

## Q ... CONTROL CHART

### PURPOSE

Generates a Quesenberry style mean, standard deviation, range, C, U, P, or NP control chart.

### DESCRIPTION

The standard control chart is a data analysis technique for determining if a measurement process has gone out of statistical control. There are 7 types of control charts available:

1. mean control chart;
2. standard deviation control chart;
3. range control chart;
4. C control chart;
5. U control chart;
6. P control chart;
7. NP control chart.

For the mean, range, and standard deviation control charts, the plot consist of:

Vertical axis = the mean, range, or standard deviation for each sub-group;  
Horizontal axis = sub-group designation.

For the C, U, P, and NP control charts, the plot consists of: the plot consist of:

Vertical axis = either the number of defectives or the proportion of defectives for each sub-group;  
Horizontal axis = sub-group designation.

In addition, horizontal lines are drawn at the mean (i.e., the mean of the means, ranges, or standard deviations) and at the upper and lower control limits.

Quesenberry control charts use modified formulas for standardizing the data for the mean, standard deviation, and range control charts and normalizing transformations for the P, NP, C, and U control charts. The 2 papers listed in the REFERENCE section provide the details. Quesenberry particularly recommends these charts for short production runs and for early detection of problems.

### SYNTAX

Q <keyword> CONTROL CHART <y> <x> <SUBSET/EXCEPT/FOR qualification>  
where <keyword> is one of MEAN, RANGE, S, C, U, NP, or P for a mean control chart, a range control chart, a standard deviation control chart, a C control chart, a U control chart, an NP control chart, or a P control chart respectively;  
<y> is the response (= dependent) variable containing the raw data values;  
<x> is an independent variable containing the sub-group identifications;  
and where the <SUBSET/EXCEPT/FOR qualification> is optional.

### EXAMPLES

```
Q MEAN CHART Y X
Q RANGE CONTROL CHART Y X
Q C CONTROL CHART Y X SUBSET X > 2
```

### NOTE 1

For the mean, range, and standard deviation control charts, the distribution of the response variable is assumed to be normal. For the C and U control charts, the distribution of the response is assumed to be Poisson. For the P and NP control charts, the distribution of the response variable is assumed to be binomial.

### NOTE 2

The attributes of the 4 traces that make up the control chart are controlled by the standard LINES, CHARACTERS, SPIKES, and BAR commands. Trace 1 is the response variable, trace 2 is the mean line, and traces 3 and 4 are the upper and lower control limits. Some analysts prefer to draw the response variable as a character or spike rather than a connected line.

### DEFAULT

None

**SYNONYMS**

The word CONTROL is optional in all of these commands.

Q XBAR CONTROL CHART, Q AVERAGE CONTROL CHART, for Q MEAN CONTROL CHART.

Q STANDARD DEVIATION CONTROL CHART, Q SD CONTROL CHART for Q S CONTROL CHART.

Q RANGE CONTROL CHART for Q R CONTROL CHART.

**RELATED COMMANDS**

CONTROL CHART	=	Generates mean, standard deviation, range, C, U, P, or NP control charts.
CHARACTERS	=	Sets the types for plot characters.
LINES	=	Sets the types for plot lines.
SPIKES	=	Sets the on/off switches for plot spikes.
BARS	=	Sets the on/off switches for plot bars.
PLOT	=	Generates a data or function plot.

**REFERENCE**

“SPC Q Charts for Start-Up Processes and Short or Long Runs,” Quesenberry, Journal of Quality Technology, Vol. 23, No. 3, July 1991.

“SPC Q Charts for a Binomial Parameter p: Short or Long Runs,” Quesenberry, Journal of Quality Technology, Vol. 23, No. 3, July 1991.

**APPLICATIONS**

Quality Control

**IMPLEMENTATION DATE**

93/12

## PROGRAM

```
SKIP 25
READ GEAR.DAT DIAMETER BATCH
.
TITLE AUTOMATIC
MULTIPLY 2 2
MULTIPLY CORNER COORDINATES 0 0 100 100
PLOT DIAMETER
LINE SOLID SOLID DOT DOT
TITLE Q MEAN CONTROL CHART
Q MEAN CHART DIAMETER BATCH
TITLE Q RANGE CONTROL CHART
Q RANGE CHART DIAMETER BATCH
TITLE Q SD CONTROL CHART
Q S CHART DIAMETER BATCH
.
END OF MULTIPLY
```

