LISTEN.
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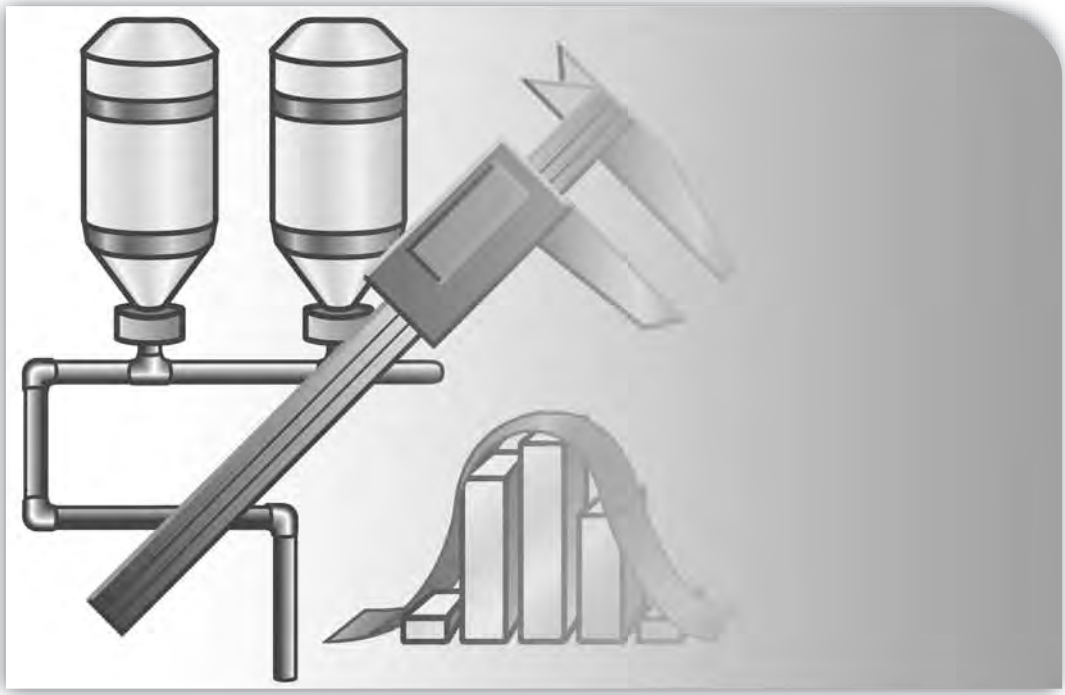
RSView®32



SPC GETTING RESULTS GUIDE

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ALLEN-BRADLEY • ROCKWELL SOFTWARE

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Chapter

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About RSView32 SPC

RSView32 SPC™ extends the functionality of RSView32™ with an integrated Statistical Process Control (SPC) solution that provides real-time SPC analysis. RSView32 SPC integrates into the RSView32 Project Manager window.

System requirements

RSView32 SPC requires **RSView32 version 7.60.00**. Recommended requirements for RSView32 SPC are based on the requirements for RSView32, but may require a faster processor or more RAM, depending on the size and complexity of your projects.

Recommended hardware. Personal computer with 200 MHz Intel® Pentium® processor and 64 MB of RAM. Individual applications may require a faster processor or more RAM.

Recommended operating system. Microsoft® Windows® Server 2003 R2 Standard Edition with Service Pack 2; Microsoft Windows XP Professional with Service Pack 1 or later; Microsoft Windows 2000 Server with Service Pack 4 or Windows 2000 Professional with Service Pack 4; Windows Vista Business with Service Pack 1 or later (32-Bit) or Windows Vista Home Basic with Service Pack 1 or later (32-Bit); Windows 7 Professional (32-Bit); and Windows Server 2008 Standard Edition Service Pack 2 (32-Bit) are supported.

Installing RSView32 SPC

The steps below explain how to install RSView32 SPC software from the RSView32 Extensions CD-ROM to your computer. Before installing RSView32 SPC, be sure that either RSView32 7.60.00 or RSView32 Active Display System is installed on the computer.

As part of the installation process, RSView32 SPC creates program folders and modifies registry entries in your computer's operating system. When installing RSView32 SPC, you must be logged in as a user with administrator rights to allow the installation program to modify the registries.

Installation steps

1. Close all open Windows programs.

2. Place the RSView32 Extensions CD-ROM in your CD-ROM drive. The

CD-ROM should start running automatically.

If the CD-ROM does not start automatically, run D:\START.EXE where D is the drive containing the CD-ROM.

3. The setup program lists the RSView32 add-on products available for installation. Click the button corresponding to RSView32 SPC. Follow the onscreen instructions.

4. In the Select Components window, select either **Full Install** or **Controls Only**.

- To install either the complete RSView32 SPC development and runtime system, select Full Install.
- To install the RSView32 SPC ActiveX controls with an RSView32 Active Display System client, select Controls Only.

5. After installation is complete, shut down and restart your computer before running RSView32.

Installing ActiveX controls on Active Display clients

RSView32 Active Display System™ is a client/server option that allows you to interact with your RSView32 applications remotely—across either a Local Area Network or the Internet. For information about installing and using RSView32 Active Display System, refer to the publication, "Getting Results with RSView32 Active Display System."

When running RSView32 Active Display System, ActiveX controls must be installed on the Active Display Station or client computer in order to show in graphic displays. Using .CAB files and Microsoft Internet Explorer, RSView32 Active Display System (version 7.60.00) can deploy ActiveX components to clients automatically when they need them.

All RSView32 Special Edition software components, such as RSView32 SPC, include the .CAB files that make automatic installation possible. You do not need to install the SPC ActiveX controls on every client computer, however, you must set certain options in Microsoft Internet Explorer on every client computer. For details, check the Rockwell Software Support Library, http://support.rockwellautomation.com/; refer to tech note A1403.

Configure Internet Explorer

The steps below apply to Microsoft Internet Explorer versions 4.x, 5.x and 6.x.

1. From the Windows Start menu, point to Start > Settings > Control Panel.

2. Double-click the Internet Options to open its properties.

3. On the General tab, click the Settings button.

4. Select the option: Every Visit to the Page. Click OK.

5. Click the Security tab.

6. If the client computer is on the same intranet as the Active Display Station, select Local Intranet Zone. If the Active Display Station is not local, select Trusted Sites Zone and add the server computer to the Sites list. (If you're using Internet Explorer 4.x, click the Reset button).

7. Open the Security Settings window:

- If you're using Internet Explorer 5.x or 6.x, click the Custom Level button.
- If you're using Internet Explorer 4.x, in the Internet Zone box, select Custom, and then click the Settings button.

8. In the Security Settings window, set the option Download Unsigned ActiveX Controls to either Prompt or Enable. Click OK.

9. Click OK to close the Internet Properties window.

TIP

Only RSView32 graphic files (.GFX) saved in RSView32 6.2 or later support the automatic installation of ActiveX .CAB files.

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Welcome to RSView32 SPC

RSView32 SPC extends the functionality of RSView32 with an integrated Statistical Process Control (SPC) solution that provides real-time SPC analysis. RSView32 SPC integrates directly into the RSView32 Project Manager window. From there you can configure project defaults, products, the individual characteristics that collect measurable data about the product, and schedule archive operations.

The runtime operator interface to SPC functionality is through ActiveX controls that you insert in standard RSView32 graphic displays.

RSView32 SPC consists of these parts:

SPC Project Setup and Products editors for configuring SPC project-level defaults, products, and individual variable characteristics.

SPC Archives editor for creating and editing archive files and scheduling archive operations.

SPC ActiveX controls for configuring the runtime operator interface. SPC ActiveX controls include: SPC Chart control, SPC Event Summary control, and SPC Product Activate control.

RSView32 SPC commands, for executing SPC-related functions in RSView32.

SPC runtime database, a Microsoft Access™ database created automatically as part of an RSView32 project.

SPC archive database, a Microsoft Access or SQL Server™ database that you specify as part of configuring an archive file.

What is Statistical Process Control?

SPC provides statistical methods for analyzing and controlling the variation of a process. Controlling a process is essential for producing quality products. Implementing SPC in industrial processes involves collecting data, or **samples**, from the process. Groups of samples, called **subgroups**, are analyzed using standard statistical methods.

Characteristics are dimensions or parameters of a part that can be measured and monitored for control and capability. Characteristics can be attribute data (data that is counted or classified) or variable data (data that is measured). RSView32 SPC currently supports variable data.

From the subgroup data for each characteristic, RSView32 SPC calculates:

- Cpk — an index of process capability
- mean — the statistical average
- range — the difference between the highest and lowest measurements
- sigma — the standard deviation of the data
- UCL and LCL — upper and lower control limits
- X-bar — the arithmetic average of the sample values within a subgroup

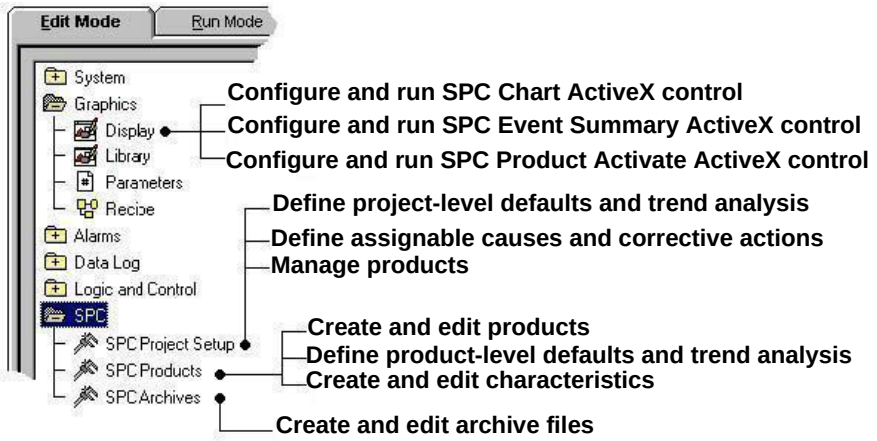
RSView32 SPC compares calculations to configured control limits and evaluates the results for statistical **trends**, such as an upward pattern in a number of consecutive subgroups. When subgroup data indicate a trend pattern, an **SPC event** occurs, logs to the SPC runtime database, and appears on the runtime event summary and on control charts. Real-time SPC trend analysis helps track the uniformity of your products and can alert you to deviations while your process is still in control, reducing scrap and increasing your production efficiency.

SPC **alarms** are based on thresholds, such as engineering specifications and upper and lower control limits, configured as part of each variable characteristic. When subgroup data indicates that configured limits have been crossed, an **SPC event** occurs, logs to the SPC runtime database, and appears on the runtime event summary.

During runtime, operators can monitor SPC events using SPC Chart and SPC Event Summary ActiveX controls embedded in RSView32 graphic displays. Operators can attach **assignable cause** and **corrective action** entries to subgroups to identify the reasons that caused SPC events and the actions that corrected the problems in the process. Using Pareto charts, you can look for patterns and set priorities for correcting the most significant and most frequent problems in the process.

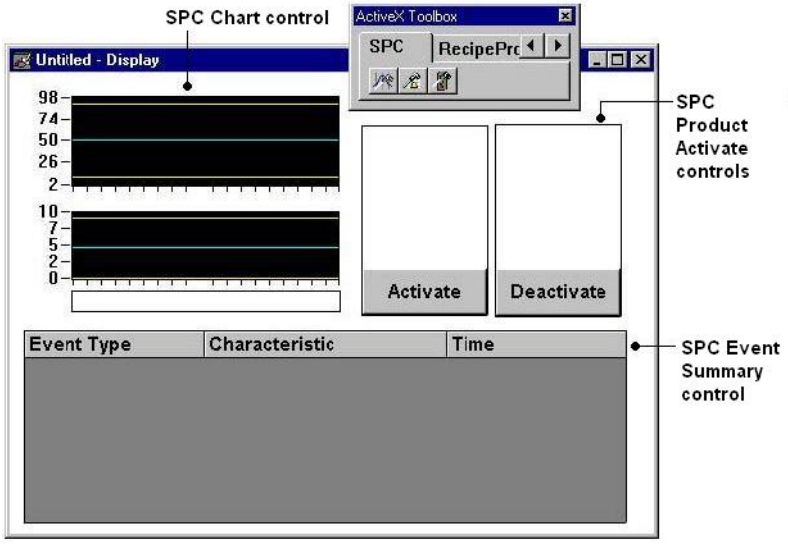
Exploring RSView32 SPC

RSView32 SPC integrates into the RSView32 Project Manager.



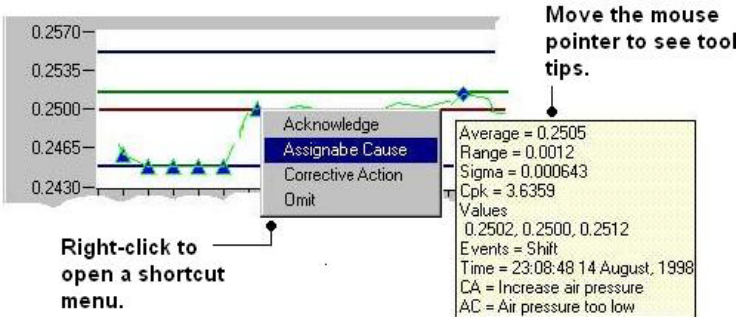
RSView32 SPC ActiveX controls

RSView32 SPC includes three separate ActiveX controls that you insert into RSView32 graphic displays.



SPC Chart control

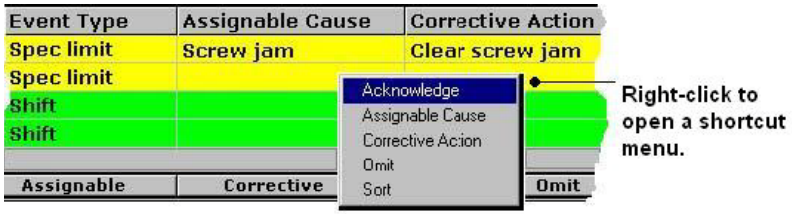
During runtime, the SPC Chart control graphically displays real-time or historical SPC information for a selected product's characteristic.



SPC Event Summary control

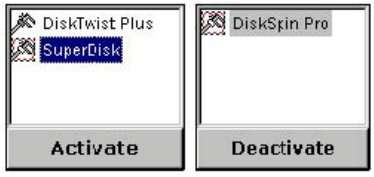
During runtime, the SPC Event Summary control displays real-time and historical SPC event information. Configurable filter settings determine which

SPC events appear in the control's display.



SPC Product Activate control

During runtime, the SPC Product Activate control allows operators to dynamically activate and deactivate SPC products. When a product is activated, RSView32 SPC collects and logs data from the product's enabled characteristics.



RSView32 SPC editors

RSView32 SPC includes three separate editors that integrate into the RSView32 Project Manager.

SPC Project Setup editor

Use the SPC Project Setup editor to:

- define project-wide defaults for subgroup size and SPC trend analysis settings. You can override these defaults for individual variable characteristics.
- set up assignable causes and corrective actions for the SPC project and group them into categories. As part of configuring a variable characteristic, you can assign an individual category to narrow the list of assignable causes and corrective actions that an operator can select from during runtime.

- create, edit, rename, duplicate, or delete SPC products; toggle a product's availability for SPC data collection; and reduce the size of the SPC runtime database after purging data or after deleting a product or variable characteristic.

SPC Products editor

Use the SPC Products editor to:

- identify which SPC events to send to the RSView32 Activity Log. You can also attach an RSView32 command, macro, or VBA code to certain SPC events.
- define product-level trend analysis settings. Use these default settings with any of the product's variable characteristics. SPC trend analysis indicates a possible problem in the process by showing certain patterns in subgroup results.
- configure the SPC system to capture data from an RSView32 tag; associate it with an SPC item such as all subgroups, a sample piece, assignable causes, corrective actions, or acknowledged or omitted flags; and log the information to the SPC runtime database for later analysis.
- Create, edit, rename, duplicate, and delete variable characteristics for a product.

SPC Archives editor

Use the SPC Archives editor to:

- configure how the SPC archive system handles data from the SPC runtime database. Choose any combination of archiving and purging, only purging, and compacting.
- schedule how often the SPC archive process should run. Base triggers on a periodic schedule, on events, or on both.
- determine which data should be archived and/or purged from the SPC runtime database each time an archive process starts. Base archiving and purging on either a specified time span backward from the current date or on a specified number of subgroups per variable characteristic.
- specify a destination and format for the archived data and select an archive database.

RSView32 SPC commands

Installing RSView32 SPC adds several SPC-related commands to RSView32. For details and syntax information, refer to RSView32 SPC online help.

- SPCCtlLimCalc. Calculates SPC control limits.
- SPCActivateProduct. Activates SPC products.
- SPCDeactivateProduct. Deactivates SPC products.
- SPCProductAvailable. Makes a product available or unavailable for SPC data collection.
- SPCEnableChar. Enables an SPC variable characteristic.
- SPCDisableChar. Disables an SPC variable characteristic.
- SPCArchiveOn. Activates an SPC archive file.
- SPCArchiveOff. Deactivates an SPC archive file.
- SPCCompactDatabase. Compacts records in the runtime database and reduces its file size.

Quick Start steps

The following steps guide you through configuring and running a simple SPC project.

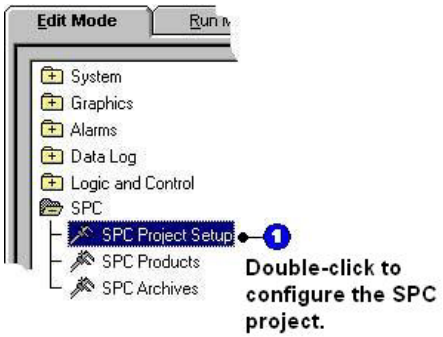
> **TIP** For details and more information as you work through these steps,click the Help button on any tab.

Step 1 ▪ Set up defaults for your SPC project

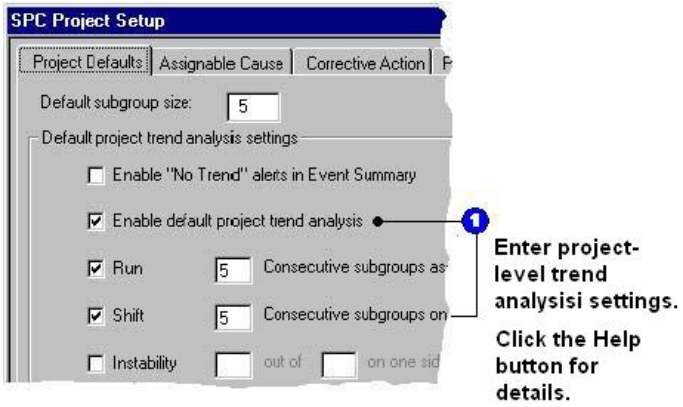
You do not create, name, or delete SPC projects. An SPC project file and an SPC runtime database are created automatically as part of an RSView32 project. An SPC project provides the means for defining default settings that apply to all of the products and characteristics that make up your SPC application.

1. Start RSView32 and create a new project.

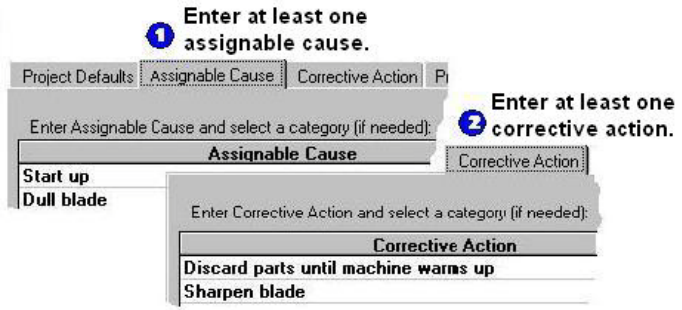
2. From the RSView32 Project Manager, create the **SPC Project Setup** editor.



3. On the **Project Defaults** tab, enter default trend analysis settings. SPC trends indicate potential process problems by showing patterns in subgroup results.(Later, we'll assign these project-level settings to a variable characteristic.)



4. On the **Assignable Cause** and **Corrective Action** tabs, enter at least one assignable cause and at least one corresponding corrective action. (Categories are optional.) During runtime, operators can attach an assignable cause to a subgroup to identify a reason for a particular SPC event. Likewise, operators can attach a corrective action to a subgroup to identify an action performed to correct a particular SPC event.



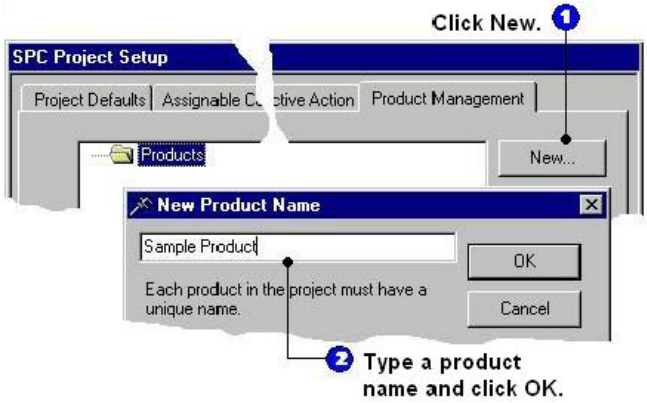
5. Click the **Product Management** tab.

From here you can create, edit, duplicate, rename, and delete products. You can also make a product available or unavailable for SPC data collection and reduce the runtime database size after purging and after deleting a product or a characteristic.

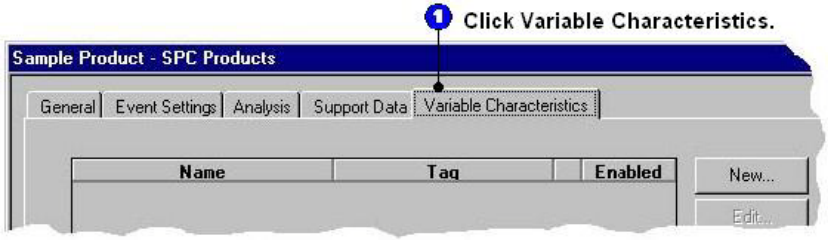
Step 2 ▪ Create a new product

An SPC project can include any number of individual products; up to 20 products can be activated at one time. A product can be any type of good that you manufacture. For example, products might include bicycle seats, garden hoses, potato chips, replacement parts for oil wells, or aluminum cans. Each product contains a unique collection of SPC characteristics that measure individual parts of the process.

1. On the **Product Management** tab, create a new SPC product.



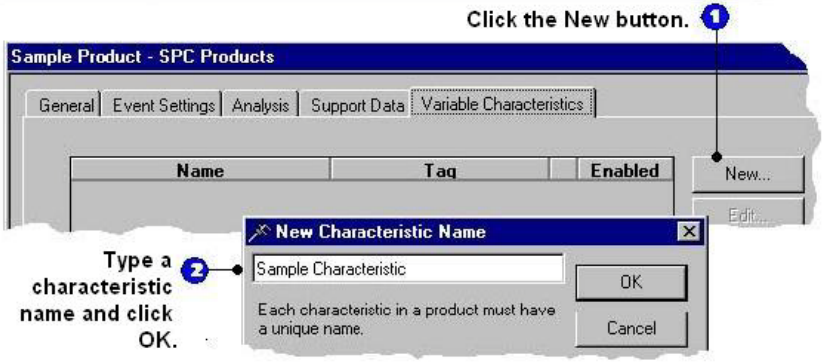
2. To get started quickly, leave all of the product-level default settings unchanged. Click the Variable Characteristics tab.



Step 3 ▪ Create a new variable characteristic

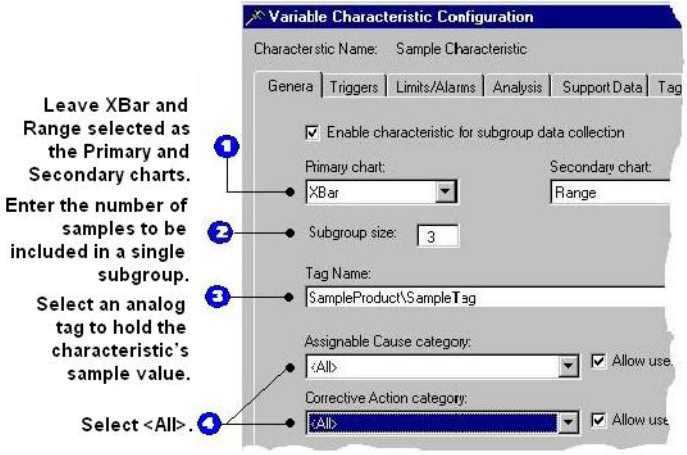
A variable characteristic is a dimension or a parameter of a part that can be measured and monitored for control and capability. Each SPC variable characteristic, which is used to gather data, is a member of a single product.Variable characteristics cannot be shared among products. For example, if you produce bicycle seats, you might want to measure the thickness of the metal underplate, the length and width of the vinyl covering, the position of the screw holes, and the diameter of the screw hole openings. Configure each of those measurements as a separate variable characteristic.

1. On the **Variable Characteristics** tab, create a new characteristic.

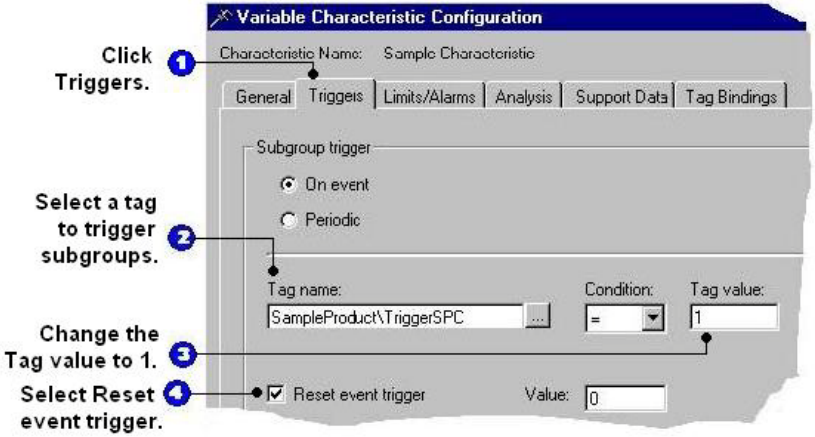


2. On the **General** tab:

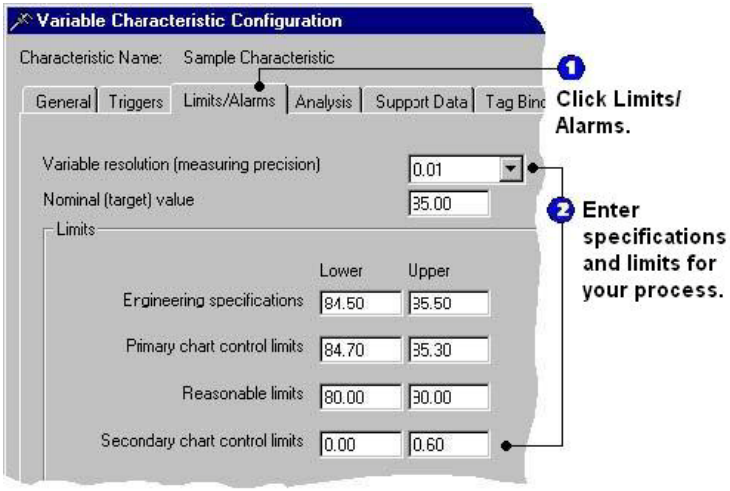
- leave the Primary and Secondary charts set to X-bar and Range (the control charts you select determine the formulas used to calculate control limits for the characteristic)
- enter a subgroup size to identify the number of samples — individual pieces or measurements — to be collected together for analysis
- select an analog tag (or use an existing tag) to hold the characteristic's sample value (later, we'll link the tag to a numeric input field; you could use a tag attached to an address inside a PLC instead)
- select <All> in the Assignable Cause and Corrective Action category boxes



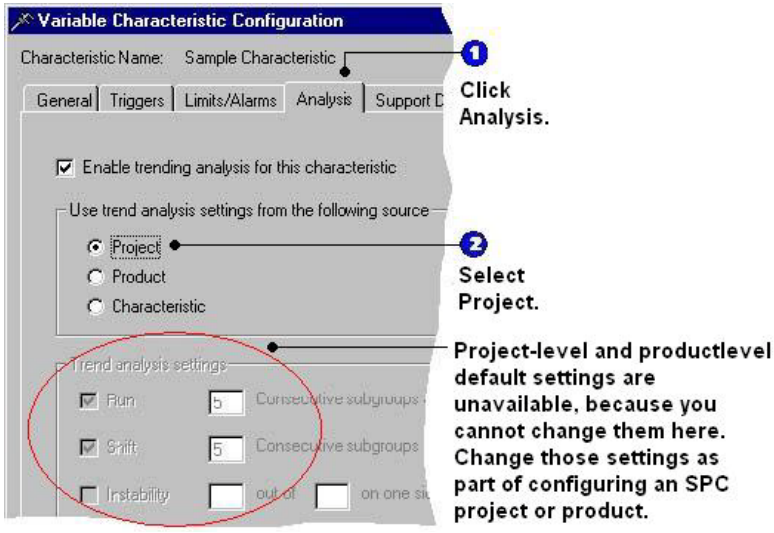
3. On the **Triggers** tab, select a tag to trigger SPC sampling. (Later, we'll link this tag to a button. You can create a new tag, select an existing tag, or use a tag attached to an address inside the PLC.)



4. On the **Limits/Alarms** tab, enter the engineering specifications, reasonable limits, and primary and secondary control limits for your process.



5. On the **Analysis** tab, identify project default settings as the source for SPC trend analysis. (We configured these project-level settings in step 1-3.)

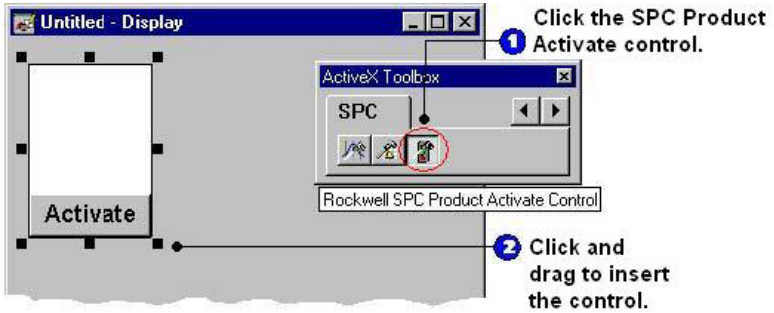


6. Click **OK** and close all of the SPC editors.

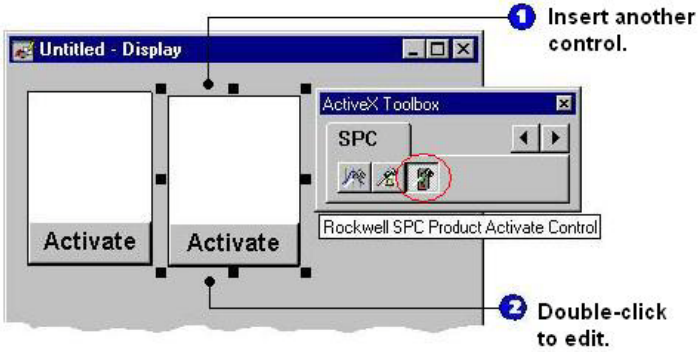
Step 4 ▪ Set up manual product activation

When a product is activated, the SPC server collects and logs SPC data for all of the product's enabled characteristics. When a product is deactivated, data is not collected or logged for any of the product's enabled characteristics. To allow activating and deactivating SPC products during runtime, configure the SPC Product Activate ActiveX control.

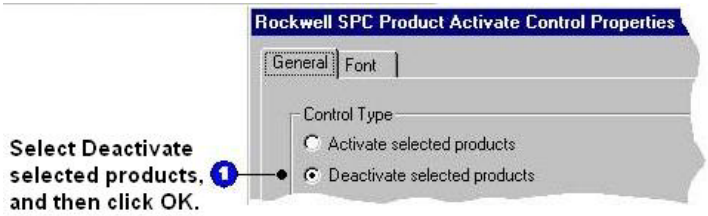
1. On a new graphic display, insert the Rockwell Software SPC Product Activate control. Leave the default property settings unchanged.



2. On the same display, insert another SPC Product Activate control and open its properties.



3. Configure the control to deactivate selected products.

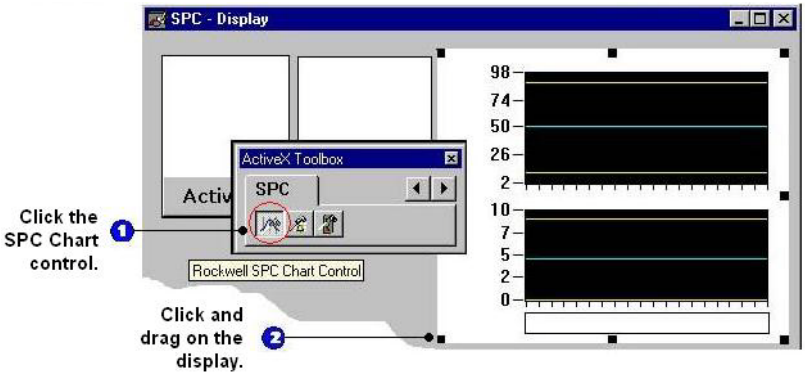


4. Save the graphic display and name it SPC. Leave it open on your screen.

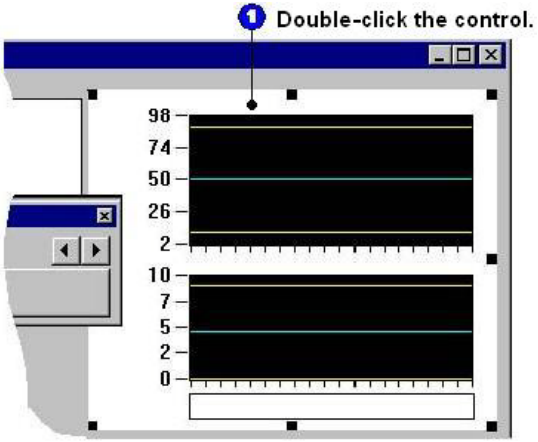
Step 5 ▪ Configure an SPC control chart

SPC Chart is an ActiveX control that you embed inside an RSView32 graphic display. During runtime, the control displays real-time and historical SPC information for a selected characteristic. For this quick start example, we'll configure an X-bar & R control chart for the characteristic.

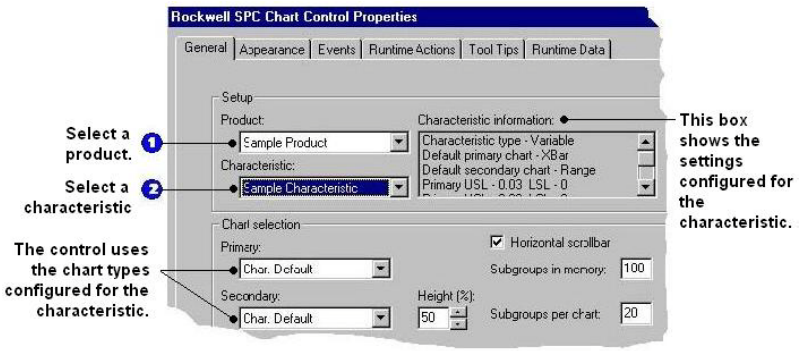
1. On the SPC graphic display you created, insert the Rockwell Software SPC Chart control.



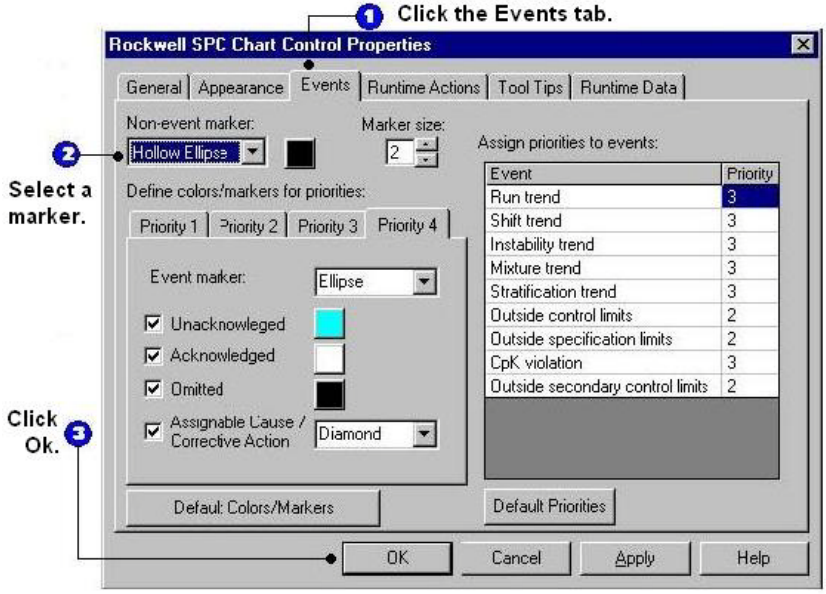
2. Edit the SPC Chart control properties.



3. On the **General** tab, select a product and a characteristic.



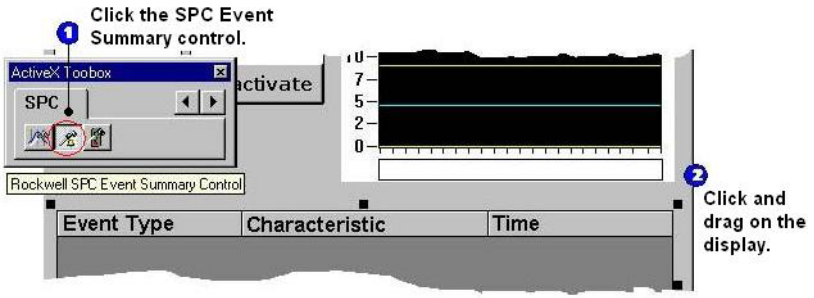
4. On the **Events** tab, select a marker to represent subgroups without associated SPC events on the runtime chart.



5. Save the graphic display and leave it open on your screen.

Step 6 ▪ Configure an SPC event summary

1. On the SPC graphic display you created, insert the Rockwell Software SPC Event Summary control.

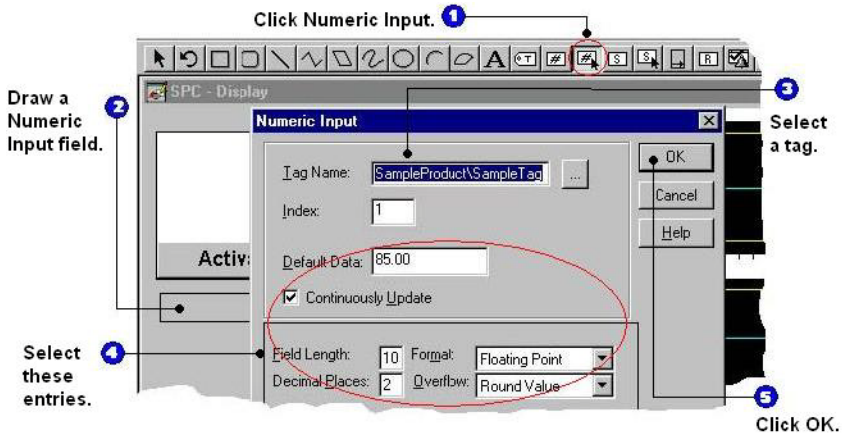


2. To get started quickly, leave the default settings unchanged. Editing the event summary properties is optional.

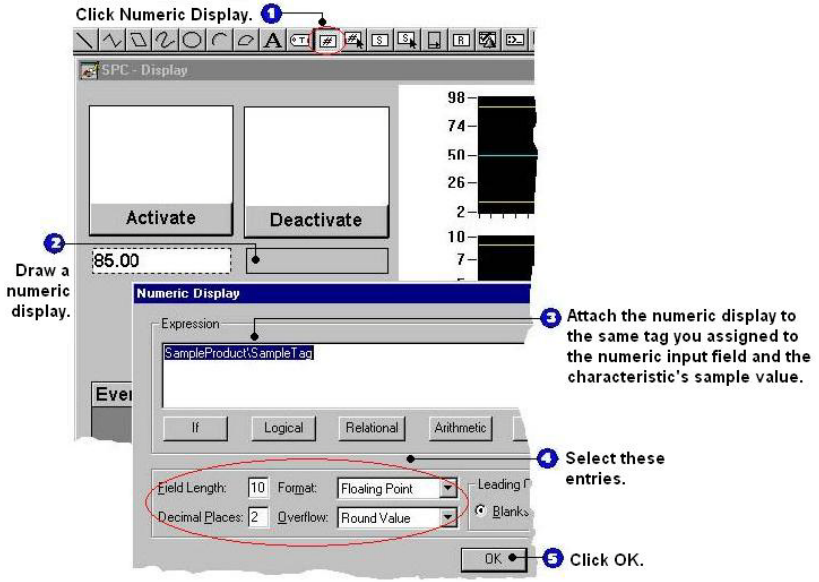
3. Save the graphic display. Leave it open on your screen.

Step 7 ▪ Monitor SPC runtime data

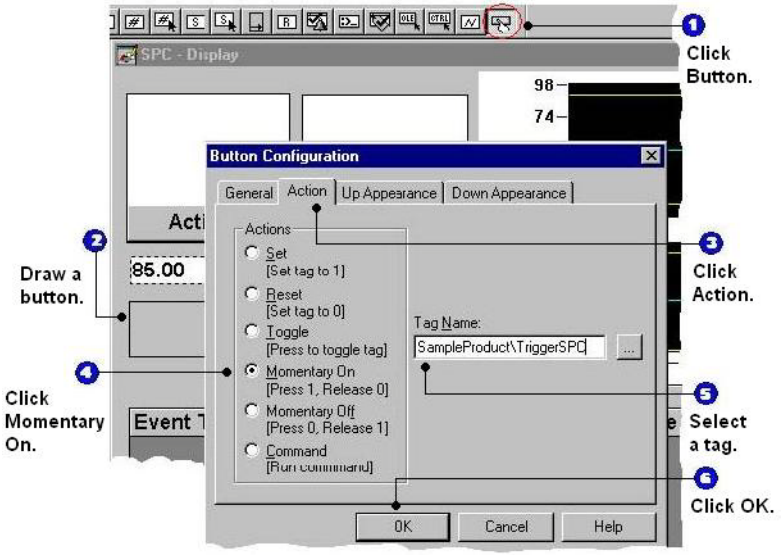
1. On the SPC graphic display you created, add a numeric input field and attach it to the tag that you assigned to the characteristic's sample value.



2. Add a numeric display attached to the same tag as the numeric input field.

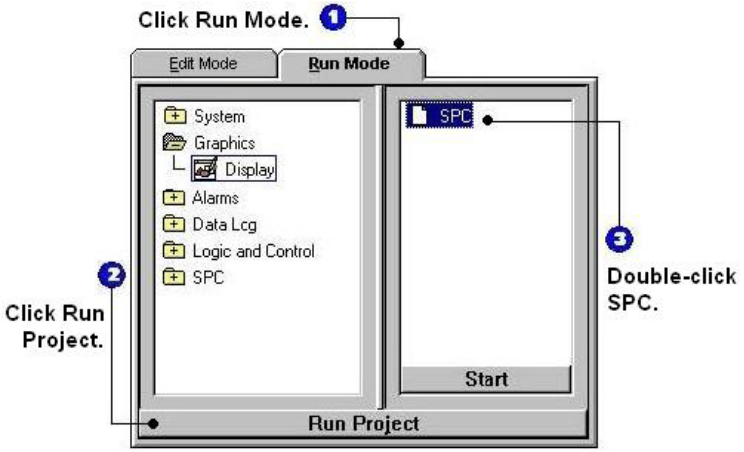


3. Add a push button to trigger SPC sampling. On the **Action** tab, attach the button to the same tag that you attached to the SPC trigger in Step 3-3.

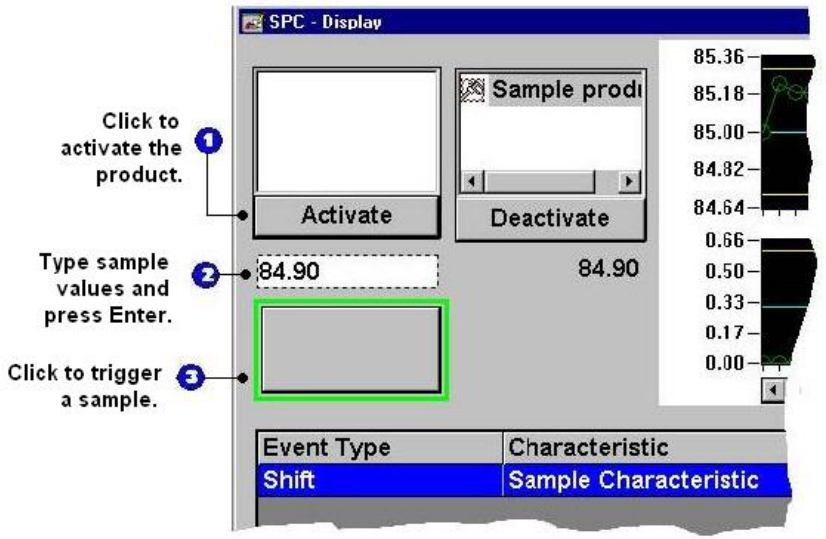


4. Save and close the graphic display.

5. Run the project you just created, and open the SPC graphic display.



6. Activate your new product. Use the numeric entry field to change the value of the characteristic. Trigger SPC sampling by clicking the push button. Each click triggers an individual sample. If the characteristic is configured with a subgroup size of 3, then a subgroup marker appears on the chart after you trigger three samples.



7. Trigger subgroups and experiment with your project.

For example, on the event summary, right-click an SPC event. Move the mouse over areas of the control chart and watch the tool tips. Right-click a subgroup on the chart.

8. Stop running your project. From the Project Manager, click the Edit Mode tab.

TIP The fastest sample rate is 10 seconds. As you click the push button to trigger SPC samples, keep in mind that you cannot create a new subgroup any faster than every 10 seconds.

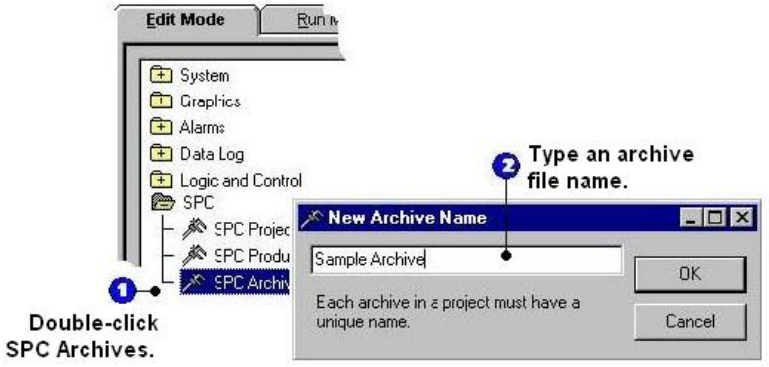
Step 8 ▪ Configure an SPC archive file

Use the SPC Archives editor to create or edit an SPC archive file, define whether to archive and/or purge SPC data, specify when the archive process should run, select which data should be archived and/or purged, and select a destination database for storing archived data.

To keep your projects running smoothly, we recommend:

- keeping the SPC runtime database no larger than 300 MB.
- running archive operations frequently; the smaller the amount of data to be archived, purged, and compacted, the faster the process will run
- running archive operations during off hours

1. From the RSView32 Project Manager, open the **SPC Archives** editor.



2. On the **Management** tab, leave the Archive Operations set to Archive and Purge.

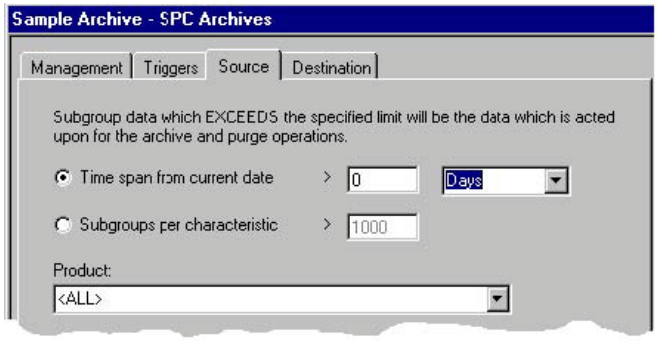
Purging deletes data from the SPC runtime database. To reduce the database size, either select the Compact check box or run the SPCCompactDatabase command.

Depending on the size of the runtime database and the amount of data to be deleted, the compact operation can take a significant amount of time to complete. You may want to schedule compact operations to run during off hours.

When you configure archive files for your production environment, we recommend that you archive and/or purge data and compact the runtime database frequently. The smaller the runtime database, the faster archive operations will run. For best results, keep your runtime database no larger than 300 MB.

3. So that you can see the archive process start within the next few minutes, on the **Triggers** tab, change the Time of Day setting to 10 minutes later than the current time. For example, if the current time is 1:12 p.m., enter 13 in the Hours box and 22 in the Minutes box.

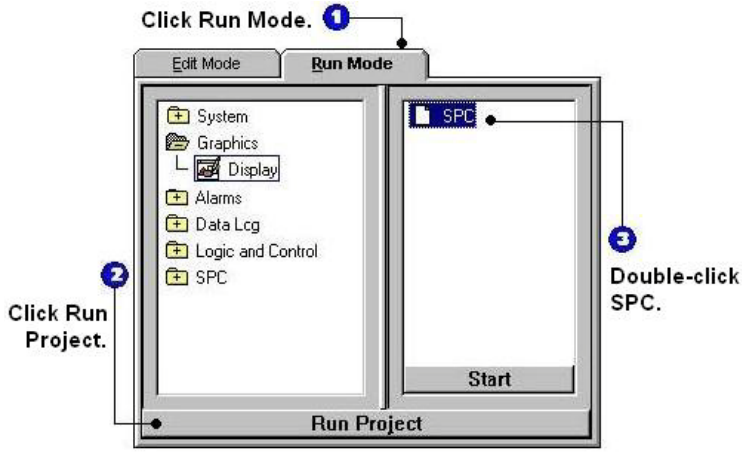
4. On the **Source** tab, select Time span from current date. For this demonstration, select 0 days.



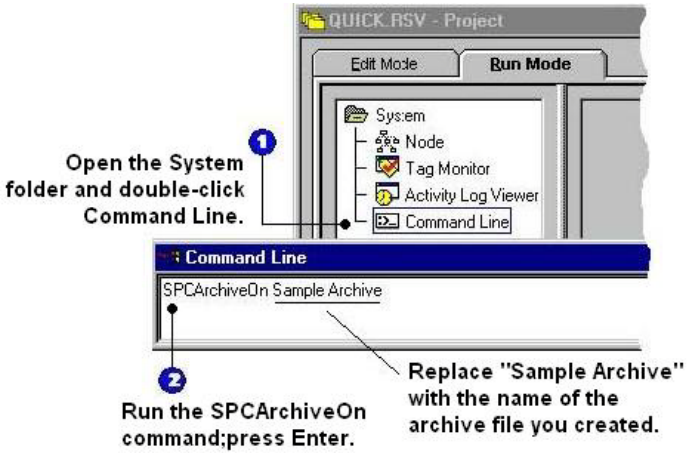
5. On the Destination tab, leave the default database settings. Click OK.

When the archive process begins, RSView32 SPC automatically creates an archive database based on Microsoft Access format (if one does not already exist) and creates the necessary tables and fields to store the archived data.

6. Run your sample project.



7. Run the **SPCArchiveOn** command to activate your new SPC archive file.



8. Make sure your sample project is activated and running. Trigger subgroups and experiment with your project while you wait for the SPC archive process to begin.

Because your sample project contains very few subgroups, the archive operation runs very quickly. When the subgroups you have generated suddenly disappear from the chart, it means that the archive process has copied the data to an archive file and purged the data from the runtime database.

Chapter

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Using RSView32 SPC online help

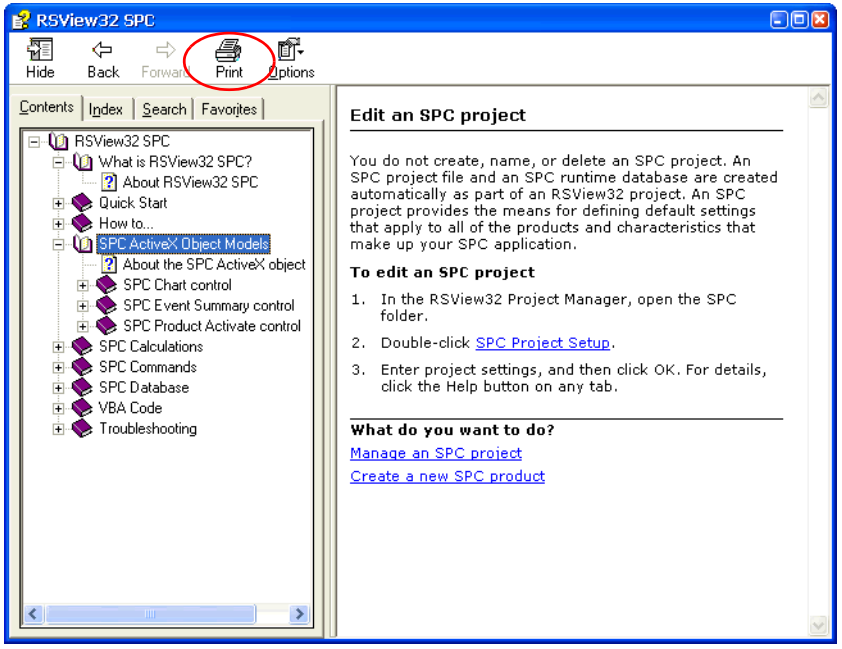
RSView32 SPC online help provides overviews, reference information, and step- by-step procedures for working with all of the features in RSView32 SPC. To open online help while running RSView32 you can:

- click the Help button on any window
- on the RSView32 menu bar, click Help> Contents.

Viewing and printing the help contents

For an overview of the RSView32 SPC help, click the Contents tab, and then double-click the RSView32 SPC book..

To print a group of help topics, select a book from the Contents tab, and then click the Print icon. All of the individual topics contained in that book will print.



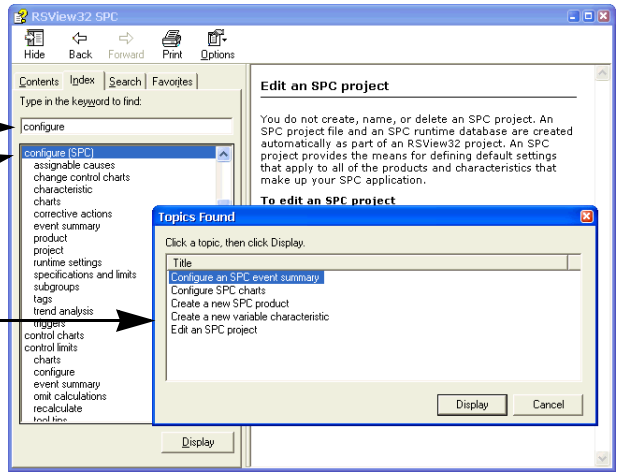
Using the index

The help index is similar to an index in a book, listing keywords for topics in the help. To see the index, click the Index tab.

As you type a word here, index entries are listed below.

To see a topic, double-click it here, or select the topic and click Display.

If the index entry refers to more than one topic, the Topics Found box opens. Double-click a topic, or select a topic and click Display



Finding RSView32 SPC version information

To find the RSView32 SPC version number and serial numbers, click Help>About RSView32 and click the Add-ons button. Select RSView32 SPC, and then click the Details button.

Using the RSView32 SPC sample project and utilities

Installing RSView32 SPC also installs a sample project and utilities that you can use to customize your own applications.

Running the RSView32 SPC Sample project

To see SPC data in action, and to get ideas for building your own SPC application in RSView32, tour the RSView32 SPC Sample project. From the Start menu, select Programs > Rockwell Software > RSView32 SPC > RSView32 SPC Sample Project, or in the directory where you installed RSView32 SPC, look for SPC Sample.rsv.

Working with the SPC Reporting Utility

The SPC Reporting Utility allows you to quickly generate simple reports from the SPC runtime database and from archive databases. The SPC Reporting Utility also serves as a starting point for creating your own customized reporting utility using Microsoft Visual Basic 6.0. All of the source code used to build the SPC Reporting Utility is available for you to learn from and expand upon.

To run the SPC Reporting Utility program, search for this file in the directory where you installed RSView32 SPC: SpcReport.exe. To work with the SPC Reporting Utility source code, search for this file: SPC Report.vbp. The source code requires Microsoft Visual Basic 6.0.

TIP	To quickly search for a file, from the Windows Start menu, select Find > Files or folders.

For more information

About RSView32

For information about RSView32, refer to the following publications.

Getting Results with RSView32 Rockwell Software Publication ID: VW32-GR001E-EN-E	RSView32 User's Guide Rockwell Software Publication ID: VW32-UM001E-EN-E
Getting Results with RSView32 Active Display system Rockwell Software Publication ID: VW32AD-GR001D-EN-E	Also available on the RSView32 installation CD-ROM and from the Programs>Rockwell Software>RSView32 menu.

About statistical process control

Many technical books about statistical process control are available from many different authors and publishers. The titles below offer a place to get started.

DataMyte Handbook, A practical guide to computerized data collection for Statistical Process Control DataMyte Business Rockwell Automation / Allen-Bradley 612-935-0018	Measuring Process Capability: Techniques and Calculations for Quality and Manufacturing Engineers Bothe, Davis R. (April 1997) McGraw Hill Text
Statistical Process Control and Beyond Clements, Richard R. 1st edition (Jan 1988) Krieger Publishing Company	Statistical Process Control Doty, Leonard A., 2nd edition (July 1996) Industrial Press
Statistical Methods for Industrial Process Control Drain, David C., (Jan 1997) Chapman & Hall	Statistical Process Control for Quality Improvement: A Training Guide to Learning SPC Evans, James L., February 1991 Prentice Hall
Introduction to Statistical Quality Control Montgomery, Douglas C. 3rd edition (August 1996) John Wiley & Sons	Statistical Process Control Oakland, John S., 3rd edition (Sept 1996) Butterworth-Heinemann
Statistical Process Control: Theory & Practice Wetherill, Barrie G.; Brown, Don W. 1st edition (March 1991) Chapman & Hall	Process Control and Quality Improvement Smith, Gerald M., 3rd edition (Aug 1997) Prentice Hall Press

Understanding Statistical Process Control

Wheeler, Donald J., Chambers, David S.

2nd edition (June 1992)

SPC PRESS (Statistical Process Control)

Technical support

If you have a question about RSView32 SPC, please consult this guide or the RSView32 SPC online help. Or, click Help>Rockwell Software on the Web, and select a home page to view. To use Rockwell Software on the Web, you must have a web browser installed on your computer and a current Internet connection.

If you cannot find the answer, call Rockwell Software Technical Support:440-646-3434.

When you call, you should be at a computer running RSView32 SPC and prepared to give the following information:

- product serial number on the Master disk labels
- product version number
- hardware you are using
- exact wording of any messages that appeared on the screen
- description of what happened when the problem occurred
- how you tried to solve the problem

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