

Using This Book

Table of Contents

Organization	3
Typographical Conventions	4
Conventions for Examples	4
Accessing the SAS/QC Sample Library in Version 7.	5
Online Help System and Updates	5
OVERVIEW OF SAS/QC SOFTWARE	6
ADX Interface for Design of Experiments	7
SQC Menu System for Statistical Quality Control	8
Procedures for Design of Experiments	9
Procedures for Control Chart Analysis	10
Procedure for Process Capability Analysis	11
Procedures for Basic Quality Problem Solving	12
Procedure for Reliability Analysis	13

Using This Book

Using This Book

SAS/QC User's Guide provides complete documentation, including introductory examples, syntax, computational details, and advanced examples for the procedures in SAS/QC software, Version 7. In general, this book can be used for all current releases of SAS/QC software, and it replaces and updates the information provided by *SAS/QC Software: Usage and Reference, Version 6, First Edition* and *SAS/QC Software: Changes and Enhancements for Release 6.12*.

Point-and-click interfaces for basic statistical quality improvement methods and design of experiments are also included in SAS/QC software. The SQC Menu System for statistical quality control applications is described in *SAS/QC Software: SQC Menu System, Version 6, First Edition*. The ADX Interface for the design and analysis of experiments is described at <http://www.sas.com/rnd/app/qc/newadx/newadx.html>.

Organization

This book is divided into parts, each of which corresponds to a procedure in SAS/QC software and contains one or more chapters. For example, the part describing the CAPABILITY procedure contains a chapter for each plot statement (such as the HISTOGRAM statement) in the procedure. Similarly, the part describing the SHEWHART procedure contains a chapter for each chart statement (such as the XRCHART statement) in the procedure.

The following list summarizes the types of information provided for each procedure:

- Overview** provides a general description of what the procedure does.
- Getting Started** illustrates simple uses of the procedure using tutorial examples.
- Syntax** constitutes the major reference section for the syntax of the procedure. First, the statement syntax is summarized. Next, functional summary tables list the options classified by function. Finally, a dictionary of options, listed in alphabetical order, provides details on each option.
- Details** describes features of the procedure, including equations, computational methods, and input and output data sets.
- Examples** provides examples that illustrate common and advanced applications of the procedure.
- References** lists books and journal articles relevant to the procedure.

Typographical Conventions

SAS/QC User's Guide uses various type styles, as explained by the following list:

<code>roman</code>	is the standard type style used for most text.
<code>UPPERCASE ROMAN</code>	is used for SAS statements, variable names, and SAS language elements when they appear in the text. However, you can enter these elements in your own SAS code in lowercase, uppercase, or a mixture of the two. This style is also used for identifying arguments and values (in the Syntax specifications) that are literals (for example, to denote valid keywords for a specific option).
<code>UPPERCASE BOLD</code>	is used in the “Syntax” section to identify SAS keywords such as the names of procedures, statements, and options.
<i>italic</i>	is used for user-supplied values for options. It is also used for terms that are defined in the text, for emphasis, and for references.
<code>monospace</code>	is used to show examples of SAS statements. In most cases, this book uses lowercase type for SAS code. You can enter your own SAS code in lowercase, uppercase, or a mixture of the two. This style is also used for values of character variables when they appear in the text.

Conventions for Examples

Most of the output shown in this book is produced with the following SAS System options:

```
options linesize=80 pagesize=76 nonumber nodate;
```

The template `STATDOC.TPL` is used to create the HTML output that appears in the online (CD) version. A style template controls stylistic HTML elements such as colors, fonts, and presentation attributes. The style template is specified in the ODS HTML statement as follows:

```
ODS HTML style=statdoc;
```

If you run the examples, you may get slightly different output. This is a function of the SAS System options used and the precision used by your computer for floating-point calculations.

The following `GOPTIONS` statement is used to create the online (color) version of the graphic output.

```
filename GSASFILE '<file-specification>';

goptions gsfname=GSASFILE   gsfmode =replace
        fileonly
        transparency        dev      = gif
        ftext      = swiss    lfactor = 1
        htext      = 4.0pct   htitle = 4.5pct
        hsize      = 5.625in  vsize  = 3.5in
        noborder    cback     = white
        horigin    = 0in     vorigin = 0in ;
```

The following GOPTIONS statement is used to create the black and white version of the graphic output, which appears in the printed version of the manual.

```
filename GSASFILE '<file-specification>';

goptions gsfname=GSASFILE   gsfmode =replace
        gaccess = sasgaedt fileonly
        transparency        dev      = pslepszf
        ftext      = swiss    lfactor = 1
        htext      = 3.0pct   htitle = 3.5pct
        hsize      = 5.625in  vsize  = 3.5in
        border      cback     = white
        horigin    = 0in     vorigin = 0in ;
```

Colors specified in example statements were remapped to a grey scale in the output.

Accessing the SAS/QC Sample Library in Version 7.

The SAS/QC sample library includes many examples that illustrate the use of SAS/QC software, including the examples used in this documentation. To access these sample programs, select **Help** from the pmenu and select **SAS System Help**. From the Main Contents list, choose **Sample SAS Programs and Applications**. In addition, by choosing **SAS on the Web** from the **Help** pmenu, you can then select **Sample Programs** to gain access to the sample programs currently maintained on the SAS Technical Support web site.

Online Help System and Updates

You can access online help information about SAS/QC software in two ways, depending on whether you are using the SAS Display Manager in the command line mode or the pull-down menu mode.

If you are using a command line, you can access the SAS/QC help menus by typing **help qc** on the display manager command line. If you are using the display manager with pull-down menus, you can select **SAS System Help** from the **Help** pmenu, and then select **SAS/QC Software** from the list of available topics.

Overview of SAS/QC Software

SAS/QC software, a component of the SAS System, provides a comprehensive set of tools for statistical quality improvement. You can use these tools to

- organize quality improvement efforts
- design industrial experiments for product and process improvement
- apply Taguchi methods for quality engineering
- establish statistical control of a process
- maintain statistical control and reduce variation
- analyze process capability
- develop and evaluate acceptance sampling plans

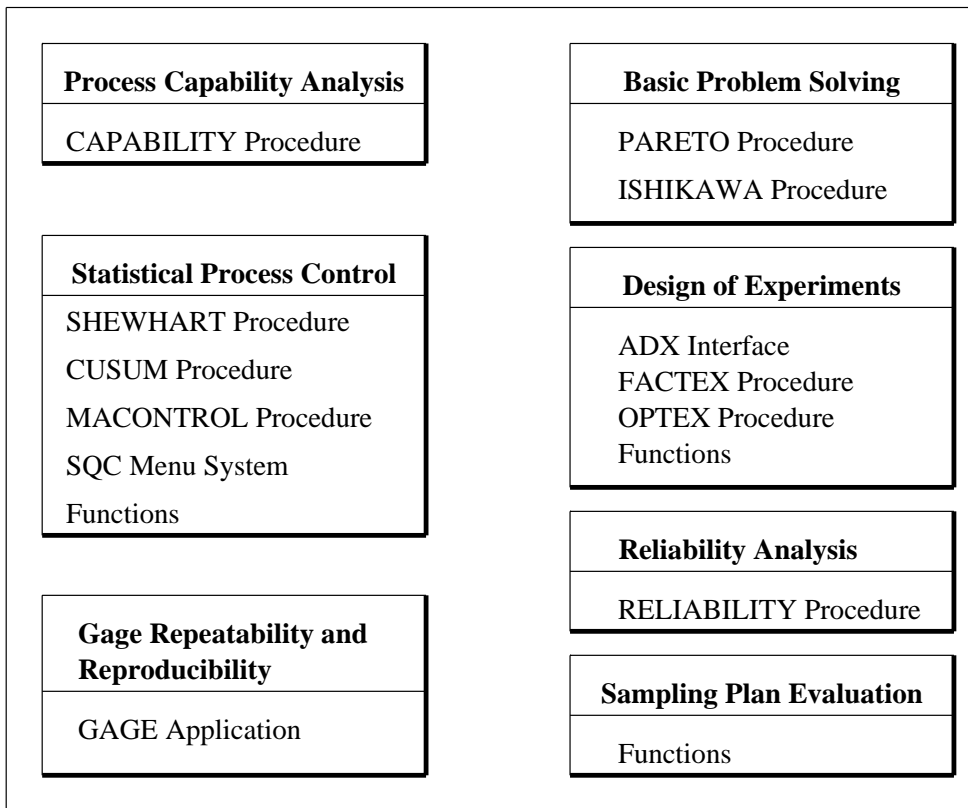
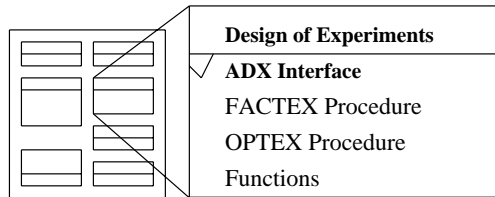


Figure 1. Components of SAS/QC Software

There are two main types of tools in SAS/QC software: menu systems and procedures.

- The menu systems are complete, full-screen oriented environments for statistical quality improvement applications. Unlike the procedures, the menu systems require no knowledge of SAS programming. Internally, however, the menu systems translate the user's selections into SAS statements that are then submitted for execution.
- The procedures in SAS/QC software offer greater flexibility and power than the menu systems. To use a procedure, you must have a basic knowledge of the SAS language and the syntax of the procedure. You can run the procedures in a batch program or interactively with the SAS Display Manager System.

ADX Interface for Design of Experiments



The ADX Interface provides a solution for engineers and researchers who require a point-and-click interface for designing and analyzing experimental designs.

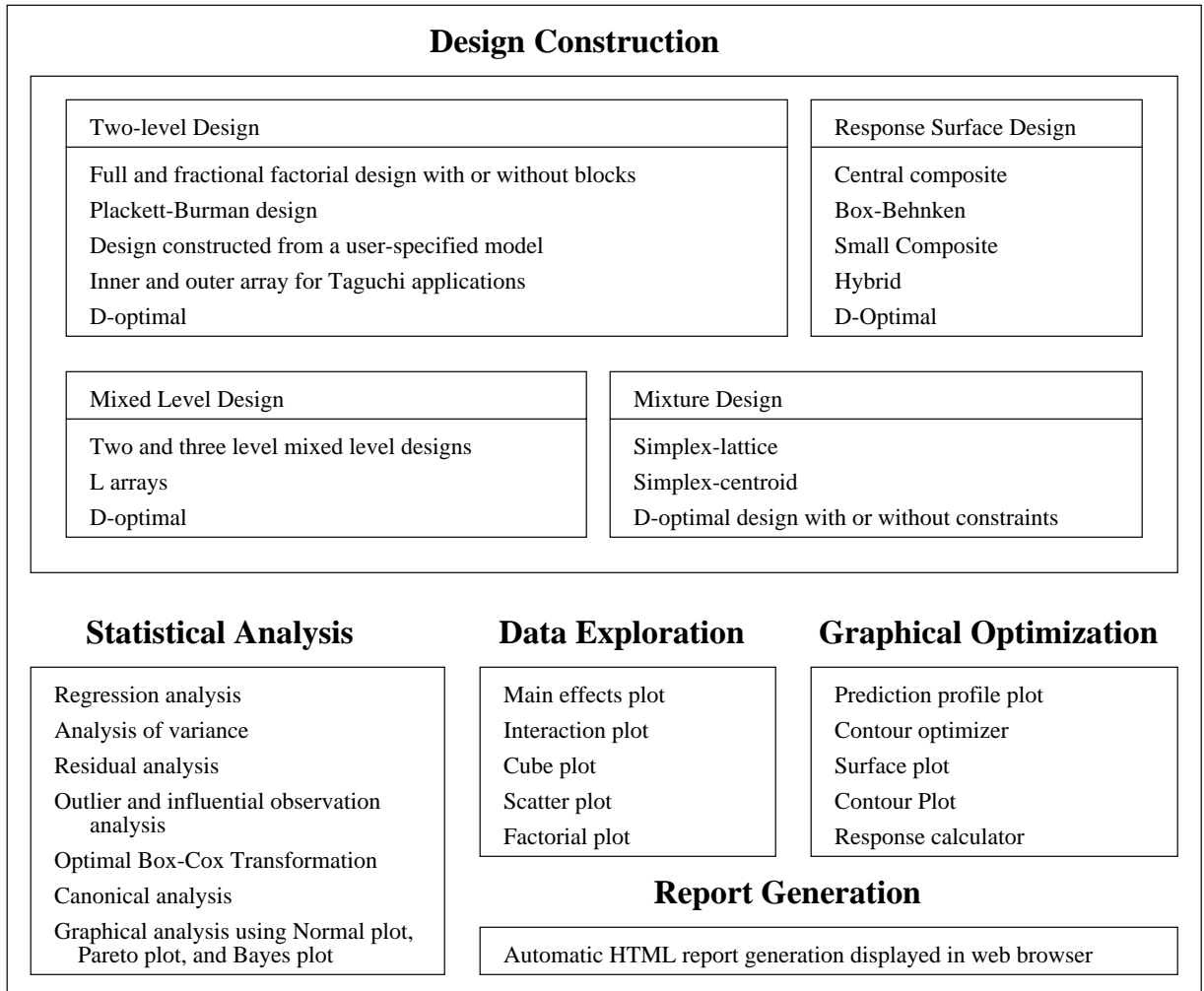
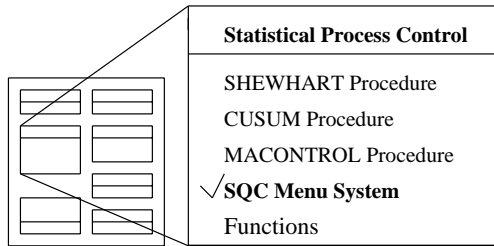


Figure 2. General Design and Analysis Facilities

Note: Information about the ADX Interface can be found at <http://www.sas.com/rnd/app/qc/newadx/newadx.html>.

SQC Menu System for Statistical Quality Control



The SQC Menu System provides facilities for standard statistical quality control applications and is intended for quality analysts, quality control managers, and other non-statisticians.

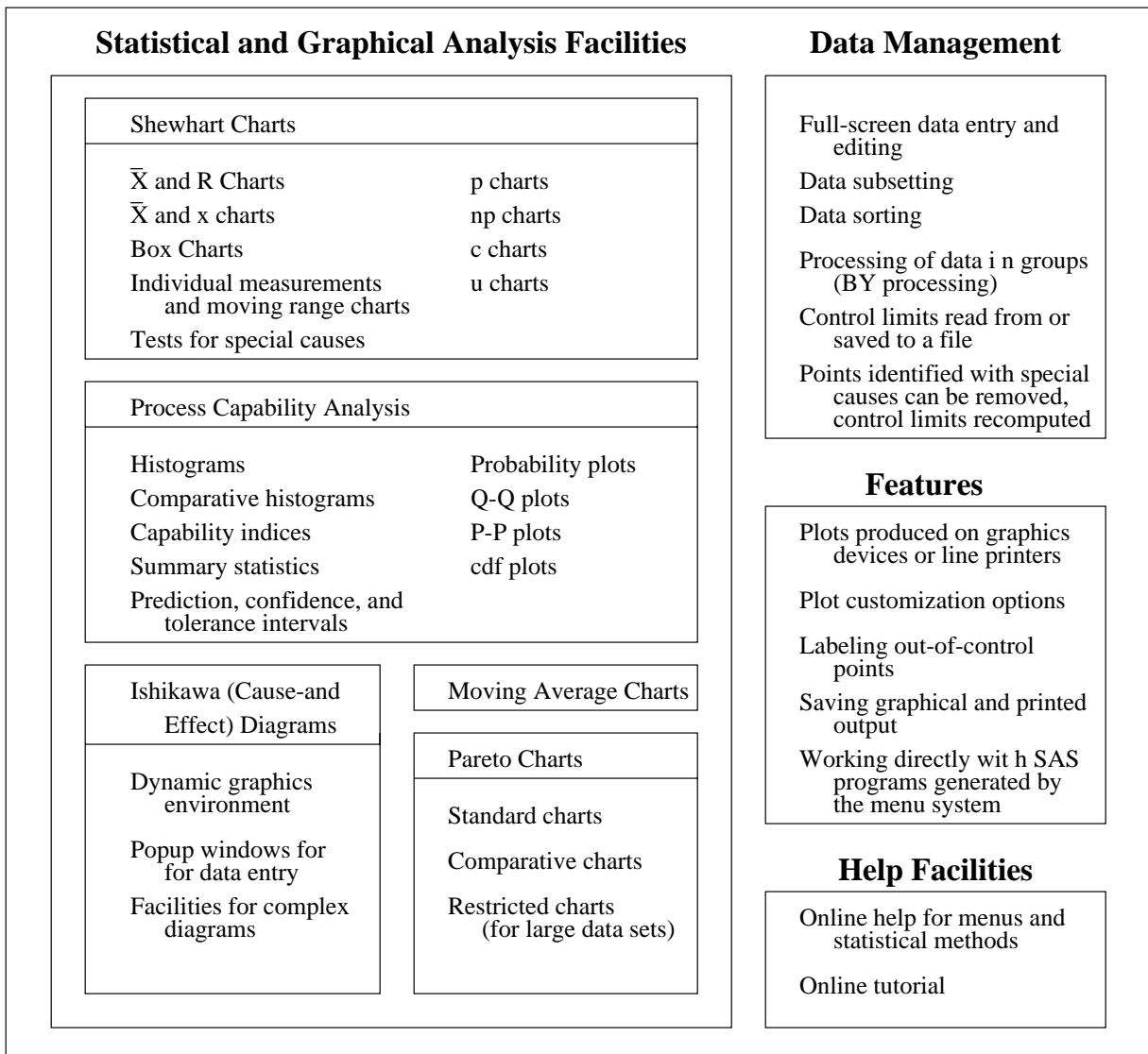
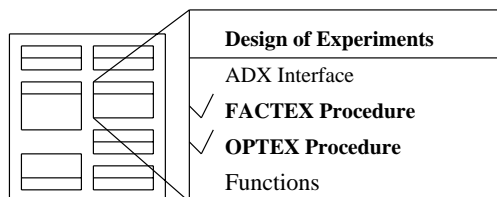


Figure 3. Overview of the SQC Menu System

Note: The SQC Menu System is documented in *SAS/QC Software: SQC Menu System, Version 6, First Edition*.

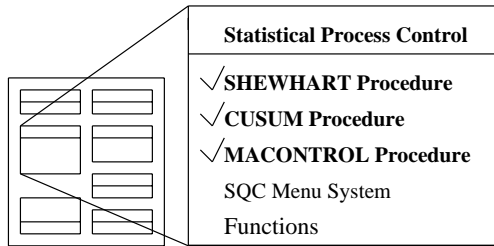
Procedures for Design of Experiments



SAS/QC software provides two procedures for the design of experiments. The FACTEX procedure constructs factorial experimental designs, which are useful for studying the effects of various factors on a response. The OPTEX procedure searches for optimal designs in situations in which standard designs are not available.

Figure 4. Overview of the Experimental Design Procedures

Procedures for Control Chart Analysis



SAS/QC software provides three procedures for the creation and analysis of control charts. The SHEWHART procedure creates all commonly encountered Shewhart charts for variables and attributes. The CUSUM procedure creates cumulative sum control charts. The MACONTROL procedure creates moving average charts.

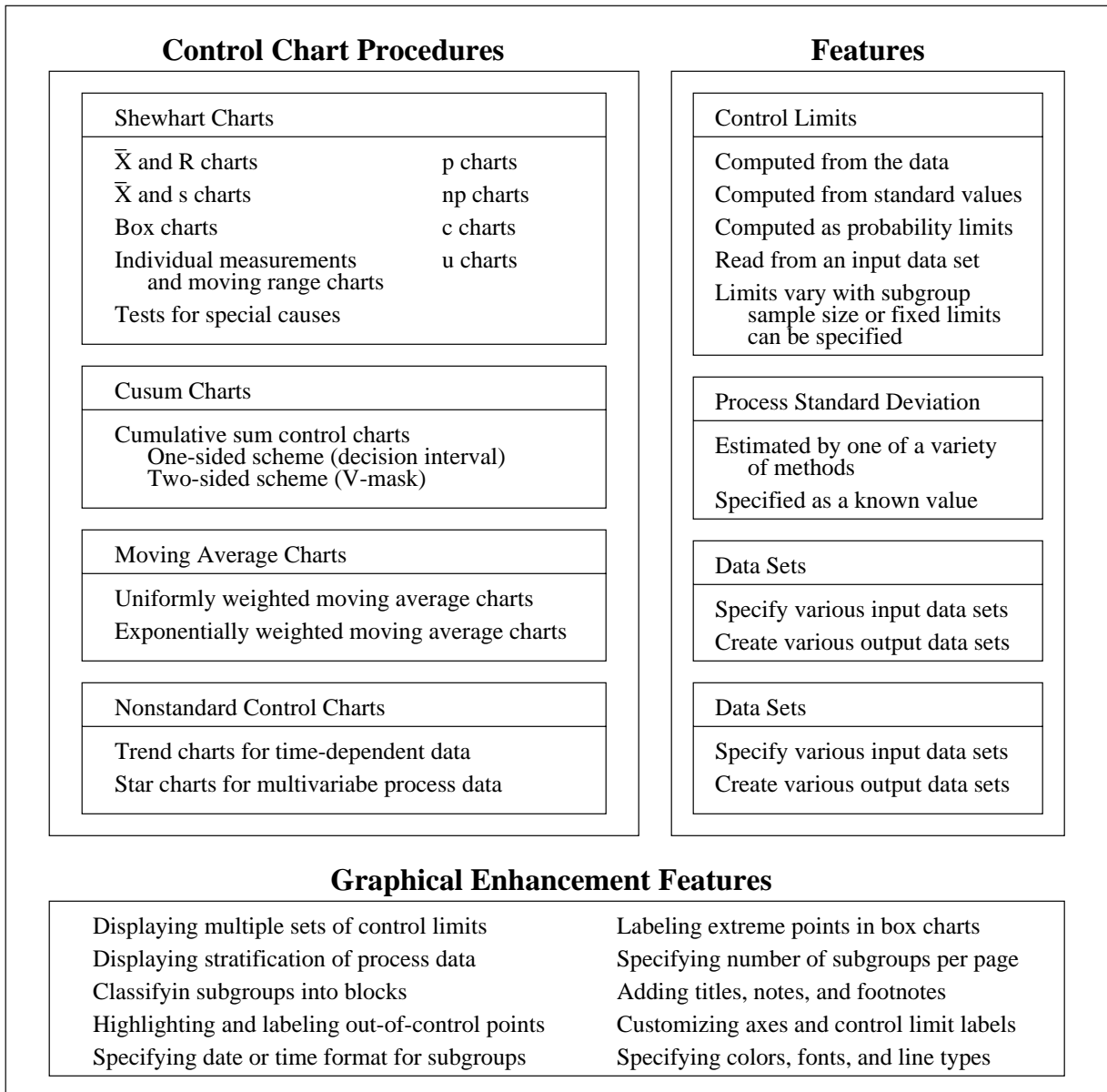
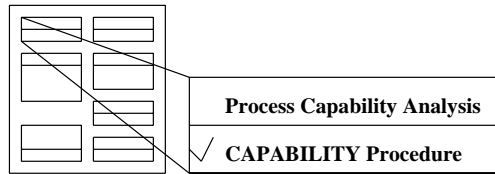


Figure 5. Overview of Control Chart Analysis Procedures

Procedure for Process Capability Analysis



SAS/QC software provides one procedure for the analysis of process capability. The CAPABILITY procedure compares the distribution of output from an in-control process to the specification limits of the process to determine the consistency with which the specification limits can be met.

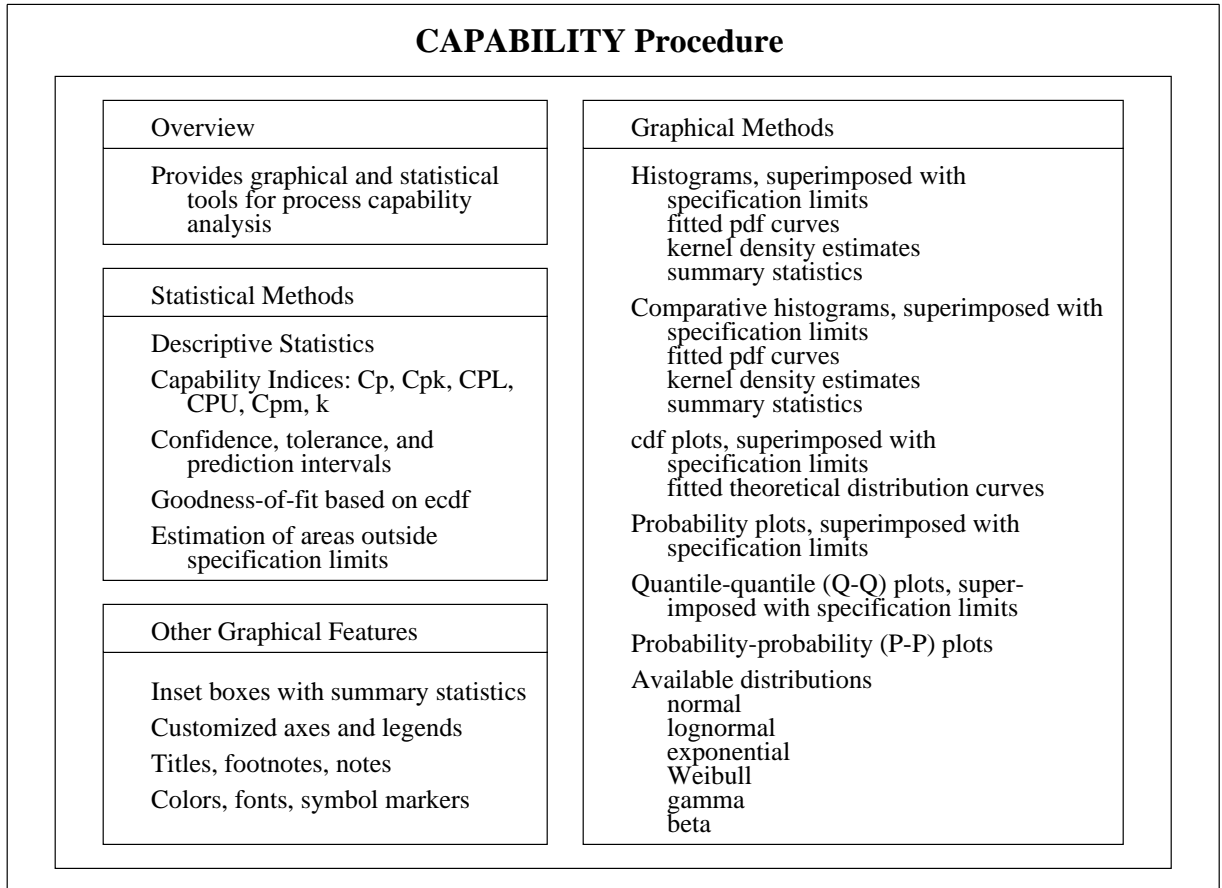
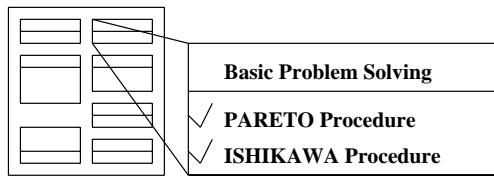


Figure 6. Overview of Process Capability Analysis

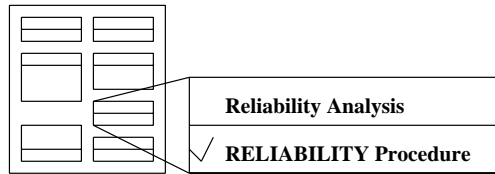
Procedures for Basic Quality Problem Solving



SAS/QC software provides two procedures for basic quality problem solving. The PARETO procedure creates charts that display the relative frequency of problems in a process or operation. The ISHIKAWA procedure creates a cause-and-effect or fishbone diagram, which displays factors that affect a quality characteristic or problem.

Figure 7. Overview of Quality Problem Solving Procedures

Procedure for Reliability Analysis



SAS/QC software provides one procedures for reliability analysis. The RELIABILITY procedure provides tools for reliability and survival data analysis and for recurrence data analysis.

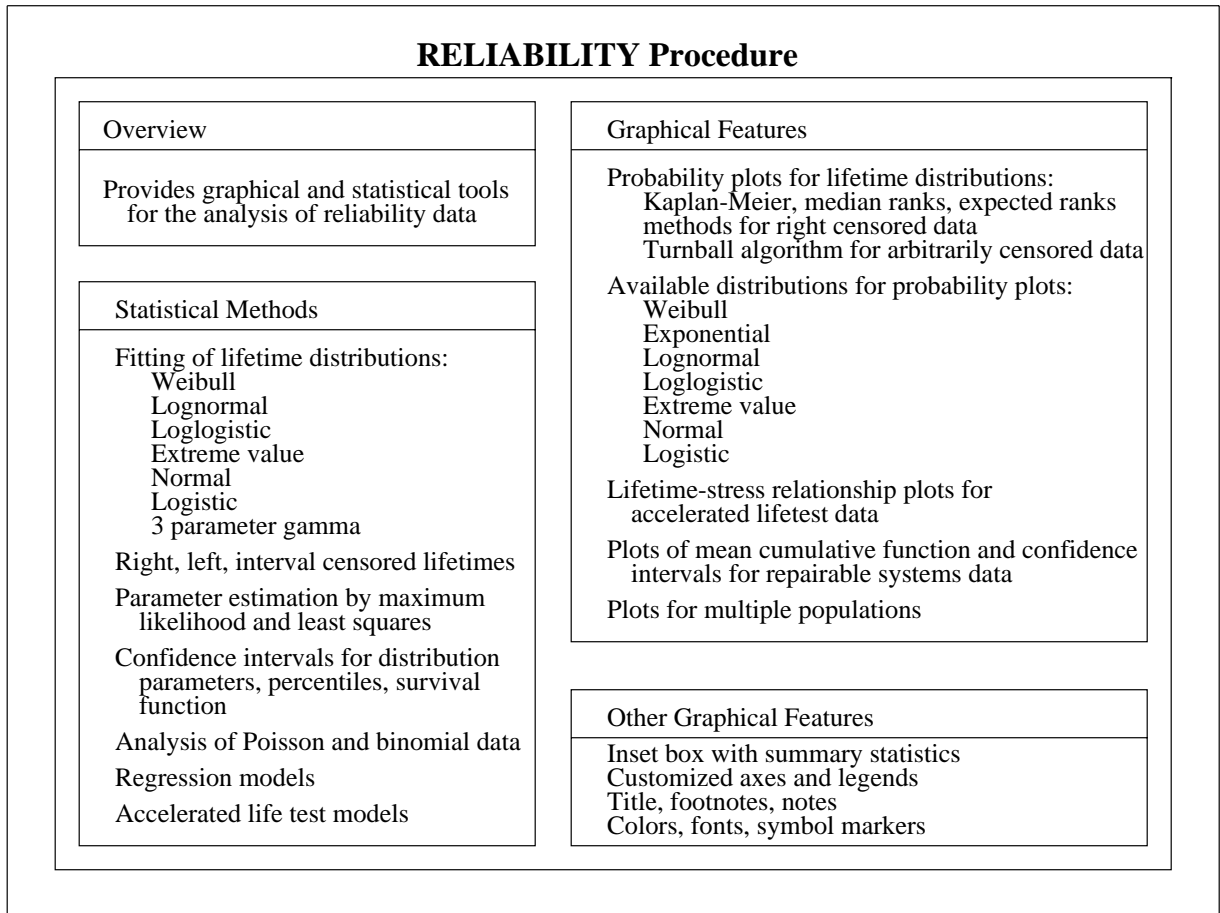


Figure 8. Overview of Reliability Analysis