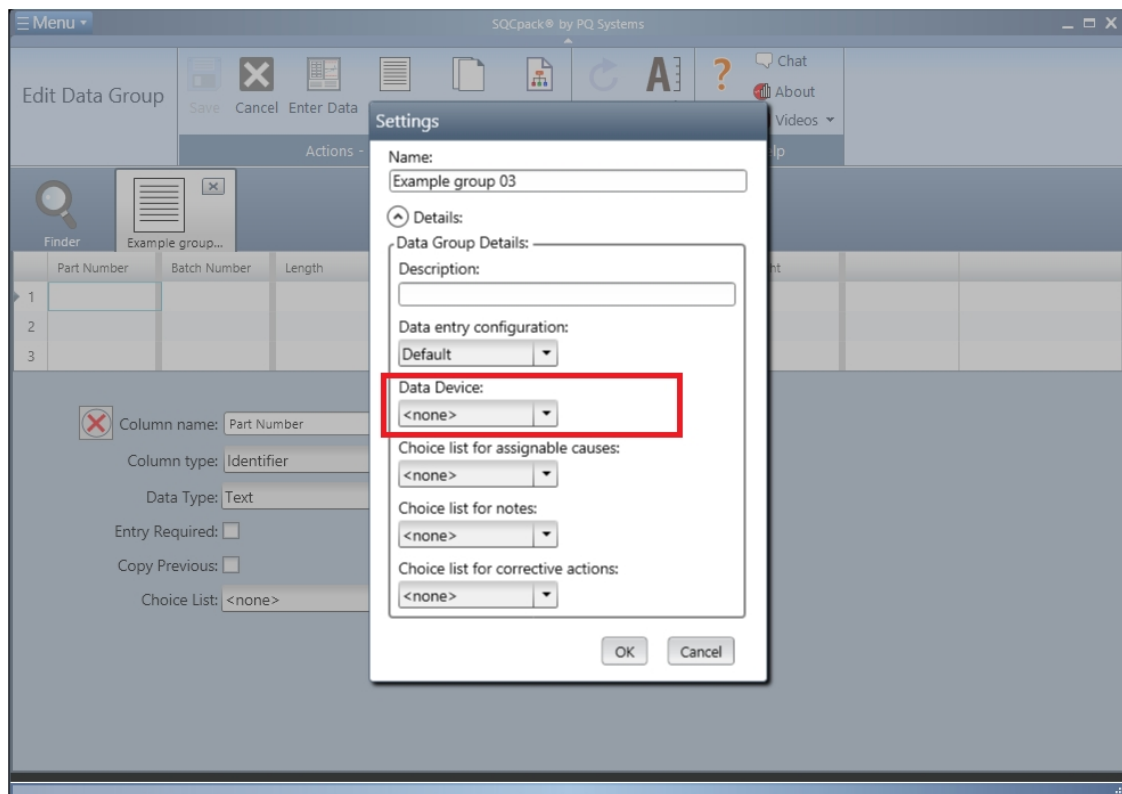


Give the device a name. Correctly specifying each of the settings on this form may require that you consult the **user guide that came with the device**. These are mostly communications settings and will vary, depending on the vendor of your device. If the device is connected to the computer, the **Test** button may be used to experiment with different settings. When you press the **Send** button on your device, data from the device will show up on this form when correctly configured. Once the device is working, click the **OK** button to save this in your device list.

You may define many different devices that show up in the list here. However, the devices are used only when they are associated with a data group and the data group is being used for data entry.

Associating a device with a data group

From the navigation menu, select **Data groups**. Select a group by clicking once on the group in the list. In the ribbon bar, click on the **Edit** button. This displays the edit group form in a new tab. Next, click on the **Settings** button in the ribbon button. This dialog will be displayed:



The combo box that is highlighted will contain the list of the data devices that you have defined. Select the one you want to use when entering data into this group, then click the **OK** button.

Just because you set the **Data Device** for a group does not mean you have to use the device. In fact, data entry for the group can proceed manually just as it always has. However, if the device is connected to the computer and if an operator presses the **send** button on the device, data will be read from the device and **entered into the current cell of the data entry grid**, as if the user had typed it.

Using a data device in this manner can reduce the chance of a measured data value being entered incorrectly.

Fixtures - Getting data from device fixtures into SQCpack

Fixtures - Getting data from device fixtures into SQCpack

When measuring output from your process, it may be a requirement to use more than a single measurement device. For example, it is common practice to put a manufactured product into a test stand and then, with a single button, measure several different characteristics of the product. Some other names used to describe these test stands include *fixture*, *jig*, *rig*, *measurement jig*, *measurement fixture*, etc. SQCpack refers to all of these as **fixtures**.

The **Devices / Fixtures** option in the navigation menu allows you to manage the fixtures that may be used in conjunction with SQCpack.

Besides helping you with multiple device measuring systems, the **Devices / Fixtures** feature also allows you to get data into a data group **without** having to use the **data entry screen**. This can be helpful in automated measuring scenarios, where the data is put into SQCpack in one place, but monitored and analyzed in a different location. In other words, the data might be gathered where an operator is not able to look at the SQCpack screens or has no need to do so.

Each **fixture** you define is stored in the SQCpack database. It has a name and an optional description, and defines one or more measurement devices connected to the computer. Each of these measuring devices is associated with a SQCpack data group and characteristic. When the measurement is taken, the device (or

devices) send their data to the computer. The program then stores the data in the appropriate data table for the data group.

When you select **Devices / Fixtures** from the navigation menu, you are starting a program that is separate from SQCpack. This program provides **two services**:

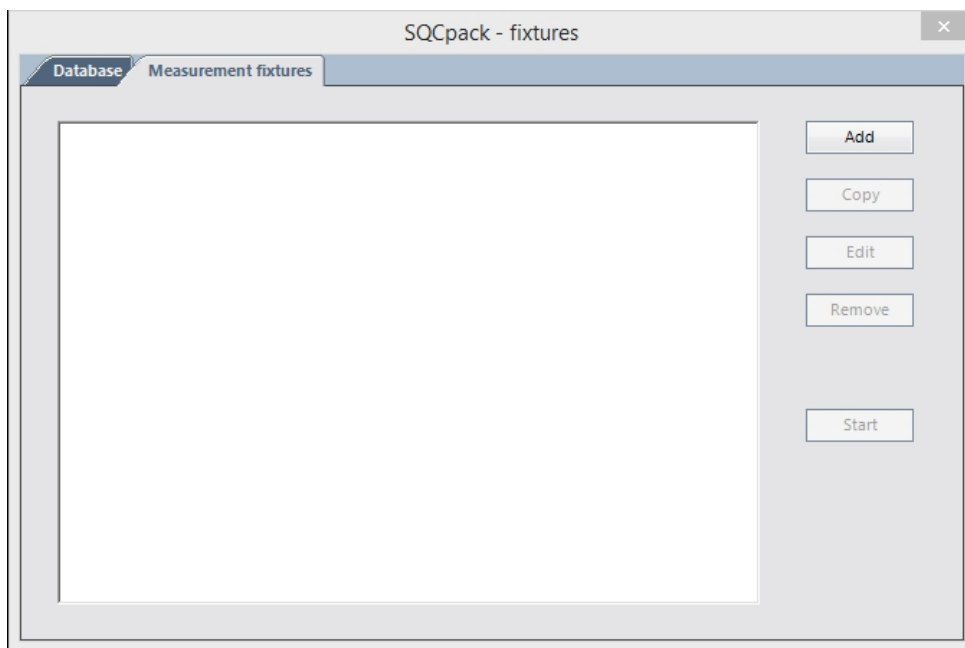
1. Manage the list of fixture definitions (add, edit, delete)
2. Start and Stop data collection associated with a selected fixture

Another way to describe these two services is this:

1. Define a fixture
2. **Use** a fixture

Defining a new fixture

Launch the fixtures program by selecting **Devices / Fixtures** from the navigation menu. The program will start and display a window similar to this:



The program contains two tabs:

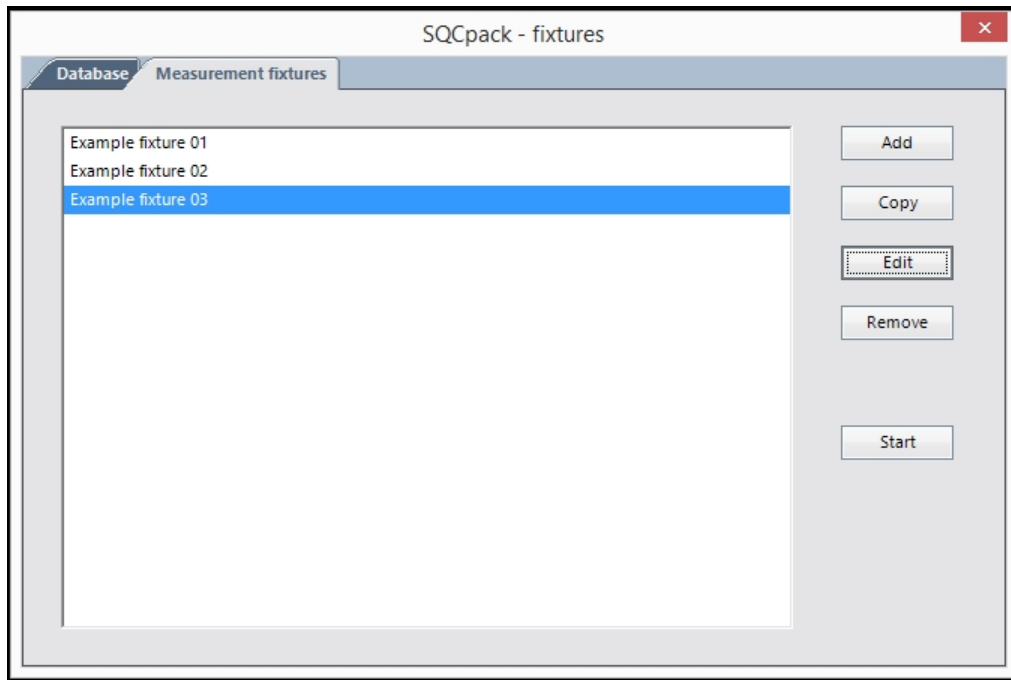
1. Database
2. Measurement fixtures

Database (tab)

The first time you launch the program, you must specify the SQCpack database to use. Click on the **Database** tab. In most cases, you will use the same database that SQCpack is using. If you are not sure, in SQCpack, select **Database** from the navigation menu. When the database view is displayed, make note of the database settings. Back in the fixtures program, set up the database tab with the same settings.

Once your database settings have been specified, the program will remember them, and most of your work will be done on the **Measurement fixtures** tab.

Measurement fixtures (tab)



Use the **Measurement fixtures** tab to manage your list of fixture definitions. On the right, buttons are available to add, copy, edit, remove, and start a fixture. In the image above, three fixtures have been defined.

Adding / editing a fixture

Use the **Add** button to add a new fixture definition. The following dialog will be displayed:



Enter a name and optional description for your fixture. Check the **Options** you want to use. Here is what they mean:

Autosend data – Check this box when you want the program to send data automatically when it has a

complete reading. Uncheck this if you prefer to have an operator click the **Send** button when a complete reading is ready to be sent to SQCpack.

Request identifiers – Check this box if you want the program to prompt the user for identifier values with each new reading. For example, machine number, part number, and employee are examples of identifiers that may be defined in the SQCpack data group into which this data is being sent.

Prompt for next reading – Check this box if you want the program to prompt the user for a new reading after each reading.

Next, you must add one or more **Devices** before you can save the fixture definition.

Adding devices to a fixture

On the fixture form, click the **Add** button to add a device to this fixture. This will display the device form as shown below:

Device type – Select one of the following options:

1. **Device connected to COM port** - This is the most common option.
2. **DDE link** - Check this option if the device is communicating with the PC via DDE. DDE stands for dynamic data exchange. This is an older standard by which devices communicated to Windows-based software.
3. **Keyboard** – Check this option if you want an operator to enter this value from the keyboard. This is useful when the group contains multiple characteristics, but only some of them get their data from a device. When this is checked, the operator might enter *Length*, while *Width* might come in from a different measuring device.

Device outputs continuous data – Check this box if your device outputs data continuously. Some devices, such as weighing scales, continuously send current readings to the computer.

Device name – Enter a name for the device. This is required.

Data group - Select an SQCpack data group from the combo box. This is the group where data from this device will be stored.

Characteristic – Select the characteristic from the combo box. This is the characteristic, typically a measurement, which is being measured by this device.

Under **COM Settings** are several options describing how your measuring device communicates with the computer. These will vary by device and device vendor. To set these options correctly, consult the **user guide for your measuring device**.

Initialization string – Some devices require that the computer send them a string, sometimes called a command, to get the device ready for use. SQCpack calls this the **initialization string**. If your device requires this, enter the string here. Consult the device manual for details. If the string must contain one or more control characters, you can enter them like "Initialize[13]" which sends "Initialize" followed by the control character defined by decimal 13 (which is a carriage-return). Click the **Send** button to send a test initialization string to the device.

Request string – Some measurement devices require the computer to send a string (or command) asking the device to "send your reading." If your device requires this, enter the string here. If the string must contain one or more control characters you can enter them like "SEND[13]" which sends "SEND" followed by the control character defined by decimal 13 (which is a carriage-return). Click the **Send** button to send a test request string to the device.

Adjust value by – Enter a positive or negative number here to adjust the incoming data value by some amount. This can be helpful for devices that send a difference from target value, when you would rather record the entire value. You may need to add to or subtract from the value as it comes from the device.

Recognition string – In a multi-device setup, all of your data devices may be connected to a single box called a **multiplexer**. For example, you may have four digital micrometers connected to a multiplexer that is connected by one cable to the computer. As data flows to the computer, there must be some way of knowing **which device** sent the data. If you are setting up **this** device, to get data from say the third micrometer, you may need to enter a 3 here. In these scenarios, often the first character to arrive from the device identifies a **port** from which the data arrives. This allows SQCpack to distinguish data coming from micrometer #1 from data coming from micrometer #4.

Input mask - When data comes from a measuring device, the raw measured value is often part of a larger string. For example, a device might send a string of data like this:

FTx12.43Qxz

The **12.43** is the measured value and the surrounding characters are device-specific information.

The input mask (shown below as #####) allows you to tell SQCpack which part of the data string to use.

| | |
|-------------|---|
| FTx12.43Qxz | <- raw data from the device |
| ##### | <- input mask denoting where the measurement value is found |

Typically, the # character is used to denote the input mask, as shown above.

Entering an accurate **Input mask** may require that you test the device and have it send a reading to the computer while you are on this form. To do this, click the **Test** button and then send a reading from the measuring device. If all connections and settings are correct, you will see the data from the device in the text area at the bottom of the screen. Use this to help you align your input mask with the data you want.

Click the **OK** button to save this device into your fixture definition.

Rules that apply when you have multiple devices in a fixture

These rules must be met in order to successfully save a fixture definition that contains multiple devices:

Rule 1 - If two devices use the same serial port, they must have identical serial port settings.

Rule 2 - Two (or more) devices with the same name must use the same serial port.

Rule 3 - Two (or more) devices with the same name must send data to different SQCpack characteristics.

Rule 4 - Two (or more) devices using the same serial port must have the same name.

Shown above is the fixture form with a single device defined: Continue to add devices to this fixture definition until it reflects your measurement fixture. Remember that *some* data entry, for example, data entry for identifiers or other measurements, might not be automated. Instead, it may be done manually, by a user, in conjunction with a fixture definition.

Using a fixture

Once your fixture has been defined, you may **use** the fixture for getting data from your measurement system into an SQCpack data group.

To get started, select **Data Devices / Fixtures** from the navigation menu. Remember, this launches a program that is separate from SQCpack. In fact, you could exit SQCpack and the fixtures program will still be running. Click once to select the fixture you want to use.

Next, click the **Start** button. This will launch the **Data collection** window (shown below). This window is used to let an operator know when data is measured and then sent to SQCpack to be saved.

When you first start a fixture running, for each active device in the fixture, if that device has an initialization string defined, it will be sent to the device.

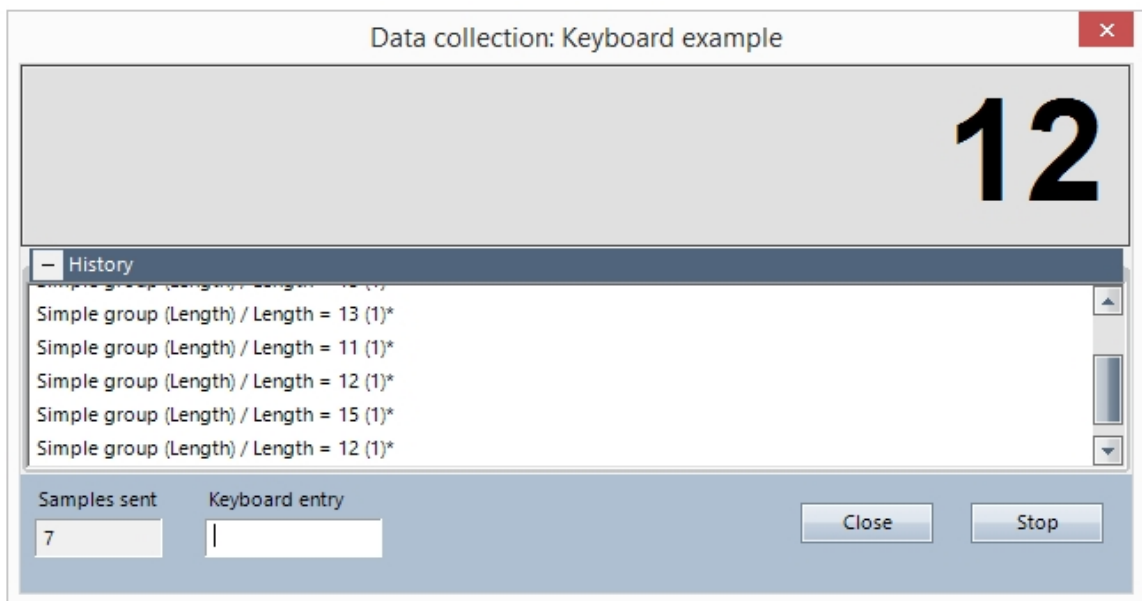
If the device requires that Fixtures ask for a reading to be sent, the **Request string** is used for that purpose.

Any device that has a **Request string** will have a button for you to click to request a reading while the fixture is running.

If you want to send a control character like a carriage return you can use **[13]** in the string, or **[10]** for a linefeed, like "ArAs[13][10]". To send a character with the ASCII value of N you use [N].

When serial data arrives at Fixtures from the device, it accumulates in a buffer until a carriage return or a linefeed character is received; at that point, it assumes that it has a line of data to be examined. The carriage return and/or linefeed characters are removed, and the resulting data line is examined to see if it matches the **Recognition string** of any active device. If it does match the **Recognition string**, and if the characters in the **Input mask** region of the data line can be converted to a number, then the numeric value is stored in the next empty observation of the characteristic associated with that device. If a device has no **Recognition string**, it matches every line of input data.

Below is an example of the data collection window that is visible while a fixture is running:



The large number at the top shows the most recent reading from the device. The **History** section below shows a history of samples that have been sent to SQCpack during this session.

Samples sent - This displays the count of samples that have been written to the SQCpack database for the specified characteristic.

Keyboard entry - If one of your devices is a keyboard device, you can type input into this field.

Using the SQCpack fixtures program does require setup and configuration. However, once a fixture has been defined and working, it can gather data with little user interaction. It is also less prone to recording of measurement values in error.

If you need help configuring an SQCpack measurement fixture, please **contact the PQ Systems [application support](#)** department. Our support representatives have experience configuring many different data collection systems and may be able to make the task easier.

For help on using Fixtures with command parameters, see [CMM Commands](#) and [Command parameters](#).

Fixtures Commands

Fixtures allows users to employ command parameters to perform common tasks such opening a database or running a fixtures job.

Command parameters can be placed in a .SQCX command file. You can double-click an SQCX command file to execute the commands between /FIXTURES and /ENDFIXTURES.

Command parameters can be run from the command prompt, the Start Menu's Run function, from a shortcut, from a batch file, or from an SQCX command file.

Command parameters can be passed on the command line to SQCpack or to the Fixtures program directly.

Command arguments must start with a forward slash (/), e.g. **/WINDOWSTATE Minimized**.

Comments in the command file are handled as explained below. See [here](#) for examples:

- Use either semicolon (;) or double-dash (--) at the start of a line to comment the entire line. White space prior to the comment is acceptable.
- Use double-dash (--) within a line to comment all of the text to the right of the comment.

Any errors that occur during command processing will be written to the log file.

If a command argument contains embedded spaces, which can occur in the path to a file, you must enclose the argument in single or double quotes as shown in the [command examples](#).

For information on general purpose command parameters, see [Command parameters](#).

Commands and arguments are not case sensitive.

The supported commands and arguments are.

/CULTURE CultureCode

Display the Fixtures user interface in the specified culture. The culture affects the user interface as well as how numbers and dates are interpreted.

[CultureCode List](#)

/FIXTURES

/FIXTURES begins a block of commands that are sent to a new instance of the Fixtures program. If a command is only processed by SQCpack, it is ignored when it is processed by the Fixtures program. Place /FIXTURES on a line by itself.

/CLOSEALLFIXTURES

Close all open instances of Fixtures. This command is only processed by the Fixtures program if it is processed by the Fixtures program.

/ENDFIXTURES

/ENDFIXTURES ends a block of commands that are sent to a newly started instance of the Fixtures program. This command is only processed by SQCpack. Place /ENDFIXTURES on a line by itself.

/OPENDB PathToDatabase

Open the specified database path, where PathToDatabase is the full path to a single-user database).

/STARTFIXTURE 'Fixture name'

Open the specified Fixtures job in the currently open database and start it.

/WINDOWPOSITION ScreenNumber Top Left
Height Width [MINIMIZED | NORMAL]

ScreenNumber - Specifies the monitor screen where Fixtures will be placed. If you have additional monitors they will be screens 2, 3, 4, etc.

Top - The top side of the Fixtures window specified as a percentage of screen height.

Left - The left side of the Fixtures window specified as a percentage of screen width.

Height - The height of the Fixtures window specified as a percentage of screen height.

Width - The width of the Fixtures window specified as a percentage of screen width.

WindowState - (Optional) The state of the Fixtures window. If not specified, the window is maximized.

| | |
|---|---|
| | The allowable states are: NORMAL or MINIMIZED . Only the left 2 characters are significant, i.e. "MI" or "NO". |
| /WINDOWSTATE MINIMIZED NORMAL | Sets the state of the Fixtures window to either: MINIMIZED or NORMAL (case insensitive) are significant, i.e. "MI" or "NO". |
| /WINDOWSLOGIN | Indicates that Fixtures should attempt to automatically login to the database using the user name. |
| /V or /V+ or /VERBOSE or /VERBOSE+ | Turns on <i>verbose</i> mode where any errors that are encountered are reported in a dialog. Irregardless of whether <i>verbose</i> mode is enabled or not, errors are reported which can be viewed using the Ctrl-Shift-L hotkey. |
| /V- or /VERBOSE- | Turns off <i>verbose</i> mode. |
| /X or /EXIT | Exit from Fixtures. Typically this is the last command on a command line or command file. If /X is not specified then the Fixtures window will remain open and be processed. |
| /@ CommandFile | If you are using a text command file for multiple command arguments, use the text file specified by <i>CommandFile</i> , and process each command line command. |

Example command file for execution by SQCpack (since it contains /CMM):

```
/FIXTURES    -- /FIXTURES opens a new instance of the Fixtures program.
              -- All commands up to /ENDFIXTURES are passed to the new Fixtures
instance.
  /WINDOWPOSITION 1 50 60 40 40 MINIMIZED    -- Set size and position of
the Fixtures window.
  /WINDOWSTATE MINIMIZED                    -- Minimize the Fixtures
window.
  /OPENDB 'D:\SQCpack\MyDatabase.dbc'        -- Open the specified
database.
  /WINDOWSLOGIN                             -- Login using Windows user
name.
  /@ 'D:\SQCpack\SomeCommands.sqcx'         -- Run commands in the file.
  /STARTFIXTURE 'My Fixture'                -- Run the specified Fixtures
job.
/ENDFIXTURES                                -- Should be on a line by
itself.
```

CMM Integration - Getting data from CMMs and other complex devices into SQCpack

CMM Integration - Getting data from CMMs and other complex devices into SQCpack

This section covers importing data from measurement devices that produce complex output. A common use for **Data Devices / CMM Integration** is importing data from coordinate measuring machines, also known as CMMs. This feature can also be used for importing any data where the data format is complicated and therefore not easily imported.

Before we look at the software, following are two example data files that demonstrate the scenario. Consider this data from an actual CMM:

```

----- Visual CMES Inspection Report -----

Operator      -
Part number   -
Part description -
Serial number -

-----

Feature - Circle1
Actual      Nominal Difference Hi-tol Lo-tol Graphic Error
AXIS X      .000      .000      .000      .000      .000
DIAMETER     47.809     47.800      .009      .150     -.150  ---*---

Feature - Circle2
Actual      Nominal Difference Hi-tol Lo-tol Graphic Error
AXIS X      -.400      .000     -.400      .130     -.130  <---+---  -.270
AXIS Z      -.184      .000     -.184      .130     -.130  <---+---  -.054
DIAMETER     64.159     66.000    -1.841      .050      .000  <---+--- -1.841

Feature - Circle3
Actual      Nominal Difference Hi-tol Lo-tol Graphic Error
AXIS X      -.003      .000     -.003      .130     -.130  ---*---
AXIS Z       .004      .000       .004      .130     -.130  ---*---
DIAMETER     42.029     42.000       .029      .050      .000  ---+*---

```

Notice the highlighted data. From this, we can imagine an SQCpack data group with three measurement characteristics:

1. Circle1-Diameter
2. Circle2-Diameter
3. Circle3-Diameter

The data values we want to record in SQCpack are also highlighted:

1. 47.809
2. 64.159
3. 42.029

The challenge here is how to import this data. Using the **Data Devices / CMM Integration** features of SQCpack, data such as this can be imported into an SQCpack data group. More importantly, it can be configured to import whenever the CMM saves a new data file.

Shown below is another example data file generated by a measuring device:

```

$$$ DATE AND TIME MADE,,,14/03/2002 12:00:00
$$$ DATE AND TIME MEASURED,,,14/03/2002 10:00:00
$$$ OPERATOR,,,
$$$ MACHINE NO,,,
$$$ WORKS ORDER NO,,,
$$$ CONCESSION NO,,,
Feat. Type,Feat. Name,Value,Measure,Actual,Nominal,Dev.,Tol-,Tol+,Out of Tol.
Circle,FLANGE O/D,1,DIAM,40.679,40.470,0.209,-0.130,0.130,0.079
Distance,BACKEND LENGTH,1,D1,24.632,24.630,0.002,-0.130,0.130,
Circle,SHROUD O/D,1,DIAM,22.569,22.500,0.069,-0.130,0.130,
Surf. Pnt,SHROUD POINT1,1,N.D.,-0.113,0.000,-0.113,-0.250,0.250,
Surf. Pnt,SHROUD POINT2,1,N.D.,0.113,0.000,0.113,-0.250,0.250,
Surf. Pnt,SHROUD POINT3,1,N.D.,-0.102,0.000,-0.102,-0.250,0.250,
Circle,BTN SEATING BORE,1,DIAM,14.622,14.620,0.002,-0.130,0.130,
Circle,VALVE PORT BTM O/D,1,DIAM,16.027,16.000,0.027,-0.130,0.130,
Circle,VALVE PORT TOP O/D,1,DIAM,16.094,16.000,0.094,-0.130,0.130,

```

There are several rows at the beginning of this data that contain information you may want in SQCpack

identifier columns. When the data rows begin, each row contains information about a **different measurement characteristic**. Once again, a traditional import program will have difficulty with data like this. However, this is the type of scenario that **Data Devices / CMM Integration** is designed to handle.

The Data Devices / CMM Integration workflow

When you select **Data Devices / CMM Integration** from the navigation menu, a **separate program** (SQC.CMM.Import.exe) is launched. This program can also be launched by itself in cases where you do not need SQCpack to be running. The program allows you to **manage a list of configurations** and to **use** them for importing device data.

A configuration has a name, one or more source files, and other settings that define how data from the source file(s) is parsed and imported into SQCpack. Once you have defined a configuration, there are two ways to use it:

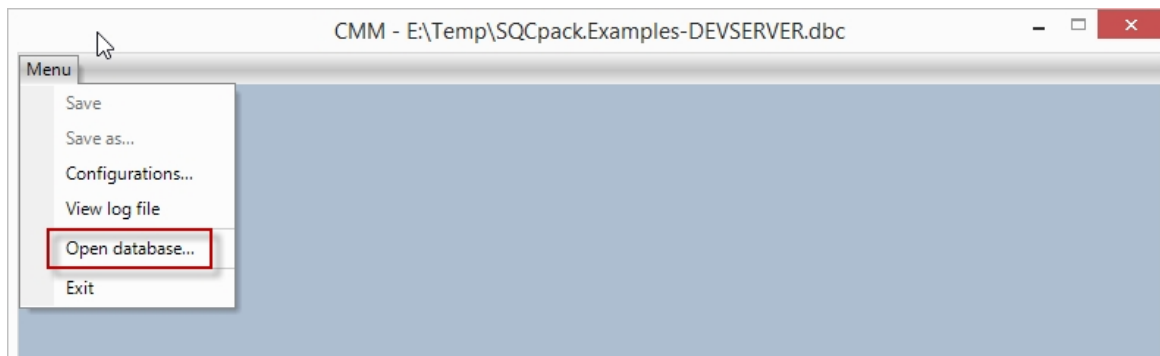
1. Interactive
2. Automated

In the **Interactive** mode, open a configuration each time the measurement device has created a new data file. On the **Start** tab, click the **Start** button and the new data file is imported. In this mode, a user starts the import each time there is a new data file.

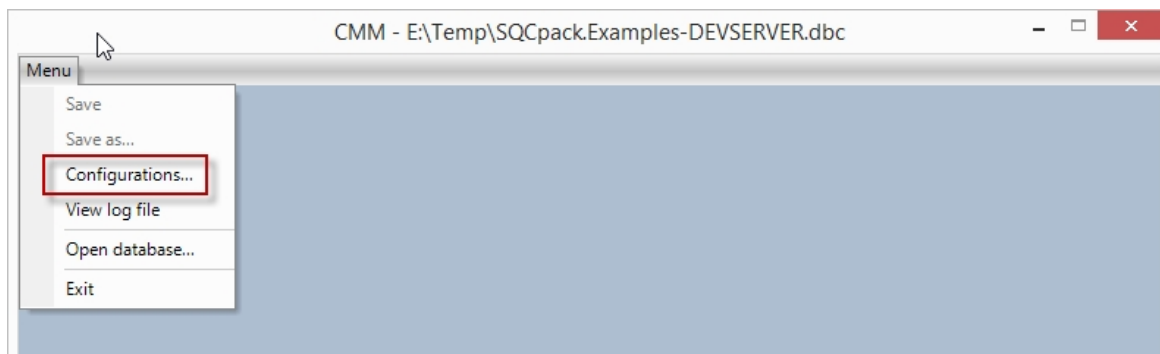
In **Automated** mode, you open a configuration once and click the **Start** button. Settings in the configuration tell the program to import new data **each time a new file** arrives in the data source folder. The configuration will continue to run until you stop it. Whenever a new source data file is detected, data from the file will be imported into SQCpack.

Create a configuration (for Data Devices / CMM Integration)

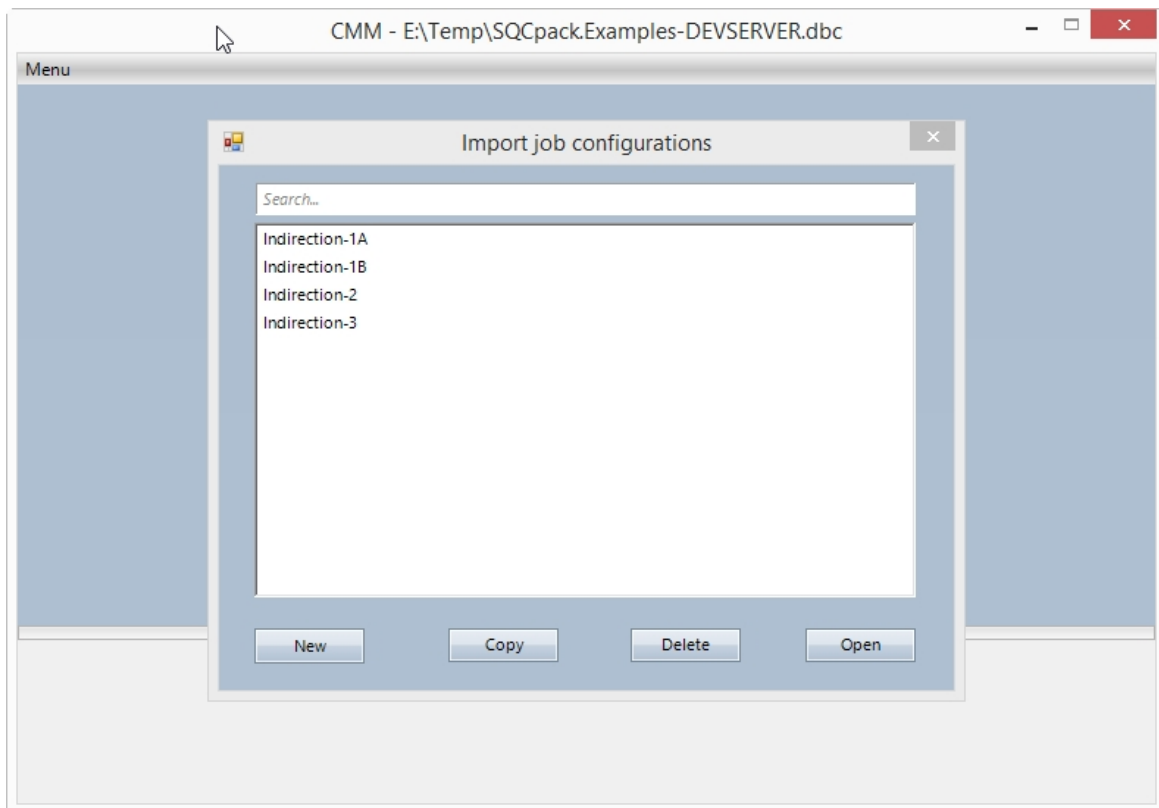
Launch the program by selecting **Data Devices / CMM Integration** from the SQCpack navigation menu.



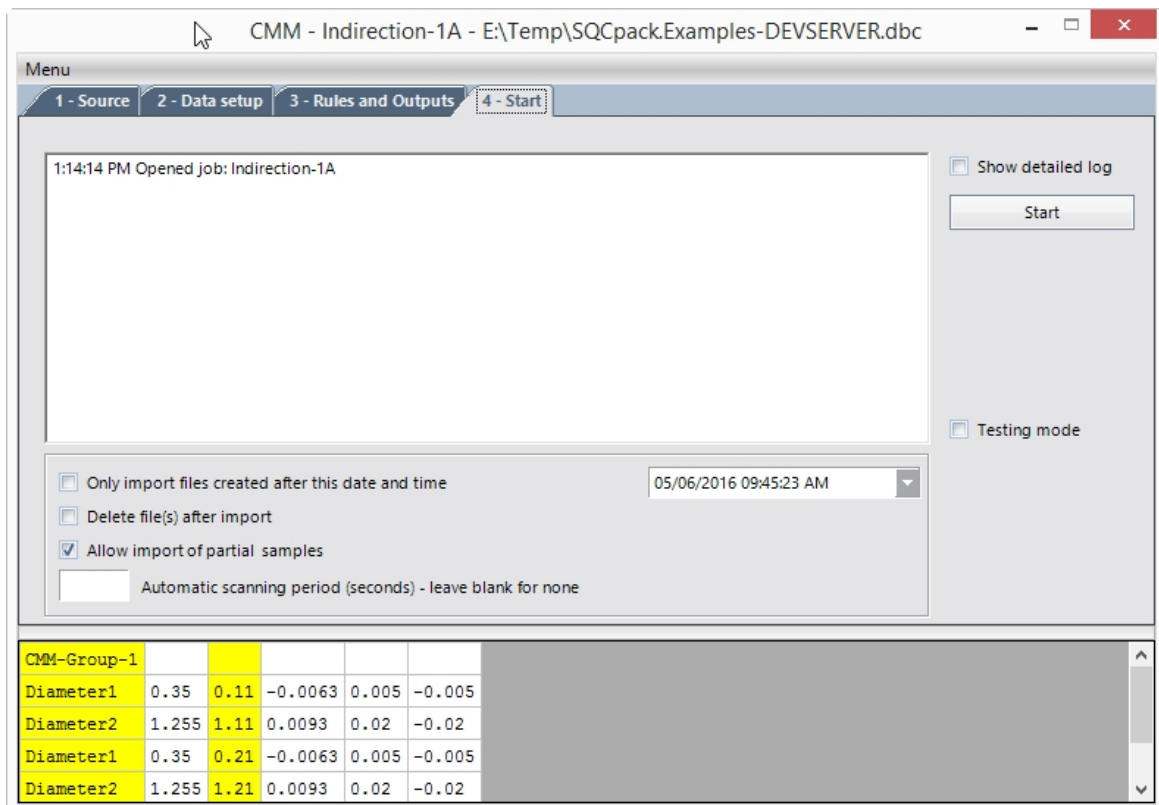
The first time you run this program, you must tell it which SQCpack database to open (as shown above). Once you have done this step, the program will remember the database when you launch this program in the future. If you are unsure about which database you are using in SQCpack, select **Database** from the SQCpack navigation menu for information about the current SQCpack database.



Select **Configurations** from the menu as shown above. This will display the configurations that are stored in the database, as shown below:



Click the **New** button to create a new job configuration, or the **Copy** button to copy a job configuration. Configuration names must be unique (case-insensitive).



The configuration window will be displayed, as shown above. Note that the job configuration name and the

database name are displayed in the window title. This window has the following tabs where you specify settings for this job configuration:

Source tab

On this tab, enter a name for this configuration and select one or more data files. The data file will be the **source** of data for this import configuration.

Data setup tab

Use this tab to describe the overall layout of the data source file and to define the **fields**. The fields will be used on the **Rules** tab to describe how the data is extracted.

Rules and Output tab

Use this tab to define where the data will go in SQCpack. These are called **Outputs**. Also, use the tab to define one or more **Rules**.

Think of a rule as a description of two things:

1. How to find the data in the file.
2. Where to put the data in SQCpack, i.e., which data group and which identifier or characteristic.

Start tab

When the **Source**, **Data setup**, and **Rules** tabs are complete, use the **Start** tab to do the work of importing the data. This tab is also used for setting up automatic processing mode by specifying a **scanning period**. For example, you might set up a configuration to scan for new files every 10 minutes. Each time your CMM (or other measuring device) creates a new data file, the program will notice the new file at the next scan interval, and proceed to import the data. This scenario allows for a CMM to run all day long and have the CMM Integration program import new data after each measuring cycle.

While you are setting the tabs for your new configuration, select **Save** from the menu to save your work in progress.

Source tab details

On the **Source** tab, give the configuration a name and specify the path to one or more source files to be processed. Configuration names must be unique (case-insensitive).

CMM - Indirection-1A - E:\Temp\SQCpack.Examples-DEVSERVER.dbc

Menu

1 - Source 2 - Data setup 3 - Rules and Outputs 4 - Start

Configuration name
Indirection-1A

Source files(s)

| # | # | |
|---|--|---|
| 1 | \\DEVSERVER\ExampleData\CMM-Data1A.csv | X |
| 2 | | X |
| 3 | | X |
| 4 | | X |
| 5 | | X |
| 6 | | X |

Browse

| CMM-Group-1 | | | | | |
|-------------|-------|------|---------|-------|--------|
| Diameter1 | 0.35 | 0.11 | -0.0063 | 0.005 | -0.005 |
| Diameter2 | 1.255 | 1.11 | 0.0093 | 0.02 | -0.02 |
| Diameter1 | 0.35 | 0.21 | -0.0063 | 0.005 | -0.005 |
| Diameter2 | 1.255 | 1.21 | 0.0093 | 0.02 | -0.02 |

For each source file, you can use the * and ? wildcard characters *in the file name* to select multiple input files. Wildcards are not supported as part of the folder path. The * wildcard matches zero or more characters. The ? wildcard matches a single character.

Data setup tab details

For **Data format**, select either 1) Data is positional; 2) Data is separated by commas; 3) Data is separated by TABs; 4) Data is separated by semicolons. If all the data rows are alike, and each column in a data row is separated by a semicolon, select #4. If all the data rows are alike, and each column in a data row is separated by TABs, select #3. If all the data rows are alike, and each column in a data row is separated by a comma, select #2. If there are multiple rows of header information before the data begins, or if the data is different (in different rows.) select #1 for positional data.

Next, use the **Create field** button to define one or more fields that you want to import. When using these buttons, the position of your cursor in the data grid below affects how the field will be defined.

When defining a field for comma-separated data, the field will highlight the entire column. When using positional data, before you click the **Create field** button, you must first drag your mouse across the cells (in the grid below) that define your field.

The screenshot shows the 'Data setup' window of the SQCpack application. The window title is 'CMM - Positional-1 - E:\Temp\SQCpack.Examples-DEVSERVER.dbc'. It has four tabs: '1 - Source', '2 - Data setup', '3 - Rules and Outputs', and '4 - Start'. The '2 - Data setup' tab is active.

Data format section:

- ☒ Data is positional
- ☐ Data is separated by commas
- ☐ Data is separated by TABs
- ☐ Data is separated by semicolons

[Refresh Source File](#)

☐ Prompt user for input(s)

Fields section:

- Field1 (col=2 length=7)
- Field2 (col=12 length=8)
- Field3 (col=1 length=8)
- Field4 (col=15 length=6)

Buttons:

Data Grid:

| D I A M E T E R | | | | | | | | | | | | | | | 4 2 . 0 2 9 | | | | | 4 2 . 0 0 0 | | | | | | | | | |
|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---------------|--|--|--|--|---------------|--|--|--|--|-------------|--|--|--|--|
| F e a t u r e | | | | | | | | | | | | | | | C i r c l e 4 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | A c t u a l | | | | | N o m i n a l | | | | | D i f f e r | | | | |
| A X I S X | | | | | | | | | | | | | | | - . 0 0 1 | | | | | . 0 0 0 | | | | | - | | | | |
| A X I S Z | | | | | | | | | | | | | | | . 0 0 5 | | | | | . 0 0 0 | | | | | | | | | |
| D I A M E T E R | | | | | | | | | | | | | | | 4 7 . 0 4 5 | | | | | 4 7 . 0 0 0 | | | | | | | | | |
| F e a t u r e | | | | | | | | | | | | | | | C i r c l e 5 | | | | | | | | | | | | | | |

In the example above, for positional data, four fields have been defined as shown with the yellow highlights. Fields may be defined that are not actually imported but instead used in a rule on the Rules and Outputs tab. For example, the field where you see the word **Feature** might be used to locate the **Circle4** to its right. Consider a rule for this, which would be something like:

*When you find **Feature**, take whatever is to its right, i.e., the Circle value, and put it into the identifier named **Feature-ID**.*

Click **Refresh Source File** to read data from the source file(s) and update the displayed data in the lower grid.

Check the box **Prompt user for input** when you want to prompt the user for input **when this configuration is started**. This will display the "Prompt user for input" grid as shown below in the red rectangle:

Check the box **Prompt for each source file** when you want to prompt the user for input prior to processing each source file:

The screenshot shows the 'Data setup' tab in the SQCpack application. The window title is 'CMM - Positional-1 - E:\Temp\SQCpack.Examples-DEVSERVER.dbc'. The 'Data format' section has four radio buttons: 'Data is positional' (selected), 'Data is separated by commas', 'Data is separated by TABs', and 'Data is separated by semicolons'. A 'Refresh Source File' link is present. The 'Fields' section lists four fields: Field1 (col=2 length=7), Field2 (col=12 length=8), Field3 (col=1 length=8), and Field4 (col=15 length=6). Below this are 'Create field' and 'Delete field' buttons. A red box highlights the 'Prompt user for input(s)' section, which includes a checkbox for 'Prompt for each source file' and a table with prompts for input(s).

| # | Prompt |
|---|---------------------|
| 1 | Operator Name |
| 2 | Shift |
| 3 | Date of Measurement |
| 4 | |
| 5 | |

The bottom section shows a preview of the data being imported, with fields highlighted in yellow: 'Feature', 'Circle4', 'DIAMETER', and '47.045'.

In the example above we have defined three **fields**:

- Field1 = starts in column 2 and extends for 7 characters, i.e., "Feature"
- Field2 = starts in column 12 and extends for 8 characters, i.e., "Circle4 "
- Field3 = starts in column 1 and extends for 8 characters, i.e., "DIAMETER"
- Field4 = starts in column 15 and extends for 6 characters, i.e., "47.045"

We have defined three **prompts**:

- Operator name
- Shift
- Date of measurement

When this configuration is started, before the import process begins, the user will be prompted to supply values for these three prompts. What the user enters is usable in a **rule** during the import. For example, **rules** can be set up to use what the user types in as identifiers in SQCpack data rows. This is done by defining **rules** that use these prompt responses.

Rules and Outputs tab details

This tab allows you to define how data from the source file will be imported into SQCpack. There are two sections 1) **Outputs** and 2) **Rules**.

CMM - Positional-1 - E:\Temp\SQCpack.Examples-DEVSERVER.dbc

Menu 1 - Source 2 - Data setup 3 - Rules and Outputs 4 - Start

Outputs Refresh Delete Help

| # | Group | Target |
|---|-------------|----------|
| 1 | CMM-Group-4 | Feature |
| 2 | CMM-Group-4 | Diameter |
| 3 | CMM-Group-4 | Date |
| 4 | | |

Rules Duplicate Delete Help

| When | is | constant | and when | is | constant | Set | to |
|--------|----------|----------|----------|----|----------|---------|--------|
| Field1 | equal to | Feature | | | | Output1 | Field2 |
| Field3 | equal to | Diameter | | | | Output2 | Field4 |
| Field3 | equal to | Diameter | | | | Output3 | Date |
| | | | | | | | |

D I A M E T E R 4 2 . 0 2 9 4 2 . 0 0 0

Feature - Circle 4

Actual Nominal Differ

A X I S X - . 0 0 1 . 0 0 0 -

A X I S Z . 0 0 5 . 0 0 0

D I A M E T E R 4 7 . 0 4 5 4 7 . 0 0 0

Feature - Circle 5

Outputs

In the **Outputs** section, define the *destinations* for the imported data. Each output (or destination) is expressed as an SQCpack data group and a target that is an identifier or characteristic. Think of each output as one *place* in SQCpack where data from the source file will be stored.

You may define one or more outputs in a configuration. What data is stored in an output is determined by how you define the **Rules** below.

Using indirection with Outputs

You can specify the **Group** and **Target** names indirectly by using a variable, such as @V1, @V2, @V3, etc. When the **Group** is specified indirectly, the **Target** may contain a user-entered value that specifies a specific target, such as "DateTime" as shown below.

Outputs Refresh Delete Help

| # | Group | Target |
|---|-------|----------|
| 1 | @V1 | @V2 |
| 2 | @V1 | @V3 |
| 3 | @V1 | DateTime |
| 4 | | |

In the Outputs shown above, if the variables contain these values:

V1 = DataGroup1
V2 = Length
V3 = Width

Then, when the job runs,

Output1 goes to data group "DataGroup1", characteristic "Length"
 Output2 goes to data group "DataGroup1", characteristic "Width"
 Output3 goes to data group "DataGroup1", identifier "DateTime"

Some examples of using indirection: [CMM Example 1 - Using indirection](#), [CMM Example 2 - Using indirection](#), [CMM Example 3 - Using indirection](#).

Rules

In the **Rules** section, specify how the source data will be read and where to store the data in the imported data row. You may have a single rule, but more commonly you will define multiple rules to define how the data will be imported. More information about the components of a rule can be found here: [CMM Rules](#)

Here is an example set of outputs and rules with a description below:

The screenshot shows the 'CMM - Positional-1' application window. The '3 - Rules and Outputs' tab is active. The 'Outputs' section has a table with 4 rows and 2 columns: '#', 'Group', and 'Target'. The first three rows are populated with 'CMM-Group-4' and 'Feature', 'Diameter', and 'Date' respectively. The 'Rules' section has a table with 8 columns: 'When', 'is', 'constant', 'and when', 'is', 'constant', 'Set', and 'to'. Three rules are defined: 'Field1' is 'equal to' 'Feature' and 'Set' to 'Field2'; 'Field3' is 'equal to' 'Diameter' and 'Set' to 'Field4'; 'Field3' is 'equal to' 'Diameter' and 'Set' to 'Date'. Below the rules, a data table shows the mapping of 'Feature' to 'Circle 4' and 'Diameter' to '47.045'.

| # | Group | Target |
|---|-------------|----------|
| 1 | CMM-Group-4 | Feature |
| 2 | CMM-Group-4 | Diameter |
| 3 | CMM-Group-4 | Date |
| 4 | | |

| When | is | constant | and when | is | constant | Set | to |
|--------|----------|----------|----------|----|----------|---------|--------|
| Field1 | equal to | Feature | | | | Output1 | Field2 |
| Field3 | equal to | Diameter | | | | Output2 | Field4 |
| Field3 | equal to | Diameter | | | | Output3 | Date |
| | | | | | | | |
| | | | | | | | |

| D I A M E T E R | | 4 2 . 0 2 9 | 4 2 . 0 0 0 |
|-----------------|---|-------------|-------------|
| Feature | - | Circle 4 | |
| Actual | | Nominal | Difference |
| AXIS X | X | - . 0 0 1 | . 0 0 0 |
| AXIS Z | Z | . 0 0 5 | . 0 0 0 |
| D I A M E T E R | | 4 7 . 0 4 5 | 4 7 . 0 0 0 |
| Feature | - | Circle 5 | |

Here, we have defined three **Outputs**:

- Output1 = An **identifier** named *Feature* in the SQCpack group named *CMM-Group-4*
- Output2 = A **measurement** named *Diameter* in the SQCpack group named *CMM-Group-4*
- Output3 = An **identifier** named *Date* in the SQCpack group named *CMM-Group-4*

These **outputs** describe where we want the data to go in SQCpack.

On the **Data setup** tab, we defined four fields containing data to store in an **output**, as shown below:

Fields

Field1 (col=2 length=7)
 Field2 (col=12 length=8)
 Field3 (col=1 length=8)
 Field4 (col=15 length=6)

Create field Delete field

Field1 = starts in column 2 and extends for 7 characters, i.e. "Features"
 Field2 = starts in column 12 and extends for 8 characters, i.e. "Circle4 "
 Field3 = starts in column 1 and extends for 8 characters, i.e. "DIAMETER"
 Field4 = starts in column 15 and extends for 6 characters, i.e. "47.045"

Next, read the **Rules**. Here is what they mean (using words):

| Rules | | | | | | | | Duplicate | Delete | Help |
|--------|--|----------|----------|----|----------|---------|--------|---------------------------|------------------------|----------------------|
| When | is | constant | and when | is | constant | Set | to | | | |
| Field1 | equal to | Feature | | | | Output1 | Field2 | | | |
| Field3 | equal to | Diameter | | | | Output2 | Field4 | | | |
| Field3 | <input checked="" type="checkbox"/> equal to | Diameter | | | | Output3 | Date | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

In each row of input data from the source file(s)...

When **Field1** is equal to **Feature**, set **Output1** to the value of **Field2**. This stores this data value "Circle4 " into the identifier named **Feature** in the SQCpack group named **CMM-Group-4**

When **Field3** is equal to **Diameter**, set **Output2** to the value of **Field4**. This stores this data value "47.045" into the measurement characteristic named **Diameter** in the SQCpack group named **CMM-Group-4**

By using rules in this way, SQCpack can scan a large and complicated file like the example shown above, extracting data only from the relevant places. This is just one example of many possible scenarios.

Remember, what ultimately happens is that **new data rows get added** to an SQCpack data group. If you open any group for data entry and look at the columns of data that are being entered, you can start to get an idea of what outputs you need to define when importing in this data group. Remember that a source data file may contain hundreds or thousands of data rows. Only rows that meet the conditions in your rules will be considered for import.

At this point, use the **Menu** and click **Save** to save your configuration.

Start tab details

Once you have done these things:

1. Entered a configuration name and selected one or more data files on the **Source** tab
2. Described your data layout and data fields on the **Data setup** tab
3. Defined your rules and outputs on the **Rules and Outputs** tab

You are ready to start the import. Click on the **Start** tab.

Menu

1 - Source

2 - Data setup

3 - Rules and Outputs

4 - Start

9:21:25 AM Opened job: CMM3-1

☐ Show detailed log

Start

☐ Testing mode

☐ Only import files created after this date and time

12/27/2015 07:27:15 AM

☐ Delete file(s) after import
☐ Allow import of partial samples

Automatic scanning period (seconds) - leave blank for none

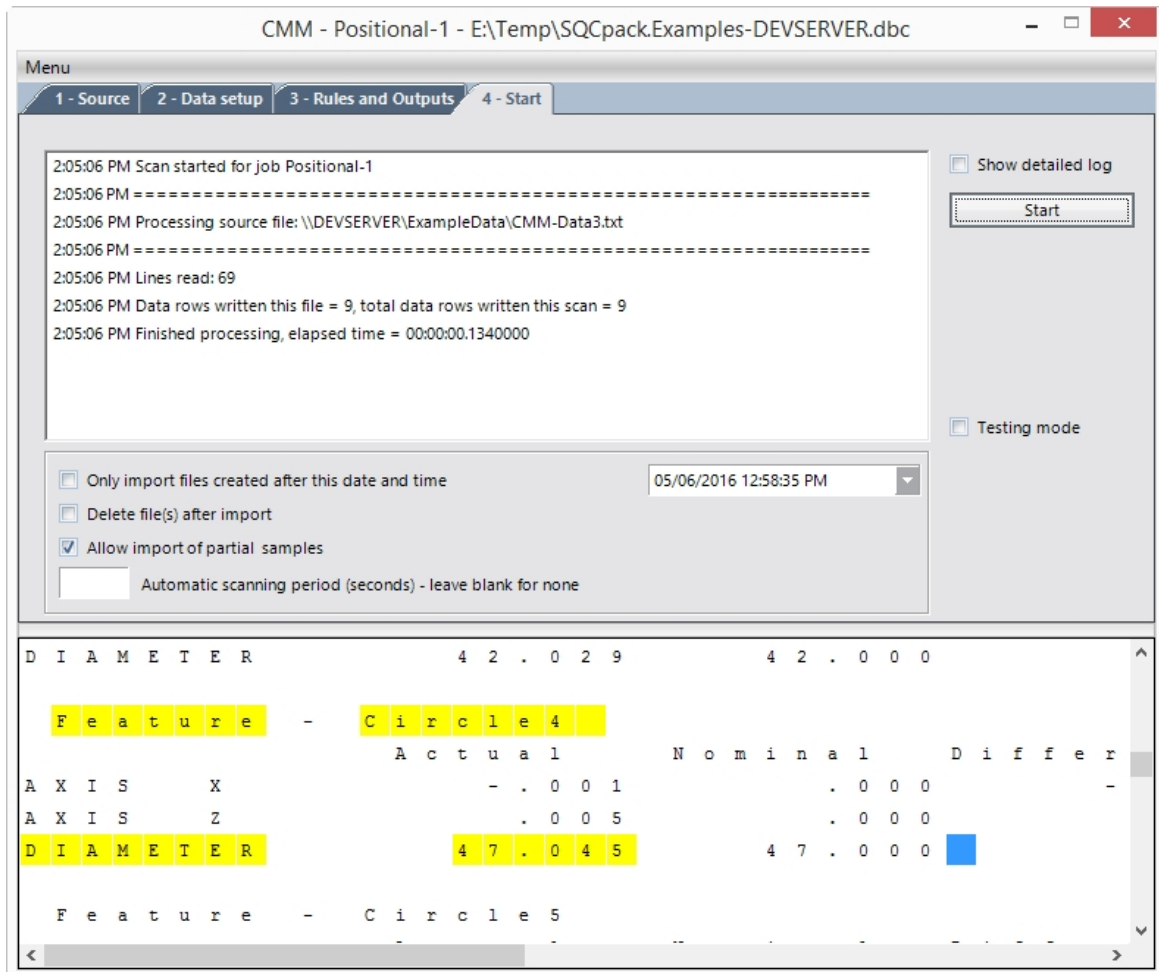
Feature - Circle 1

| | | Actual | Nominal | Difference |
|----------|---|--------|---------|------------|
| AXIS | X | .000 | .000 | |
| DIAMETER | | 47.809 | 47.800 | |

Feature - Circle 2

| | | Actual | Nominal | Difference |
|------|---|--------|---------|------------|
| AXIS | X | -.400 | .000 | - |
| AXIS | Z | -.184 | .000 | - |

The import process will begin when you click the **Start** button.



As lines of input data are processed, the window will show how many lines are read from the data source file and how many rows are added to SQCpack data groups.

To further customize how the import is done, consider these additional options:

Show detailed log - When this box is checked, the log information contains more information about what is happening with files and rules during the import process.

Only import files created after this date and time - Check this box when the input files are not being deleted after being imported, to ensure that no source file gets imported more than once. When the configuration job is opened, a scan is made of the source files at that time and the highest file creation date and time is placed in the input field associated with this checkbox. The user may need to adjust the date and time to an appropriate value prior to clicking the **Start** button. The displayed date and time will be updated after source files are processed to reflect the highest file creation date that was processed. When

Delete file(s) after import - Check this box to have the program delete each source data file **after** it has been imported. This can be helpful with measuring devices that always create a source file with the same file name, or when you don't want to clutter the folder with lots of already-processed source files. It is best if each source file has a unique file name so that there is minimal chance of conflict between CMM Integration and the program that creates the source file. No source files are deleted when in **Testing mode**.

Allow import of partial samples - This works as follows:

- When this box **is not selected**, the current sample will be saved to the database only when **all** of the **Outputs** have been assigned a value by a **Rule**.
- When this box **is selected**, the current sample will be saved to the database when an attempt is made to assign a value to any **Output** that has **already** been assigned a value during the

processing of that sample. Or, to put it another way, the partial sample will be saved when a **Rule** tries to assign a value to the same **Output** twice.

Automatic scanning period (seconds) - If you enter a number here, for example 60, then once you click the **Start** button, the program will check every 60 seconds to see if there are any source files to import. This is helpful when a measuring device is continuously in use and you want source files to be imported as they are created.

Testing mode - Check this box to enable testing mode. When testing mode is enabled, no imported samples are stored in the database, and no source files are deleted after processing. This allows you to test the job configuration.

If you need help

The **Rules and Outputs** tab of a configuration file can be complicated to define. It requires knowledge of the data source format. It also requires a sense of how data files are processed and how the rules are used to parse the data file.

PQ Systems has helped many customers define configuration files for their specific measurement system. Once a configuration is working and saved, it can continue to work with very little effort. If you need help creating a configuration for your measurement device, please contact PQ Systems [application support](#). We have service offerings to help with implementation and training so you can be productive in no time.

See Also

[CMM Rules](#)

[CMM Commands](#)

[CMM Example 1 - Using indirection](#)

[CMM Example 2 - Using indirection](#)

[CMM Example 3 - Using indirection](#)

CMM Rules

CMM Integration Rules

Each rule defined on the **Rules and Outputs** tab is comprised of up to eight parts as follows:

When - This section is required and is the main trigger for an action to occur. Generally, the information used here will be a **field**, but it may also be a **Count** (the count of values stored so far in the sample) or a **Linecount** (the number of input data lines processed since this count was last reset).

Is - This specifies the type of comparison or check to perform. The valid values are:

Equal to - If the items being compared are numeric, they must have the same value. If they are not numeric, leading and trailing spaces are trimmed and they must be identical (case-insensitive). For example: V1 **equal to** Diameter

Not equal to - This is the opposite of equal (but still case-insensitive). For example: Field4 **not equal to** ReadError

Equal to (case-sensitive) - If the items being compared are numeric, they must have the same value. If they are not numeric, leading and trailing spaces are trimmed and they must be identical (case-sensitive).

Not equal to (case-sensitive) - This is the opposite of equal (but still case-sensitive).

Like - When used with numbers, this means "equal." Otherwise, the items are trimmed of all leading and trailing spaces and compared case-insensitive. You can use the following wildcard characters. Example: Field1 **like** ?art*

- ? Question mark means any single character
- * Asterisk means zero or more characters
- # Any single digit (0-9)
- [charlist] Any single character in charlist
- [!charlist] Any single character not in charlist

Not like - This is the opposite of like (but still case-insensitive). Example: Field2 **not like** ?art*

Less than - This term is the opposite of "greater than." For numbers, the meaning is obvious. Otherwise, the comparison is alphanumeric and case-insensitive and means "before in the alphabet." Thus, "frog" is less than "toad," since "f" comes before "t."

Greater than - For numbers, the meaning is obvious. Otherwise, the comparison is alphanumeric and case-insensitive and means "after in the alphabet." So, for example, "dog," is greater than "cat" since alphabetically, "d" comes after "c."

Numeric - This criteria means that the **when** value can be evaluated as a number. An empty field is not regarded as being numeric.

Not numeric - This is the opposite of **Numeric**.

Blank - Using this criteria means that the **when** consists entirely of space characters, or is a zero length field.

Not blank - This is the opposite of **blank**. It means that the **when** value contains at least one non-space character.

Starts with - This means that the **when** value starts with the specified characters (case-insensitive).

Constant - The first **constant** column is where you provide a value to compare to the **when**. Some **is** values, like **numeric** and **blank**, do not require a **constant** entry.

And when - The second **and when - is - constant** section is optional and is provided to allow for more complex comparisons to be made. If it is used, the following two or three sections must also be completed. It is similar to the first **when - is - constant** section described above.

Is - This section uses the same criteria as the first **is** section. Again, if the **Is** requires a parameter, it is entered in the second **constant** section.

Constant - The second **constant** column is where you provide a value to compare to the **And when**. Some **is** values, like **numeric** and **blank**, do not require a **constant** entry.

Set - The value of the **to** entity will be applied to the **set** entity. The main selections here are the **Outputs** (such as Output1 and Output2). Also available are the **variables** (such as V1 and V2) currently in use. In addition, **Linecount** is available and can be set in a rule to zero which resets the internal count of data lines to zero.

To - The value of the **to** entity will be applied to the **set** entity. The **to** list includes all **fields** and **variables** currently in use. If there are any questions listed on the **Prompts** tab, the answers to those questions are

also available to be used as a **to** entity. In addition, the following keywords can be used to set a date or time identifier to the current date and/or time:

Date - When applied to an **output** for a date-only identifier, this sets the current date. When applied to an **output** for a DateTime identifier this sets the current date and time. Do not use **Date** with a time-only identifier.

Time - When applied to an **output** for a time-only identifier, this sets the current time. Do not use **Time** with a date-only or DateTime identifier.

CMM Commands

CMM Integration allows users to employ command parameters to perform common tasks such opening a database or running a CMM configuration job.

Command parameters can be placed in a .SQCX command file. You can double-click an SQCX command file to execute the commands between /CMM and /ENDCMM.

Command parameters can be run from the command prompt, the Start Menu's Run function, from a shortcut, from a batch file, or from an SQCX command file.

Command parameters can be passed on the command line to SQCpack or to CMM Integration directly.

Command arguments must start with a forward slash (/), e.g. **/WINDOWSTATE Minimized**.

Comments in the command file are handled as explained below. See [here](#) for examples:

- Use either semicolon (;) or double-dash (--) at the start of a line to comment the entire line. Whitespace prior to the comment is acceptable.
- Use double-dash (--) within a line to comment all of the text to the right of the comment.

Any errors that occur during command processing will be written to the log file.

If a command argument contains embedded spaces, which can occur in the path to a file, you must enclose the argument in single or double quotes as shown in the [command examples](#).

For information on general purpose command parameters, see [Command parameters](#).

Commands and arguments are not case sensitive.

The supported commands and arguments are.

/CULTURE CultureCode

Display the CMM Integration user interface in the specified culture. The operation that the user interface uses as well as how numbers and dates are interpreted.

[CultureCode List](#)

/CMM

/CMM begins a block of commands that are sent to a new CMM Integration instance. If the command is processed only by SQCpack, it is ignored when it is processed by CMM Integration. This command is processed line by itself.

/CLOSEALLCMM

Close all open instances of CMM Integration. This command is processed only by SQCpack. This command is ignored when it is processed by CMM Integration.

/ENDCMM

/ENDCMM ends a block of commands that are sent to a newly started instance of CMM Integration. This command is processed only by SQCpack. Place /ENDCMM on a line by itself.

| | |
|--|---|
| /OPENDB PathToDatabase | Open the specified database path, where PathToDatabase is the full path to a single-user database). |
| /RUNJOB 'Job name' | Open the specified configuration job in the currently open database and |
| /WINDOWPOSITION ScreenNumber Top Left Height Width [MINIMIZED NORMAL] | <p>ScreenNumber - Specifies the monitor screen where CMM Integration primary screen. If you have additional monitors they will be screens 2, 3</p> <p>Top - The top side of the CMM window specified as a percentage of screen</p> <p>Left - The left side of the CMM window specified as a percentage of screen</p> <p>Height - The height of the CMM window specified as a percentage of screen</p> <p>Width - The width of the CMM window specified as a percentage of screen</p> <p>WindowState - (Optional) The state of the CMM window. If not specified, the default is NORMAL. The allowable states are: NORMAL or MINIMIZED. Only the left 2 characters are significant, i.e. "MI" or "NO".</p> |
| /WINDOWSTATE MINIMIZED NORMAL | Sets the state of the CMM window to either: MINIMIZED or NORMAL . (case insensitive) are significant, i.e. "MI" or "NO". |
| /WINDOWSLOGIN | Indicates that CMM Integration should attempt to automatically login to Windows user name. |
| /V or /V+ or /VERBOSE or /VERBOSE+ | Turns on <i>verbose</i> mode where any errors that are encountered are reported to the dialog. Regardless whether <i>verbose</i> mode is enabled or not, errors are also reported which can be viewed using the Ctrl-Shift-L hotkey. |
| /V- or /VERBOSE- | Turns off <i>verbose</i> mode. |
| /X or /EXIT | Exit from CMM Integration. Typically this is the last command on a command file. If /X is not specified then the CMM Integration window will remain open after commands have been processed. |
| /@ CommandFile | If you are using a text command file for multiple command arguments, use the text file specified by <i>CommandFile</i> , and process each command line command. |

Example command file for execution by SQCpack (since it contains /CMM):

```

/CMM -- /CMM opens a new instance of CMM Integration.
      -- All commands up to /ENDCMM are passed to the new CMM instance.
      /WINDOWPOSITION 1 50 60 40 40 MINIMIZED -- Set size and position of
the CMM window.
      /WINDOWSTATE MINIMIZED -- Minimize the CMM window.
      /OPENDB 'D:\SQCpack\MyDatabase.dbc' -- Open the specified
database.
      /WINDOWSLOGIN -- Login using Windows user
name.
      /@ 'D:\SQCpack\SomeCmmCommands.sqc' -- Run commands in the file.
      /RUNJOB 'My Fine Job' -- Run the specified job.
/ENDCMM -- Should be on a line by
itself.

```

CMM Example 1 - Using indirection

This is an example of a CMM import job that uses indirection to specify the data group name and characteristic name.

Data setup tab

The data comes from a CSV source data file. Field1 is the first column of data and Field2 is the third column of data.

CMM - Indirection-1A - E:\Temp\SQCpack.Examples-DEVSERVER.dbc

Menu

1 - Source 2 - Data setup 3 - Rules and Outputs 4 - Start

Data format

☐ Data is positional
☒ Data is separated by commas
☐ Data is separated by TABs
☐ Data is separated by semicolons

[Refresh Source File](#)

☐ Prompt user for input(s)

Fields

Field1 (col=1)
Field2 (col=3)

Create field Delete field

| | | | | | |
|-------------|-------|------|---------|-------|--------|
| CMM-Group-1 | | | | | |
| Diameter1 | 0.35 | 0.11 | -0.0063 | 0.005 | -0.005 |
| Diameter2 | 1.255 | 1.11 | 0.0093 | 0.02 | -0.02 |
| Diameter1 | 0.35 | 0.21 | -0.0063 | 0.005 | -0.005 |
| Diameter2 | 1.255 | 1.21 | 0.0093 | 0.02 | -0.02 |
| Diameter1 | 0.35 | 0.31 | -0.0063 | 0.005 | -0.005 |
| | | | | | |

Rules and Outputs tab

CMM - Indirection-1A - E:\Temp\SQCpack.Examples-DEVSERVER.dbc

Menu

1 - Source 2 - Data setup 3 - Rules and Outputs 4 - Start

Outputs [Refresh](#) [Delete](#) [Help](#)

| # | Group | Target |
|---|-------|--------|
| 1 | @V1 | @V2 |
| 2 | @V1 | @V3 |
| 3 | @V1 | Date |
| 4 | | |

Rules [Duplicate](#) [Delete](#) [Help](#)

| When | is | constant | and when | is | constant | Set | to |
|--------|-----------|-----------|----------|---------|----------|---------|--------|
| Field1 | not blank | | Field2 | blank | | V1 | Field1 |
| Field1 | equal to | Diameter1 | Field2 | numeric | | V2 | Field1 |
| Field1 | equal to | Diameter1 | | | | Output3 | Date |
| Field1 | equal to | Diameter1 | Field2 | numeric | | Output1 | Field2 |
| Field1 | equal to | Diameter2 | Field2 | numeric | | V3 | Field1 |
| Field1 | equal to | Diameter2 | Field2 | numeric | | Output2 | Field2 |

| CMM-Group-1 | | | | | |
|-------------|-------|------|---------|-------|--------|
| Diameter1 | 0.35 | 0.11 | -0.0063 | 0.005 | -0.005 |
| Diameter2 | 1.255 | 1.11 | 0.0093 | 0.02 | -0.02 |
| Diameter1 | 0.35 | 0.21 | -0.0063 | 0.005 | -0.005 |
| Diameter2 | 1.255 | 1.21 | 0.0093 | 0.02 | -0.02 |
| Diameter1 | 0.35 | 0.31 | -0.0063 | 0.005 | -0.005 |

Outputs

The **Group** and **Target** names are specified indirectly by using a variable, such as @V1, @V2, @V3, etc. When the **Group** is specified indirectly, the **Target** may contain a user-entered value that specifies a specific target, such as "Date" as shown above.

Rules

The **Rules** section specifies these rules:

When **Field1** is **not blank** and **Field2** is **blank**, set variable **V1** to the value of **Field1**. This stores this data value "CMM-Group-1" into the variable named **V1**. **V1** is used indirectly in the **Outputs** to specify the data group name.

When **Field1** is **equal to** (case insensitive) **Diameter1** and **Field2** is **numeric**, set variable **V2** to the value of **Field1**. This stores the data value "Diameter1" into the variable named **V2**. **V2** is used indirectly in the **Outputs** to specify the characteristic name.

When **Field1** is **equal to** (case insensitive) **Diameter1**, set **Output3** to the current date and time. This stores the current date and time into the identifier named "Date".

When **Field1** is **equal to** (case insensitive) **Diameter1** and **Field2** is **numeric**, set **Output1** to the value of **Field2**. This stores this data value in column 3 of the source file in the Diameter1 measurement characteristic in data group CMM-Group-1.

When **Field1** is **equal to** (case insensitive) **Diameter2** and **Field2** is **numeric**, set variable **V3** to the value of **Field1**. This stores the data value "Diameter2" into the variable named **V3**. **V3** is used indirectly in the **Outputs** to specify the characteristic name.

When **Field1** is **equal to** (case insensitive) **Diameter2** and **Field2** is **numeric**, set **Output2** to the value of

Field2. This stores this data value in column 3 of the source file in the Diameter2 measurement characteristic in data group CMM-Group-1.

More information about the components of a rule can be found here: [CMM Rules](#)

CMM Example 2 - Using indirection

This is an example of a CMM import job that uses indirection to specify the data group name and characteristic name.

In this example, the characteristic names in the source data file do not correspond to the characteristic names in the data group, and a rule is used to translate between the two names.

Data setup tab

The data comes from a CSV source data file. Field1 is the first column of data and Field2 is the third column of data.

| | | | | | |
|-------------|-------|------|---------|-------|--------|
| CMM-Group-1 | | | | | |
| Reading1 | 0.35 | 0.11 | -0.0063 | 0.005 | -0.005 |
| Reading2 | 1.255 | 1.11 | 0.0093 | 0.02 | -0.02 |
| Reading1 | 0.35 | 0.21 | -0.0063 | 0.005 | -0.005 |
| Reading2 | 1.255 | 1.21 | 0.0093 | 0.02 | -0.02 |
| Reading1 | 0.35 | 0.31 | -0.0063 | 0.005 | -0.005 |

Rules and Outputs tab

CMM - Indirection-1B - E:\Temp\SQCpack.Examples-DEVSERVER.dbc

Menu

1 - Source 2 - Data setup 3 - Rules and Outputs 4 - Start

Outputs [Refresh](#) [Delete](#) [Help](#)

| # | Group | Target |
|---|-------|--------|
| 1 | @V1 | @V2 |
| 2 | @V1 | @V3 |
| 3 | @V1 | Date |
| 4 | | |

Rules [Duplicate](#) [Delete](#) [Help](#)

| When | is | constant | and when | is | constant | Set | to |
|--------|-----------|----------|----------|---------|----------|---------|-----------|
| Field1 | not blank | | Field2 | blank | | V1 | Field1 |
| Field1 | equal to | Reading1 | Field2 | numeric | | V2 | Diameter1 |
| Field1 | equal to | Reading1 | Field2 | numeric | | Output1 | Field2 |
| Field1 | equal to | Reading1 | | | | Output3 | Date |
| Field1 | equal to | Reading2 | Field2 | numeric | | V3 | Diameter2 |
| Field1 | equal to | Reading2 | Field2 | numeric | | Output2 | Field2 |

| CMM-Group-1 | | | | | |
|-------------|-------|------|---------|-------|--------|
| Reading1 | 0.35 | 0.11 | -0.0063 | 0.005 | -0.005 |
| Reading2 | 1.255 | 1.11 | 0.0093 | 0.02 | -0.02 |
| Reading1 | 0.35 | 0.21 | -0.0063 | 0.005 | -0.005 |
| Reading2 | 1.255 | 1.21 | 0.0093 | 0.02 | -0.02 |
| Reading1 | 0.35 | 0.31 | -0.0063 | 0.005 | -0.005 |

Outputs

The **Group** and **Target** names are specified indirectly by using a variable, such as @V1, @V2, @V3, etc. When the **Group** is specified indirectly, the **Target** may contain a user-entered value that specifies a specific target, such as "Date" as shown above.

Rules

The **Rules** section specifies these rules. Two of the rules are used to translate between a name stored in the source data file and a characteristic name in the data group.

When **Field1** is **not blank** and **Field2** is **blank**, set variable **V1** to the value of **Field1**. This stores this data value "CMM-Group-1" into the variable named **V1**. **V1** is used indirectly in the **Outputs** to specify the data group name.

When **Field1** is **equal to** (case insensitive) **Reading1** and **Field2** is **numeric**, set variable **V2** to the specified value **Diameter1**. This stores this data value "Diameter1" into the variable named **V2**. **V2** is used indirectly in the **Outputs** to specify the characteristic name. This rule translates the data value **Reading1** into the characteristic name **Diameter1**.

When **Field1** is **equal to** (case insensitive) **Reading1** and **Field2** is **numeric**, set variable **V2** to the value of **Field1**. This stores the data value "Diameter1" into the variable named **V2**. **V2** is used indirectly in the **Outputs** to specify the characteristic name.

When **Field1** is **equal to** (case insensitive) **Reading1**, set **Output3** to the current date and time. This stores the current date and time into the identifier named "Date".

When **Field1** is **equal to** (case insensitive) **Reading1** and **Field2** is **numeric**, set **Output1** to the value of **Field2**. This stores this data value in column 3 of the source file in the Diameter1 measurement characteristic in data group CMM-Group-1.

When **Field1** is **equal to** (case insensitive) **Reading2** and **Field2** is **numeric**, set variable **V3** to the value of **Field1**. This stores the data value "Diameter2" into the variable named **V3**. **V3** is used indirectly in the **Outputs** to specify the characteristic name.

When **Field1** is **equal to** (case insensitive) **Reading2** and **Field2** is **numeric**, set variable **V3** to the specified value **Diameter2**. This stores this data value "Diameter2" into the variable named **V3**. **V3** is used indirectly in the **Outputs** to specify the characteristic name. This rule translates the data value **Reading2** into the characteristic name **Diameter2**.

When **Field1** is **equal to** (case insensitive) **Reading2** and **Field2** is **numeric**, set **Output2** to the value of **Field2**. This stores this data value in column 3 of the source file in the Diameter2 measurement characteristic in data group CMM-Group-1.

More information about the components of a rule can be found here: [CMM Rules](#)

CMM Example 3 - Using indirection

This is an example of a CMM import job that uses indirection to specify the data group name and characteristic name.

In this example, one source data file provides data for two different data groups, where the data group name is read from the data file.

Data setup tab

The data comes from a CSV source data file. Field1 is the first column of data and Field2 is the third column of data.

CMM - Indirection-2 - E:\Temp\SQCpack.Examples-DEVSERVER.dbc

Menu

1 - Source 2 - Data setup 3 - Rules and Outputs 4 - Start

Data format

☐ Data is positional
☒ Data is separated by commas
☐ Data is separated by TABs
☐ Data is separated by semicolons

[Refresh Source File](#)

☐ Prompt user for input(s)

Fields

Field1 (col=1)
Field2 (col=3)

Create field Delete field

| | | | | | |
|-------------|-------|------|---------|-------|--------|
| CMM-Group-1 | | | | | |
| Diameter1 | 0.35 | 0.11 | -0.0063 | 0.005 | -0.005 |
| Diameter2 | 1.255 | 1.11 | 0.0093 | 0.02 | -0.02 |
| Diameter1 | 0.35 | 0.21 | -0.0063 | 0.005 | -0.005 |
| Diameter2 | 1.255 | 1.21 | 0.0093 | 0.02 | -0.02 |
| Diameter1 | 0.35 | 0.31 | -0.0063 | 0.005 | -0.005 |
| CMM-Group-2 | | | | | |
| Diameter1 | 0.35 | 0.12 | -0.0063 | 0.005 | -0.005 |
| Diameter2 | 1.255 | 1.12 | 0.0093 | 0.02 | -0.02 |

Rules and Outputs tab

CMM - Indirection-2 - E:\Temp\SQCpack.Examples-DEVSERVER.dbc

Menu

1 - Source 2 - Data setup 3 - Rules and Outputs 4 - Start

Outputs [Refresh](#) [Delete](#) [Help](#)

| # | Group | Target |
|---|-------|--------|
| 1 | @V1 | @V2 |
| 2 | @V1 | @V3 |
| 3 | @V1 | Date |
| 4 | | |

Rules [Duplicate](#) [Delete](#) [Help](#)

| When | is | constant | and when | is | constant | Set | to |
|--------|-----------|-----------|----------|---------|----------|---------|--------|
| Field1 | not blank | | Field2 | blank | | V1 | Field1 |
| Field1 | equal to | Diameter1 | Field2 | numeric | | V2 | Field1 |
| Field1 | equal to | Diameter1 | Field2 | numeric | | Output1 | Field2 |
| Field1 | equal to | Diameter1 | Field2 | numeric | | Output3 | Date |
| Field1 | equal to | Diameter2 | Field2 | numeric | | V3 | Field1 |
| Field1 | equal to | Diameter2 | Field2 | numeric | | Output2 | Field2 |

| CMM-Group-1 | | | | | |
|-------------|-------|------|---------|-------|--------|
| Diameter1 | 0.35 | 0.11 | -0.0063 | 0.005 | -0.005 |
| Diameter2 | 1.255 | 1.11 | 0.0093 | 0.02 | -0.02 |
| Diameter1 | 0.35 | 0.21 | -0.0063 | 0.005 | -0.005 |
| Diameter2 | 1.255 | 1.21 | 0.0093 | 0.02 | -0.02 |
| Diameter1 | 0.35 | 0.31 | -0.0063 | 0.005 | -0.005 |
| CMM-Group-2 | | | | | |
| Diameter1 | 0.35 | 0.12 | -0.0063 | 0.005 | -0.005 |
| Diameter2 | 1.255 | 1.12 | 0.0093 | 0.02 | -0.02 |
| Diameter1 | 0.35 | 0.22 | -0.0063 | 0.005 | -0.005 |
| Diameter2 | 1.255 | 1.22 | 0.0093 | 0.02 | -0.02 |
| Diameter1 | 0.35 | 0.32 | -0.0063 | 0.005 | -0.005 |

Outputs

The **Group** and **Target** names are specified indirectly by using a variable, such as @V1, @V2, @V3, etc. When the **Group** is specified indirectly, the **Target** may contain a user-entered value that specifies a specific target, such as "Date" as shown above.

Rules

The **Rules** section specifies these rules.

When **Field1** is **not blank** and **Field2** is **blank**, set variable **V1** to the value of **Field1**. This stores this data value that specifies the data group name into the variable named **V1**. **V1** is used indirectly in the **Outputs** to specify the data group name.

When **Field1** is **equal to** (case insensitive) **Diameter1** and **Field2** is **numeric**, set variable **V2** to the value of **Field1**. This stores the data value "Diameter1" into the variable named **V2**. **V2** is used indirectly in the **Outputs** to specify the characteristic name.

When **Field1** is **equal to** (case insensitive) **Diameter1** and **Field2** is **numeric**, set **Output1** to the value of **Field2**. This stores this data value in column 3 of the source file in the Diameter1 measurement characteristic in data group CMM-Group-1.

When **Field1** is **equal to** (case insensitive) **Diameter1**, set **Output3** to the current date and time. This stores the current date and time into the identifier named "Date".

When **Field1** is **equal to** (case insensitive) **Diameter2** and **Field2** is **numeric**, set variable **V3** to the value of **Field1**. This stores the data value "Diameter2" into the variable named **V3**. **V3** is used indirectly in the **Outputs** to specify the characteristic name.

When **Field1** is **equal to** (case insensitive) **Diameter2** and **Field2** is **numeric**, set **Output2** to the value of **Field2**. This stores this data value in column 3 of the source file in the Diameter2 measurement characteristic in data group CMM-Group-1.

More information about the components of a rule can be found here: [CMM Rules](#)

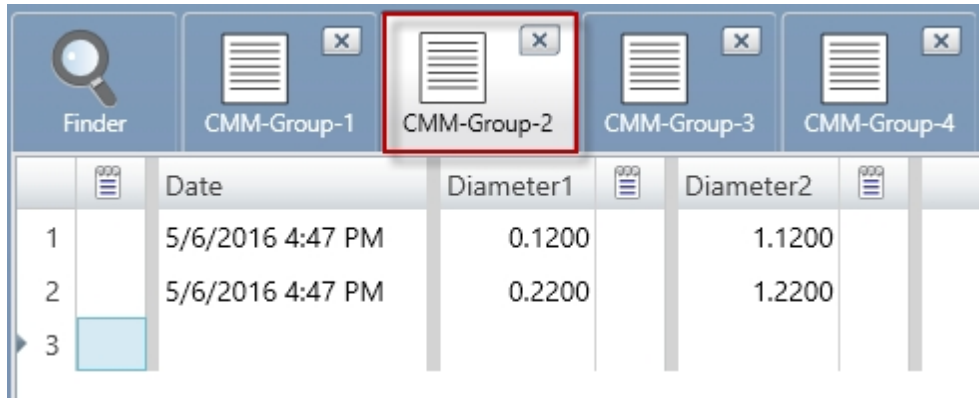
| | Finder | CMM-Group-1 | CMM-Group-2 | CMM-Group-3 | CMM-Group-4 |
|---|--------|------------------|-------------|-------------|-------------|
| | | Date | Diameter1 | Diameter2 | |
| 1 | | 5/6/2016 4:43 PM | 0.1100 | 1.1100 | |
| 2 | | 5/6/2016 4:43 PM | 0.2100 | 1.2100 | |
| 3 | | 5/6/2016 4:43 PM | 0.3100 | | |
| 4 | | | | | |

| | Finder | CMM-Group-1 | CMM-Group-2 | CMM-Group-3 | CMM-Group-4 |
|---|--------|------------------|-------------|-------------|-------------|
| | | Date | Diameter1 | Diameter2 | |
| 1 | | 5/6/2016 4:43 PM | 0.1200 | 1.1200 | |
| 2 | | 5/6/2016 4:43 PM | 0.2200 | 1.2200 | |
| 3 | | 5/6/2016 4:43 PM | 0.3200 | | |
| 4 | | | | | |

When this job is run using the data shown above, this is what the two data groups look like.

Row 3 contains a value only for **Diameter1** because **Allow import of partial rows** was selected. If **Allow import of partial rows** was not selected, each data group would receive only the first two rows of imported data, like this:

| | Finder | CMM-Group-1 | CMM-Group-2 | CMM-Group-3 | CMM-Group-4 |
|---|--------|------------------|-------------|-------------|-------------|
| | | Date | Diameter1 | Diameter2 | |
| 1 | | 5/6/2016 4:47 PM | 0.1100 | 1.1100 | |
| 2 | | 5/6/2016 4:47 PM | 0.2100 | 1.2100 | |
| 3 | | | | | |



| | Date | Diameter1 | Diameter2 |
|---|------------------|-----------|-----------|
| 1 | 5/6/2016 4:47 PM | 0.1200 | 1.1200 |
| 2 | 5/6/2016 4:47 PM | 0.2200 | 1.2200 |
| 3 | | | |

The third row of data was not sent to the data group because the row was not full; i.e. Diameter2 did not have a value assigned.

CMM Example 4 - Using indirection

This is an example of a CMM import job that uses indirection to specify the data group name and characteristic name.

In this example, there are two source CSV data files that provide data for two different data groups. The identifier and characteristic names are arranged in columns and are used to specify the identifier and characteristic names in the SQCpack data group. The *data* name is read from line 1, column 2 of the data file and then is translated into the data group name that is actually used in SQCpack.

Source tab

The data comes from two CSV source data files. CMM-Data4A.csv has 4 columns of data. CMM-Data4B.csv has 3 columns of data.

CMM - Indirection-4 [CSV, group and characteristics in columns, group name translation] - E:\Temp\...

Menu

1 - Source 2 - Data setup 3 - Rules and Outputs 4 - Start

Configuration name
Indirection-4 [CSV, group and characteristics in columns, group name translation]

Source files(s)

| # | # | |
|---|--|---|
| 1 | \\DEVSERVER\ExampleData\CMM-Data47.csv | X |
| 2 | | X |
| 3 | | X |
| 4 | | X |
| 5 | | X |
| 6 | | X |

Browse

| Name: | Widget-1 | | |
|-------------------|----------|---------------|--------|
| Date and Time | Diameter | Circumference | Weight |
| 5/2/2016 11:50 AM | 3.554 | 14.288 | 16.336 |
| 5/2/2016 12:32 PM | 3.543 | 14.249 | 15.973 |
| 5/2/2016 1:47 PM | 3.492 | 14.266 | 16.411 |
| Name: | Widget-2 | | |
| Date and Time | Length | Width | |
| 5/2/2016 2:37 PM | 4.1 | 7.25 | |
| 5/2/2016 3:27 PM | 3.9 | 7.12 | |
| 5/2/2016 4:32 PM | 4 | 7.32 | |

Data setup tab

CMM - Indirection-4 [CSV, group and characteristics in columns, group name translation] - E:\Temp\...

Menu

1 - Source 2 - Data setup 3 - Rules and Outputs 4 - Start

Data format

☐ Data is positional
☒ Data is separated by commas
☐ Data is separated by TABs
☐ Data is separated by semicolons

[Refresh Source File](#)

☐ Prompt user for input(s)

Fields

Field1 (col=1)
Field2 (col=2)
Field3 (col=3)
Field4 (col=4)

Create field Delete field

| Name: | Widget-1 | | |
|-------------------|----------|---------------|--------|
| Date and Time | Diameter | Circumference | Weight |
| 5/2/2016 11:50 AM | 3.554 | 14.288 | 16.336 |
| 5/2/2016 12:32 PM | 3.543 | 14.249 | 15.973 |
| 5/2/2016 1:47 PM | 3.492 | 14.266 | 16.411 |
| Name: | Widget-2 | | |
| Date and Time | Length | Width | |
| 5/2/2016 2:37 PM | 4.1 | 7.25 | |
| 5/2/2016 3:27 PM | 3.9 | 7.12 | |
| 5/2/2016 4:32 PM | 4 | 7.32 | |
| | | | |

The columns are mapped as **Field1** through **Field4**.

Rules and Outputs tab

CMM - Indirection-4 [CSV, group and characteristics in columns, group name translation] - E:\Temp\...

Menu

1 - Source 2 - Data setup 3 - Rules and Outputs 4 - Start

Outputs [Refresh](#) [Delete](#) [Help](#)

| # | Group | Target |
|---|-------|--------|
| 1 | @V1 | @V2 |
| 2 | @V1 | @V3 |
| 3 | @V1 | @V4 |
| 4 | @V1 | @V5 |

Rules [Duplicate](#) [Delete](#) [Help](#)

| When | is | constant | and when | is | constant | Set | to |
|-----------|----------|----------|----------|----|----------|---------|-------------|
| Linecount | equal to | 1 | | | | V1 | Field2 |
| Linecount | equal to | 2 | | | | V2 | Field1 |
| Linecount | equal to | 2 | | | | V3 | Field2 |
| Linecount | equal to | 2 | | | | V4 | Field3 |
| Linecount | equal to | 2 | | | | V5 | Field4 |
| V1 | equal to | Widget-1 | | | | V1 | CMM-Group-6 |
| V1 | equal to | Widget-2 | | | | V1 | CMM-Group-5 |
| Field2 | numeric | | | | | Output1 | Field1 |
| Field2 | numeric | | | | | Output2 | Field2 |
| Field2 | numeric | | | | | Output3 | Field3 |
| Field2 | numeric | | | | | Output4 | Field4 |

| | | | |
|-------------------|----------|---------------|--------|
| Name: | Widget-1 | | |
| Date and Time | Diameter | Circumference | Weight |
| 5/2/2016 11:50 AM | 3.554 | 14.288 | 16.336 |
| 5/2/2016 12:32 PM | 3.543 | 14.249 | 15.973 |
| 5/2/2016 1:47 PM | 3.492 | 14.266 | 16.411 |
| Name: | Widget-2 | | |
| Date and Time | Length | Width | |
| 5/2/2016 2:37 PM | 4.1 | 7.25 | |
| 5/2/2016 3:27 PM | 3.9 | 7.12 | |
| 5/2/2016 4:32 PM | 4 | 7.32 | |

Outputs

The **Group** and **Target** names are specified indirectly by using variables. @V1 specifies the SQCpack data group name. @V2 through @V5 specify the identifier and characteristic names in the data group.

Rules

The **Rules** section specifies these rules.

The following rule lines pick up the data group name, identifier name, and characteristic names:

When **Linecount** is **equal to** 1, set variable **V1** to the value of **Field2**. This stores this data value ("Widget-1" or "Widget-2") that specifies the data group into the variable named **V1**. **V1** is used indirectly in the **Outputs** to specify the data group name. Lines 6 and 7 of the rules perform translation of the group name found in the data file into the actual group name ("CMM-Group-6" or "CMM-Group-5") used in SQCpack.

When **Linecount** is **equal to** 2, set variable **V2** to the value of **Field1**. This stores the identifier name "Date and Time" into the variable named **V2**. **V2** is used indirectly in the **Outputs** to specify the identifier name.

When **Linecount** is **equal to** 2, set variable **V3** to the value of **Field2**. This stores the characteristic name "Diameter" or "Length" into the variable named **V3**. **V3** is used indirectly in the **Outputs** to specify the characteristic name.

When **Linecount** is **equal to 2**, set variable **V4** to the value of **Field3**. This stores the characteristic name "Circumference" or "Width" into the variable named **V4**. **V4** is used indirectly in the **Outputs** to specify the characteristic name.

When **Linecount** is **equal to 2**, set variable **V5** to the value of **Field4**. This stores the characteristic name "Weight" or "" into the variable named **V5**. **V5** is used indirectly in the **Outputs** to specify the characteristic name.

The next two rule lines are used to translate the data name found in the source data file (and stored in **V1**) into the data group name that is actually used in SQCpack.

When **V1** is **equal to** "Widget-1", set variable **V1** to "CMM-Group-6".

When **V1** is **equal to** "Widget-2", set variable **V1** to "CMM-Group-5".

The next four lines send data to the outputs:

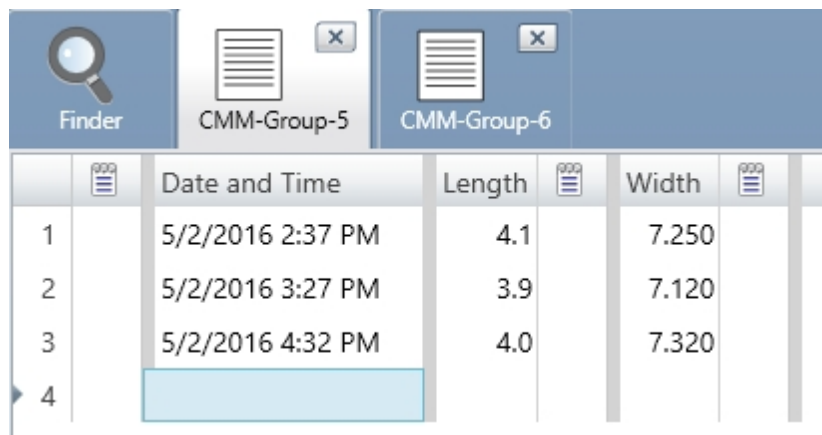
When **Field2** is **numeric**, set **Output1** to the value of **Field1**. This stores the "Date and Time" value into the identifier named "Date and Time" in the data group.

When **Field2** is **numeric**, set **Output2** to the value of **Field2**. This stores the "Diameter" or "Length" value into that characteristic in the data group.

When **Field2** is **numeric**, set **Output3** to the value of **Field3**. This stores the "Circumference" or "Width" value into that characteristic in the data group.

When **Field2** is **numeric**, set **Output4** to the value of **Field4**. This stores the "Weight" (or blank) value into the "Weight" characteristic in the data group. When this rule is evaluated in the context of the data file that only has 3 columns, the program thinks to itself "I'm supposed to store the value in the 4th column into data group 'CMM-Group-5' with target name ' '. Since a blank target name does not match any identifier or characteristic in that data group, I'll just ignore this rule."

More information about the components of a rule can be found here: [CMM Rules](#)



| | Date and Time | Length | Width |
|---|------------------|--------|-------|
| 1 | 5/2/2016 2:37 PM | 4.1 | 7.250 |
| 2 | 5/2/2016 3:27 PM | 3.9 | 7.120 |
| 3 | 5/2/2016 4:32 PM | 4.0 | 7.320 |
| 4 | | | |

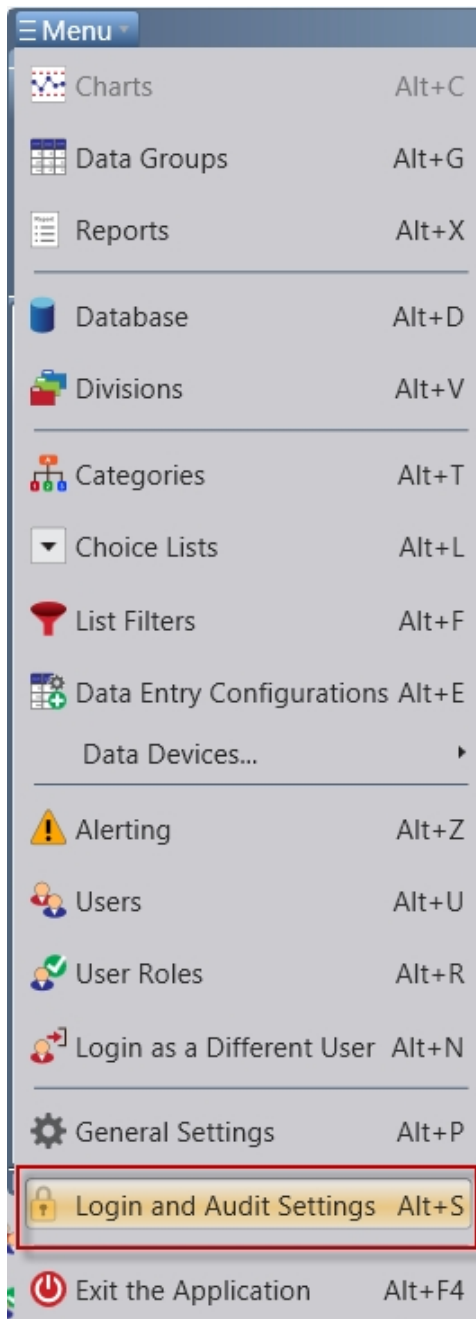
| <div> <div>Finder</div> <div>CMM-Group-5</div> <div>CMM-Group-6</div> </div> | | | | | | | |
|--|--|-------------------|----------|--|---------------|--|--------|
| | | Date and Time | Diameter | | Circumference | | Weight |
| 1 | | 5/2/2016 11:50 AM | 3.554 | | 14.288 | | 16.336 |
| 2 | | 5/2/2016 12:32 PM | 3.543 | | 14.249 | | 15.973 |
| 3 | | 5/2/2016 1:47 PM | 3.492 | | 14.266 | | 16.411 |
| 4 | | | | | | | |

When this job is run using the data shown above, this is what the two data groups look like.

Reference - Login and audit settings

This is a reference section that contains topics related to login and audit settings in SQCpack.

To get to the login and audit settings select **Login and Audit Settings (Alt-S)** in the navigation menu.



Login management

When user login is enabled, the auditing feature of SQCpack will record the SQCpack user name of the person who performed the audited action. An SQCpack administrator will need to create the SQCpack user accounts that will be used by your organization.

The **admin** user is special in these ways:

- All rights and privileges are permanently granted to the **admin** user.
- The **admin** user cannot be set to inactive.
- The **admin** user is not deactivated after a number of failed login attempts (7.0.16001.1 or higher).

When user login is disabled, all SQCpack users are effectively logged in as the **admin** user and can

perform all actions without restriction.

Once created, an SQCpack user account can never be deleted. You can deactivate a user account so that it cannot be used to login to SQCpack, but you cannot delete the user account. The **admin** user is an exception and cannot be deactivated.

It is possible to create an SQCpack user account that enables logging into SQCpack using the user's Windows login credentials. This has the advantage of not requiring the user to remember an SQCpack password, and password management is handled by Active Directory instead of being managed by SQCpack itself.

Login settings:

- ☒ Require user login
- ☐ Enforce minimum password length

5
- ☐ Passwords expire after this many months

6
- Grace logins allowed:

3
- ☐ Deactivate user after this many failed logins

3

Require user login – Enable this to require SQCpack users to log in prior to gaining access to SQCpack.

Enforce minimum password length – Enable this to enforce a minimum password length on all SQCpack user accounts.

Passwords expire after this many months – Enable this for all SQCpack user passwords to expire after the indicated number of months. When users attempts to log in with an expired password, they will be told that they need to change their password. If they do not change their password and login using the expired password, they will consume one of the specified number of **Grace logins allowed**. When all of the grace logins have been consumed, the user *must* change their password in order to login.

Deactivate user after this many failed logins – Each time a user attempts to login to SQCpack using an incorrect password the count of failed logins is incremented by one. When the failed login count exceeds the specified number, the user's SQCpack account will be deactivated. Only someone who is a member of the Administrators role can re-activate a user who has been deactivated (by pressing Alt-U to navigate to the Users administration area of SQCpack). The **admin** user is an exception and will not be deactivated due to failed login attempts (7.0.16001.1 or higher).

Audit trail management

When the auditing feature is enabled, SQCpack records in the current SQCpack database information regarding who, when, and what type of action is performed in these cases:

- Modify data group
- Delete data group
- Modify data row
- Delete data row
- Delete internal chart definition

- Delete external chart definition
- Delete report definition
- Late data entry due to “Sample prompting” in the data editor
- Sample prompting disabled during a data entry session
- Sample prompting enabled during a data entry session

SQCpack allows you to create an auditing report that shows audit activity over a period of time.

Audit settings:

☒ Enable auditing - Record audit trail information for traceability purposes

When previously entered records are modified:

Create audit record with no user interaction ▼

When previously entered records are deleted:

Create audit record with no user interaction ▼

Purge audit trail history prior to:

1/5/2017 15 Purge now

☐ Enable automatic purging of the audit trail history

Number of days to keep new audit records: 30

Audit report:

Start date: 1/1/2017 15

End date: 1/5/2017 15

Review recent activity

Enable auditing – Enable this to turn on the auditing feature in SQCpack.

When previously entered records are modified – Choose the type of auditing action to perform when an auditable record is modified:

- **No audit record is created** – When this is selected, auditing is effectively “turned off” when auditable records are modified.
- **Create audit record with no user interaction** – An audit record is silently created. No interaction with the user takes place regarding why the record was modified.
- **Create audit record with optional reason** – An audit record is created. The user is given the optional opportunity to state why the record was modified.
- **Create audit record with mandatory reason** – An audit record is created. The user *must* state why the record was modified.

When previously entered records are deleted – Choose the type of auditing action to perform when an auditable record is deleted:

- **No audit record is created** – When this is selected auditing is effectively “turned off” when auditable records are deleted.
- **Create audit record with no user interaction** – An audit record is silently created. No interaction with the user takes place regarding why the record was deleted.
- **Create audit record with optional reason** – An audit record is created. The user is given the optional opportunity to state why the record was deleted.
- **Create audit record with mandatory reason** – An audit record is created. The user *must* state why the record was deleted.

Purge now – All audit records that are created by SQCpack will remain in the SQCpack database unless someone in the Administrators role uses this button to purge records that are older than the specified date.

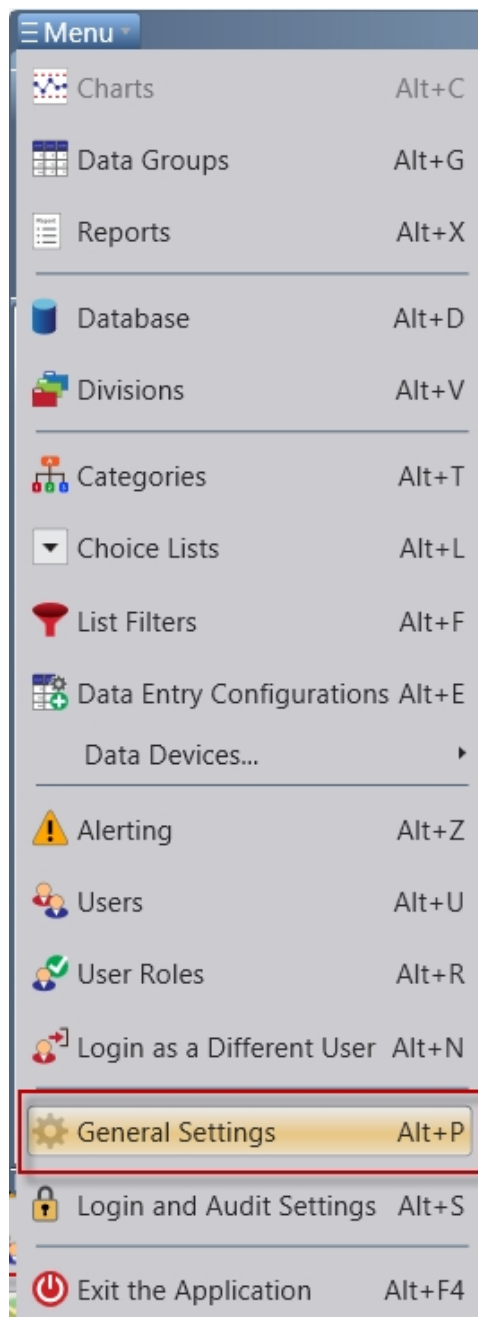
Enable automatic purging – Automatically purges audit records once they pass the specified number of days to be kept.

Review recent activity – Click this button to create a report of auditing records that occurred between the specified **start** and **end** dates.

Reference - General Settings

This is a reference section that contains topics related to general settings in SQCpack.

To get to the general settings select "General Settings" (Alt-P) in the navigation menu.



Email tab

To get to the Email settings tab, select **General Settings** (Alt-P) in the navigation menu, then click on the **Email** tab.

Outgoing mail server – This specifies the server that handles your email traffic. You can enter the IP address of the outbound mail (SMTP) server, or the computer name if that resolves to an IP address. If you don't know the IP address or name of the mail server, ask your IT department. Alternatively, you can leave this field blank and SQCpack will automatically attempt to locate the appropriate mail server for you; in this case you may have problems delivering email because the computer running the SQCpack software is not defined as being an authorized sender of email for your organization or domain.

From (email address) – This address will be displayed in the 'From' box of the message whenever SQCpack sends an email. Some mail servers require that this address have the same domain as the recipient address. For instance, if your company's domain is company.com, and you are sending to bob@company.com, then the sender must be someone in company.com, e.g. sqcpack@company.com.

Subject – Some mail servers will reject the test message if it doesn't specify a subject.

Test email recipient – This is the email address to receive the test email message, e.g. bob@company.com.

Show advanced settings – Some mail servers have security settings in place that require applications to provide valid credentials before they are given permission to send messages. If your mail server has such security, check this box so that you can enter the port number, username, and password below. If you don't have a set of credentials to use here, consult your IT department.

Port – This field stores the port number that SQCpack will try to communicate through when it talks to the mail server to send emails.

Email server username / Password – If SQCpack must provide the mail server with credentials in order to send an SMTP email message, enter them here.

Send test email – Click this button to send a test email. The SMTP conversation between SQCpack and the mail server is shown in the "Test email status" field. If there is a problem sending email an examination of the SMTP conversation can lead to the solution.

Getting SQCpack setup to send email can be a challenge in some environments. If you are having difficulties getting email to work, please contact [PQ Systems Application Support](#).

Out-of-control tests tab

To get to the Out-of-control tests tab, select **General Settings** (Alt-P) in the navigation menu, then click on the **Out-of-control tests** tab.

The screenshot shows the 'Out-of-control tests' tab in the SQCpack software. At the top, there is a navigation bar with tabs: Email, Out-of-control tests (selected), Language Setup, Settings, Quick Report, Custom Text, and Chart Settings. Below the navigation bar, there is a section for 'Active tests (new charts default to these tests):' with a dropdown menu currently showing 'AIAG'. To the right of this section, a message states: 'Changes made to out-of-control tests are automatically saved'.

Below the active tests section, there is a table titled 'All out-of-control tests:'. The table has three columns: Name, Description, and Standard?. The table lists several test rules, some of which are marked as standard with a checkmark in the 'Standard?' column.

| Name | Description | Standard? |
|--------------------------|--------------------------------------|-------------------------------------|
| GITLOW ATTRIBUTES | | <input type="checkbox"/> |
| GITLOW VARIABLES | | <input type="checkbox"/> |
| SQCWIN | | <input type="checkbox"/> |
| SWED EISENHART RUN TESTS | | <input type="checkbox"/> |
| AIAG | AIAG | <input checked="" type="checkbox"/> |
| AT&T | AT&T | <input checked="" type="checkbox"/> |
| Duncan | Duncan | <input checked="" type="checkbox"/> |
| Gitlow-A | Gitlow, attributes | <input checked="" type="checkbox"/> |
| Gitlow-V | Gitlow, variables | <input checked="" type="checkbox"/> |
| Healthcare Advanced | From 'Quality Health Care' by Robert | <input checked="" type="checkbox"/> |
| Healthcare API | From Associates for Process Improver | <input checked="" type="checkbox"/> |

Below the table, there are four buttons: Add, Edit, Delete, and Copy. To the right of the table, there is a section titled 'Rules for: GITLOW ATTRIBUTES'. This section contains a list of rules: Beyond limits, 8 ascending, and 8 descending. Below this list, there are three buttons: Add, Edit, and Delete.

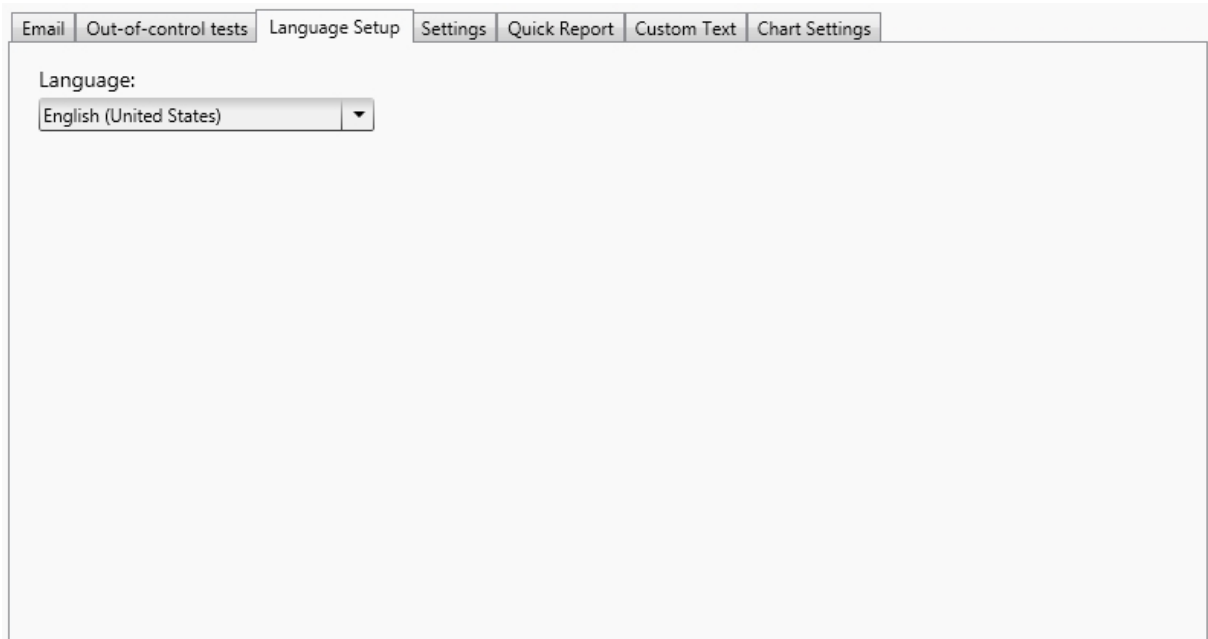
Out-of-control test rules are used by control charts to determine when a point is out-of-control.

Active tests - The set of test rules you specify here will be used by default for new control charts that are created. You can edit a control chart definition and specify that the chart use a different set of test rules.

The "Standard?" column - SQCpack comes with some standard out-of-control test rules. These have a check mark in the "Standard?" column. Any out-of-control test rules that you define and add to SQCpack will not have a check mark in the "Standard?" column.

Language setup tab

To get to the Language Setup tab, select **General Settings** (Alt-P) in the navigation menu, then click on the **Language Setup** tab.



Language – Select the language used by SQCpack to display the user interface. After you change the language, it will be necessary to restart SQCpack in order for the language change to be reflected in all portions of the application.

The following choices are available:

- ☐ Automatic
- ☐ Chinese (Simplified)
- ☐ English (United States)
- ☐ French (France)
- ☐ German (Germany)
- ☐ Portuguese (Brazil)
- ☐ Spanish (Mexico)

The **Automatic** choice will cause SQCpack to select a supported language based upon the locale settings in Windows. If no match is possible English is used.

If your company needs support for an additional language, please contact [PQ Systems](#).

Settings and Alerting configuration tab

Navigate to *Settings* tab in the *General Settings*. To get to the *Settings* tab, select *General Settings (Alt-P)* in the navigation menu, then click on the *Settings* tab.

The screenshot shows the 'Settings' tab of the SQCpack application. The 'Miscellaneous' section includes an 'Images folder' text box and two checked checkboxes: 'Show horizontal grid lines in data entry' and 'Alternate row colors in data entry'. The 'Alerting' section has a checked checkbox for 'Use master alert service', a text box for 'Master alert service location' containing 'SPC-Server', and four buttons: 'View Configuration File', 'View Log File', 'Send test email', and 'Restart service'. The 'Alerting and Temporary Limits' section features two radio buttons; the second one, 'Do not allow alert items to be based on charts with temporary control limits:', is selected. The 'Slideshow' section has a text box for 'Slideshow auto-advance interval in seconds' set to 15. The 'Messages' section has an unchecked checkbox for 'Play sound notification when new mail arrives' and a checked checkbox for 'Automatically purge deleted messages (all users) older than n days, where n = 14'.

Miscellaneous pane

Images folder – Specify the location of the folder used for image files. This setting is stored in the SQCpack database and applies to all users of that database. Image files in this folder can be used by the @IMAGE(ImageName) title macro. For example, if the images folder is set to "\\MyServer\ChartImages" and the title macro is @IMAGE(CompanyLogo.jpg, 10%), the @IMAGE macro will work properly if the image file "\\MyServer\ChartImages\CompanyLogo.jpg" exists. Typically, the images folder is located on a network share so that all the users in the organization can retrieve images from that folder. In that case, the users will need at least read access to the network share folder.

Show horizontal grid lines in data entry - Select this to enable the display of horizontal grid lines in the data entry grid editor.

Alternate row colors in data entry - Select this to enable the display of alternate row colors in the data entry grid editor.

Alerting pane - Configuring the SQCpack database for alerting

Configuration of the SQCpack database can be accomplished on any computer where SQCpack is installed. This configuration only needs to be done one time since the configuration information is stored in the SQCpack database.

Ensure that the SQCpack database you want to configure for alerting purposes is open. If login is enabled, login as an SQCpack user who is in a User Role that assigns Write privileges to the General Settings area of SQCpack.

The **Alerting** pane contains settings that are stored in the currently open multi-user database. These settings will be used by each instance of SQCpack that opens the multi-user database that is currently being configured. See [What is alerting?](#)

It is important to understand that in order for alerting to work correctly, each multi-user database involved in alerting must be configured as specified below. In addition, each multi-user database must also be referenced in the Master Alerting Service's configuration file. Refer to the file **Master-Alerting-Service-Installation.pdf** (section *Edit the Master Alerting Service configuration file*), in the *MasterAlertingService* folder where the Master Alerting Service was installed, for information related to configuring the Master Alerting Service.

Use master alert service - Select this checkbox to enable alerting for the currently open database. If this checkbox is disabled, it is because the current database is a single-user database. Remember that the **Master Alerting Service** will work only with multi-user databases.

Master alert service location - Specify the IP address, or a value that resolves to the IP address, of the computer where the Master Alerting Service is installed. You may need to talk to your IT personnel to get this address. Typically, this is either the IP address of a network interface on the computer, or the computer name, or a DNS name that points to the computer's IP address. The location you enter here must resolve to the same IP address as that used for the ServiceAddress in the *SQC.Master.Alerting.Service.Config.xml* configuration file. Click the View Configuration File button to verify that SQCpack can talk to the Master Alerting Service on the specified computer. If there is a problem with communication, it may be due to firewall settings.

View Configuration File - Click to connect to the Master Alerting Service on the computer specified by the **Master alert service location** and retrieve the contents of the configuration file. If this succeeds, it verifies that communication is possible between SQCpack and the Master Alerting Service at the specified location. This also allows you to verify that the current multi-user database is referenced in the configuration file. If it is not, you must have the appropriate person update the configuration file for the Master Alerting Service.

View Log File - Click to connect to the Master Alerting Service on the computer specified by the **Master alert service location** and retrieve the contents of the log file. If this succeeds, it verifies that communication is possible between SQCpack and the Master Alerting Service at the specified location. This also allows you to examine the log file for the Master Alerting Service.

Alerting and Temporary Limits - We recommend that you select the choice to **NOT** allow the use of temporary limits with alerting. For the reasons behind this recommendation see: [Control charts and temporary control limits](#).

Alerting and Temporary Limits:

- ☒ Allow alert items to be based on charts with temporary control limits - but warn the user:
- When alert item is based on a chart with temporary control limits, these limits will be re-computed at each evaluation based on a rolling number of up to the most recent subgroups
- ☐ Do not allow alert items to be based on charts with temporary control limits:

If you choose to allow temporary limits, you can specify the width of the sliding window, in subgroups, as shown above.

Slideshow pane

Slideshow auto advance interval in seconds – Enter the number of seconds of pause between charts in a slideshow. Enter 0 (zero) if you do not want the slideshow to auto advance to the next chart.

Messages pane

Play sound notification when new mail arrives – Select this to enable the playing of the Windows "New Mail Notification" sound when a new SQCpack message arrives.

Automatically purge deleted messages (all users) older than n days, where n = NN – Select this to enable automatic purging of deleted SQCpack messages that are older than the specified number of days.

Quick Report tab

To get to the Quick Report settings, select **General Settings** (Alt-P) in the navigation menu, then click on the **Quick Report** tab.

Here you define the columns that will be included when a Quick Report is created.

The screenshot shows the 'Quick Report' tab in a settings window. At the top, there is a navigation bar with tabs: 'Email', 'Out-of-control tests', 'Language Setup', 'Settings', 'Quick Report' (selected), 'Custom Text', and 'Chart Settings'. Below the navigation bar, the main content area has a title 'When creating a quick report for a data group, include these columns by default:'. Under this title, there are three columns of input fields. The first column is labeled 'Data group name' and contains two input fields: 'Data Group' and 'Name'. The second column is labeled 'Characteristic name' and contains two input fields: 'Characteristic' and 'Name'. The third column is labeled 'Mean' and contains two input fields: 'Mean' and an empty field. Below each column of input fields, there is a red 'X' icon. At the bottom of the main content area, there are two buttons: 'Select Columns' and 'Get me started'.

Get me started - This button will add the Data Group name, Characteristic name, and Mean columns to your Quick report settings (as shown above).

Select Columns - This button opens a window to allow you to choose which columns you want to appear in the Quick Report (as shown below).

Select content for this report column

| Type of content | Specific content | |
|---------------------------|----------------------------|-------------------------------------|
| All | Stat | Selected? |
| Capability statistics | Average range | <input type="checkbox"/> |
| Chi square statistics | Average sigma | <input type="checkbox"/> |
| Control chart information | Characteristic description | <input type="checkbox"/> |
| Descriptive statistics | Characteristic name | <input checked="" type="checkbox"/> |
| General information | Chart description | <input type="checkbox"/> |
| Out-of-spec statistics | Chart Type | <input type="checkbox"/> |
| Process Statistics | Chi-Square | <input type="checkbox"/> |
| Sigma Statistics | Coefficient of variance | <input type="checkbox"/> |
| Specification Statistics | Confidence level | <input type="checkbox"/> |
| Subgroup Statistics | Control chart name | <input type="checkbox"/> |
| | Control limit(2), center | <input type="checkbox"/> |
| | Control limit(2), lower | <input type="checkbox"/> |
| | Control limit(2), upper | <input type="checkbox"/> |
| | Control limit(3), center | <input type="checkbox"/> |

OK Cancel

For more information on creating a Quick Report, see [Creating a Quick Report](#).

Custom text

To get to the Custom Text tab, select **General Settings** (Alt-P) in the navigation menu, then click on the **Custom Text** tab.

Custom Text

In Data Groups, Finder, you can click on the Quick Find button to quickly find and select a data group for data entry.

Finder

Current List: ☐ Data Groups ☒ Charts ☐ Reports

Filter:

Search in list:

Change the quick find text:

1. To set this custom text select "General Settings" (Alt-P) in the navigation menu, then click on the "Custom Text" tab.

Email Out-of-control tests Language Setup Settings Quick Report Custom Text Chart Settings

This text is used as the main prompt in the 'Quick Find' view
Standard text is...
Type in group name:
Instead, use this custom text...

This text is used as a tooltip on the 'Quick Find' view
Standard text is...
Type in first few letters of group name to open for data entry
Instead, use this custom text...

- The first box will allow you to change the standard text from: “**Type in group name:**” to your custom text. This text is located above the search box when you open the quick find dialog. A typical example is: “**Type in the Part Number:**”
 - The second box will allow you to change the standard text from “**Type in first few letters of group name to open for data entry**” to your custom text. This text is used for the tooltip when you hold your mouse over the search box in the quick find dialog.
2. Click **Save** in the Actions ribbon bar to apply your changes.
- Now in the Finder, you can click on the Quick Find button to quickly find and select a group for data entry using your custom text.

Chart settings

To get to the Chart settings tab, select **General Settings** (Alt-P) in the navigation menu, then click on the **Chart Settings** tab.

Email
Out-of-control tests
Language Setup
Settings
Quick Report
Custom Text
Chart Settings

Chart defaults
When creating new charts, default to using the Last n subgroups. n =

How to size and scale text on charts:
☒ Apply the technique that was in use prior to April 2017.

Page text (title rows added by the user around the chart):
☒ Adjust text size based on size of window or paper
☐ Size text to specified font sizes
☐ Allow the chart text size slider to affect Page text
Chart text (chart type titles, limits / spec titles, axis labels):
☐ Adjust text size based on size of window or paper
☒ Size text to specified font sizes
☒ Allow the chart text size slider to affect Chart text

Chart Templates

| Chart category | Reference for new charts | Titles? | | |
|--|--|-------------------------------------|-----|--------------------------|
| Measurement control charts (individual values) | SQCpack defaults | <input checked="" type="checkbox"/> | ... | <input type="checkbox"/> |
| Measurement control charts (subgroup values) | SQCpack defaults | <input checked="" type="checkbox"/> | ... | <input type="checkbox"/> |
| Distribution and Capability Analysis | Measurement - Chart for Lee - Capability Arti... | <input checked="" type="checkbox"/> | ... | <input type="checkbox"/> |
| Count or Classification (attribute) control charts | SQCpack defaults | <input checked="" type="checkbox"/> | ... | <input type="checkbox"/> |
| Rare Events | SQCpack defaults | <input checked="" type="checkbox"/> | ... | <input type="checkbox"/> |
| Pareto Bar charts | SQCpack defaults | <input checked="" type="checkbox"/> | ... | <input type="checkbox"/> |
| Pareto Column charts | SQCpack defaults | <input checked="" type="checkbox"/> | ... | <input type="checkbox"/> |
| Line charts | SQCpack defaults | <input checked="" type="checkbox"/> | ... | <input type="checkbox"/> |
| Measurement charts (special) | SQCpack defaults | <input checked="" type="checkbox"/> | ... | <input type="checkbox"/> |

Chart Defaults

Chart defaults specify what values to apply to certain chart properties when newly created.

Chart defaults
When creating new charts, default to using the Last n subgroups. n =

How to size and scale text on charts

Prior to April of 2017, SQCpack used your font size settings as a starting point, but automatically made **adjustments** to the font size based on window size. If you displayed a chart, then resized the window, you would notice that the Page text size was adjusted and the chart text size remained constant. In this scenario, the font sizes were usually not the **exact** sizes you entered into the edit panel. In the May 2017 release of SQCpack, additional options allow more control over how chart text size is determined. These options are pictured below.

How to size and scale text on charts:

☐ Apply the technique that was in use prior to April 2017.

Page text (title rows added by the user around the chart):

- ☒ Adjust text size based on size of window or paper
- ☐ Size text to specified font sizes
- ☐ Allow the chart text size slider to affect Page text

Chart text (chart type titles, limits / spec titles, axis labels):

- ☐ Adjust text size based on size of window or paper
- ☒ Size text to specified font sizes
- ☒ Allow the chart text size slider to affect Chart text

When you check the box **Apply the technique that was in place prior to April 2017**, SQCpack will size text the same way it has been since the original SQCpack 7 release. When you un-check the box, you will have additional options for controlling the size of text around the charts.

Some customers have requested that SQCpack use the font sizes as specified by the user in the chart definition. If the user requests a 20 point font then use a 20 point font. If you want this, select the two radio buttons that begin with **Size text...**

The check boxes that mention the **chart text size slider** enable or disable the slider which allows the viewer of a chart to make the text larger or smaller.

Page text

Page text includes titles entered by the user for display around the edges of the chart. In the image below, the **page text** is highlighted in red:

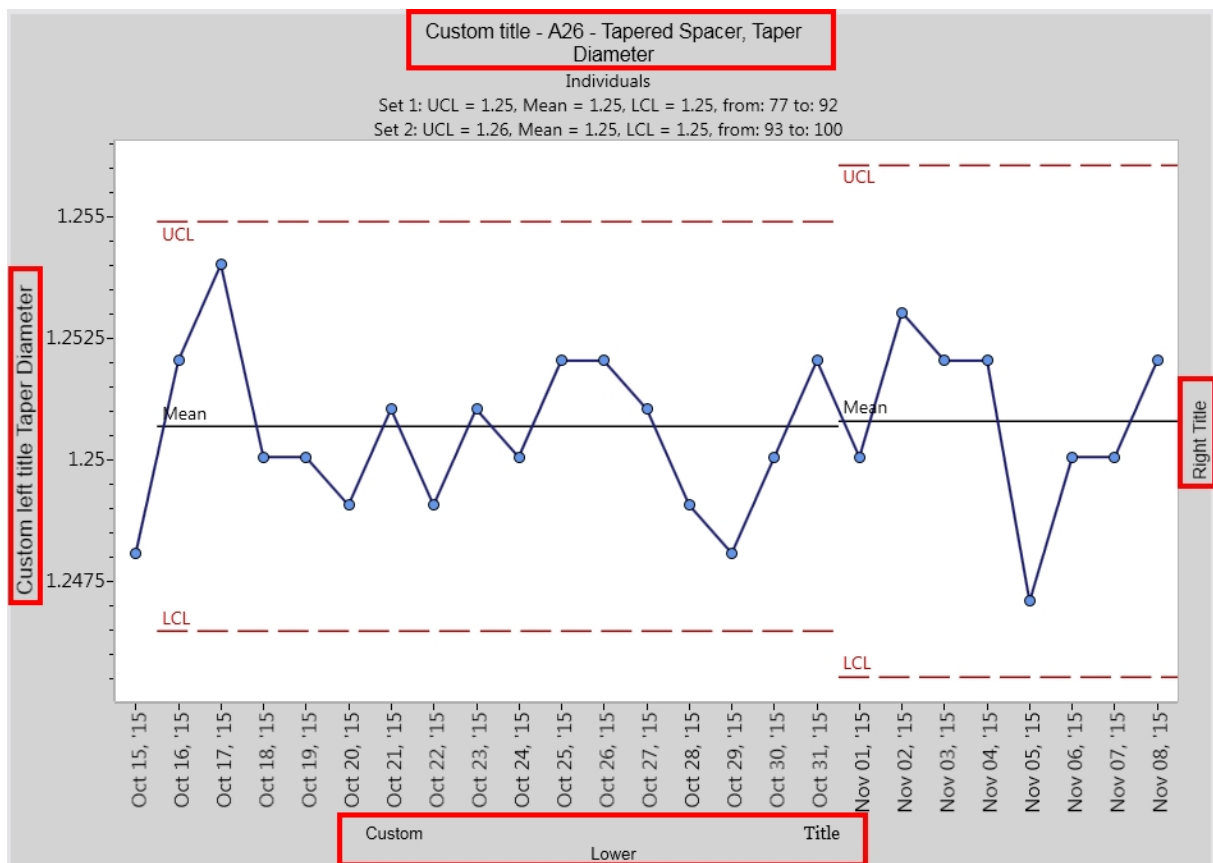
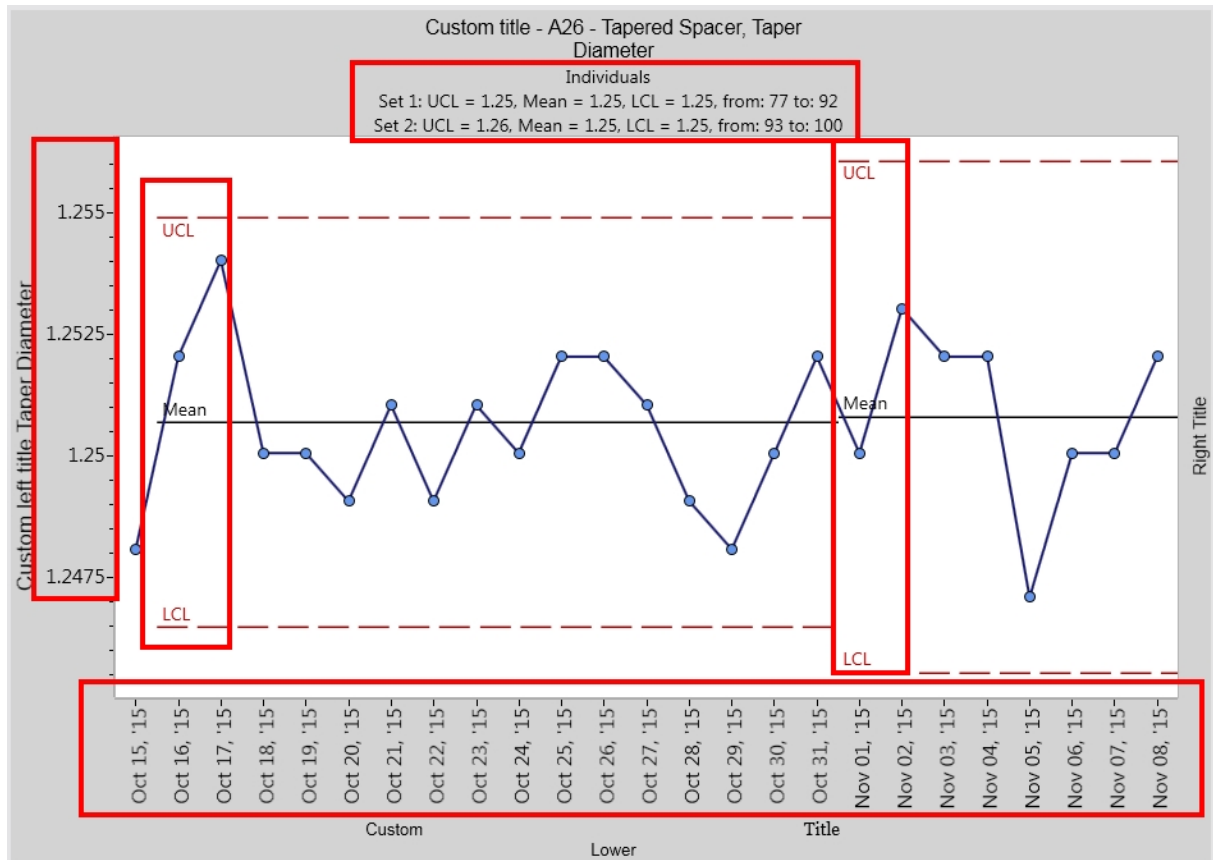


Chart text

Chart text includes the axis labels, chart line labels, chart type titles, and control limits titles. In the image below the **chart text** is highlighted in red:



When editing a SQCpack chart definition, there are settings that **specify font sizes** for different type of chart text. In the images below, these settings are highlighted in red:

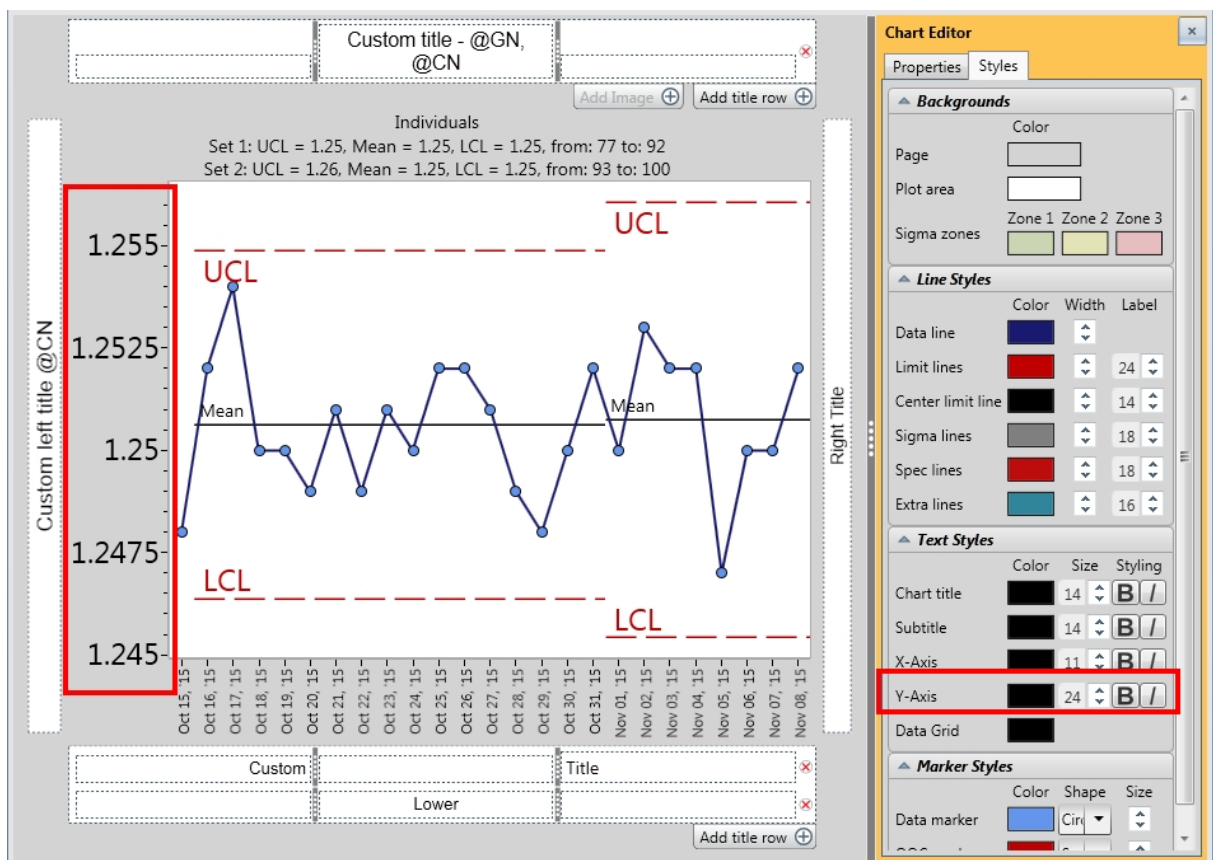
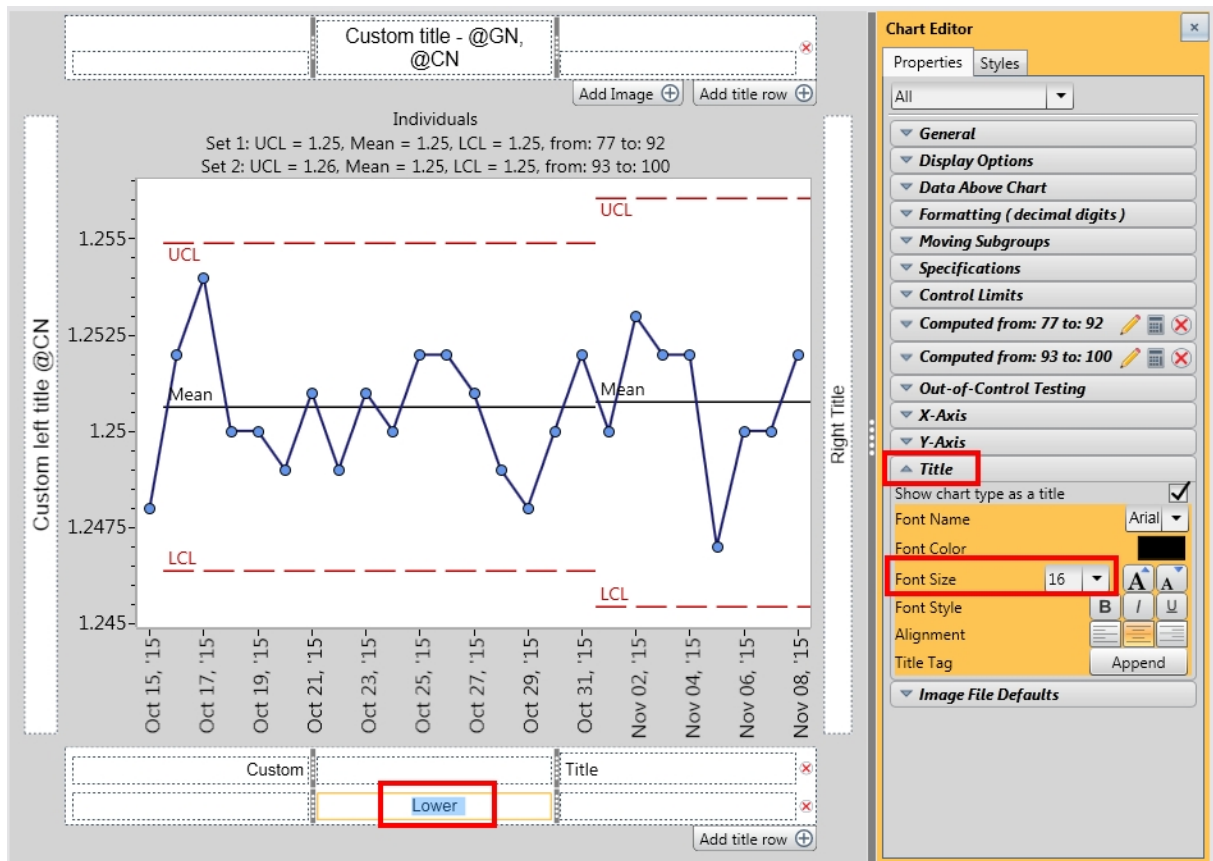


Chart Templates

Chart Templates specify how a chart within a specific chart category will look and the defaults it will have when newly created.

| Chart Templates | | |
|--|--|---|
| Chart category | Reference for new charts | Titles? |
| Measurement control charts (individual values) | SQCpack defaults | <input checked="" type="checkbox"/> ... <input checked="" type="checkbox"/> |
| Measurement control charts (subgroup values) | SQCpack defaults | <input checked="" type="checkbox"/> ... <input checked="" type="checkbox"/> |
| Distribution and Capability Analysis | Measurement - Chart for Lee - Capability Arti... | <input checked="" type="checkbox"/> ... <input checked="" type="checkbox"/> |
| Count or Classification (attribute) control charts | SQCpack defaults | <input checked="" type="checkbox"/> ... <input checked="" type="checkbox"/> |
| Rare Events | SQCpack defaults | <input checked="" type="checkbox"/> ... <input checked="" type="checkbox"/> |
| Pareto Bar charts | SQCpack defaults | <input checked="" type="checkbox"/> ... <input checked="" type="checkbox"/> |
| Pareto Column charts | SQCpack defaults | <input checked="" type="checkbox"/> ... <input checked="" type="checkbox"/> |
| Line charts | SQCpack defaults | <input checked="" type="checkbox"/> ... <input checked="" type="checkbox"/> |
| Measurement charts (special) | SQCpack defaults | <input checked="" type="checkbox"/> ... <input checked="" type="checkbox"/> |

Chart category – On the first step of the chart wizard, you can choose a chart type. The many chart types are broken down into sections. These sections are referred to as Chart Categories.

Reference for new charts – This is the name of the chart you have selected to be your template for all charts of the specified category.

When you have created a chart, the chart selected will pull from the reference chart. SQCpack is installed with default references for all available chart types. You can change these defaults by going to **General Settings** from the menu and navigating to the **Chart Templates** tab. Select the browse button (as shown below).



After clicking the browse button, a window will appear with all of the charts in the database. Select the chart that you wish to use as the new default for that chart type. The next chart that you create in the chart wizard will use the new chart you have selected as a reference. If you make changes to the chart you have selected to use as the reference, you must return to **Chart Templates** and re-select the chart for the changes to be reflected when new charts are created. You can also revert to the SQCpack defaults by selecting the red **X** button.

Appendix A: Formula references

This section contains reference information about the statistical process control formulas used by SQCpack.

Attributes control charts (traditional)

In This Section

[chart](#)
[p-chart](#)
[c-chart](#)
[u-chart](#)

See Also

[Appendix A: Formula references](#)
[Capability analysis](#)
[Histogram statistics](#)
[Measurement control charts](#)
[Tabular constants for computing variable](#)
[Rare event charts](#)

chart**Nonconforming with Constant Sample Size**

n = Sample size

k = number of samples

np_i = the number of nonconforming units in the i^{th} sample

$$p_i = \frac{\text{number of nonconforming units in } i^{\text{th}} \text{ sample}}{\text{total number of units in } i^{\text{th}} \text{ sample}}$$

Mean
$$\bar{np} = \sum_{i=1}^k \frac{np_i}{k}$$

Standard deviation (sigma)
$$\hat{\sigma}_{np} = \sqrt{n\bar{p}(1-\bar{p})}$$

np-chart, upper control limit
$$UCL_{np} = n\bar{p} + 3\sqrt{n\bar{p}(1-\bar{p})}$$

np-chart, center line
$$\bar{np} = \sum_{i=1}^k \frac{np_i}{k}$$

np-chart, lower control limit
$$LCL_{np} = n\bar{p} - 3\sqrt{n\bar{p}(1-\bar{p})}$$

See Also

[Attributes control charts \(traditional\)](#)

[p-chart](#)

[c-chart](#)

[u-chart](#)

p-chart**Nonconforming with Varying Sample Size**

n = Sample size

k = number of samples

$n_i p_i$ = the number of nonconforming units in the i^{th} sample

$$p_i = \frac{\text{number of nonconforming units in } i^{\text{th}} \text{ sample}}{\text{total number of units in } i^{\text{th}} \text{ sample}}$$

$$\bar{p} = \frac{\sum_{i=1}^k (n_i * p_i)}{\sum_{i=1}^k n_i}$$

Mean

$$\text{Overall Mean} = \bar{p} = \frac{\sum_{i=1}^k (n_i * p_i)}{\sum_{i=1}^k n_i}$$

Standard deviation (sigma)

$$\hat{\sigma}_p = \sqrt{\frac{\bar{p}(1-\bar{p})}{\bar{n}}}$$

p-chart, upper control limit

$$UCL_p = \bar{p} + 3\sqrt{\frac{\bar{p}(1-\bar{p})}{\bar{n}}}$$

p-chart, center line

$$\text{centerline} = \bar{p}$$

p-chart, lower control limit

$$LCL_p = \bar{p} - 3\sqrt{\frac{\bar{p}(1-\bar{p})}{\bar{n}}}$$

See Also

[Attributes control charts \(traditional\)](#)

[chart](#)

[c-chart](#)

[u-chart](#)

c-chart

Nonconformities with Constant Sample Size

Sample size is constant:

k = number of samples

ci = the number of nonconformities in the ith sample

Mean
$$\bar{c} = \sum_{i=1}^k \frac{c_i}{k}$$

Standard deviation (sigma)
$$\hat{\sigma}_c = \sqrt{\bar{c}}$$

c-chart, upper control limit
$$UCL_c = \bar{c} + 3\sqrt{\bar{c}}$$

c-chart, center line
$$\bar{c} = \sum_{i=1}^k \frac{c_i}{k}$$

c-chart, lower control limit
$$LCL_c = \bar{c} - 3\sqrt{\bar{c}}$$

See Also

[Attributes control charts \(traditional\)
chart](#)
[p-chart](#)
[u-chart](#)

u-chart

Nonconformities with Varying Sample Size

ni = number of units in ith sample

k = number of samples

ci = the number of nonconformities in the ith sample

$$\bar{u} = \frac{\sum_{i=1}^k c_i}{\sum_{i=1}^k n_i}$$

Mean
$$mean = \bar{u}$$

| | |
|------------------------------|---|
| Standard deviation (sigma) | $\hat{\sigma}_u = \sqrt{\frac{\bar{u}}{n}}$ |
| u-chart, upper control limit | $UCL_u = \bar{u} + 3\sqrt{\frac{\bar{u}}{n}}$ |
| u-chart, center line | $centerline = \bar{u}$ |
| u-chart, lower control limit | $LCL_u = \bar{u} - 3\sqrt{\frac{\bar{u}}{n}}$ |

See Also

[Attributes control charts \(traditional\)](#)
[chart](#)
[p-chart](#)
[c-chart](#)

Capability analysis

| In This Section | See Also |
|--|---|
| Capability indices - two-sided specifications | Attributes control charts (traditional) |
| Capability indices - one-sided specification | Histogram statistics |
| Performance indices - two-sided specifications | Measurement control charts |
| Performance indices - one-sided specification | Tabular constants for computing variability |
| Capability analysis - non-normal distributions | Rare event charts |

Capability indices - two-sided specifications

Process capability refers to what a process is "capable" of doing. Process performance refers to what a process is "actually" doing. Process capability compares the specification spread to the inherent variation of a process (6 sigma based on estimated sigma). The standard analysis assumes:

- 1. The process is statistically stable (in-control)
- 2. The process output is normally distributed with:

$mean = \bar{\bar{X}}$ and estimated sigma = $\hat{\sigma}_e = \frac{\bar{R}}{d_2}$

Measures of Capability are: Cp, Cpk, and Cr which use estimated sigma in the calculations.

| In This Section | See Also |
|-----------------|----------|
|-----------------|----------|

| | |
|---------------------|---|
| Cp | Capability analysis |
| Cpk | Capability indices - one-sided specification |
| Cr | Performance indices - two-sided specification |
| | Performance indices - one-sided specification |
| | Capability analysis - non-normal distribution |

Cp

The Cp index is used to summarize a system's ability to meet two-sided specification limits (upper and lower). It uses estimated sigma and, therefore, shows the systems potential to meet the specifications. However, it ignores the process average and only considers the spread of the specifications compared to the process spread. If the process is not centered in the specifications, Cp by itself may be misleading.

$$C_p = \frac{\text{specification spread}}{\text{process spread}} = \frac{(USL - LSL)}{6\hat{\sigma}_e}$$

| In This Section | See Also |
|---------------------------------|--|
| Interpreting Cp | Capability indices - two-sided specification |
| | Cpk |
| | Cr |

Interpreting Cp

Cp > 1 The specification spread is larger than the process spread (good)

Cp = 1 The specification spread equals the process spread (on the edge)

Cp < 1 The specification spread is smaller than the process spread (not good)

The higher the Cp value the smaller the spread of the process output in comparison to the spread of the specification. Cp is a measure of spread only. If the process is well centered, Cp will serve as a relatively good measure of process performance. However, a process with a narrow spread (a high Cp) may not meet customer needs if it is not centered within the specifications. Cpk takes into account where the process is centered. If both Cp and Cpk are used together, the spread and the centering can be evaluated at the same time.

See Also

[Cp](#)

Cpk

Cpk is a capability index which indicates how well a process is doing in terms of meeting specification limits. Cpk calculations use estimated sigma. Since Cpk takes the location of the process average into account, the process does not need to be centered on the target value for this index to be useful. However, since Cpk is calculated using the specification limit closest to the mean, it penalizes the process by assuming that both distances to the specification limits from the mean are equal to the smallest one. This does produce a desired result which is to get suppliers to center their processes in order to maximize Cpk. In fact, if the process is centered in the specification (on nominal), Cp and Cpk will be equal.

| In This Section | See Also |
|----------------------------------|--|
| Interpreting Cpk | Capability indices - two-sided specification |

Interpreting Cpk

Cpk > 1 The process is expected to produce more than 99.7% good

Cpk = 1 The process is expected to produce at least 99.7% good

Cpk < 1 The process is not expected to produce at least 99.7% good

Cpk should be used in conjunction with the Cp index. Cpk indicates what the process is doing and Cp indicates what it could do if it was centered. If they are not equal, some decision rules can be instituted indicating what action should be taken.

Cp > 1 and Cpk < 1 Center the process making Cpk > 1

Cp < 1 and Cpk < 1 Need to improve the process by narrowing the process spread.

Cp >= 1 and Cpk >= 1 Celebrate and change reference value to 1.33, 1.67, or 2.00.

$$C_{pk} = \frac{Z_{Min}}{3}$$

Where:

$$Z_{Min} = \text{smaller of } Z_{Upper}, Z_{Lower}$$

$$Z_{Upper} = \frac{(USL - \bar{\bar{X}})}{\hat{\sigma}_e}$$

$$Z_{Lower} = \frac{(\bar{\bar{X}} - LSL)}{\hat{\sigma}_e}$$

See Also

[Cpk](#)

Cr

The Cr capability ratio is used to summarize how much of the specification spread is being used by the process spread. It is the inverse of Cp and like Cp, Cr does not consider process centering. The formula is:

$$C_r = \frac{\text{process spread}}{\text{specification spread}} = \frac{6\hat{\sigma}_e}{(USL - LSL)} = \frac{1}{C_p}$$

When the Cr value is multiplied by 100, the result shows the percent of the specifications that are being used by the variation in the process.

See Also

[Capability indices - two-sided specifications](#)

[Cp](#)

[Cpk](#)

Capability indices - one-sided specification

There are many specifications that are expressed as one-sided. For example, many strength tests have a minimum but no maximum value. In other cases, the value is often bound by zero (flatness, roundness, etc.) and yet, zero is often the value one would like to achieve. Since Cpk and Ppk are based on the specification closest to the mean, both indices would be reduced as the objective is achieved. Consequently, the use of only one specification solves this dilemma. For completeness, the calculations for Cp = Cpk and Pp= Ppk.

For one-sided specifications, calculations for Cp, Cr, and Cpk are:

For upper specification

For lower specification

$$C_p = \frac{(USL - \bar{\bar{X}})}{3\hat{\sigma}_e}$$

$$C_p = \frac{(\bar{\bar{X}} - LSL)}{3\hat{\sigma}_e}$$

$$C_{pk} = \frac{(USL - \bar{\bar{X}})}{3\hat{\sigma}_e}$$

$$C_{pk} = \frac{(\bar{\bar{X}} - LSL)}{3\hat{\sigma}_e}$$

$$C_r = \frac{3\hat{\sigma}_e}{(USL - \bar{\bar{X}})}$$

$$C_r = \frac{3\hat{\sigma}_e}{(\bar{\bar{X}} - LSL)}$$

Note: When using one-sided specifications, Cp and Cpk are the same.

See Also

[Capability analysis](#)

[Capability indices - two-sided specifications](#)

[Performance indices - two-sided specifications](#)

[Performance indices - one-sided specification](#)

[Capability analysis - non-normal distributions](#)

Performance indices - two-sided specifications

Performance capability refers to what a process is "capable" of doing. Process performance refers to what a process is "actually" doing. Performance capability compares the specification spread to the inherent variation of a process (6 sigma based on sigma of the individual values). The standard analysis assumes:

1. The process is statistically stable (in-control)
2. The process output is normally distributed with:

$$\text{mean} = \bar{\bar{X}} \text{ and sigma of the individual values} = \hat{\sigma}_i = \sqrt{\frac{\sum (X_i - \bar{\bar{X}})^2}{n-1}}$$

Measures of Performance are: Pp, Ppk, and Pr which use sigma of the individual values in the calculations.

| In This Section | See Also |
|---------------------|---|
| Pp | Capability analysis |
| Ppk | Capability indices - two-sided specification |
| Pr | Capability indices - one-sided specification |
| | Performance indices - one-sided specification |
| | Capability analysis - non-normal distribution |

Pp

The Pp index is used to summarize a system's ability to meet two-sided specification limits (upper and lower). It uses sigma of the individual values and, therefore, shows the systems potential to meet the specifications. However, it ignores the process average and only considers the spread of the specification compared to the process spread. If the process is not centered in the specifications, Pp by itself may be misleading.

$$P_p = \frac{\text{specification spread}}{\text{process spread}} = \frac{(USL - LSL)}{6\hat{\sigma}_i}$$

| In This Section | See Also |
|---------------------------------|---|
| Interpreting Pp | Performance indices - two-sided specification |
| | Ppk |
| | Pr |

Interpreting Pp

- Pp > 1 The specification spread is larger than the process spread (good)
- Pp = 1 The specification spread equals the process spread (on the edge)
- Pp < 1 The specification spread is smaller than the process spread (not good)

The higher the Pp value the smaller the spread of the process output in comparison to the spread of the specification. Pp is a measure of spread only. If the process is well centered, Pp will serve as a relatively good measure of process performance. However, a process with a narrow spread (a high Pp) may not meet customer needs if it is not centered within the specifications. Ppk takes into account where the process is centered. If both Pp and Ppk are used together, the spread and the centering can be evaluated at the same time.

| See Also |
|--------------------|
| Pp |

Ppk

Ppk is a capability index that indicates how well a process is doing in terms of meeting specification limits. Ppk calculations use sigma of the individual values. Since Ppk takes the location of the process average into account, the process does not need to be centered on the target value for this index to be useful. However, since Ppk is calculated using the specification limit closest to the mean, it penalizes the process by assuming that both distances to the specification limits from the mean are equal to the smallest one. This does produce a desired result which is to get suppliers to center their processes in order to maximize Ppk. In fact, if the process is centered in the specification (on nominal), Pp and Ppk will be equal.

| In This Section | See Also |
|----------------------------------|---|
| Interpreting Ppk | Performance indices - two-sided specification |
| | Pp |
| | Pr |

Interpreting Ppk

Ppk > 1 The process is expected to produce more than 99.7% good product

Ppk = 1 The process is expected to produce at least 99.7% good product

Ppk < 1 The process is not expected to produce 99.7% good product

Ppk should be used in conjunction with the Pp index. Ppk indicates what the process is doing and Pp indicates what it could do if it was centered. If they are not equal, some decision rules can be instituted indicating what action should be taken.

Pp > 1 and Ppk < 1 Center the process making Ppk greater than one

Pp < 1 and Ppk < 1 Need to improve the process by narrowing the process spread.

Pp >= 1 and Ppk >= 1 Celebrate and change reference value for Ppk to 1.33, 1.67, or 2.00.

$$P_{pk} = \frac{Z_{Min}}{3}$$

Where:

$$Z_{Min} = \text{smaller of } Z_{Upper}, Z_{Lower}$$

$$Z_{Upper} = \frac{(USL - \bar{\bar{X}})}{\hat{\sigma}_i}$$

$$Z_{Lower} = \frac{(\bar{\bar{X}} - LSL)}{\hat{\sigma}_i}$$

| See Also |
|---------------------|
| Ppk |
| Pr |

The Pr capability ratio is used to summarize how much of the specification spread is being used by the process spread. It is the inverse of Pp and like Pp, Pr does not consider process centering. The formula is:

$$P_r = \frac{\text{process spread}}{\text{specification spread}} = \frac{6\hat{\sigma}_i}{(USL - LSL)} = \frac{1}{P_p}$$

When the Pr value is multiplied by 100, the result shows the percent of the specifications that are being used by the variation in the process.

See Also

[Performance indices - two-sided specifications](#)

[Pp](#)

[Ppk](#)

Performance indices - one-sided specification

There are many specifications that are expressed as one-sided. For example, many strength tests have a minimum but no maximum value. In other cases, the value is often bound by zero (flatness, roundness, etc.) and yet, zero is often the value one would like to achieve. Since Ppk and Cpk are based on the specification closest to the mean, both indices would be reduced as the objective is achieved. Consequently, the use of only one specification solves this dilemma. The calculations for Cp and/or Pp is not applicable since both specifications are not present.

For one-sided specifications, calculations for Pp, Pr, and Ppk are:

For upper specification

For lower specification

N/A

N/A

$$P_{pk} = \frac{(USL - \bar{X})}{3\hat{\sigma}_i}$$

$$P_{pk} = \frac{(\bar{X} - LSL)}{3\hat{\sigma}_i}$$

N/A

N/A

Note: When using one-sided specifications, Pp and Ppk are the same.

See Also

[Capability analysis](#)

[Capability indices - two-sided specifications](#)

[Capability indices - one-sided specification](#)

[Performance indices - two-sided specifications](#)

[Capability analysis - non-normal distributions](#)

Capability analysis - non-normal distributions

PQ software uses Pearson curve-fitting techniques to analyze non-normal distributions. These techniques

give useful measures of process capability in some situations, when using the standard process capability study would be misleading and inappropriate.

Pearson curve techniques apply to a wide range of distributions. But before applying the techniques to your own data, it is important to understand a few points:

1. These techniques are meant to be used for understanding process variability in situations where the parameter is expected NOT to vary according to a normal distribution. That is, some parameters will not vary normally because of the nature of the measured characteristic. Examples of this are measures of concentricity, contamination, or flatness. None of these parameters can be negative, yet often the measured values will be close to zero. If the mean of one of these characteristics is near zero, with significant standard deviation, one cannot expect a normal distribution, since by their very definitions, these parameters cannot be negative. Even if the process is in control, the individual measurements may vary according to some kind of folded, truncated, or transformed normal distribution. It is in situations like this that the Pearson curve-fitting techniques are to be used. Do not use the techniques merely because the data looks non-normal; there is an important difference between expecting the data to be distributed non-normally and having the data happen to be distributed non-normally. Collected data may be non-normally distributed for a number of reasons. Remember, if collected data which was expected to be distributed normally turns out to be non-normally distributed, the process is not necessarily in control. Capability studies are thus inappropriate and misleading (just as they are for any situation in which the process is out-of-control).
2. Pearson curves are a large family of curves with a few restricting properties. If your expected distribution has the same properties, the techniques are likely to yield a good fit. If not, the techniques have little value.

The important properties of Pearson curves:

- Pearson curves are generally unimodal. Exceptions to this are when the curves are markedly J- or U-shaped instead of unimodal; however, the vast majority of them are indeed unimodal.
- Pearson curves generally have smooth contact with the x-axis. That is, when the value of the curve is small, the curve should have a small derivative (slope) and thus be close to horizontal. The tails of the curve should have "smooth landings" on the x-axis. Again, there are some J- and U-shaped distributions in the family and these do not always have smooth contact with the x-axis, but the vast majority do have smooth contact.
- By and large, the curves in the Pearson family start off by slowly leaving the x-axis, rising to a central "hump," descending, and returning to the x-axis gently. The Pearson family includes many familiar distributions:
 1. The normal distribution
 2. Beta, inverse beta, gamma, and inverse gamma distributions which usually have an overall bell-shape but are generally skewed left or right
 3. Student t distributions, which are symmetrical (unskewed) but have longer tails than the normal distribution
 4. Type II distributions, which are symmetric but have thicker, shorter tails than the normal distribution. The uniform distribution is of Type II.

| In This Section | See Also |
|---|---|
| Fitting the distribution using Pearson curves | Capability analysis |
| Non-normal capability analysis computations | Capability indices - two-sided specification |
| One-sided, non-normal capability studies | Capability indices - one-sided specification |
| Bibliography | Performance indices - two-sided specification |
| References | Performance indices - one-sided specification |

Fitting the distribution using Pearson curves

The first step in applying the Pearson curve-fitting technique to data is to decide which member of the family is most likely to fit well. This is done by computing the kurtosis and skewness values and then a third value, called K. With the skewness, kurtosis, and K values, consider the following table:

| Types | Criterion | Remarks |
|---------------|-------------------------|--|
| Beta | $K < 0$ | Limited range; Usually is bell-shaped, but may be skewed. Can be U-, J,- or twisted J-shaped |
| Type IV | $0 < K < 1$ | Unlimited range; may be skewed or bell-shaped |
| Inverse Beta | $K > 1$ | Unlimited range in one direction; may be Skewed, bell- or J-shaped. |
| Normal | $K = 0, SK = 0, KU = 0$ | Unlimited range: symmetrical, bell-shaped |
| Type II | $K = 0, SK = 0, KU < 0$ | Limited range; symmetrical usually bell-shaped but U-shaped when $K < -1.2$ |
| Student t | $K = 0, SK = 0, KU > 0$ | Unlimited range; symmetrical; bell-shaped |
| Gamma | | Unlimited range in one direction; usually bell-shaped, but may be J-shaped |
| Inverse Gamma | $K = 1$ | Unlimited range in one direction; bell-shaped |

$$K = \frac{(SK)^2 * (KU + 6)^2}{4[4KU - 3(SK)^2 + 12][2KU - 3(SK)^2]}$$

SK = Skewness

KU = Kurtosis

Once the curve type is selected and the appropriate parameters computed (see Gruska, et al, for the method), a natural question presents itself: How well does the selected distribution fit the gathered data? This question is answered in the same way that is used to determine whether a given set of data is normally distributed: through the Chi-Square goodness-of-fit test. The type of distribution fitted to the data is displayed as well as a message indicating whether the chi-squared test indicates a good fit.

Once the appropriate distribution is selected and the chi-squared test indicates a good fit, a capability study can be performed using the fitted non-normal curve. This is more complicated than the capability study for normally distributed data but follows in the same spirit.

See Also

[Capability analysis - non-normal distributions](#)

[Non-normal capability analysis computations](#)

[One-sided, non-normal capability studies](#)

[Bibliography](#)

[References](#)

Non-normal capability analysis computations

For normal distributions, the Cp ratio is defined as the width of the specifications divided by 6 sigma. For a normal distribution, 99.7% of the distribution will lie within this 6-sigma wide range. The way that Cpk is defined for normal distributions is as the minimum distance from the mean to the specs, measured in sigma,

divided by three. That is, Cpk is the minimum of the Zupper and Zlower, divided by three (or the minimum of Cpu and Cpl).

For non-normal distributions, we apply the same logic and recognize the differences between the normal distribution and other distributions in the Pearson family.

So far, a function has been fitted to the observed data. Instead of working with a distribution that fits the observed data directly though, we will work with a distribution which has been normalized so that the mean is zero and the standard deviation is one. So, let $f(t)$ be the name of the normalized version of the distribution which has been fitted to the data. This is the same idea as in a normal capability study; where the data has been standardized by using z-values.

First, compute two important values using the function $f(t)$ which relates to the area under the curve. PL is defined as the point at which 0.0015 proportion of the distribution lies to the left (below) of it.

PL is the value so that:

$$\int_{-\infty}^{PL} f(t) dt = 0.0015$$

So, PL represents the z-value for the selected distribution such that the area of the curve to the left of PL is 0.0015. That would equal -3 if the selected distribution function happened to be the normal distribution.

PU is the marker, as the solution to this equation:

$$\int_{PU}^{+\infty} f(t) dt = 0.0015$$

So, PU represents the z-value for the selected distribution such that the area of the curve to the right of PU is 0.0015. That would equal 3 if the selected distribution function happened to be the normal distribution.

So, now it is clear that the area under the curve between the lower marker PL and the upper marker PU is 0.997, or 99.7%. This is because the area under the entire distribution is 1, and there is 0.0015 area in each tail region ($0.997 + 0.0015 + 0.0015 = 1$.)

Remember that with a Pearson curve, a distribution may be skewed. If the distribution is skewed, the values of PL and PU will not necessarily be equal distance from the mean since the tails will have different shapes in the left and right directions. Notice this in Figure 1. Here, the PU value is smaller than the PL value. That is, the PU line is closer to the mean than the PL value. This is because the right side of the distribution has a short, stubby tail, while the left tail is long and thin. The lower marker PL needs to be further away from the mean to guarantee that only 0.0015 of the area lies to its left.

Now you are ready to compute the capability indices. To compute C_p and C_r , use the following equivalent formulas:

$$\begin{aligned}
 C_p &= \frac{\text{spec width}}{(\text{lower marker} + \text{upper marker}) * \sigma} \\
 &= \frac{USL - LSL}{(PU + PL) * \sigma} \\
 C_p &= \frac{\text{spec width measured in standard deviations}}{(PL + PU)}
 \end{aligned}$$

Similarly, for C_r , use the reciprocal of the computations above.

$$\begin{aligned}
 C_r &= \frac{(\text{lower marker} + \text{upper marker}) * \sigma}{\text{spec width}} \\
 C_r &= \frac{(PL + PU) * \sigma}{(USL - LSL)} \\
 C_r &= \frac{(PL + PU)}{\text{spec width measured in standard deviations}}
 \end{aligned}$$

Notice that these are the natural analogues of the formulas for C_p and C_r for the normal distribution when

you choose to regard C_p as:

$$C_p = \frac{\text{spec width}}{\text{width containing 99.7\% of the area} = 6\sigma}$$

and C_r as:

$$C_r = \frac{\text{width containing 99.7\% of the area} = 6\sigma}{\text{spec width}}$$

Defining C_{pk} in the non-normal analysis is slightly more complicated. C_{pk} should somehow reflect the distance from the mean to the nearest specification line. In the normal case, take the distance measured in sigma and divide by three. But in the non-normal case, measure the distance to the specification in a way that incorporates the (possible) skewness of the Pearson curve. Thus, the distances measured are scaled to the specifications by the lower marker and upper marker. That is, first compute the distance measured in sigma, then instead of dividing by three, divide by the lower and upper markers.

If the distribution is normal, divide by 3. Compute:

$$Z_{Upper} = \frac{(USL - \bar{X})}{\hat{\sigma}}$$

and:

$$Z_{Lower} = \frac{(\bar{X} - LSL)}{\hat{\sigma}}$$

$$Z_{Min} = \text{smaller of } Z_{Upper}, Z_{Lower}$$

which are exactly as before. But to now compute C_{pk} , take the minimum of two values:

$$C_{pk} = \text{minimum of } \left(\frac{Z_{Lower}}{PL} \text{ and } \frac{Z_{Upper}}{PU} \right)$$

where PL is the lower marker, from above, and PU is the upper marker. Remember that in the case where the fitted distribution $f(t)$ is the normal distribution, both PL and PU are equal distant from the mean, conforming to the usual definition of C_{pk} .

The other measure of capability displayed is the theoretical percentage out-of-spec. For the non-normal distribution, this is computed by evaluating the integral of the fitted normalized distribution:

$$\% \text{ below spec} = \int_{-\infty}^{Z_{Upper}} f(t) dt$$

$$\% \text{ above spec} = \int_{Z_{Lower}}^{+\infty} f(t) dt$$

And the total theoretical fraction out-of-spec is the sum of the amounts below and above the spec as computed above.

See Also[Capability analysis - non-normal distributions](#)[Fitting the distribution using Pearson curves](#)[One-sided, non-normal capability studies](#)[Bibliography](#)[References](#)**One-sided, non-normal capability studies**

One-sided specification studies use the same ideas as for the two-sided specification study, except that the formulas work out differently. The calculations for C_p and/or P_p is not applicable since both specifications are not present. For a one-sided specification, you need to compute PU, the upper marker, or PL, the lower marker, as shown above. The table below contains the formulas used in making the calculations.

For upper specification**For lower specification**

N/A

N/A

$$C_{pk} = \frac{(USL - \bar{X})}{PU * \hat{\sigma}}$$

$$C_{pk} = \frac{(\bar{X} - LSL)}{PL * \hat{\sigma}}$$

N/A

N/A

The theoretical percentages out-of-specification are computed exactly the same way as for the two-sided case, except that the fraction is defined to be zero if there is no relevant specification. These computations naturally parallel the way that a one-sided capability study is performed on a normal distribution.

See Also[Capability analysis - non-normal distributions](#)[Fitting the distribution using Pearson curves](#)[Non-normal capability analysis computations](#)[Bibliography](#)[References](#)**Bibliography**

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See Also

[Capability analysis - non-normal distributions](#)
[Fitting the distribution using Pearson curves](#)
[Non-normal capability analysis computations](#)
[One-sided, non-normal capability studies](#)
[References](#)

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See Also

[Capability analysis - non-normal distributions](#)
[Fitting the distribution using Pearson curves](#)
[Non-normal capability analysis computations](#)
[One-sided, non-normal capability studies](#)
[Bibliography](#)

Histogram statistics

In This Section

[Chi-Squared test](#)
[Coefficient of variation](#)
[Cpm](#)

See Also

[Attributes control charts \(traditional\)](#)
[Capability analysis](#)
[Measurement control charts](#)

[Cpu and Cpl](#)

[Data points, maximum and minimum](#)

[Dpm \(defectives per million\)](#)

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[Within # of sigma](#)

[Tabular constants for computing variability](#)

[Rare event charts](#)

Chi-Squared test

The Chi-Squared test can be used to see if the data is significantly different from an assumed distribution. The assumed distribution is given a high degree of acceptance (generally 95 percent). The test is for the given mean and standard deviation calculated from the data resulting in the loss of 2 degrees of freedom along with one for the calculated Chi-Squared value. The calculated Chi-Square value is sensitive to the formulation of the number of classes, the class interval to be used in the histogram as well as the starting point for the first class. In some cases, this leads to the acceptance of the assumed distribution for one formulation of a histogram and rejection for other formulations using the same data.

In general, the test is performed by creating a histogram of the data which gives the actual frequencies for each class. Then using the same mean and standard deviation, the theoretical curve being tested is used to develop theoretical frequencies for the same intervals as used on the histogram. Each class must have an expected frequency of five or more to be valid. If it does not, it is combined with the next class until the expected frequency is larger than five. This is done on a repetitive basis starting with the smallest class and working up. Then one starts with the largest class and works down. The Chi-Squared degrees of freedom are based on the valid number of classes (expected frequency greater than five) less the three degrees of freedom mentioned above. The resulting calculated Chi-Squared value is then compared to the appropriate value taken from the table below.

Chi-Squared steps:

In SPC, the Chi-Squared statistic is used to determine how well the actual distribution fits the expected distribution. Chi-Squared compares the number of observations found in each cell in a histogram (actual) to the number of observations that would be found in an expected distribution. If the differences are small, the distribution fits the theoretical distribution. If the differences are large, the distribution probably does not fit the expected distribution.

Using Chi-Squared with the assumption of a normal distribution

1. The calculated Chi-Squared is compared to the value in the table of constants for Chi-Squared based on the number of "degrees of freedom."
2. If the calculated Chi-Squared is less than the value in the table, the Chi-Squared test passes. You can keep the assumption that the process has a normal distribution.
3. If the Chi-Squared is larger than the value in the table, the Chi-Squared test fails. At this confidence level, you either do not have enough data to judge the process, or you should reject the assumption that the process has a normal distribution with the mean and standard deviation used.

For Chi-Squared test:

Degrees of Freedom = number of "good cells" - 3

Good cell defined:

A cell where the expected number of observations is at least five based on the theoretical distribution (normal curve). If the expected number of observations is not five or more as per Duncan, then the cells are added together until the expected value of five or more is reached.

Many sources refer to degrees of freedom as n - 1. SQCpack for Windows uses n - 3 because the application is estimating the population mean and the standard deviation.

| In This Section | See Also |
|--|---|
| Chi-Squared formulas | Histogram statistics |
| Chi-Squared table values | Coefficient of variation |
| | Cpm |
| | Cpu and Cpl |
| | Data points, maximum and minimum |
| | Dpm (defectives per million) |
| | Kurtosis |
| | Mean, range-bar and sigma-bar |
| | Out-of-spec (actual) - statistics |
| | Out-of-spec (theoretical) with z formulas |
| | Sigma lines |
| | Sigma(e) and sigma(i) |
| | Skewness |
| | Specifications |
| | Within # of sigma |

Chi-Squared formulas

$$\text{Chi-Square} = \chi^2 = \sum \frac{(f(a) - f(e))^2}{f(e)}$$

where:

$f(a)$ = actual frequency

$f(e)$ = expected frequency

| See Also |
|--|
| Chi-Squared test |
| Chi-Squared table values |

Chi-Squared table values

| Alpha Values = 5% | | Alpha Values = 1% | |
|--------------------|-------|--------------------|-------|
| Degrees of freedom | Value | Degrees of freedom | Value |
| 1 | 3.84 | 1 | 6.63 |
| 2 | 5.99 | 2 | 9.21 |
| 3 | 7.82 | 3 | 11.3 |
| 4 | 9.49 | 4 | 13.3 |
| 5 | 11.1 | 5 | 15.1 |
| 6 | 12.6 | 6 | 16.8 |
| 7 | 14.1 | 7 | 18.5 |
| 8 | 15.5 | 8 | 20.1 |
| 9 | 16.9 | 9 | 21.7 |
| 10 | 18.3 | 10 | 23.2 |
| 11 | 19.7 | 11 | 24.7 |
| 12 | 21.0 | 12 | 26.2 |
| 13 | 22.4 | 13 | 27.7 |
| 14 | 23.7 | 14 | 29.1 |
| 15 | 25.0 | 15 | 30.6 |
| 16 | 26.3 | 16 | 32.0 |
| 17 | 27.6 | 17 | 33.4 |
| 18 | 28.9 | 18 | 34.8 |
| 19 | 30.1 | 19 | 36.2 |
| 20 | 31.4 | 20 | 37.6 |
| 21 | 32.7 | 21 | 38.9 |
| 22 | 33.9 | 22 | 40.3 |
| 23 | 35.2 | 23 | 41.6 |
| 24 | 36.4 | 24 | 43.0 |
| 25 | 37.7 | 25 | 44.3 |

See Also

[Chi-Squared test](#)

[Chi-Squared formulas](#)

Coefficient of variation

The coefficient of variation is a measure of how much variation exists in relation to the mean. Another way to describe it is a measure of the significance of the sigma in relation to the mean. The larger the coefficient of variation, the more significant is the sigma, relative to the mean. Estimated sigma is used by default.

Sigma of the individuals will be used if performance is selected in the Custom Parameters tab.

For example, if the standard deviation is 10, what does it mean? If the process average (mean) is 1000, a sigma value of 10 is not very significant. However, if the average is 15, a standard deviation of 10 is VERY significant.

$$\text{Coefficient of Variation} = CV = \frac{\sigma_i}{\bar{X}}$$

See Also

[Histogram statistics](#)

[Chi-Squared test](#)

[Cpm](#)

[Cpu and Cpl](#)

[Data points, maximum and minimum](#)

[Dpm \(defectives per million\)](#)

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Cpm

The Cpm index indicates how well the system can produce within specifications. Its calculation is similar to Cp, except that sigma is calculated using the target value instead of the mean. The larger the Cpm, more likely the process will produce output that meets specifications.

$$C_{pm} = \frac{(USL - LSL)}{6 * \hat{\sigma}_{cpm}}$$

Where:

$$\hat{\sigma}_{cpm} = \sqrt{\frac{\sum_{i=1}^{n*k} (X_i - T)^2}{k * n - 1}}$$

T = specification target (often the nominal value)

X_i = a given individual reading of " i "

n*k = total number of individual readings

See Also

[Histogram statistics](#)
[Chi-Squared test](#)
[Coefficient of variation](#)
[Cpu and Cpl](#)
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[Dpm \(defectives per million\)](#)
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Cpu and Cpl

Cpu is a Cp value for where only the upper specification applies. The formula for this is:

$$C_{pu} = \frac{(USL - \bar{\bar{X}})}{3\hat{\sigma}_e}$$

Cpl is a Cp value for one-sided specifications, where only the lower specification applies. Use the following formula:

$$C_{pl} = \frac{(\bar{\bar{X}} - LSL)}{3\hat{\sigma}_e}$$

Note: Cpk is equal to the minimum of Cpu and Cpl.

See Also

[Histogram statistics](#)
[Chi-Squared test](#)
[Coefficient of variation](#)
[Cpm](#)
[Data points, maximum and minimum](#)
[Dpm \(defectives per million\)](#)
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Data points, maximum and minimum

Data points are the individual observations that are not marked as caused data.

Data points = Sample size (n) * Number of samples – Number of caused data points

The maximum is the largest data point that is not caused data.

The minimum is the smallest data point that is not caused data.

See Also

[Histogram statistics](#)

[Chi-Squared test](#)

[Coefficient of variation](#)

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[Specifications](#)

[Within # of sigma](#)

Dpm (defectives per million)

Dpm shows the expected defectives per million

The Dpm = Theoretical % of data out-of-spec x 10,000.

The user can select a different base by selecting "Defects per X" if so desired (e.g., defectives per 100,000).

See Also

[Histogram statistics](#)

[Chi-Squared test](#)

[Coefficient of variation](#)

[Cpm](#)

[Cpu and Cpl](#)

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[Within # of sigma](#)

Kurtosis

Kurtosis is a measure of the combined weight of the tails in relation to the rest of the distribution. As the tails of a distribution become heavier, the kurtosis value will increase. As the tails become lighter the kurtosis value will decrease. By subtracting three from the value of a kurtosis equation, the kurtosis for a histogram with a normal distribution has a value of 0. If the distribution is more peaked than the normal (tall and skinny), it will have a kurtosis greater than 0 and is said to be leptokurtic. If the value for kurtosis is less than zero, the distribution is flat, and is said to be platykurtic.

$$\text{Kurtosis} = \gamma_2 = \frac{\sum \left(\frac{X - \bar{X}}{\sigma} \right)^4}{n} - 3$$

Some references to kurtosis do not subtract 3 (as above). SQCpack subtracts 3 to make the statistic 0 for a normal distribution.

See Also

[Histogram statistics](#)

[Chi-Squared test](#)

[Coefficient of variation](#)

[Cpm](#)

[Cpu and Cpl](#)

[Data points, maximum and minimum](#)

[Dpm \(defectives per million\)](#)

[Mean, range-bar and sigma-bar](#)

[Out-of-spec \(actual\) - statistics](#)

[Out-of-spec \(theoretical\) with z formulas](#)

[Sigma lines](#)

[Sigma\(e\) and sigma\(i\)](#)

[Skewness](#)

[Specifications](#)

[Within # of sigma](#)

Mean, range-bar and sigma-bar

| In This Section | See Also |
|---------------------------|---|
| Mean | Histogram statistics |
| Range bar | Chi-Squared test |
| Sigma bar | Coefficient of variation |
| | Cpm |
| | Cpu and Cpl |
| | Data points, maximum and minimum |
| | Dpm (defectives per million) |
| | Kurtosis |
| | Out-of-spec (actual) - statistics |
| | Out-of-spec (theoretical) with z formulas |
| | Sigma lines |
| | Sigma(e) and sigma(i) |
| | Skewness |
| | Specifications |
| | Within # of sigma |

Mean

The mean is the average value of the non-caused data points.

$$\bar{X} = \frac{\sum_{i=1}^n (\text{Sum of data values excluding caused data values})}{\text{number of data values summed (exc. caused data)}}$$

| See Also |
|---|
| Mean, range-bar and sigma-bar |
| Range bar |
| Sigma bar |

Range bar

The range bar shows the average of the subgroup ranges. If there are caused samples, the ranges are excluded from the R-bar calculation similar to above.

$$\bar{R} = \frac{R_1 + R_2 + .. + R_k}{k}$$

| See Also |
|---|
| Mean, range-bar and sigma-bar |
| Mean |
| Sigma bar |

Sigma bar

The sigma bar is the average of the subgroup sigma.

$$\text{Average sigma} = \bar{s} = \frac{s_1 + s_2 + \dots + s_k}{k}$$

$$\text{where: } s = \sqrt{\frac{\sum_{i=1}^n (X_i - \bar{X})^2}{n-1}}$$

See Also

[Mean, range-bar and sigma-bar](#)

[Mean](#)

[Range bar](#)

Out-of-spec (actual) - statistics

This shows the percentage of data points falling above and below the specification limits. This is accomplished by taking each data point (excludes cause data) and comparing it to the upper specification to determine the number of defective units above the upper specification. This is repeated for the lower specification to determine the number below the lower specification. These two numbers are then divided by the number of units checked to determine the proportion outside each specification. This is turned into a percentage by multiplying each result by 100. These two numbers are added together to give the total percent of data out-of-spec.

See Also

[Histogram statistics](#)

[Chi-Squared test](#)

[Coefficient of variation](#)

[Cpm](#)

[Cpu and Cpl](#)

[Data points, maximum and minimum](#)

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[Out-of-spec \(theoretical\) with z formulas](#)

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[Within # of sigma](#)

Out-of-spec (theoretical) with z formulas

Theoretical % above spec: - The theoretical % above spec is used to estimate how much of your data is expected (estimated) to be above the upper spec limit.

Theoretical % below spec: - The theoretical % below spec is used to estimate how much of your data is expected (estimated) to be below the lower spec limit.

Theoretical % out-of-spec = Theoretical % above spec + Theoretical % below spec

To calculate theoretical % above or below spec, you need four pieces of information:

1. mean (X-bar)
2. sigma
3. at least one specification
4. standard normal table.

In addition, the process must be stable and in control.

To find out the theoretical % above spec:

1. Calculate the Zupper value, using the following formula.

$$Z_{Upper} = \frac{(USL - \bar{\bar{X}})}{\hat{\sigma}_e}$$

2. Locate the value for Zupper in a standard normal table. This value represents the proportion of the distribution that lies above the upper specification.
3. Multiple the Z-value by 100 to get the theoretical % above the upper spec limit.

To find out the theoretical % below specs:

1. Calculate the Zlower value, using the following formula.

$$Z_{Lower} = \frac{(\bar{\bar{X}} - LSL)}{\hat{\sigma}_e}$$

2. Locate the value for Zlower in a standard normal table. This value represents the proportion of the distribution that lies below the lower specification.
3. Multiply this Z-value by 100 to get the theoretical % below the lower spec limit.

The formula for Target Z is:

$$Z_T = \frac{\bar{\bar{X}} - Target}{\sigma}$$

Where:

$\bar{\bar{X}}$ = the mean of the X-bars

T = specification target

Sigma is estimated sigma or sigma of the individual, depending on how the histogram is configured.

See Also

[Histogram statistics](#)
[Chi-Squared test](#)
[Coefficient of variation](#)
[Cpm](#)
[Cpu and Cpl](#)
[Data points, maximum and minimum](#)
[Dpm \(defectives per million\)](#)
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[Mean, range-bar and sigma-bar](#)
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Sigma lines

Sigma lines can be placed on the histogram to indicate where +1.00, +2.00, +3.00, or a user entered number of sigma lines on the distribution for comparison purposes. Estimated sigma is used by default. Sigma of the individuals will be used if performance is selected on the Custom Parameters tab.

See Also

[Histogram statistics](#)
[Chi-Squared test](#)
[Coefficient of variation](#)
[Cpm](#)
[Cpu and Cpl](#)
[Data points, maximum and minimum](#)
[Dpm \(defectives per million\)](#)
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Sigma(e) and sigma(i)

SQCpack offers two types of sigma, estimated and individual (based on the square root of the summed squared deviations about the mean). One of these two sigma is used to do the calculations for the statistics on the Descriptive stats tab for the Histogram, the sigma lines on the histogram, etc. The default is to use estimated sigma.

Estimated sigma is an estimate of the standard deviation calculated by dividing the average range by the tabular constant d_2 . It is used to calculate process capability indices.

$$\text{Estimated sigma} = \hat{\sigma}_e = \frac{\bar{R}}{d_2}$$

Sigma individuals is the standard deviation calculated from the individual data values in a data set. It is used to calculate process performance indices.

$$\text{Sigma individuals} = \hat{\sigma}_i = \sqrt{\sum \frac{(X_i - \bar{X})^2}{n - 1}}$$

Where:

n = the total number of individual readings

\bar{X} (bar) = the average of the individual readings

Note: Estimated sigma is the default sigma used in the calculations of statistics for the histogram.

See Also

[Histogram statistics](#)

[Chi-Squared test](#)

[Coefficient of variation](#)

[Cpm](#)

[Cpu and Cpl](#)

[Data points, maximum and minimum](#)

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Skewness

Skewness is the measure of the asymmetry of a histogram (frequency distribution). A histogram with normal distribution is symmetrical. In other words, the same amount of data falls on both sides of the mean. A normal distribution will have a skewness of 0. The direction of skewness is to the tail is. The larger the

number, the longer the tail. If skewness is positive, the tail on the right side of the distribution will be longer. If skewness is negative, the tail on the left side will be longer.

$$\text{Skewness} = \gamma_1 = \frac{\sum \left(\frac{X - \bar{X}}{\sigma} \right)^3}{n}$$

See Also

[Histogram statistics](#)

[Chi-Squared test](#)

[Coefficient of variation](#)

[Cpm](#)

[Cpu and Cpl](#)

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[Specifications](#)

[Within # of sigma](#)

Specifications

Specifications are boundaries, usually set by management, engineering, or customers, within which a system must operate. They are sometimes called engineering tolerances. Specification values may be entered on the specifications tab

See Also

[Histogram statistics](#)

[Chi-Squared test](#)

[Coefficient of variation](#)

[Cpm](#)

[Cpu and Cpl](#)

[Data points, maximum and minimum](#)

[Dpm \(defectives per million\)](#)

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[Mean, range-bar and sigma-bar](#)

[Out-of-spec \(actual\) - statistics](#)

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[Skewness](#)

[Within # of sigma](#)

Within # of sigma

Within 1 sigma indicates the percent of the non-caused data points falling between 1 sigma below mean to 1 sigma above the mean using estimated sigma. Sigma of the individuals will be used if Performance is selected on the Descriptive stats tab.

Within 2 sigma indicates the percent of the non-caused data points falling between 2 sigma below mean to 2 sigma above the mean using estimated sigma. Sigma of the individuals will be used if Performance is selected on the Descriptive stats tab.

Within 3 sigma indicates the percent of the non-caused data points falling between 3 sigma below mean to 3 sigma above the mean using estimated sigma. Sigma of the individuals will be used if Performance is selected on the Descriptive stats tab.

See Also

[Histogram statistics](#)

[Chi-Squared test](#)

[Coefficient of variation](#)

[Cpm](#)

[Cpu and Cpl](#)

[Data points, maximum and minimum](#)

[Dpm \(defectives per million\)](#)

[Kurtosis](#)

[Mean, range-bar and sigma-bar](#)

[Out-of-spec \(actual\) - statistics](#)

[Out-of-spec \(theoretical\) with z formulas](#)

[Sigma lines](#)

[Sigma\(e\) and sigma\(i\)](#)

[Skewness](#)

[Specifications](#)

Measurement control charts

In This Section

[Measurement control charts \(n=1\)](#)

[Measurement control charts \(n>1\)](#)

See Also

[Attributes control charts \(traditional\)](#)

[Capability analysis](#)

[Histogram statistics](#)

[Tabular constants for computing variability](#)

[Rare event charts](#)

Measurement control charts (n=1)

| In This Section | See Also |
|--|---|
| Measurement control charts (n=1) statistics | Measurement control charts |
| Individuals moving range chart formulas (standard) | Measurement control charts (n>1) |

Measurement control charts (n=1) statistics

$n = 1$ size of the sample or subgroup (taken at one time)

k = number of samples or subgroups taken for analysis

Moving range $MR_i = |(X_i - X_{i+1})|$

Average $\bar{X} = \frac{X_1 + X_2 + \dots + X_k}{k}$

Average moving range $\overline{MR} = \frac{|X_1 - X_2| + |X_2 - X_3| + \dots + |X_{(k-1)} - X_k|}{k-1}$

Estimated sigma $\hat{\sigma}_e = \frac{\overline{MR}}{d_2}$

| See Also |
|--|
| Measurement control charts (n=1) |
| Individuals moving range chart formulas (standard) |

Individuals moving range chart formulas (standard)

Estimated sigma $\hat{\sigma}_e = \frac{\overline{MR}}{d_2}$

Individuals chart, upper control limit $UCL_X = \bar{X} + E_2 \overline{MR}$

Individuals chart, center line $CL_X = \bar{X}$

Individuals chart, lower control limit $LCL_X = \bar{X} - E_2 \overline{MR}$

Moving range chart, upper control limit $UCL_{MR} = D_4 \overline{MR}$

Moving range chart, center line $CL_{MR} = \overline{MR}$

Moving range chart, lower control limit $LCL_{MR} = D_3 \overline{MR}$

See Also

[Measurement control charts \(n=1\)](#)
[Measurement control charts \(n=1\) statistics](#)

Measurement control charts (n>1)

In This Section

[Measurement control charts \(n>1\) statistics](#)
[X-bar range chart formulas \(standard\)](#)
[X-bar sigma chart formulas \(standard\)](#)
[Control limits and missing data](#)

See Also

[Measurement control charts](#)
[Measurement control charts \(n=1\)](#)

[Measurement control charts \(n>1\) statistics](#)

In This Section

[Sample statistics](#)
[Summary sample statistics](#)

See Also

[Measurement control charts \(n>1\)](#)
[X-bar range chart formulas \(standard\)](#)
[X-bar sigma chart formulas \(standard\)](#)
[Control limits and missing data](#)

Sample statistics

n = size of the sample or subgroup (taken at one time)

k = number of samples or subgroups taken for analysis

Sample mean $\bar{X} = \frac{X_1 + X_2 + \dots + X_i}{n}$

Sample sigma

$$s = \sqrt{\frac{\sum_{i=1}^n (X_i - \bar{X})^2}{n-1}}$$

Sample range

$$R = X_{Max} - X_{Min}$$

See Also

[Measurement control charts \(n>1\) statistics](#)

[Summary sample statistics](#)

Summary sample statistics

$$\text{X-barbar} \quad \bar{\bar{X}} = \frac{\bar{X}_1 + \bar{X}_2 + \dots + \bar{X}_k}{k}$$

$$\text{R-bar} \quad \bar{R} = \frac{R_1 + R_2 + \dots + R_k}{k} \quad \text{Sigma- bar} \quad \bar{s} = \frac{s_1 + s_2 + \dots + s_k}{k}$$

$$\text{Estimated sigma} \quad \hat{\sigma}_e = \frac{\bar{R}}{d_2} \quad \text{Sigma average} \quad \hat{\sigma}_s = \frac{\bar{s}}{c_4}$$

$$\text{Sigma individuals} \quad \hat{\sigma}_i = \sqrt{\frac{\sum_{i=1}^n (X_i - \bar{X})^2}{n-1}}$$

See Also

[Measurement control charts \(n>1\) statistics](#)

[Sample statistics](#)

X-bar range chart formulas (standard)

$$\text{Estimated sigma} \quad \hat{\sigma}_e = \frac{\bar{R}}{d_2}$$

$$\text{X-bar chart, upper control limit} \quad UCL_{\bar{X}} = \bar{\bar{X}} + A_2 \bar{R}$$

$$\text{X-bar chart, center line} \quad CL_{\bar{X}} = \bar{\bar{X}}$$

$$\text{X-bar chart, lower control limit} \quad LCL_{\bar{X}} = \bar{\bar{X}} - A_2 \bar{R}$$

$$\text{Range chart, upper control limit} \quad UCL_R = D_4 \bar{R}$$

Range chart, center line $CL_R = \bar{R}$

Range chart, lower control limit $LCL_R = D_3 \bar{R}$

See Also

[Measurement control charts \(n>1\)](#)

[Measurement control charts \(n>1\) statistics](#)

[X-bar sigma chart formulas \(standard\)](#)

[Control limits and missing data](#)

[X-bar sigma chart formulas \(standard\)](#)

$$\hat{\sigma}_s = \frac{\bar{s}}{c_4}$$

Average sigma (based on sample sigma)

$$where : \bar{s} = \frac{s_1 + s_2 + \dots + s_k}{k}$$

X-bar chart, upper control limit $UCL_{\bar{X}s} = \bar{\bar{X}} + A_3 \bar{s}$

X-bar chart, center line $CL_{\bar{X}} = \bar{\bar{X}}$

X-bar chart, lower control limit $LCL_{\bar{X}s} = \bar{\bar{X}} - A_3 \bar{s}$

Sigma chart, upper control limit $UCL_s = B_4 \bar{s}$

Sigma chart, center line $CL_s = \bar{s}$

Sigma chart, lower control limit $LCL_s = B_3 \bar{s}$

See Also

[Measurement control charts \(n>1\)](#)

[Measurement control charts \(n>1\) statistics](#)

[X-bar range chart formulas \(standard\)](#)

[Control limits and missing data](#)

[Control limits and missing data](#)

For measurement (variables) data where the sample size is greater than one, control limit calculations are adjusted when samples are incomplete. If your subgroup size is 5 and you enter only 3 readings for a given sample, the sample contains missing data. When this sample is used on a chart, the control limits will be adjusted to reflect the missing data.

Note: User entered control limits will not be adjusted for missing data.

Assume:

- k = number of samples
- n = sample size
- ni = size of ith sample (i = 1 to k)

The X-bar chart centerline is a weighted average to account for samples with missing data values. If all the samples are complete, the weighted average is identical to the average of the X-bars:

$$\bar{\bar{X}} = \frac{n_1 \bar{X}_1 + n_2 \bar{X}_2 + \dots + n_k \bar{X}_k}{n_1 + n_2 + \dots + n_k}$$

The following formulas produce an estimated sigma based on the weighted sum of the sample statistic. As in the formula for the Xs, if all the samples are complete, these formulas reduce to their original form:

$$\hat{\sigma}_e = \frac{\bar{R}}{d_2} \quad \hat{\sigma}_s = \frac{\bar{s}}{c_4}$$

$$\hat{\sigma}_e = \frac{1}{k} * \left[\frac{R_1}{d_2(\text{for } n_1)} + \frac{R_2}{d_2(\text{for } n_2)} + \dots + \frac{R_k}{d_2(\text{for } n_k)} \right]$$

$$\hat{\sigma}_s = \frac{1}{k} * \left[\frac{s_1}{c_4(\text{for } n_1)} + \frac{s_2}{c_4(\text{for } n_2)} + \dots + \frac{s_k}{c_4(\text{for } n_k)} \right]$$

The following example uses tabular (standard) control limit calculations for X-bar and Range:

| Sample # | Observations | | | | | Range | | |
|----------|--------------|---|---|---|---|-----------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 | \bar{X} | n = 4 | n = 5 |
| 1 | 3 | 3 | 3 | 4 | 4 | 3.40 | --- | 1 |
| 2 | 3 | 4 | 6 | 4 | 4 | 4.20 | --- | 3 |
| 3 | 4 | 5 | 5 | 6 | | 5.00 | 2 | --- |
| 4 | 4 | 4 | - | 4 | 3 | 3.75 | 1 | --- |
| 5 | 3 | 4 | 5 | 4 | 3 | 3.80 | --- | 2 |

Total observations = 23

1. Find the centerline for the X-bar chart:

$$\bar{\bar{X}} = \frac{5(3.40) + 5(4.20) + 4(5.00) + 4(3.75) + 5(3.80)}{23} = 4.00$$

2. Find the estimated sigma based on the ranges:

$$\hat{\sigma}_e = \frac{1}{5} * \left[\frac{1}{2.326} + \frac{3}{2.326} + \frac{2}{2.059} + \frac{1}{2.059} + \frac{2}{2.326} \right] = 0.807$$

3. Find the centerline for the range chart. Samples with different sample sizes will have different centerlines:

$$\text{When } n = 4, \text{ then: } \bar{R} = 2.059 * 0.807 = 1.66$$

$$\text{When } n = 5, \text{ then: } \bar{R} = 2.326 * 0.807 = 1.88$$

4. Find the control limits for the X-bar chart:

$$UCL_{\bar{X}}, LCL_{\bar{X}} = \bar{\bar{X}} \pm A_2 (\text{for } n_i) * \bar{R} (\text{for } n_i)$$

$$\text{When } n = 4, \text{ then: } UCL_{\bar{X}}, LCL_{\bar{X}} = 4.00 \pm 0.729 * 1.66 = 5.21, 2.79$$

$$\text{When } n = 5, \text{ then: } UCL_{\bar{X}}, LCL_{\bar{X}} = 4.00 \pm 0.577 * 1.88 = 5.08, 2.92$$

5. Find the control limits for the Range chart:

$$UCL_{R(\text{for } n_i)} = D_4 (\text{for } n_i) * \bar{R} (\text{for } n_i)$$

$$LCL_{R(\text{for } n_i)} = D_3 (\text{for } n_i) * \bar{R} (\text{for } n_i) \quad \text{where } n_i \geq 6$$

$$\text{When } n = 4, \text{ then: } UCL_R = 2.282 * 1.662 = 3.79, \text{ (no lower limit)}$$

$$\text{When } n = 5, \text{ then: } UCL_R = 2.114 * 1.877 = 3.97, \text{ (no lower limit)}$$

The same steps can be followed for median and sigma charts using formulas shown elsewhere in this guide.

Note: There is no lower control limit for ranges if sample size is 6 or smaller. There is no lower control limit for sigma if sample size is 5 or smaller. The E2 value for individual data (sample size of 1) is 2.66.

See Also

[Measurement control charts \(n>1\)](#)

[Measurement control charts \(n>1\) statistics](#)

[X-bar range chart formulas \(standard\)](#)

[X-bar sigma chart formulas \(standard\)](#)

Cusum chart

Cusum chart

Each value to be plotted is derived from a target value. The difference from the target is calculated. Each successive plotted value is the sum of that difference and the previous sum, thus, a cumulative sum.

The calculations used to arrive at the plotted values and the wedge-shape can be found on this website:

<http://www.itl.nist.gov/div898/handbook/pmc/section3/pmc323.htm>

EWMA chart

EWMA (Exponentially Weighted Moving Average) chart

Each value to be plotted is derived from a target value. The difference from the target is calculated. The plotted value is arrived at using a Lambda factor, which gives a certain amount of control to the current difference and a certain amount of control to the previous plotted value.

The calculations used to arrive at the plotted values and the wedge-shape can be found on this website:

<http://www.itl.nist.gov/div898/handbook/pmc/section3/pmc324.htm>

Tabular constants for computing variable control limits

| Sample Size | A2 | A3 | B3 | B4 | d2 | D3 | D4 | E2 |
|-------------|-------|-------|-------|-------|-------|-------|-------|-------|
| 2 | 1.880 | 2.659 | -- | 3.267 | 1.128 | -- | 3.268 | 2.660 |
| 3 | 1.023 | 1.954 | -- | 2.568 | 1.693 | -- | 2.574 | 1.772 |
| 4 | 0.729 | 1.628 | -- | 2.266 | 2.059 | -- | 2.282 | 1.457 |
| 5 | 0.577 | 1.427 | -- | 2.089 | 2.326 | -- | 2.114 | 1.290 |
| 6 | 0.483 | 1.287 | 0.030 | 1.970 | 2.534 | -- | 2.004 | 1.184 |
| 7 | 0.419 | 1.182 | 0.118 | 1.882 | 2.704 | 0.076 | 1.924 | 1.109 |
| 8 | 0.373 | 1.099 | 0.185 | 1.815 | 2.847 | 0.136 | 1.864 | 1.054 |
| 9 | 0.337 | 1.032 | 0.239 | 1.761 | 2.970 | 0.184 | 1.816 | 1.010 |
| 10 | 0.308 | 0.975 | 0.284 | 1.716 | 3.078 | 0.223 | 1.777 | 0.975 |

In This Section

[Formulas for control charts limits](#)

See Also

[Attributes control charts \(traditional\)](#)

[Capability analysis](#)

[Histogram statistics](#)

[Measurement control charts](#)[Rare event charts](#)**Formulas for control charts limits****In This Section**[X-bar & R](#)[X-bar & S](#)[Individual & MR](#)**See Also**[Tabular constants for computing variability](#)

X-bar & R

$$UCL_{\bar{X}} = \bar{\bar{X}} + A_2 \bar{R} \quad LCL_{\bar{X}} = \bar{\bar{X}} - A_2 \bar{R} \quad UCL_R = D_4 \bar{R}$$

$$LCL_R = D_3 \bar{R}$$

See Also[Formulas for control charts limits](#)[X-bar & S](#)[Individual & MR](#)

X-bar & S

$$UCL_{\bar{X}_s} = \bar{\bar{X}} + A_3 \bar{s} \quad LCL_{\bar{X}_s} = \bar{\bar{X}} - A_3 \bar{s} \quad UCL_s = B_4 \bar{s}$$

$$LCL_s = B_3 \bar{s}$$

See Also[Formulas for control charts limits](#)[X-bar & R](#)[Individual & MR](#)

Individual & MR

$$UCL_{\bar{X}} = \bar{\bar{X}} + E_2 \overline{MR} \quad LCL_{\bar{X}} = \bar{\bar{X}} - E_2 \overline{MR} \quad UCL_{MR} = D_4 \overline{MR}$$

$$LCL_{MR} = D_3 \overline{MR}$$

See Also[Formulas for control charts limits](#)[X-bar & R](#)[X-bar & S](#)

Rare event charts

| In This Section | See Also |
|--------------------------|---|
| t-charts | Attributes control charts (traditional) |
| g-charts | Capability analysis |
| | Histogram statistics |
| | Measurement control charts |
| | Tabular constants for computing variability |

t-charts

The t-chart formula:

$$T' = t^{(1/3.6)} = t^{0.2778}$$

$$\overline{mrT'} = \frac{|T'_1 - T'_2| + |T'_2 - T'_3| + \dots + |T'_{n-1} - T'_n|}{n}$$

$$\bar{T'} = \frac{T'_1 + T'_2 + \dots + T'_n}{n}$$

$$t\text{-bar} = \bar{T'} \quad (3.6)$$

$$UL \neq UCL$$

$$UL = \bar{T'} + (2.66 * \overline{mrT'})$$

$$LL \neq LCL$$

$$LL = \bar{T'} - (2.66 * \overline{mrT'})$$

$$UCL_T = UL \quad (3.6)$$

$$CL = t\text{-bar} = \bar{T'} \quad (3.6)$$

$$LCT_T = LL \quad (3.6)$$

t = time since last incident

t' = transformed time where:

t' = t raised to the (1/3.6) power or $t^{(1/3.6)}$

t'-bar = average of t'

MR-bar' = Average moving range values of the transformed time, t'

$$UCL = t'\text{-bar} + 2.660 * MR\text{-bar}'$$

$$CL = t'\text{-bar}$$

$$LCL = \bar{t} - 2.660 * \bar{MR}$$

See Also

[Rare event charts](#)

[g-charts](#)

g-charts

The g-chart formula:

$$\bar{g} = g\text{-bar} = \frac{g_1 + g_2 + \dots + g_n}{n}$$

where $g_1 = \frac{\text{between}}{\text{for first date}}$

where $g_2 = \frac{\text{between}}{\text{for second date}}$

$$UCL_g = \bar{g} + 3 \sqrt{\bar{g}(\bar{g} + 1)}$$

$$CL_g = 0.693 * \bar{g}$$

$$LCL_g = \bar{g} - 3 \sqrt{\bar{g}(\bar{g} + 1)}$$

$g\text{-bar}$ = The average of the counts or Mean (of the counts)

CL = Center Line = $g\text{-bar} * \ln(2)$ This is often estimated as: $CL = (g\text{-bar} * 0.693)$

$UCL = g\text{-bar} + 3 * [\text{Square root of } (g\text{-bar} * (g\text{-bar} + 1))]$

LCL = There is no LCL with g-charts

See Also

[Rare event charts](#)

[t-charts](#)

Appendix B: Title substitution codes

All charts in SQCpack can have titles. There may be several rows of titles both above and below a chart along with one vertical title on each side of the chart.

When entering any title, you may use a **title substitution code**. These codes begin with @ followed by one or more additional letters. When the chart is rendered, these codes are expanded to their meaning in the current context. For example, if you enter @D as a title, when the chart is rendered, the current date will be *substituted* for the @D.

These are helpful when you want the same thing on many charts, but it will vary for each chart. For example, **Chart name**. Rather than manually type and change this for each chart, just use the @CTN code and the correct chart name will always be used, even if you change the chart name later.

See also:

[Chart titles codes](#)

[Report title codes](#)

[Format strings](#)

Chart title codes

The **@IMAGE(FilePath,PctWidth)** title code displays the image file specified by FilePath. If FilePath contains embedded spaces you must enclose the path with double-quote characters. If the image file specified by FilePath cannot be found using the specified path, then SQCpack will try to find the image file in the [Images folder](#). The desired width of the displayed image is specified as a percentage of the chart width by PctWidth. The aspect ratio of the image will be maintained as it is resized in order to fit within the specified width of the chart. The following image file types are supported: BMP, JPG, JPEG and PNG.

Some examples:

Display the image file specified by the full path "N:\My Images\picture.jpg". Since the path contains an embedded space you must enclose the path with double-quote marks. For this to work properly all SQCpack users must have at least read access to the same mapped "N" network drive.

```
@IMAGE("N:\My Images\picture.jpg")
```

Display the image file specified by the UNC path "\\MyServer\MyShare\My Images\picture.jpg". Since the UNC path contains an embedded space you must enclose the path with double-quote marks. For this to work properly all SQCpack users must have at least read access to the specified UNC folder.

```
@IMAGE("\\MyServer\MyShare\My Images\picture.jpg")
```

Display the image file 'picture.jpg' with width 10% of the chart width. SQCpack will look for picture.jpg in the [Images folder](#).

```
@IMAGE(picture.jpg, 10)
```

Display the image file 'picture.jpg'. The height and width of the image determine its size in the chart. SQCpack will look for picture.jpg in the [Images folder](#).

```
@IMAGE(picture.jpg)
```

These are the supported title substitution codes:

| | |
|-----------------------------|---|
| @!SGF @!FILTER @WHERE | Current filter – even if disabled |
| @AIS | Percentage – actual in-spec |
| @AOOS | Percentage – actual out-of-spec |
| @CBAR | C-bar or average of counts on a c-chart |
| @CD @CHAR_DESC | Characteristic description |
| @CN @CHAR_NAME | Characteristic name |
| @CNM | Column names of measurements |
| @CP | Cp value |
| @CPK | Capability index value |
| @CPL | Cpl value, Cp-lower |
| @CPU | Cpu value, Cp-upper |
| @CR | Cr value – Capability ratio |
| @CTD @CHART_DESC | Chart description |
| @CTN | Chart name |

| | |
|---|--|
| @CHART_NAME | |
| @CTR @CHART_REFRESH | Chart refresh interval (seconds) |
| @CVAR @CVAROBS | Coefficient of variation |
| @D(<i>format</i>) @DATE(<i>format</i>) | Current date. To display with the default date format, simply use @D or @DATE. For more information on date formatting, see Format strings |
| @DT @DATETIME | Current date and time. For more information on time formatting, see Format strings |
| @DCS @DATA_CONNECT | Data source connection string |
| @DPM | Dpm – defects per million |
| @DSN @DATA_NAME | ADO or ODBC data source name |
| @DSO @DATA_ORDER | Column name by which data is ordered |
| @DTM @DATETIMEM | Current date and time (short date and short time) . For more information on time formatting, see Format strings |
| @ESIGMAR | Estimated sigma from range |
| @ESIGMAS | Estimated sigma from sigma |
| @FMT | Characteristic's data entry format |
| @GBAR | G-bar or average value on a g-chart |
| @GD @GROUP_DESC | Data group description |
| @GN @GROUP_NAME | Data group name |
| @IMAGE(FilePath, pct) @IMAGE(FilePath) | Display the image file with the specified name and optional percent of chart width. (See above for more information) |
| @IMEAN | Average number inspected on p, np, and u charts |
| @KURT @KURTOBS | Kurtosis |
| @LSL | Lower specification limit |
| @MAX | Maximum value found |
| @MAX @MAXOBS | Maximum value |
| @MD | Date and time of last chart modification |
| @MEAN | Mean value |
| @MEAN @MEANOBS | Mean value |
| @MEANRANGE @RBAR | Mean of the range values |
| @MEDIAN | Median value |
| @MEDIAN @MEDIANOBS | Median value |
| @MIN @MINOBS | Minimum value |
| @MOV | Number of subgroups used for moving average, moving range |
| @NDP | Number of values (data points) |
| @NPBAR | NP-bar or average value on np-chart |
| @NUMBARS | Numver of bars (or columns), Pareto chart |
| @NUMCATS | Number of categories / items available, Pareto chart |
| @NUMENTRIES @NUMGROUPS | Number of entries – or groups, Pareto chart |
| @OOC | Out-of-control test rules in use |
| @PBAR | P-bar or average value on p-chart |
| @PP | Pp value |

| | |
|---|--|
| @PR | Pr value – Capability ratio (performance) |
| @PPK | Capability index value (performance) |
| @PPL | Ppl value, Pp-lower |
| @PPU | Ppu value, Pp-upper |
| @RBAR | R-bar, average of range values |
| @SBAR | S-bar, average of sigma values |
| @SKEW | Skewness |
| @SS | Subgroup size |
| @SGF | Current filter – only if enabled |
| @FILTER | |
| @SGS | What rows are included in chart? All, First n, Last n |
| @SCOPE | |
| @SIGMA | Sigma |
| @SIGMAOBS | |
| @SQL | SQL select statement used to retrieve data |
| @T(<i>format</i>) @TIME(<i>format</i>) | Current time. Current date. To display with the default time format, simply use @T or @TIME. For more information on time formatting, see Format strings |
| @TBAR | T-bar or average value on t-chart |
| @TIS | Percentage in-spec (theoretical) |
| @TM @TIMEM | Current time (short) . For more information on time formatting, see Format strings |
| @TOOS | Percentage out-of-spec (theoretical) |
| @TOTALCOUNT | Total count value, Pareto chart |
| @TOTALNEG | Total count, negative values, Pareto chart |
| @TOTALPOS | Total count, positive values, Pareto chart |
| @TSL @TS | Target specification limit |
| @UBAR | U-bar or average value on u-chart |
| @USL | Upper specification limit |
| @XBARBAR | X-bar-bar – mean of the x-bar values |
| @ZLOW | Z-lower |
| @ZTARG | Z-target |
| @ZUP | Z-upper |

See also:

[Chart titles](#)

[Chart title codes](#)

[Report title codes](#)

[Format strings](#)

Report title codes

The following substitution codes can be used in reports:

| | |
|--------------------|---|
| @D @DATE | Current date |
| @DT @DATETIME | Current date and time |
| @DTM @DATETIMEM | Current date and time (short date and short time) |
| @T @TIME | Current time |

| | |
|---------------|----------------------|
| @TM @TIMEM | Current time (short) |
|---------------|----------------------|

See also:

[Chart title codes](#)

[Format strings](#)

Format strings

The @D, @DATE, @T, and @TIME codes can be formatted to your specifications by using format strings.

Note that the codes are case sensitive, such as “m” representing minutes and “M” representing months.

| Date (@D, @DATE) formatting codes | |
|-----------------------------------|--|
| Code | Displayed (Current) Value |
| d | The day (1-31) |
| dd | The day (01-31) |
| ddd | The 3 letter abbreviation for the day of the week (Mon, Tue, etc.) |
| dddd | The full name of the day of the week (Monday, Tuesday, etc.) |
| M | The month, from 1-12 |
| MM | The month, from 01-12 |
| MMM | The 3 letter abbreviation for the month (Jan, Feb, etc.) |
| MMMM | The full name of the month (January, February, etc.) |
| y | The year, from 0-99 |
| yy | The year, from 00-99 |
| yyy | The year, with a minimum of 3 digits (001, 1900, 2009) |
| yyyy | The year as a four digit number |

| Time (@T, @TIME) formatting codes | |
|-----------------------------------|--|
| Code | Displayed Value |
| f | Fractions of a second accurate to as many decimal places as there are f s (up to 10 millionths of a second with 7 f s) |
| F | Fractions of a second the same as above, but only if the value is not zero |
| h | The hour, using a 12-hour clock from 1-12 |
| hh | The hour, using a 12-hour clock from 01-12 |
| H | The hour, using a 24-hour clock from 0-23 |
| HH | The hour, using a 24-hour clock from 00-23 |
| m | The minute, from 0-59 |
| mm | The minute, from 00-59 |
| s | The second, from |

| | |
|----|--|
| ss | The second, from 00-59 |
| t | The first character of the AM or PM designator |
| t | The AM/PM designator |

The following table gives examples of each date and time code and how they display in a chart or report:

| Code | Example Title | Example Output |
|---|--|---|
| @D(<i>format</i>) @DATE(<i>format</i>) | Date: @D(dddd, MMMM d, yyyy) | Date: Wednesday, January 11, 2017 |
| @D @DATE | Date: @D | Date: 1/18/2017 |
| @DT @DATETIME | Report Generated On: @DT | Report Generated On: 1/18/2017 3:19:11 PM |
| @DTM @DATETIMEM | Report Generated On: @DTM | Report Generated On: 1/18/2017 3:19 PM |
| @T(<i>format</i>) @TIME(<i>format</i>) | Current data as of: @T(HH:mm:ss.ffff) | Current data as of: 15:19:11.2654 |
| @T @TIME | Time: @T | Time: 3:19:11 PM |
| @TM @TIMEM | Time: @TM | Time: 3:19 PM |

See also:

[Chart title codes](#)

[Report title codes](#)

Appendix C: Light Pole Integration

During data entry for a data group, it is possible for the data entry session to have a *color state*. The *color state* can be used to alert personnel regarding an important data entry condition.

A [data entry configuration](#) is used to specify conditions that cause the *color state* of a data entry tab to change. The following conditions can cause the *color state* to change:

- Notify with color when data is out-of-spec / out-of-control
- Sample prompting is enabled and sufficient time has elapsed since the last sample to change the color state

The current color state of SQCpack can be shown by connecting an optional light pole to the computer running SQCpack.

The *color states* are:

- **Off** = no condition needs the operator's attention.
- **Green** = lowest level of attention needed.
- **Yellow** = middle level of attention needed.
- **Red** = highest level of attention needed.

When SQCpack's color state changes, a batch file called SetColorState.bat is executed. The batch file

receives a color state integer value as follows:

- **0** = Off
- **1** = Green state
- **2** = Yellow state
- **3** = Red state

SetColorState.bat is used as the interface between SQCpack and light-pole controller.

SQCpack comes with a light-pole controller that can be used with [Delcom HID light poles](#). This light-pole controller can be found in the "ColorState\DelcomHID" folder where SQCpack is installed. The DelcomHidController.exe light-pole-controller works only with the HID (Generation II) version of the lights.

Command line parameters supported by DelcomHidController.exe:

- **0** = Off
- **1** = Green flashing
- **2** = Yellow flashing
- **3** = Red flashing
- **10** = Green solid
- **20** = Yellow solid
- **30** = Red solid

If you want to use a different light system, you will need a light-pole controller EXE that accepts command line switches that allow you to place your light(s) in the desired state. See the instructions in SetColorState.bat for additional details.

Customers can implement a light-pole controller for their specific brand and model of light pole. Or, you can contact [PQ Systems application support](#) if you would like us to create a light-pole-controller that works with your light poles.

You can optionally play a sound file when a color state change is made. See the instructions in SetColorState.bat for additional details.

Appendix D: Charting external data sources

SQCpack provides you with one data storage system for your quality data. The SQCpack database is a Microsoft SQL Server database. When you create a data group and enter data for the data group, this information is being stored in SQL Server tables. When you create charts from your SQCpack data, these charts are also being stored in SQL Server.

PQ realizes that you have other systems, that store data in other forms, which you need to analyze using the SPC charts provided by SQCpack. To this end, SQCpack allows you to define charts that get their data from an **external data source**. These charts are created, displayed, and edited the same as SQCpack charts; the only difference is they get data from **outside** the SQCpack database.

New charts in SQCpack are created with **the new chart wizard**, which breaks the chart creation process into three steps:

1. Select a chart type
2. Select a data source
3. Describe the data fields

In **step 2**, you have the option to select a **data source**. For the most part, your data source may be SQCpack data. However, when you need to chart **external** data, you will select one of the following options from the data source combo box:

Microsoft Access
 Microsoft Excel
 ODBC provider
 ADO; OLE DB provider
 SQL Server

This list of options gives SQCpack charts access to data in almost any form. For example, if you have data in a **text file**, you might use ODBC or ADO. Similarly, if you have data in an Oracle database, you might use an ADO; OLE DB provider designed for the version of Oracle you are using. If you have data in a MySQL database, there is probably an ODBC driver that will give you access to the data.

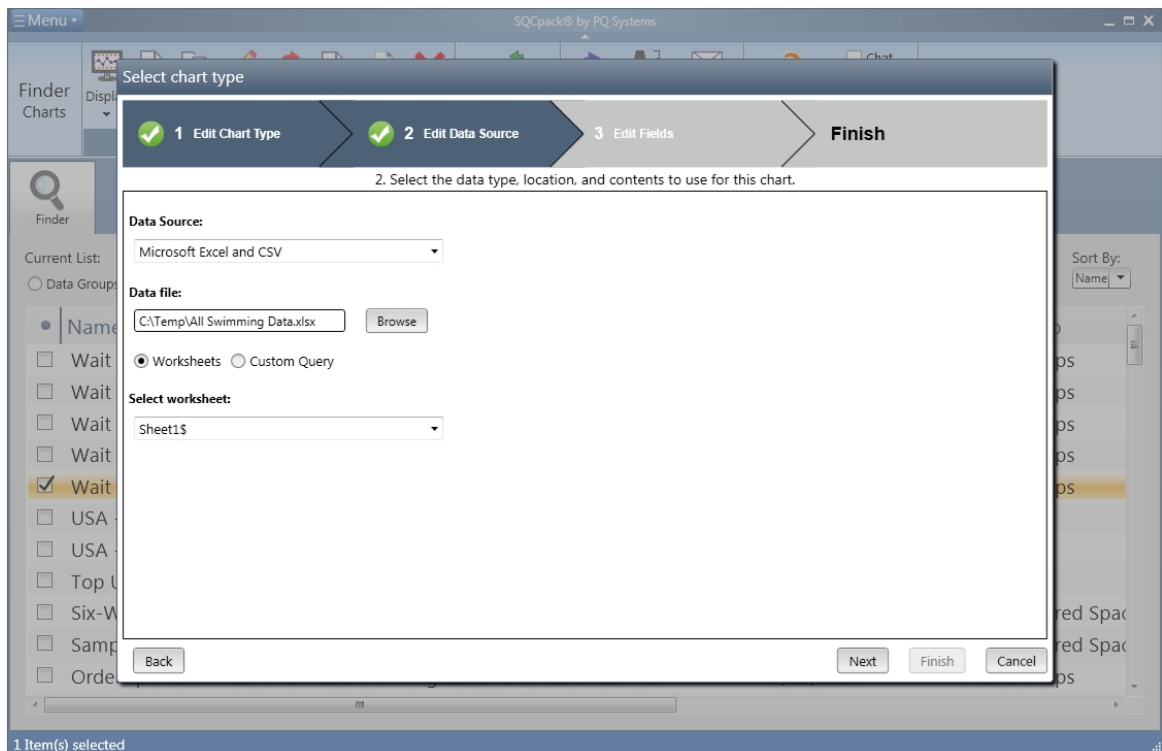
This appendix provides guidance on setting up charts which use external data.

Making your first connection to external data may be difficult. However, once you get one chart working, it is easy to use that as a template for many other charts. Do not hesitate to call the PQ customer service line. We have support and service offerings to help you through this work. We have encountered and charted many types of data and can help you use your time effectively to solve this challenge.

Excel

Select **Charts** from the navigation menu. Click the **New** button in the ribbon bar to create a new chart. On step 1 of the wizard, select the desired chart type. On step 2 of the wizard, select **Microsoft Excel** from the data source combo box.

Next, click the browse button to find and select one of your Excel files.



In the **Worksheet** combo box, each worksheet in your Excel file will be included. Select the worksheet that contains the data you want to chart. Note that if your Excel file has any **named ranges** of cells, these may also show up as worksheets. This would allow you chart data that may not begin at the top of the sheet.

You have the option to select **Custom Query** rather than **Workbook**. A custom query allows you to specify a SQL SELECT query to fetch data from your worksheet. This is not typically used in Excel but may be

helpful if you need to do a join query that includes data from more than one worksheet. Click the Next button to move on to step 3 or **Edit Fields**.

Use the **Edit Fields** screen to tell SQCpack which columns contain identifiers, which column or columns contain measurements, and which columns to ignore. Do this by selecting from the **Treat as** combo box. Once the required columns (for the chart type) are mapped, click **Finish** to display the chart.

Notes on Excel

Keep in mind that this chart **definition** is being kept in the SQCpack database, so other SQCpack users will be able to see the chart in the list of charts. However, if they ask to display the chart, SQCpack must be able to find the data. Because of this, you will typically use an Excel file that is on a network shared disk drive, accessible by any SQCpack user who might be using this SQCpack database. If you use an Excel file on your local disk, other SQCpack users will not be able to get to your data when they try to display this chart.

It is not a requirement that you have Microsoft Office installed for SQCpack to be able to make charts from Excel data. However, there are Microsoft data access components that must be present before SQCpack can chart Excel data. See this PQ Systems Knowledge Base article for details:

<http://pqsystems.knowledgebase.co/article.php?id=544>

Additional Excel tips here:

<http://pqsystems.knowledgebase.co/article.php?id=541>

Access

Select **Charts** from the navigation menu. Click the **New** button in the ribbon bar to create a new chart. On step 1 of the wizard, select the desired chart type. On step 2 of the wizard, select **Microsoft Access** from the data source combo box.

Next, click the browse button to find and select one of your Access files.

Notice that the combo-box will display any tables, views, or procedures found in the Access database file.

You have the option to select **Custom Query**. This allows you to specify an SQL Select query to get data from the database. Typically, you will be better off to define your SQL as a query in the Access database.

However, you can define the SELECT statement here if you must. Click **Next** to move on to step 3 or **Edit fields**.

Use the **Edit Fields** screen to tell SQCpack which columns contain identifiers, which column or columns contain measurements, and which columns to ignore. Do this by selecting from the **Treat as** combo box. Once the required columns (for the chart type) are mapped, click **Finish** to display the chart.

Notes on Access

Keep in mind that this chart **definition** is being kept in the SQCpack database, so other SQCpack users will be able to see the chart in the list of charts. However, if they ask to display the chart, SQCpack must be able to find the data. Because of this, you will typically use an Access database file that is on a network shared disk drive, accessible by any SQCpack user who might be using this SQCpack database. If you use an Access database file on your local disk – other SQCpack users will not be able to get to your data when they try to display this chart.

It is not a requirement that you have Microsoft Office installed for SQCpack to be able to make charts from Access data. However, there are Microsoft data access components that must be present before SQCpack can chart from Access data. See this knowledge base article for details:

<http://pgsystems.knowledgebase.co/article.php?id=544>

SQL Server

There are multiple options for charting data from SQL Server. Before you begin, it is a good idea to discover some information. You will typically need the following, and your IT staff may need to provide this for you:

- The server name
- The database name
- The table, view, or stored procedure name (containing the data you wish to chart)
- How should you log on?
 - Windows Authentication
 - SQL Server Authentication

Please note that SQCpack takes a **read-only view** of any data you chart from external sources. It will query for data but never add, remove, or change data in the source database.

From the **Server name** combo box, select the server that contains your data. Notice that on a network, it can take several seconds for this combo box to fill after you click on it.

Next, select your option for how to log on to the server.

Next, select the name of the database that you want to use from the combo box.

Once you select the database, you will also be able to select the table, view, or stored procedure using a combo box. The form will look similar to this:

If you select **Use SQL Server Authentication** you will be prompted for a user name and password – required to access this SQL Server.

Click the **Next** button to move on to the **Edit fields** step.

Use the **Edit Fields** screen to tell SQCpack which columns contain identifiers, which column or columns contain measurements, and which columns to ignore. Do this by selecting from the **Treat as** combo box. Once the required columns (for the chart type) are mapped, click **Finish** to display the chart.

SQL Server via Connection string

An alternative approach for SQL Server is to use a connection string.

Select **Charts** from the navigation menu. Click the **New** button in the ribbon bar to create a new chart. On step 1 of the wizard, select the desired chart type. On step 2 of the wizard, select **SQL Server via Connection string** from the data source combo box.

This will display additional options on the view. Click the **Select a template** button. This allows you to select from two common connection string templates. Alternatively, you may click the **Edit** button and enter the connection string directly, assuming that you know what is required.

Next, click the **Edit** button to manually edit your connection string information. This will vary based on your version of SQL Server, how you authenticate, and other options your IT staff may want to use. In general, your connection string will look similar to this:

```
server=ServerName;Initial Catalog=DatabaseName;Integrated Security=SSPI;
```

The items in bold will vary for each installation. The first one is the server name, the second one is the database name. Once this information is complete and correct, click the **Done** button. This will display a combo box where you can select the table, view, or stored procedure you want to use for this chart.

Click the **Next** button to move on to the **Edit fields** step.

Use the **Edit Fields** screen to tell SQCpack which columns contain identifiers, which column or columns contain measurements, and which columns to ignore. Do this by selecting from the **Treat as** combo box. Once the required columns (for the chart type) are mapped, click **Finish** to display the chart.

If you do not see the combo box for **Table/View/Procedure**, there is probably an error in your connection string. It is important that both the server name and database name be correct and that you have permissions to see this information.

ADO; OLE DB provider

OLE DB is a Microsoft standard for accessing data. Microsoft has created OLE DB providers but other vendors have also done this, to allow access to their specific data. When you select this option in SQCpack, there are many different data formats that you might be trying to access. For example, you might use this to get to SQL Server data or text files or Oracle data. It is a general purpose way to get to a variety of data sources.

Select **Charts** from the navigation menu. Click the **New** button in the ribbon bar to create a new chart. On step 1 of the wizard, select the desired chart type. On step 2 of the wizard, select **ADO; OLE DB provider** from the data source combo box.

This will display additional options on the view. Click the **Select a template** button. This allows you to select from a list of common ADO DB templates. Alternatively, you may click the **Edit** button and enter the ADO DB connection string directly – assuming you know what is required. A great web site for learning about connection strings is:

<http://www.connectionstrings.com/>

If you are not sure what to enter for your ADO DB connection string, this is one place to start.

Next, click the **Edit** button to manually edit your connection string information. This will vary based on your version source of data, how you authenticate, and other options your IT staff may want to use. In general, the connection string will look similar to this:

```
Provider=sqloledb; Data Source=<server>; Initial Catalog=<database>; User Id={{USER}};
Password={{PASSWORD}};
```

This connection string is for using ADO DB to get to SQL Server data. You will specify the **server** and the **initial catalog** based on your specific needs. Other connection strings for other data sources will contain different information.

Besides the correct connection string, depending on the data you are trying to reach, you may also have to install software that makes up the **provider** for your data source.

Once this is correct, you will be able to select a table, view, or stored procedure from the combo box. After that, click the **Next** button to move on to the **Edit fields** step.

Use the **Edit Fields** screen to tell SQCpack which columns contain identifiers, which column or columns contain measurements, and which columns to ignore. Do this by selecting from the **Treat as** combo box. Once the required columns (for the chart type) are mapped, click **Finish** to display the chart.

If you do not see the combo box for **Table/View/Procedure**, there is probably an error in your connection string. It is important that both the server name and database name be correct and that you have permissions to see this information.

ODBC provider

ODBC is an older standard for accessing data. Many application vendors have created ODBC drivers to allow access to their specific data. ODBC is not a single data format; instead it is a standard approach for programs to use when asking other systems for data. You might use ODBC to get to data stored in text files. It might also be used for getting to data in an old dBase file.

Select **Charts** from the navigation menu. Click the **New** button in the ribbon bar to create a new chart. On step 1 of the wizard, select the desired chart type. On step 2 of the wizard, select **ODBC provider** from the data source combo box.

This will display additional options in the view. Click the **Select a template** button. This allows you to select from a list of common ODBC templates. Alternatively, you may click the **Edit** button and enter the ODBC connection string directly, assuming that you know what is required. On the screen below, an ODBC template for Excel has been selected:

2. Select the data type, location, and contents to use for this chart.

Data Source: ODBC provider

User name:

Password:

Connection string:

Driver={Microsoft Excel Driver (*.xls, *.xlsx, *.xlsm, *.xlsb)}; Dbq=<file.xls>

☐ Prompt for User/Password in each session

☐ Show all database objects

Here, the connection string must be changed so that instead of **file.xls**, a specific Excel file of yours is specified with a full path. Once this is done, the combo box allowing you to select which **Worksheet** to use will become visible.

Note that you may have to install and/or configure an ODBC driver for your specific scenario before this will work properly.

Select your **Worksheet** and then click the **Next** button to move on to the **Edit fields** step.

Use the **Edit Fields** screen to tell SQCpack which columns contain identifiers, which column or columns contain measurements, and which columns to ignore. Do this by selecting from the **Treat as** combo box. Once the required columns (for the chart type) are mapped, click **Finish** to display the chart.

Notes on using an Oracle database

If you have data in an Oracle database, PQ recommends that you access this data (for charting) using an **ADO; OLE DB** provider.

Select **Charts** from the navigation menu. Click the **New** button in the ribbon bar to create a new chart. On step 1 of the wizard, select the desired chart type. On step 2 of the wizard, select **ADO; OLE DB provider** from the data source combo box.

This will display additional options on the view. Click the **Select a template** button. This allows you to select from a list of common ADO DB templates. Select the template named **OLE DB Provider for Oracle**.

This will give you the beginnings of a connection string for Oracle. Depending on the version of Oracle you are using and recommendations from your IT staff, you will need to customize this connections string.

The article at the following link, although originally written for CHARTrunner, contains helpful information for using Oracle data:

<http://pgsystems.knowledgebase.co/article.php?id=23>

Additionally, you will want to check the box **Using Oracle**. Once you do this, click the **Customize** button. This will show you a **Date Wrapper** string that is required for Oracle. Oracle handles dates differently than other products. You may need to customize this date wrapper – but at a minimum you must use this for Oracle.

Once you have the connection string and date wrapper correct, you should be able to select a table, view, or stored procedure as the source of data for your chart. The remaining steps are the same as for any other data source. Specify the columns on the **Edit fields** step and then click **Finish** to display the chart.

Appendix E: Command parameters

SQCpack allows you to use commands to perform common tasks such as displaying a chart or saving a chart as an image file.

Commands can be specified on the SQCpack command line, or they can be placed in a command file.

If you give a command file the .SQCX file extension, you can right-click or double-click the command file from Windows Explorer (or File Explorer) to execute the commands in the .SQCX file.

In this chapter

[Command parameters](#)

[Example command usage](#)

[The SQCX command file](#)

Command parameters

SQCpack allows users to employ command parameters to perform common tasks such as displaying a chart, saving a chart as an image file, printing one or more charts, or opening a data group for data entry.

Command parameters can be placed in a .SQCX command file. You can double-click an SQCX command file to execute the commands, or drag-and-drop an SQCX file onto SQCpack to execute the commands.

Command parameters can be run from the command prompt, the Start Menu's Run function, from a shortcut, from a batch file, or from an SQCX command file.

Command parameters can be passed on the command line to SQCpack.

You can drag a data group or chart from SQCpack to your desktop (or any other folder) to create an SQCX command file.

To execute commands on the command line, enter the full path to SQCpack.exe, followed by as many commands and arguments as needed, e.g.:

```
"C:\Program Files x86\PQ Systems\SQCpack 7.0\SQCpack.exe" /DISPLAY A26* * *
```

If you want to run multiple commands, you can create a text command file with the [SQCX file extension](#) as demonstrated below and use the **/@ CommandFile** command or execute the command file from Windows Explorer via the right-click **Execute commands** context menu or by double-clicking the SQCX file.

Command arguments must start with a forward slash (/), e.g. **/DISPLAY**.

Comments in the command file are handled as explained below. See [here](#) for examples:

- Use either semicolon (;) or double-dash (--) at the start of a line to comment the entire line. Whitespace prior to the comment is acceptable.
- Use double-dash (--) within a line to comment all of the text to the right of the comment.

Any errors that occur during command processing will be written to the log file. Press the **Ctrl-Shift-L** hotkey while in SQCpack to view the log file.

The **OutputSpec** notation represents a full path to a file system folder (e.g. C:\ChartImages\) or a file (e.g. C:\ChartImages\MyChart.jpg). The **CommandFile** notation represents a full path to a text command file that contains command line arguments (e.g., C:\SQCpack\MyCommands.sqcX).

Commands that operate on charts (e.g. **/PRINT**, **/IMAGE**, **/DISPLAYWINDOW**, **/DISPLAY** and **/THUMBNAI**) take three arguments, e.g.:

/DISPLAY DataGroup Characteristic Chart.

Wildcard support: Each of the three arguments supports the wildcard characters **?**, **#** and *****, where **?** matches any single character, **#** matches any single digit (0-9), and ***** matches zero or more characters. Also, **[aB4]** matches the characters in the brackets, i.e. the single character "a", or the single character "B", or the single character "4". For example, **[01][AB]*** matches **0Bstuff** and **1Ajunk**, but not **2Afault**. If the first character is **!** it means **does not match**. For example, **![01][AB]*** matches **2Afault** but not **0Bstuff** and **1Ajunk**.

1. **DataGroup** = Data group name(s) to match. For example, **A26*** matches all data groups that begin with A26. Specify **""** (two double-quote characters) for an external data chart, a multi-chart, a chart group, or a StatBoard.
2. **Characteristic** = Characteristic name(s) to match. For example, **Length#** matches **Length1** and

Length2. Just * matches all characteristic names. Specify "" (two double-quote characters) for an external data chart, a multi-chart, a chart group, or a StatBoard.

3. **Chart** = Chart name(s) to match. For example, Default* matches "Default Control Chart" and "Default Histogram". Just * matches all chart names.
4. **Report** = Report name(s) to match. For example, Monthly* matches "Monthly Summary Report" and "Monthly Detailed Report". Just * matches all report names.

If a command argument contains embedded spaces, which can occur in the path to a file, you must enclose the argument in single or double quotes as shown in the [command examples](#).

Commands and arguments are not case sensitive.

The supported commands and arguments are.

/CULTURE CultureCode Display the SQCpack user interface in the specified culture. The culture affects the language that the user interface uses as well as number and date formatting.

These are the CultureCodes for which SQCpack has a translation:

de = German (Germany)
fr = French (France)
es = Spanish (Mexico)
pt = Portuguese (Brazil)
zh = Chinese (Simplified)

If you like, you can specify the full [Language Culture Name](#), such as **de-DE** or **zh-CN**.

/CLOSEALLCMM Close all open instances of CMM Integration.

/CLOSEALLFIXTURES Close all open instances of Fixtures. This command is only processed by SQCpack, it is ignored when it is processed by Fixtures.

/CLOSECHARTS Close all charts in separate windows and charts in tabs.
/CLOSECHARTS all

/CLOSECHARTS tabs Close all charts in tabs.

/CLOSECHARTS windows Close all charts in separate windows.

/CLOSEDATAENTRY DataGroup Close the data entry tab(s) associated with the specified data group(s). Use an asterisk for *DataGroup* to close all data entry tabs, e.g. /CloseDataEntry *.

/CREATEDB PathToDatabase Create and open the specified single-user database, where PathToDatabase is the full path to the single-user MDF database file.

/CMM commands **/ENDCMM** Place /CMM on a line by itself. Place /ENDCMM on a line by itself. All commands between the /CMM line and the /ENDCMM line will be passed to a new instance of CMM Integration, as described [here](#).

/D DataGroup Characteristic Chart Display the specified chart(s) in new tab(s). If the specified chart already has an open chart tab it will become the focused tab.

-or-
/DISPLAY DataGroup
 Characteristic Chart

/DELETEALLROWS DataGroup Delete all rows in the specified data group.

/DW DataGroup Characteristic Chart Display the specified chart(s) in new window(s) that are separate from the SQCpack window. Each window's monitor number, size, position,

| | |
|---|---|
| -or- | and window state are specified by the most recent /DWS command. |
| /DISPLAYWINDOW DataGroup Characteristic Chart | |
| /DWS ScreenNumber Top Left Height Width [MIN MAX NORMAL] | This command specifies the state of subsequent chart windows created by the /DW command. The arguments to this command are: |
| -or- | |
| /DISPLAYWINDOWSTATE ScreenNumber Top Left Height Width [MINIMIZED MAXIMIZED NORMAL] | <p>ScreenNumber - Specifies the monitor screen where the chart window will be created. Monitor 1 is the primary screen. If you have additional monitors, they will be screens 2, 3, 4, etc.</p> <p>Top - The top side of the chart window specified as a percentage of screen height, e.g. 10.</p> <p>Left - The left side of the chart window specified as a percentage of screen width, e.g. 10.</p> <p>Height - The height of the chart window specified as a percentage of screen height, e.g. 80.</p> <p>Width - The width of the chart window specified as a percentage of screen width, e.g. 80.</p> <p>WindowState - (Optional) The state of the chart window. If not specified this defaults to NORMAL. The allowable states are: NORMAL, MINIMIZED, or MAXIMIZED. Only the left 2 characters (case insensitive) are significant, i.e. "NO", "MI" or "MA".</p> |
| /E DataGroup | Open the specified data group(s) for data entry. If the specified data group already has an open data entry tab it will become the focused tab. |
| -or- | |
| /ENTERDATA DataGroup | |
| /EXPORTDATATOCVS DataGroup OutputPath [LastN] | Export all columns (excluding ROWID and SEQUENCENUMBER) from the data group(s) specified by DataGroup to the CSV file or folder specified by OutputPath . All data rows are processed unless LastN is specified, in which case only the "Last N" rows are processed. If OutputPath specifies a folder path the data group name is used as the filename. |
| /EXPORTDATATOSQCG DataGroup OutputPath | Export the data groups specified by DataGroup to SQCG file(s) . If OutputPath specifies a folder path the data group name is used as the filename. |
| /FIXTURES command /ENDFIXTURES | Place /FIXTURES on a line by itself. Place /ENDFIXTURES on a line by itself. All commands between the /FIXTURES line and the /ENDFIXTURES line will be passed to a new instance of Fixtures, as described here . |
| /I DataGroup Characteristic Chart | Save the specified chart(s) as image files. Either /O or /OUTPUT must have been specified prior to this command so that SQCpack knows where to create the image files. Optionally /T or /IMAGETYPE can be specified prior to this command to determine what type of image files to create. |
| -or- | |
| /IMAGE DataGroup Characteristic Chart | This command requires the purchase of an optional "Web Publishing License". |
| /IMAGETYPE ImageType | Specify the type of image files that a subsequent /IMAGE or /I will create. |
| -or- | |
| /T ImageType | Only the first letter (case insensitive) of ImageType is significant. Supported image types are: |

B = Bitmap
G = GIF
J = JPEG
P = PNG

| | |
|--|---|
| /IMPORT [RECURSIVE] ChartPath | Import the CHARTrunner 3.6 or CHARTrunner Lean chart(s) specified by ChartPath, where ChartPath is the full path to a chart definition file, or the full path to a folder containing chart definition files. RECURSIVE can be used with a folder path to recurse though all sub-folders. |
| /IMPORT65 [RECURSIVE] SqdPath | Import the SQCpack 6.5 database files specified by SqdPath (wildcards supported), where SqdPath is the full path to one or more SQCpack databases, or a folder containing SQCpack database(s). Some examples of SqdPath are: C:\MyDatabases\ C:\MyDatabases*.sqd C:\MyDatabases\blue??.sqd RECURSIVE can be used with a folder path to recurse though all sub-folders looking for SQD database files. You may want to use /VIEWLOG after this command in order to see if any errors occurred during the import operation. |
| /LOG 'Text to write to the log' | Write the specified text to the log file. If the text contains embedded spaces then enclose it in single or double quotes. |
| /MSG 'Text to display' | Display the specified text in a popup message dialog. If the text contains embedded spaces then enclose it in single or double quotes. |
| /OPENDB PathToDatabase | Open the specified database path, where PathToDatabase is the full path to a DBC file (or MDF file for a single-user database). The specified database path <i>will not</i> be remembered as the last-used database. If user login is required an attempt will be made to login using the user's Windows name . No login dialog will be displayed because /OPENDB must be useable with background execution (such as from Task Scheduler) where no human is available to enter login credentials. Use the /SETDEFAULTDB command when you want to specify the database SQCpack will use when it starts, and a human will be interactively logging into SQCpack. |
| /O OutputSpec -or- /OUTPUT OutputSpec | Specify the full path to a file or folder. Used prior to /IMAGE to specify where to create the chart image files. Used prior to /REPORT to specify where to create the report output files. |
| /OH HeightInPixels -or- /HEIGHT HeightInPixels | Specify the chart image height in pixels. Used prior to /IMAGE to specify the height of the created chart images. Defaults to 1500 pixels. |
| /OW WidthInPixels -or- /WIDTH WidthInPixels | Specify the chart image width in pixels. Used prior to /IMAGE to specify the width of the created chart images. Defaults to 2000 pixels. |
| /P DataGroup Characteristic Chart -or- /PRINT DataGroup Characteristic Chart | Print the specified chart(s). If "query" mode is enabled via /Q or /QUERY then the user is prompted to specify printer parameters prior to printing the chart definition. If "query" mode is disabled, then the chart will be printed to the default printer. |
| /Q or /QUERY or /Q+ or /QUERY+ | Turns on "query" mode. Used prior to /PRINT to prompt the user for printer parameters. |

| | |
|---|--|
| /Q- or /QUERY- | Turns off "query" mode. |
| /R ReportName OutputType -or- /REPORT ReportName OutputType | Generate one or more reports as specified by ReportName. Wildcard characters are supported (see Wildcard support above). Send the report output to OutputType, which can be one of these values: PREVIEW PDF XLS RTF CSV MHTML IMAGE Report output other than PREVIEW is created in the path specified by a prior /OUTPUT command. |
| /SETDEFAULTDB PathToDatabase | Set the specified database path as the <i>default</i> SQCpack database, where PathToDatabase is the full path to a DBC file (or MDF file for a single-user database). The <i>default</i> SQCpack database is opened automatically when SQCpack is started. If you want SQCpack to always start using a specific database, use /SETDEFAULTDB rather than /OPENDB because /OPENDB does not display the login dialog and only works when SQCpack is setup to use Windows login credentials. The /SETDEFAULTDB command results in the login dialog being displayed (as needed) and the user can login using either SQCpack credentials or Windows user credentials (depending on how the SQCpack database is setup). |
| /SQCPACK MINIMIZED MAXIMIZED NORMAL | Sets the state of the main SQCpack window to either: MINIMIZED , MAXIMIZED , or NORMAL . Only the left 2 characters (case insensitive) are significant, i.e. "NO", "MI" or "MA". |
| /STARTFIXTURE | Open the Data collection window for the Fixture. |
| /TN DataGroup Characteristic Chart -or- /THUMBNAIL DataGroup Characteristic Chart | Update the thumbnail image for each of the specified charts. The thumbnail images are updated by SQC.BackgroundRender.WPF.exe which runs in the background whenever SQCpack needs one or more thumbnails generated. |
| /V or /V+ or /VERBOSE or /VERBOSE+ | Turns on <i>verbose</i> mode where any errors that are encountered are reported to the user via a popup dialog. Irregardless of whether <i>verbose</i> mode is enabled or not, errors are always written to the log file which can be viewed using the Ctrl-Shift-L hotkey. |
| /VIEWLOG | Open the SQCpack log file in NotePad.exe. |
| /V- or /VERBOSE- | Turns off <i>verbose</i> mode. |
| /X or /EXIT | Exit from SQCpack. Typically, this is the last command on a command line or the last command in a command file. If /X is not specified then the SQCpack window will remain after all commands have been processed. |
| /@ CommandFile | If you are using a text command file for multiple command arguments, use this command to read the text file specified by CommandFile, and process each command line contained therein. The command file can include lines that are blank or commented-out with a semicolon (;). It is suggested that the command file have the SQCX file extension so that you can execute the commands from Windows Explorer. |

See Also

[Appendix E: Command parameters](#)

[Example command usage](#)

[The SQCX command file](#)

Example command usage

Commands in a batch file

When creating a batch file, you must specify the full path to SQCpack.exe, as shown in the examples below. Remember to enclose the full path in double-quotes when the path contains embedded spaces (the path almost always does contain embedded spaces).

```
; Display all matching charts in new tabs.
"C:\Program Files x86\PQ Systems\SQCpack 7.0\SQCpack.exe" /D A26* * *

; Save all matching charts as PNG image files in "C:\My Images\" with height=768 pixels
and width=1024 pixels.
"C:\Program Files x86\PQ Systems\SQCpack 7.0\SQCpack.exe" /OW 1024 /OH 768 /T PNG /V /O
"C:\My Images\" /I A26* * *

; Execute all the commands in MyCommands.sqcx and then close SQCpack.
"C:\Program Files x86\PQ Systems\SQCpack 7.0\SQCpack.exe" /@ "C:\My
Charts\MyCommands.sqcx" /X
```

Commands in an SQCX file

If you put your commands in an SQCX command file you don't have to deal with the full path the SQCpack.exe like you do in a batch file. That's because the SQCX file extension is registered with Windows to be associated with SQCpack, so Windows knows where to locate SQCpack.exe.

See [The SQCX command file](#) for information about executing commands in an SQCX command file.

See Also

[Appendix E: Command parameters](#)

[Command parameters](#)

[The SQCX command file](#)

The SQCX command file

If you put commands in a text file with the **SQCX** file extension you will be able to double-click the command file from Windows Explorer (File Explorer in Windows 8+) to execute the commands. Or, you can right-click on the SQCX file and select **Execute commands**.

You can put as many commands as you like in the SQCX file. Commands can stack horizontally across a line, or commands can be placed on separate lines, or a combination of both.

SQCpack will be started as needed when you execute the SQCX command file. If SQCpack is already running when you execute the SQCX command file, the commands will be executed by the already running instance of SQCpack.

You can drag a data group or chart from SQCpack to your desktop (or any other folder) to create an SQCX command file.

If **/OPENDB** is not specified in the commands, the currently open database will be used. Recall that SQCpack automatically opens the previously used database when it starts.

Comments

; A semicolon at the start of a line indicates a comment line.

; Double-dash within a line comments text to the right of the comment, like this:

```
/OPENDB D:\Database\MyFineDatabase.dbc    -- This is a comment at the end of the line.
```

Example - Print all charts for the Width characteristic for the data group named MyGroup in the currently open database. The command file could be named "Print-MyGroup-Width-AllCharts.sqcx".

```
/V /Q /PRINT "MyGroup" "Width" ""
```

Example - Open for data entry the data group named "Grinder 1" in the specified database. The command file could be named "EnterData-Grinder-1.sqcx".

```
/VERBOSE
/OPENDB "N:\SQCpack\SQCpack-Database.dbc"
/ENTERDATA "Grinder 1"
```

Example - Display the charts that begin with "Dashboard" for all characteristics in the data group named "Grinder 1" in the specified database. The command file could be named "Display-MyGroup-Dashboard-Charts.sqcx".

```
/OPENDB "N:\SQCpack\SQCpack-Database.dbc"
/DISPLAY "Grinder 1" "" "Dashboard"
```

Example - Display the specified multi-charts in a separate maximized window on the specified monitor. This example assumes that the computer has four monitors. The command file could be named "Display-Multi-Monitor-Charts.sqcx".

```
/SQCPACK minimized
/OPENDB "N:\SQCpack\SQCpack-Database.dbc"

/DISPLAYWINDOWSTATE 1 2 2 98 98 MAXIMIZED
/DISPLAYWINDOW "" "" "Multi-Chart-1"

/DISPLAYWINDOWSTATE 2 2 2 98 98 MAXIMIZED
/DISPLAYWINDOW "" "" "Multi-Chart-2"

/DISPLAYWINDOWSTATE 3 2 2 98 98 MAXIMIZED
/DISPLAYWINDOW "" "" "Multi-Chart-3"

/DISPLAYWINDOWSTATE 4 2 2 98 98 MAXIMIZED
/DISPLAYWINDOW "" "" "Multi-Chart-4"
```

See Also

[Appendix E: Command parameters](#)

[Command parameters](#)

[Example command usage](#)

Appendix F: Frequently Asked Questions (FAQ)

If you have a problem with SQCpack, or just have a question, please contact PQ Systems [application support](#). We are here to help.

This Frequently-Asked-Questions appendix addresses these issues:

- [Cannot open database](#)
 - [Due to out-of-date database schema](#)
 - [Due to other issues](#)
- [How to convert a single-user database into a multi-user database](#)
- [How to send a copy of a database to PQ Systems](#)
- [Why doesn't automatic chart refresh work on a computer](#)

Cannot open database

If you get an error message when trying to open an SQCpack database, please consult the following topics.

Remember that when SQCpack starts it tries to open the database it used during the previous session. If that database can no longer be opened, you will get a database open error even though you did not explicitly attempt to open a database.

Database related errors can be:

[Due to out-of-date database schema](#)

[Due to other issues](#)

Due to out-of-date database schema

Out-of-date database schema

Sometimes in order to support new features in SQCpack, it becomes necessary to modify the database schema.

Generally speaking, a schema error should not occur because SQCpack will update (if needed and with your permission) the schema of a database when it is opened.

If you get an error message with the word "schema" in the message, it is possible that the SQCpack database version is not compatible with the version of SQCpack that you are attempting to use. This scenario can occur when a user installs a newer version of SQCpack that requires an update to the database format (schema).

When there is a schema problem and you are using a [multi-user database](#), the error message is:

"SQCpack is unable to open this database due to a schema change. Please contact your database administrator or PQ Systems application support. Press F1 to find the contact information for PQ Systems application support. "

When there is a schema problem and you are using a [single-user database](#), the error message is:

"SQCpack is unable to open this database due to a schema change. Please contact PQ Systems application support. Press F1 to find the contact information for PQ Systems application support. Or, press F1 and search for 'Cannot open database' to fix this problem yourself."

If you feel that you want some help with this, please contact [PQ Systems application support](#).

The SQCpack database utility

The database utility is typically not used since SQCpack performs its own upgrade of the database schema. However, PQ Systems application support may ask that you use the database utility in some situations.

You can use the SQCpack database utility to upgrade the schema of a single-user or multi-user SQCpack database to work with the version of SQCpack that is in the same installation folder.

On a 32-bit operating system, the utility is typically found here:

C:\Program Files\PQ Systems\SQCpack 7.0\SQCDbUtility.exe

On a 64-bit operating system, the utility is typically found here:

C:\Program Files (x86)\PQ Systems\SQCpack 7.0\SQCDbUtility.exe

Updating a single-user database

An end-user of SQCpack can usually upgrade a single-user database as follows:

1. Run the SQCpack database utility.

2. In the **Server name** field, enter: (l o c a l d b) \ M S S Q L L o c a l D B (you will have to type this in or paste it from the clipboard)
3. In the **Database** drop-down list, select the single-user SQCpack database that you want to upgrade.
4. We recommend that you select the **Backup Target Database** checkbox so that a backup is made of your database before the upgrade begins (just in case something unexpected happens during the upgrade). In the **Backup folder** field enter the folder path where the backup file will be created.
5. Click the **Next>>** button, then the **Finish** button. The upgrade process will execute and a log file will be created in the same folder as the database utility.

Updating a multi-user database

If your multi-user SQCpack database has been set up with the [security features](#) that PQ recommends, then only your network or database administrator has sufficient rights to upgrade the multi-user database. Typically an end-user will not have the needed rights.

1. Run the SQCpack database utility.

2. In the **Server name** field, enter the name of the computer where SQL Server is installed. Typically, you have to type this in yourself.
3. In the **Authentication** field, select **SQL Server Authentication** (assuming things are setup the [recommended way](#)). Enter the **User name** and **Password** for the SQL Server user who has **full** rights (e.g. dbowner) to the database.
4. In the **Database** drop-down list, select the multi-user SQCpack database that you want to upgrade.
5. We recommend that you select the **Backup Target Database** checkbox so that a backup is made of your database before the upgrade begins (just in case something unexpected happens during the upgrade). In the **Backup folder** field, enter the folder path where the backup file will be created. Note that the backup folder path must exist on the computer where SQL Server is installed, not on the computer where the database utility is running.
6. Click the **Next>>** button, then the **Finish** button. The upgrade process will execute and a log file will be created in the same folder as the database utility.

Due to other issues

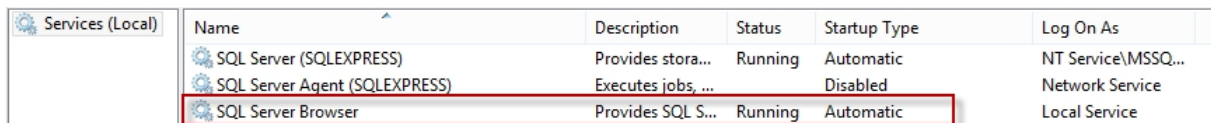
Issues associated with a multi-user database

In this scenario, the SQCpack on computer A (client computer) is talking to SQL Server running on computer B (server computer). While it is possible that computer A and computer B are the same computer, most of the time that is not the case.

Client computer does not know that SQL Server instance is installed on a server computer

In this case, you can connect to SQL Server if you type in the proper computer name or address, but the drop-down list of available SQL Servers does not contain the SQL Server you want to connect to.

This typically occurs when the SQL Server Browser service (on the computer where SQL Server is installed) is not running. The SQL Browser Service helps client computers locate running instances of SQL Server.



| Name | Description | Status | Startup Type | Log On As |
|-------------------------------|--------------------|----------|--------------|--------------------|
| SQL Server (SQLEXPRESS) | Provides stora... | Running | Automatic | NT Service\MSSQ... |
| SQL Server Agent (SQLEXPRESS) | Executes jobs, ... | Disabled | Disabled | Network Service |
| SQL Server Browser | Provides SQL S... | Running | Automatic | Local Service |

Open the Services applet, start the SQL Server Browser service, and set the Startup Type to **Automatic**.

Client computer cannot connect to a SQL Server instance

In this case, you cannot connect to SQL Server even if you type in the proper computer name or address.

Here are some quick things to check:

- **Firewall** - Is a software firewall on the server computer blocking your attempts to connect to SQL Server? Try temporarily turning the firewall off and see if that corrects the problem. If it does, the firewall needs to allow connections to SQL Server.
- **Network** - Is the TCP network protocol installed on both the client and server computers? Does the server computer have a static IP address? Does the server computer name you are trying to use resolve to the correct IP address of the server computer?
- Is SQL Server configured to allow client connections via the TCP/IP network protocol? Configure this with **SQL Server Configuration Manager** as explained in [this article](#) under *Enable Protocols*.
- Is the SQL Server instance actually running on the server computer?

[Here is a detailed article](#) that covers the typical problems and solutions for when you cannot connect to SQL Server.

Issues associated with a single-user database

In this scenario, the SQCpack on computer A is talking to SQL Server Express LocalDB running on computer A.

If you are trying to use a single-user database as a production database, then [stop and read this](#).

If you attempt to put the database files (*.mdf and *.ldf) on a network share you will get an error message because that is not a supported way of using a single-user LocalDB database.

You can get an error message if the database files (*.mdf and *.ldf) are no longer accessible to you. Perhaps they were renamed or deleted. Or perhaps someone changed the security permissions on the files so that you can no longer access them.

You decide not to update the database schema

Considerations for when SQCpack prompts you to upgrade the database schema

When SQCpack attempts to open a database, it will tell you if the database schema (i.e. the structure of the database) needs to be updated in order to support the new version of SQCpack. PQ tries to minimize the number of database schema upgrades, but from time to time in order to support new features the database schema must be updated.

If the database schema must be updated, you will be told the *minimum required version* of SQCpack that must be used with the updated database. Versions prior to this *minimum required version* should not (and generally cannot) be used with the updated SQCpack database.

If you choose not to update the database schema, this help topic will be automatically opened for your consideration.

Evaluate the new version of SQCpack using the sample database

If you prefer not to update the schema of your production SQCpack database, you can always open the sample database that comes with SQCpack.

The sample database is typically located here (open it as a *single-user* database):

C:\Program Files (x86)\PQ Systems\SQCpack 7\SampleData\SampleDatabase.mdf

Installing an older version of SQCpack

Due to the restriction that all computers running SQCpack in your organization must run the minimum required version of SQCpack, you may decide to postpone upgrading SQCpack. In that case, you will probably want to install the older version of SQCpack that you were using previously.

Older versions of SQCpack are available at <http://pqsystems.com/sqcpack/oldversions>.

See also:

[How to update SQCpack on lots of computers](#)

[Installing SQCpack via Group Policy](#)

How to convert a single-user database into a multi-user database

You created your data groups, charts, and reports using a single-user database. Now you want other people to be able to access this database and realize that is not possible with a single-user database. A single-user database can be accessed only by other users on the same computer where the single-user database files live.

Fortunately, it is possible to convert your single-user database into a multi-user database. Just follow these steps. You will probably need to get your network administrator or IT department involved if they manage the SQL Server instance you need to use.

Single-user versus multi-user database

A **single-user database** is actually a SQL Server Express LocalDB database. The database files live on the local computer, and only users on the local computer can access the database. The big attraction to this type of SQL Server database is ease of installation (the needed components are installed when SQCpack is installed) and ease of administration. If it were not for the fact that using a LocalDB database makes the SQCpack trial/demo process much easier, we probably would not have included support for this type of SQL Server database (since it generally is a [poor choice for a production database](#)).

A **multi-user database** is hosted by an instance of SQL Server (which comes in various editions, all of

which must be purchased), or by an instance of [SQL Server Express](#) (which is free).

The conversion process

This process must be executed by a person with administrator rights (i.e. a member of the **sysadmin** server role) on the target SQL Server where the multi-user database will be created.

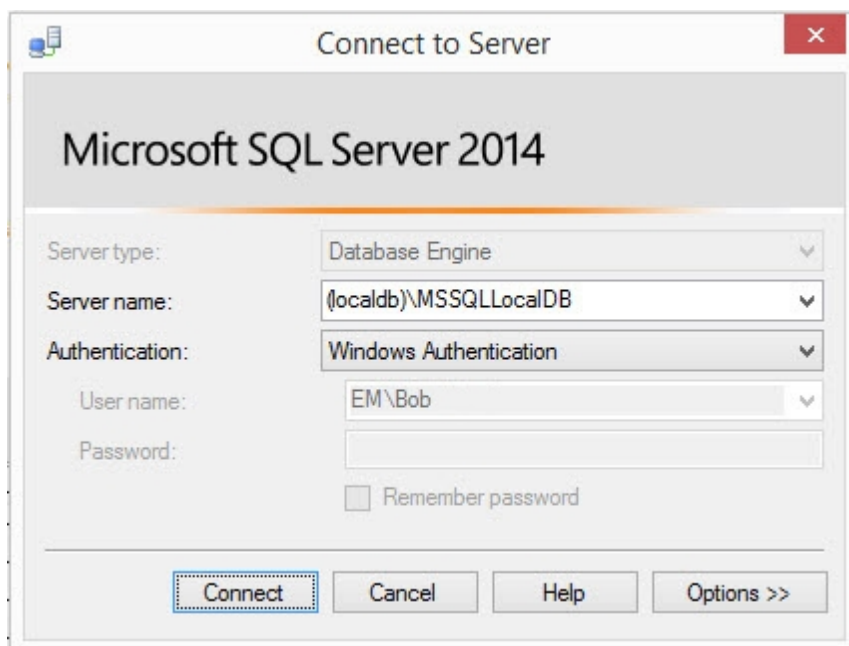
Follow these steps to convert your single-user database into a multi-user database:

Obtain a SQL Server instance to host your network database

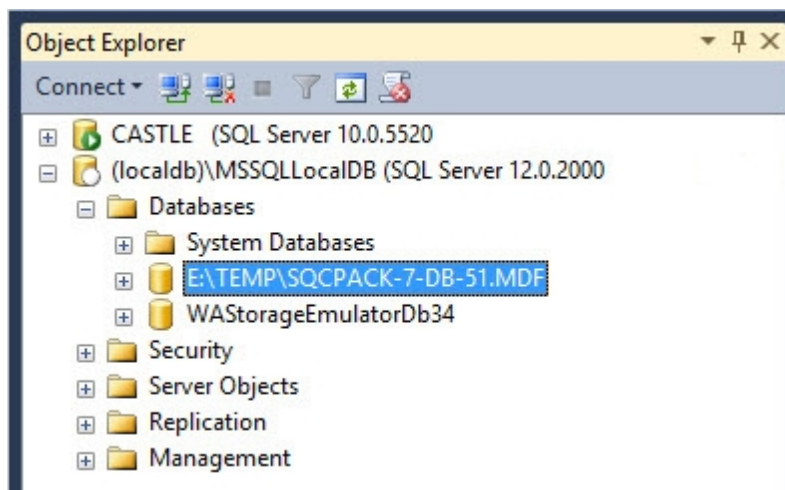
You can use a new or existing SQL Server (most likely managed by your IT department). Or, you install an instance of SQL Server Express and use that. See [Getting started with your own database](#).

Export the single-user database to the multi-user database

Install and run SQL Server Management Studio on the computer where the single-user database lives. See [Installing SQL Server Express](#). You only need to install the **management tools** to get SQL Server Management Studio.

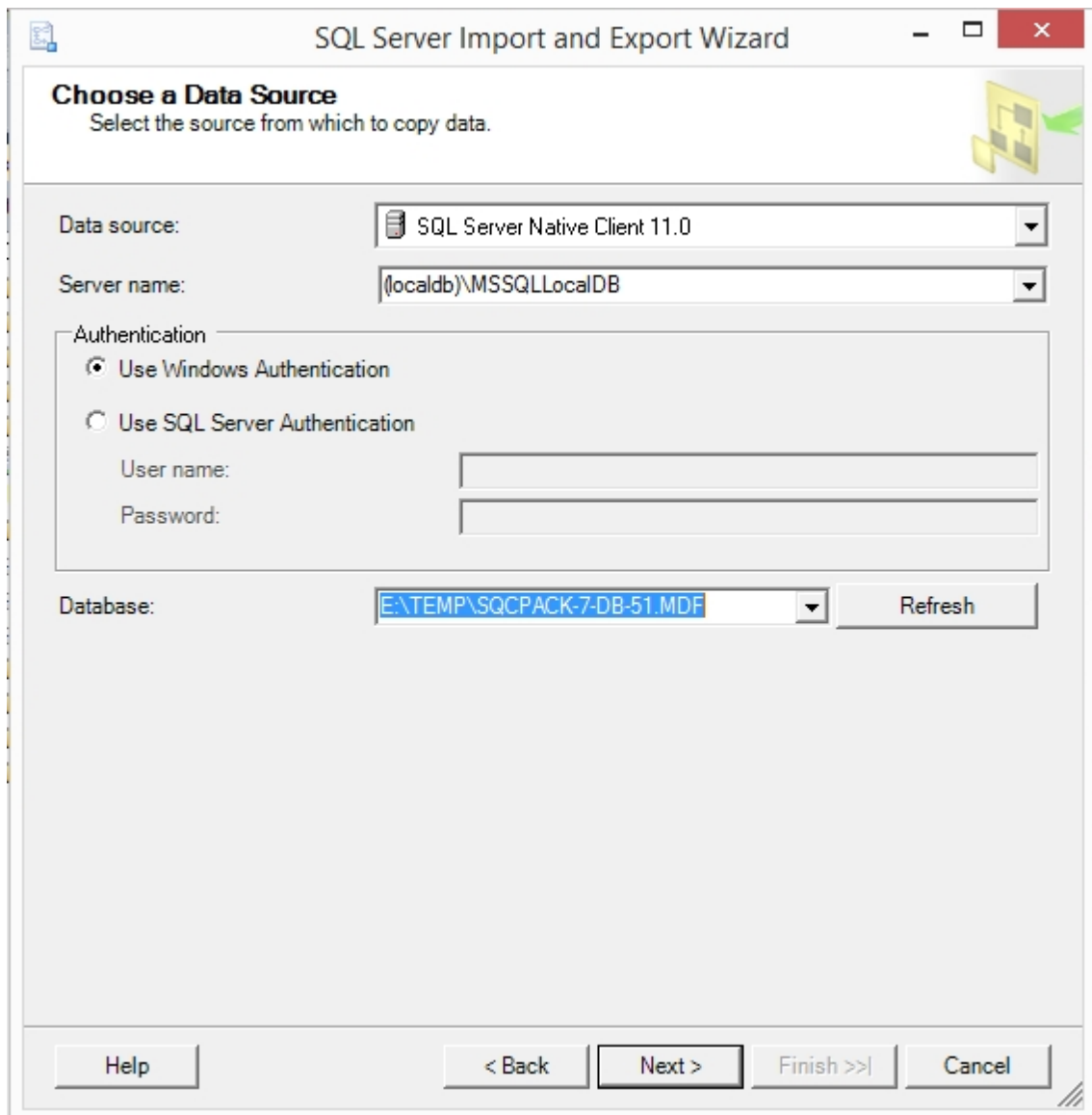


For the **Server name** enter (localdb)\MSSQLLocalDB. That is the special name you must use to connect to LocalDB. For **Authentication** use Windows Authentication.



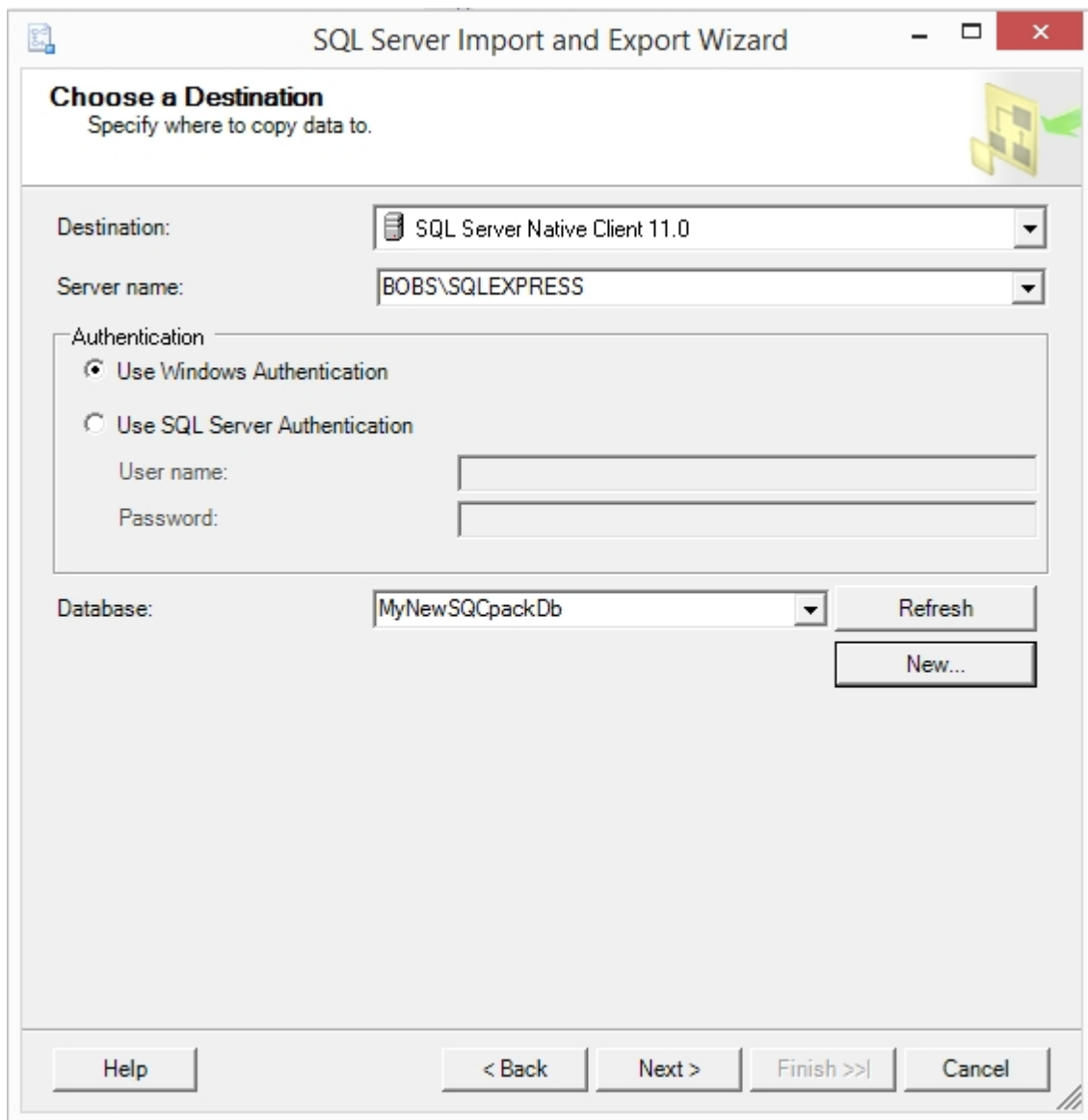
In Object Explorer (the left-hand panel) select your single-user database.

Right-click and select **Tasks > Export data**.



The screenshot shows the 'SQL Server Import and Export Wizard' window, specifically the 'Choose a Data Source' step. The window title is 'SQL Server Import and Export Wizard'. Below the title bar, there is a sub-header 'Choose a Data Source' and a instruction 'Select the source from which to copy data.' To the right of the instruction is a yellow icon of a folder with a green arrow pointing to it. The main area contains several fields: 'Data source:' with a dropdown menu showing 'SQL Server Native Client 11.0'; 'Server name:' with a dropdown menu showing '(localdb)\MSSQLLocalDB'; an 'Authentication' section with two radio buttons: 'Use Windows Authentication' (selected) and 'Use SQL Server Authentication'; 'User name:' and 'Password:' text boxes; 'Database:' with a dropdown menu showing 'E:\TEMP\SQCpack-7-DB-51.MDF' and a 'Refresh' button; and a 'Help' button. At the bottom, there are four buttons: '< Back', 'Next >', 'Finish >>', and 'Cancel'.

For the **Data source** use "SQL Server Native Client" as shown above. The **Server name** should be (localdb)\MSSQLLocalDB as shown above. Verify that the correct database is selected as the source. Click **Next>**.



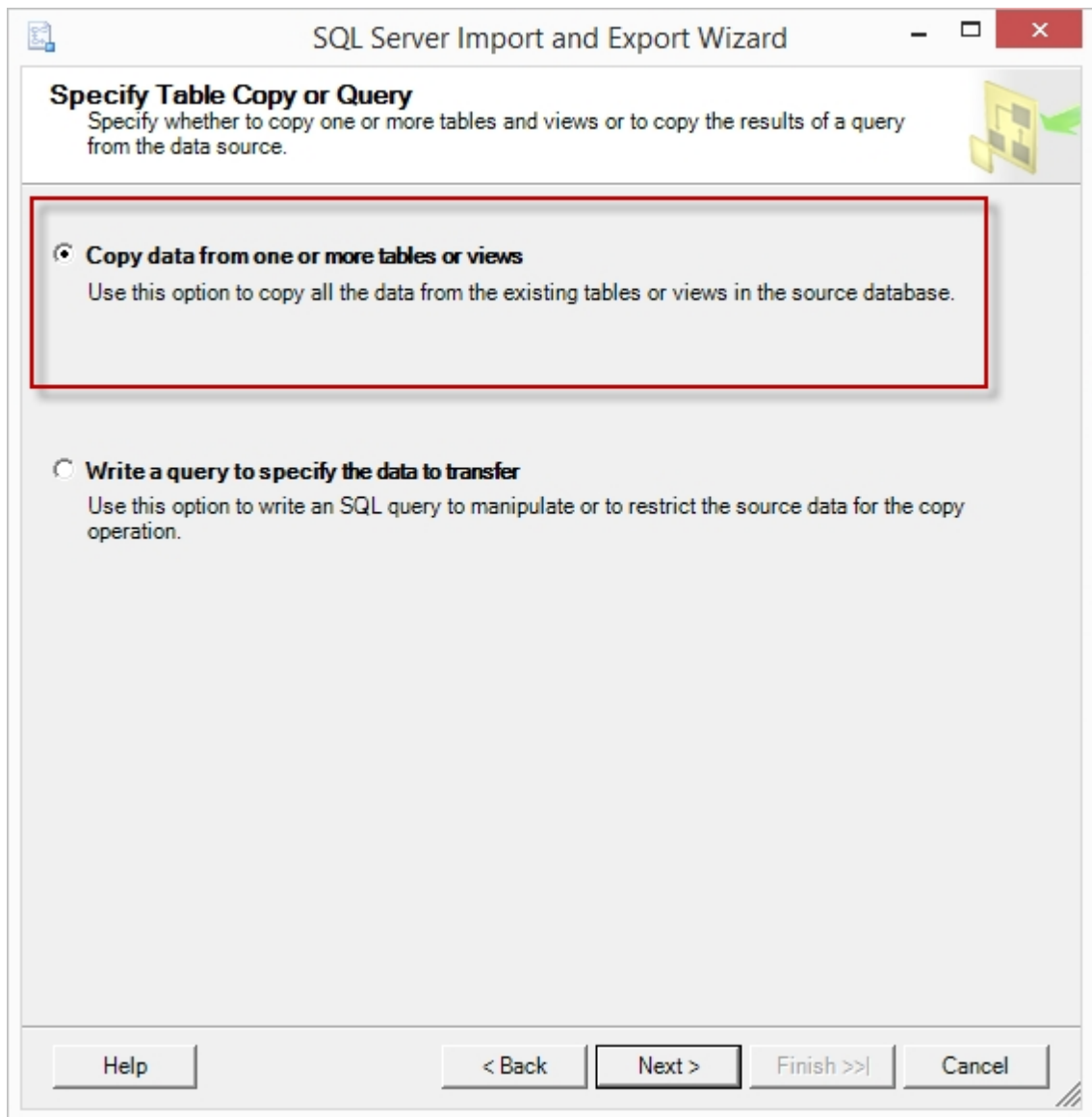
The screenshot shows the 'SQL Server Import and Export Wizard' window, specifically the 'Choose a Destination' step. The window title is 'SQL Server Import and Export Wizard'. The subtitle is 'Choose a Destination' with the instruction 'Specify where to copy data to.' The 'Destination' dropdown is set to 'SQL Server Native Client 11.0'. The 'Server name' dropdown is set to 'BOBS\SQLEXPRESS'. Under the 'Authentication' section, 'Use Windows Authentication' is selected. The 'Database' dropdown is set to 'MyNewSQCpackDb'. There are 'Refresh' and 'New...' buttons next to the database dropdown. At the bottom, there are 'Help', '< Back', 'Next >', 'Finish >>', and 'Cancel' buttons.

On the **Choose a Destination** page, ensure that Destination is set to "SQL Server Native Client" as shown above. Set the **Server name** field to the SQL Server that will host the multi-user database.

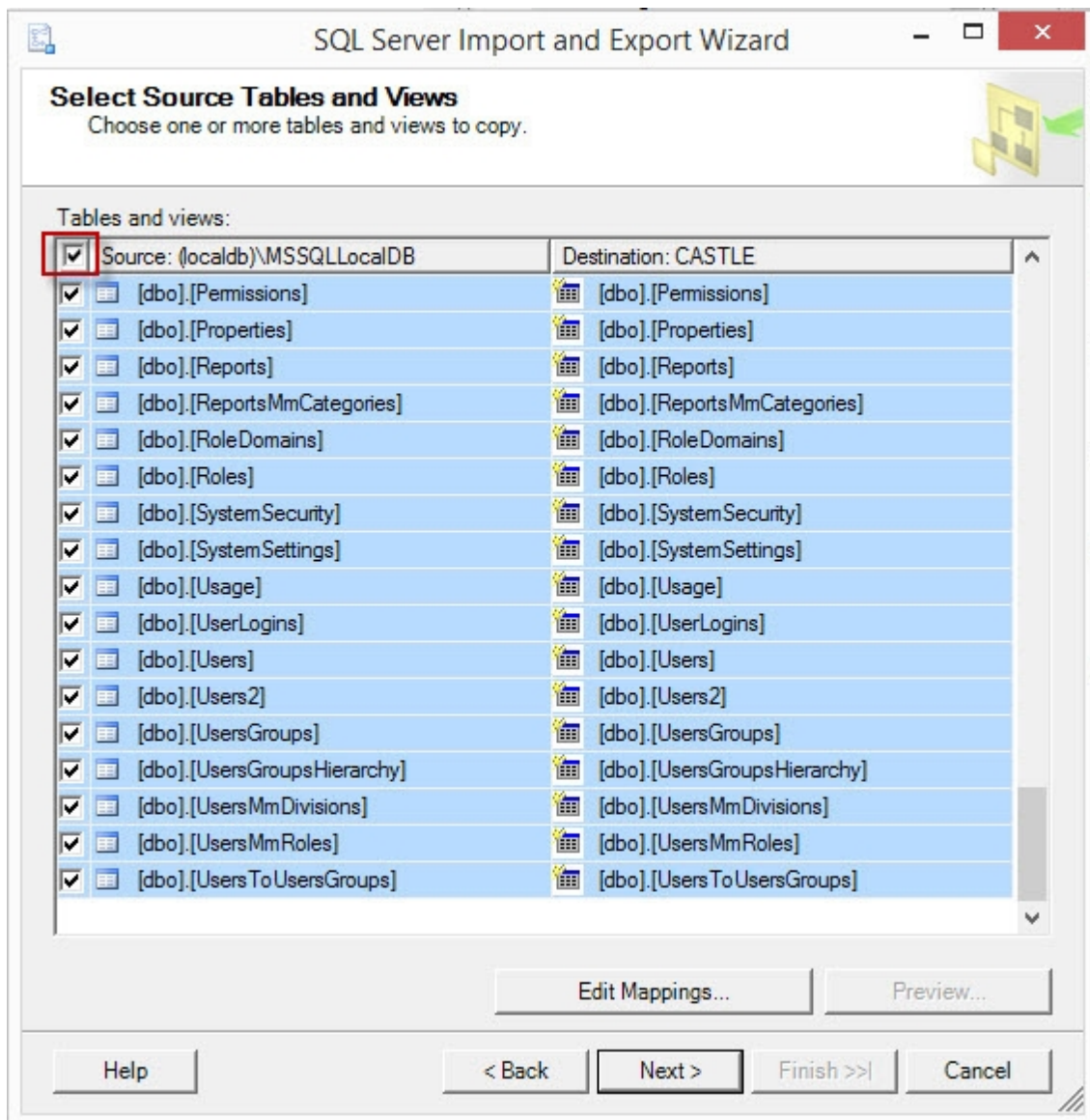
For the **Database** field, click the **New** button and create the new multi-user SQCpack database. The database is typically named **SQCpack**.

Do not select the name of an existing database that already contains tables.

Click **Next>**.



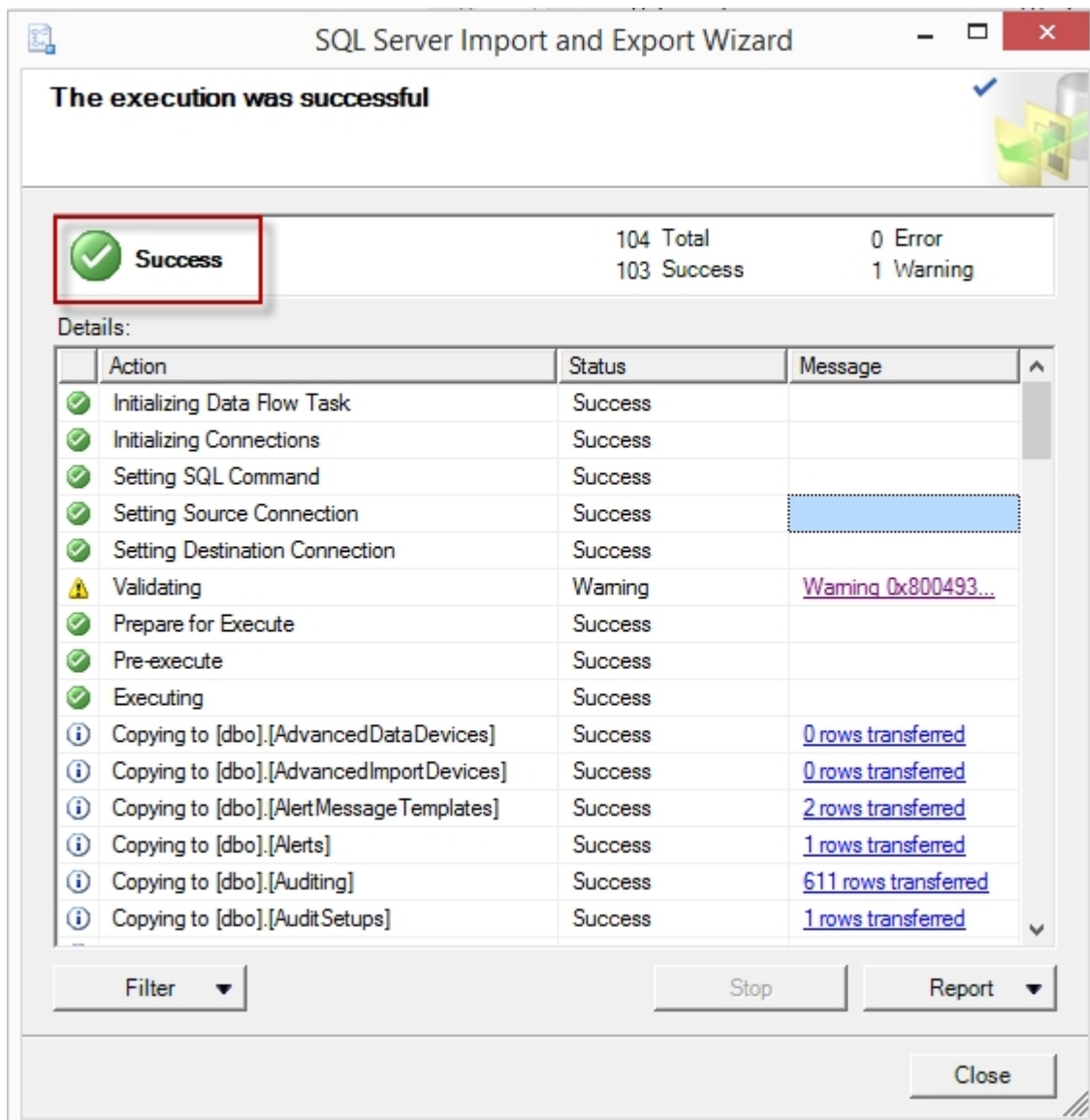
Select "Copy data ..." as shown above and click **Next>**.



Click in the checkbox shown in the red rectangle above to select all the source tables. There is no need to click on **Edit Mappings**. Click **Next>**.

Ensure Run immediately is selected, then click **Finish>>** and **Finish**.

A window shows the progress as tables and data are copied to the destination database.



You should end up with a window similar to the one shown above that shows **Success**.

The administrator of the destination SQL Server should [set up the recommended SQL Server security](#) and [establish a backup plan](#) for the new SQCpack multi-user database.

PQ recommends that users open the multi-user SQCpack database by [using a DBC file](#) that has been set up for this purpose. Put the DBC file on a network share or drive that all SQCpack users have access to. Instruct your SQCpack users to open the multi-user database via this DBC file.

Setup the [login, users, and user roles](#) as appropriate for your organization.

After these steps have been accomplished, you can let users open the multi-user SQCpack database.

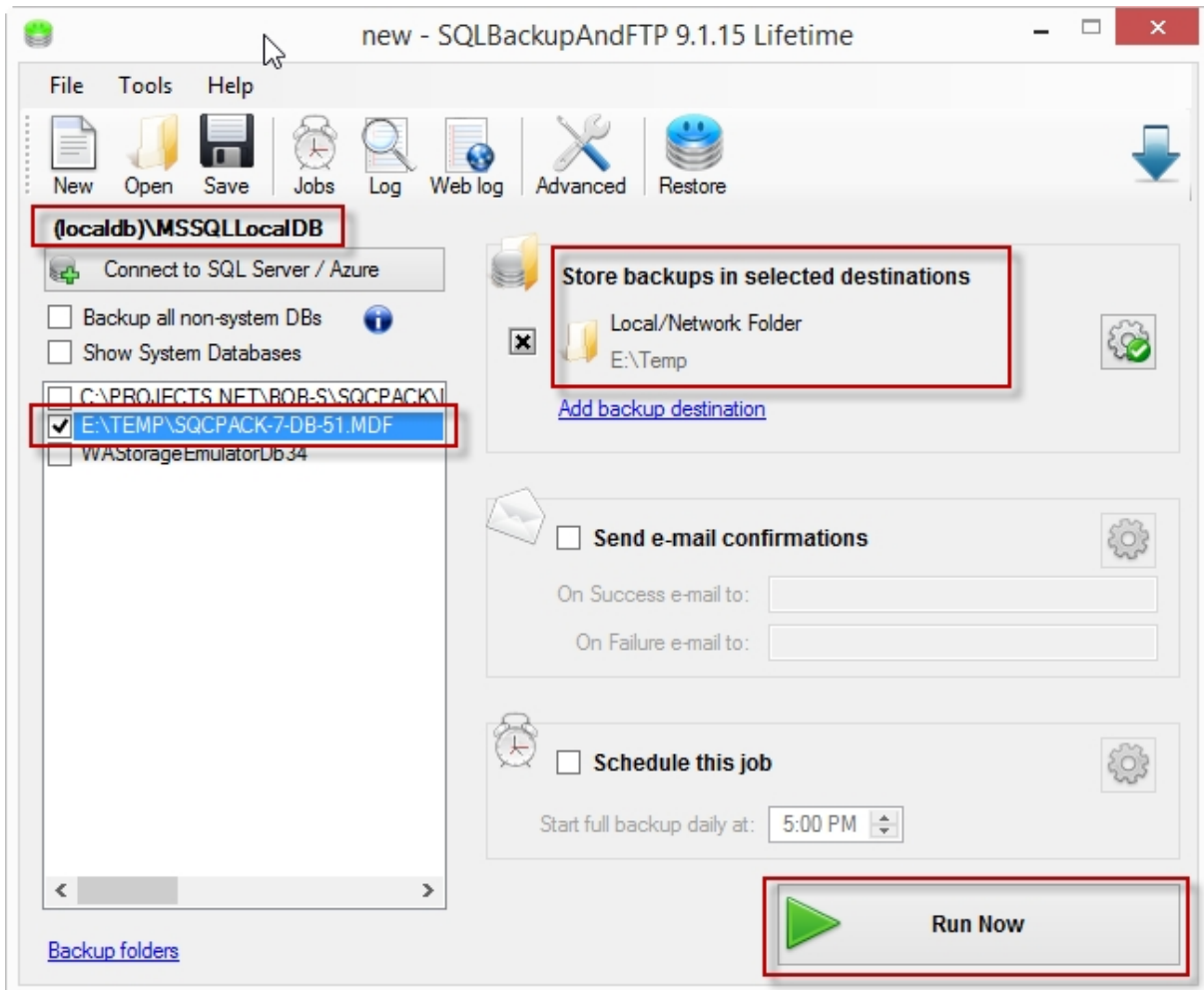
How to send a copy of a database to someone

Follow these steps to send a backup of your SQCpack database to someone, such as to [PQ Systems application support](#).

Backing-up and sending a single-user database

Download and install (on the local computer) [SQL Backup and FTP](#) if you have not already done so. Run the backup software and click the **Connect to SQL Server** button and connect to the LocalDB instance by

entering (localdb)\MSSQLLocalDB in the **Server Name** field. Select the single-user database you want to send, enter a backup destination, and then click **Run Now**. A zip file containing the database backup will be placed in the backup destination folder. Send that zip file.



Backing-up and sending a multi-user database

You will probably need to get your network administrators or IT department involved if they manage the SQL Server instance where the multi-user database is located.

Method 1 (preferred and the simplest) - Download and install [SQL Backup and FTP](#) on the database server if you have not already done so. Run the backup software and click the **Connect to SQL Server** button and connect to the SQL Server instance by entering the server name in the **Server Name** field. If SQL Server Express is installed on the local computer, and the instance name is SQLEXPRESS, you can enter **.\SQLEXPRESS** (that's period, then backslash, then instance name). Choose the appropriate type of authentication; you will need to connect as someone who has rights to perform a backup of the desired database (usually a database administrator). On the main screen, enter a backup destination and click **Run Now**. A zip file will be placed in the backup destination folder. Send that zip file. The recipient can use [SQL Backup and FTP](#) to restore the received zip file to a single-user or multi-user database.

Method 2 - Ask the database administrator to create a backup of the multi-user SQCpack database and give the backup file to you. Place the database backup file into a zip archive and send the zip file. The recipient can use SQL Server Management Studio (or [SQL Backup and FTP](#)) to restore the backup to a single-user or multi-user database.

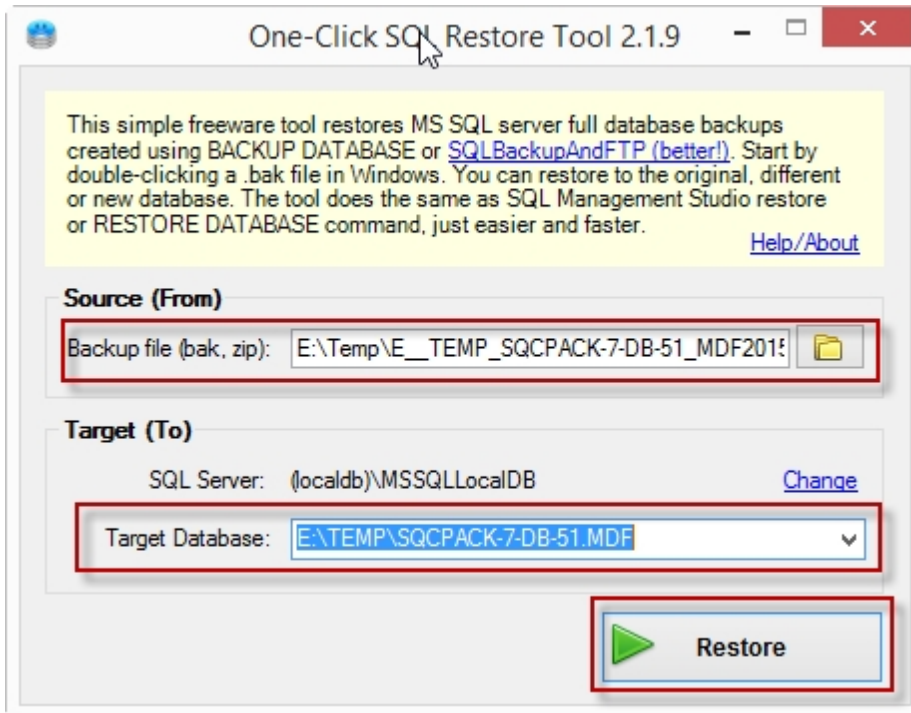
Restoring a database from a backup

The restore process puts the contents of the database backup into an existing single-user or multi-user database. If necessary, use SQCpack to create the destination database that will receive the contents of the backup.

Warning: The restore operation will delete the current contents of the destination database and insert the contents of the backup into the destination database.

The recipient can use [SQL Backup and FTP](#) to restore the received backup file to an existing single-user or multi-user database. Or, the recipient can use SQL Server Management Studio. For this example, it is assumed that [SQL Backup and FTP](#) is used.

Run [SQL Backup and FTP](#) and select **Tools > Restore**. This starts the **One-Click SQL Restore Tool** as shown below.



Select the backup ZIP or BAK file as the **Source**. Select the destination **SQL Server**. If the destination database is a multi-user database, the restore must be performed by someone with sufficient rights for the destination SQL Server.

Enter (localdb)\MSSQLLocalDB in the **SQL Server** field when the destination database is a single-user database.

Select the **Target Database** from the list.

Click the **Restore** button.

If the backup file is too large to send via email

If you need to send a backup file to [PQ Systems application support](#), and the file is too large to send as an email attachment, please [contact application support](#) for alternate ways to send the file.

How to rename or move a single-user database

A **single-user database** is actually a SQL Server Express LocalDB database. The database consists of two files (MDF and LDF) that live on the local computer.

Resist the urge to just rename and/or move the two database files. That's not a good idea and there is a good chance that something unexpected will happen.

In order to rename the single-user database files, or move the single-user database files to a new folder

location, follow these steps.

Use SQCpack to create a new single-user database with the desired name in the desired folder location.

Follow the [instructions here](#) to create a backup of the existing single-user database and restore the backup into the new single-user database.

Run SQCpack and open the new single-user database.

If all is well with the new single-user database, open the old single-user database in SQCpack, press **Ctrl-Shift-Alt-D** to dismount the old database from SQL Server. Then open the new single-user database in SQCpack.

You can now move or delete the old single-user database files.

How to control checking for a new version

By default, SQCpack periodically checks for a newer version of the software. If a newer version is available, a popup message appears in the system tray area. If the user clicks the popup message, a dialog with options to get more information about the new version or to install the new version appears.

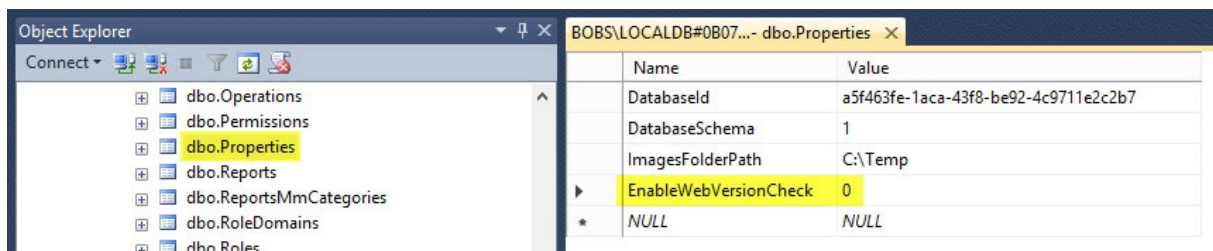
The IT department at your organization may not allow users to install new software. In this case the "check for new version" feature can be disabled as follows.

Property table in the SQCpack database

This is the simplest way to turn off newer version checking because you do it once at the database level and it affects all SQCpack users who use that database.

Using SQL Server Management Studio connect as a user with **db_owner** rights to the SQCpack database. See [Installing SQL Server Express](#) if you need to install SQL Server Management Studio. You need to install only the **management tools** to get SQL Server Management Studio.

Locate the SQCpack database, right-click on the **Properties** table, and **Edit** the table. If needed, add a row for a property named **EnableWebVersionCheck** and set the **Value** to **0** (i.e. zero), as shown below. If this property row doesn't exist, then SQCpack defaults to performing the new version check.



| Name | Value |
|-----------------------|--------------------------------------|
| DatabaseId | a5f463fe-1aca-43f8-be92-4c9711e2c2b7 |
| DatabaseSchema | 1 |
| ImagesFolderPath | C:\Temp |
| EnableWebVersionCheck | 0 |
| NULL | NULL |

Registry value on the local computer

Use this method when you want to turn off new version checking on a single computer.

Open RegEdit.exe and navigate to the key specified below:

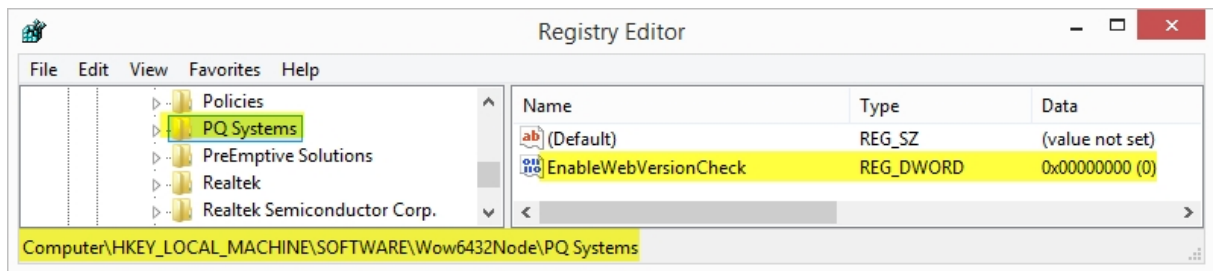
32-bit computer

HKEY_LOCAL_MACHINE\SOFTWARE\PQ Systems

64-bit computer

HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\PQ Systems

Create a DWORD value named **EnableWebVersionCheck** and set the value to **0** (i.e. zero) as shown below.



Why doesn't automatic chart refresh work on a computer?

Automatic refresh when data changes only applies to internal data charts, i.e. charts that are owned by a data group. This type of automatic chart refresh does not apply to external data charts.

You can set an internal chart's **Automatic refresh** mode (on the **General** edit panel) to **Refresh when data changes**. In this mode, whenever data is changed in the data group, the chart automatically refreshes to reflect the changed data.

When SQCpack starts, it begins listening for a UDP broadcast message at IP address **230.44.44.44** on port **4444**. Note that the IP address and port number can be changed - if you feel this is needed please contact [PQ Systems application support](#).

Every time a data group's data is changed, the SQCpack making the change sends a "data changed" broadcast message over the network announcing that data changed for a specific data group in a specific database.

When the "data changed" message is received by an SQCpack that is displaying a chart for that specific data group, the chart is automatically refreshed if it is set to **Refresh when data changes**.

If SQCpack on computer A sends the "data changed" message, and SQCpack on computer B doesn't automatically refresh the appropriate chart(s), here are some things to check.

Different network subnets

If computer A is on a different network subnet than computer B (ask your IT department about this), then it may be that UDP broadcast messages are not being passed between the subnets. By default, SQCpack sets TTL (Time to Live) to 128, which means that the UDP broadcast can cross up to 128 subnets. But your IT department may block UDP broadcasts between subnets.

Software firewall

Typically, a software firewall prevents unexpected inbound network traffic from reaching the protected computer. If computer B is running a software firewall it may be set to block the inbound "data changed" message sent by computer A from being received by SQCpack on computer B. You must set up the firewall to allow the SQCpack program to receive inbound network traffic.

How to install or update SQCpack on lots of computers

How to install or update SQCpack on lots of computers

When you need to install SQCpack on many computers, or install a newer version on many computers, you can use Group Policy to perform a mass update to many computers.

See [Installing SQCpack via Group Policy](#).

Appendix G: Keyboard Shortcuts

Ctrl+F1 - Open the Quick Start Guide.

F1 - Open user guide.

F5 - Refresh the current view.

Ctrl+D - If you are in a chart, this will toggle the chart editor.

Ctrl+Shift+L - Open the log file in notepad.

Ctrl+Shift+R - Resize the SQCpack window to be 80% of the screen and show the window on the main monitor.

Ctrl+Shift+F2 - Create a diagnostic zip archive on the Desktop.

Ctrl+Shift+F7 - In the folder specified under settings, create a "chart display" SQCX file for each selected chart in Charts Finder.

In data entry

Ctrl+D - Duplicate what is in the cell above.

Ctrl+Home - Open the first data page.

Ctrl+End - Open the last data page.

Ctrl+PgUp - Open the previous data page.

Ctrl+PgDn - Open the next data page.

Ctrl+G - Open the data page containing the specified Row Number. If possible, the data page will be centered on the specified Row Number. The specified Row Number will be the current row.

F6 - Make the currently active data entry cell become visible (for when you have scrolled away from it and want to return to it).