

## ... CONTROL CHART

### PURPOSE

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

### DESCRIPTION

A control chart is a data analysis technique for determining if a measurement process has gone out of statistical control. It consists of:

- Vertical axis = the mean, range, or standard deviation 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.

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.

The first 3 types are used for a measurement process while the remaining 4 are for cases when counting the number of defectives.

### SYNTAX 1

**XBAR CONTROL CHART** <y> <x> <SUBSET/EXCEPT/FOR qualification>

where <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.

This syntax generates a mean control chart.

### SYNTAX 2

**R CONTROL CHART** <y> <x> <SUBSET/EXCEPT/FOR qualification>

where <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.

This syntax generates a range control chart.

### SYNTAX 3

**S CONTROL CHART** <y> <x> <SUBSET/EXCEPT/FOR qualification>

where <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.

This syntax generates a standard deviation control chart.

### SYNTAX 4

**C CONTROL CHART** <y> <x> <SUBSET/EXCEPT/FOR qualification>

where <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.

This syntax generates a C control chart.

### SYNTAX 5

**U CONTROL CHART** <y> <x> <SUBSET/EXCEPT/FOR qualification>

where <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.

This syntax generates a U control chart.

#### SYNTAX 6

P CONTROL CHART <y> <x> <SUBSET/EXCEPT/FOR qualification>

where <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.

This syntax generates a P control chart.

#### SYNTAX 7

NP CONTROL CHART <y> <x> <SUBSET/EXCEPT/FOR qualification>

where <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.

This syntax generates an NP control chart.

#### EXAMPLES

XBAR CONTROL CHART Y X

R CONTROL CHART Y X

S CONTROL CHART Y X

#### 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 variable is assumed to be Poisson. For the N and NP control charts, the distribution of the response variable is assumed to be binomial. These assumptions are the basis for calculating the upper and lower control limits. Most books on statistical quality control will provide the details on calculating the control limits.

#### 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 a spike rather than a connected line.

#### DEFAULT

None

#### SYNONYMS

X CONTROL CHART, MEAN CONTROL CHART, AVERAGE CONTROL CHART for XBAR CONTROL CHART

S CHART, STANDARD DEVIATION CONTROL CHART for S CONTROL CHART

R CHART, RANGE CONTROL CHART for RANGE CONTROL CHART

C CHART for C CONTROL CHART

U CHART for U CONTROL CHART

P CHART for P CONTROL CHART

NP CHART for NP CONTROL CHART

#### RELATED COMMANDS

Q ... CONTROL CHART	=	Generate Quesenberry style 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.
LAG PLOT	=	Generates a lag plot.
4-PLOT	=	Generates 4-plot for univariate analysis.
ANOP PLOT	=	Generates an ANOP plot.

## REFERENCE

"Guide to Quality Control," Kaoru Ishikawa, Asian Productivity Organization, 1982 (Chapter 7).

Control charts are described in just about any text on statistical quality control.

## APPLICATIONS

Quality Control

## IMPLEMENTATION DATE

Pre-1987

## 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 MEAN CONTROL CHART
MEAN CONTROL CHART DIAMETER BATCH
TITLE RANGE CONTROL CHART
RANGE CONTROL CHART DIAMETER BATCH
TITLE S CONTROL CHART
STANDARD DEVIATION CONTROL CHART DIAMETER BATCH
END OF MULTIPLY
```

