Real Time SPC

with the

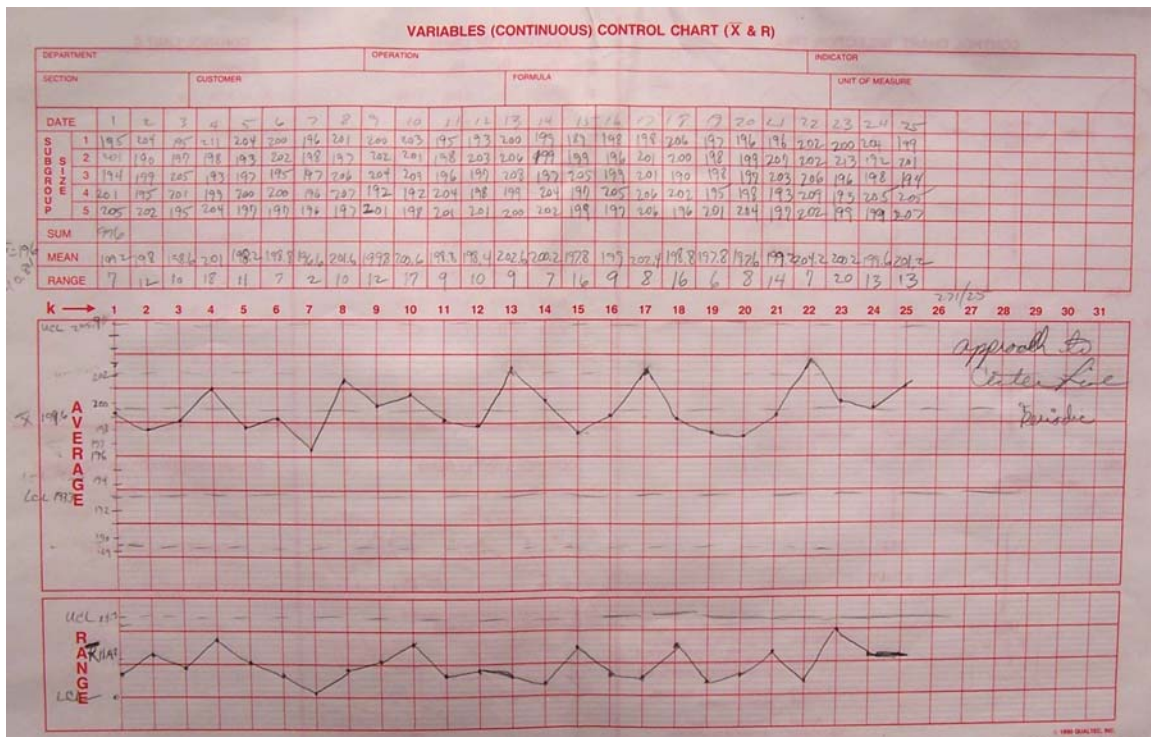## QI Macros SPC Software for Excel

And

Microridge GageWay Interfaces

By Jay Arthur

To meet the ever increasing customer requirements for quality, manufacturers large and small rely on measurement and statistical process control (SPC) to detect shifts in production quickly and correct them. These measurements used to be entered manually into control chart worksheets. Control limits were determined with handheld calculators:


Or evaluated using elaborate SPC software programs.

Now, however, using modern digital gages, Microsoft Excel and the QI Macros SPC Software, SPC can be as easy as clicking the data button on your gage (below):
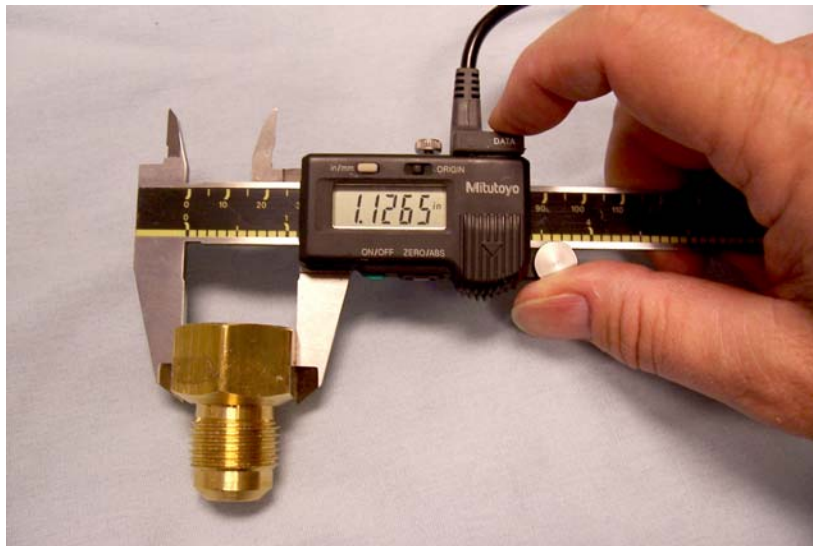
Gages with SPC Output

Modern SPC-output gages like the Mitutoyo shown above offer a digital readout and data port. This can be connected to an interface like the Microridge Gageway series which, in turn, connects to a PC (see below). One-to-four gages can be connected in this way.
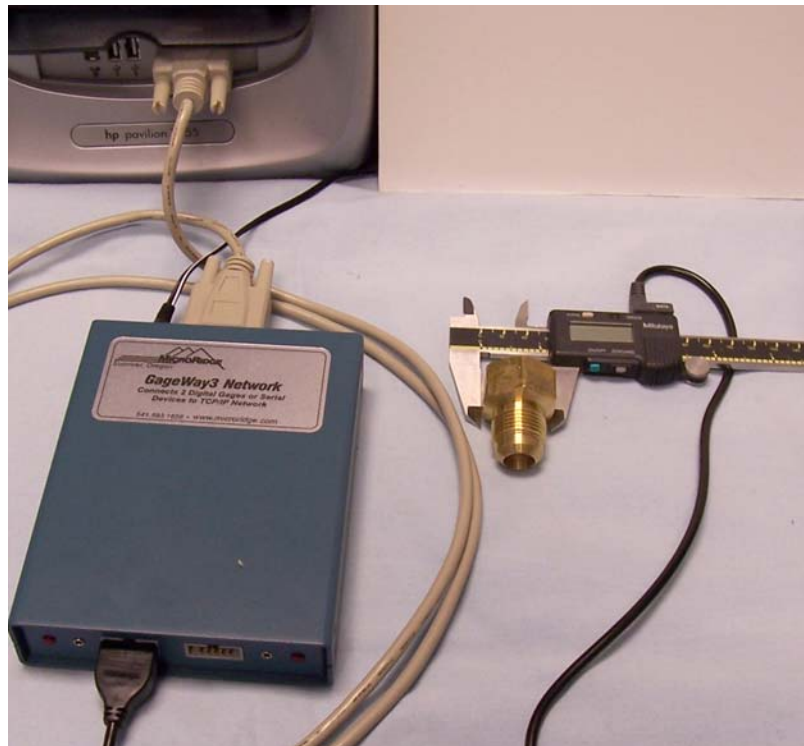
Keyboard-like Input

Software allows the gage to behave like it is a typist at the keyboard. The gage name, data value, date/time stamp and so on can be transferred to an Excel spreadsheet with a single click of the gage's "data" button.

Microridge offers a software tool called *Wedgelink* which takes data from the gage and passes it to whatever program is active in your PC. In this case, we're using Excel as the tool to receive the gage data. Combined with a GageWay interface, this program will act like a typist transcribing everything the gage reads into Excel.

Using the QI Macros XmR template (for a single gage) or Real Time SPC Worksheet (for 2-8 gages), data read from each gage can automatically populate control charts, histograms and normal probability plots *in real time*. Cp and Cpk values can be read directly from the worksheets. Unstable conditions can be identified directly from the control charts.

Single Gage - Real Time SPC

Click on the QI Macros pull down menu, select Fill-in-the-Blanks Templates and from the SPC Charts, open the XmR Chart Template in Excel. A completed one looks like this:
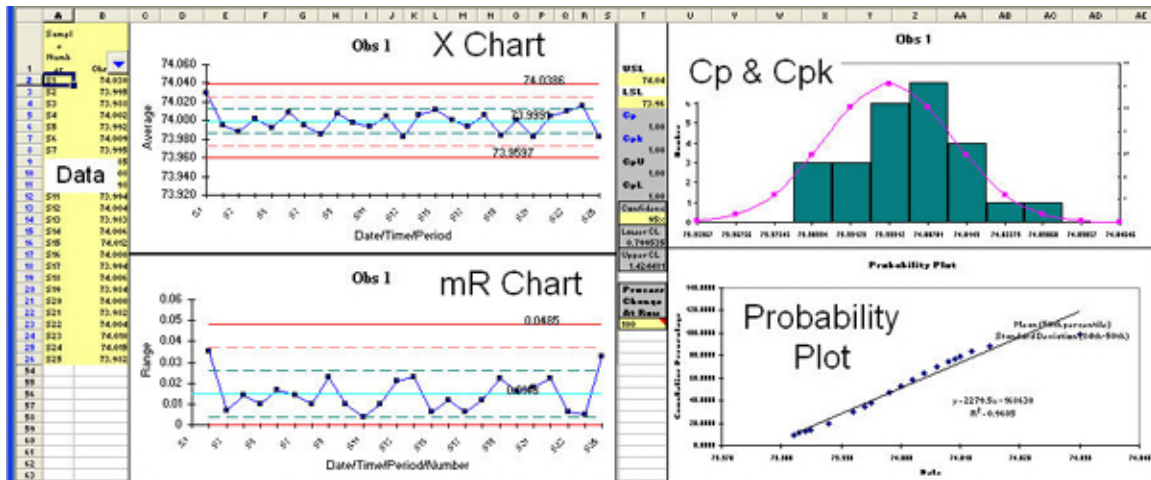

There are three ways to enter gage data into this worksheet:

1. **Type:** Click on Cell B2 and type in your values.

2. **Paste:** Or open your gage data file (.csv, .txt or .xls) and copy/paste the single column of data into the yellow input area of the XmR Chart Template.

3. **Button:** Click on Cell B2 and let your keyboard interface type the data.

Using Microridge's GageWay SM/HW interface for a single gage and Wedgelink, simply click on Cell B2 and then start measuring with your gage. Every time you press the data button, the interface will send the data to the PC and Wedgelink will type it into Excel.
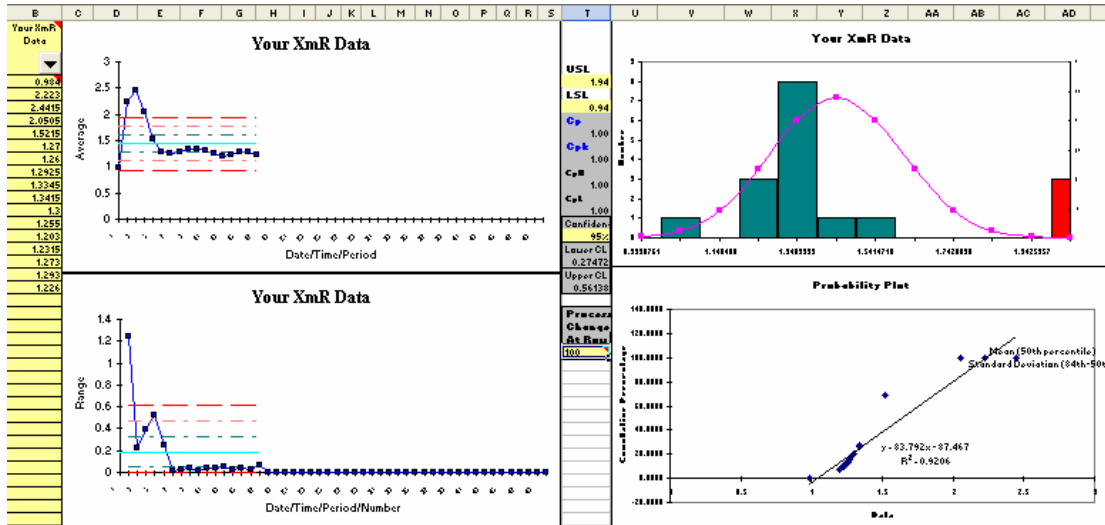
Since you're starting in cell B2, Wedgelink will type the data followed by a carriage return (CR) which moves the cursor to cell B3 and so on. As you press the data button on the gage, the spreadsheet fills with data and the control charts, histograms and normal probability plot update *automatically*!

When you're done, if you want to view just the cells with data, click on the arrow in cell B1 and select "non-blanks":
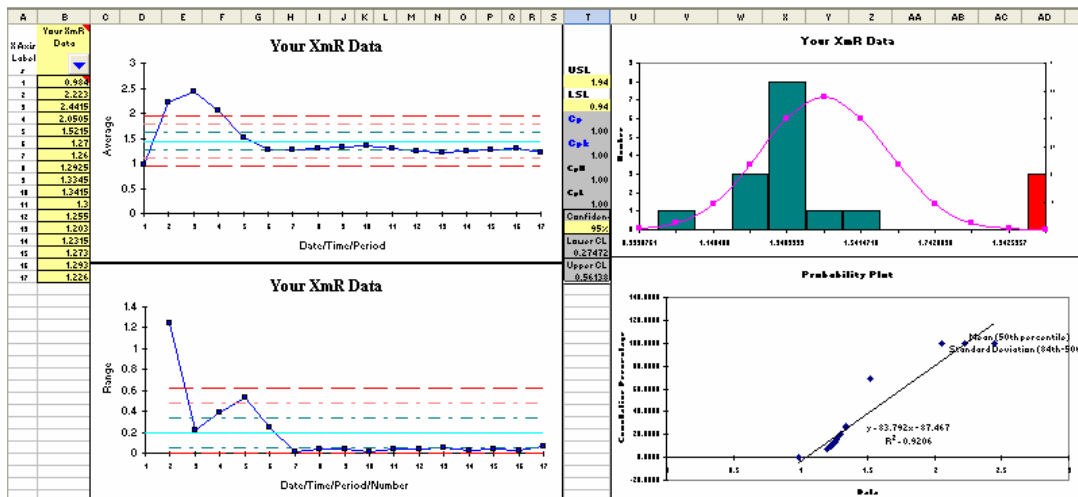
As you can see from this example, the process started out off spec, so you might want to go back and use the data in B7 onward. Just copy/paste the data into B2:
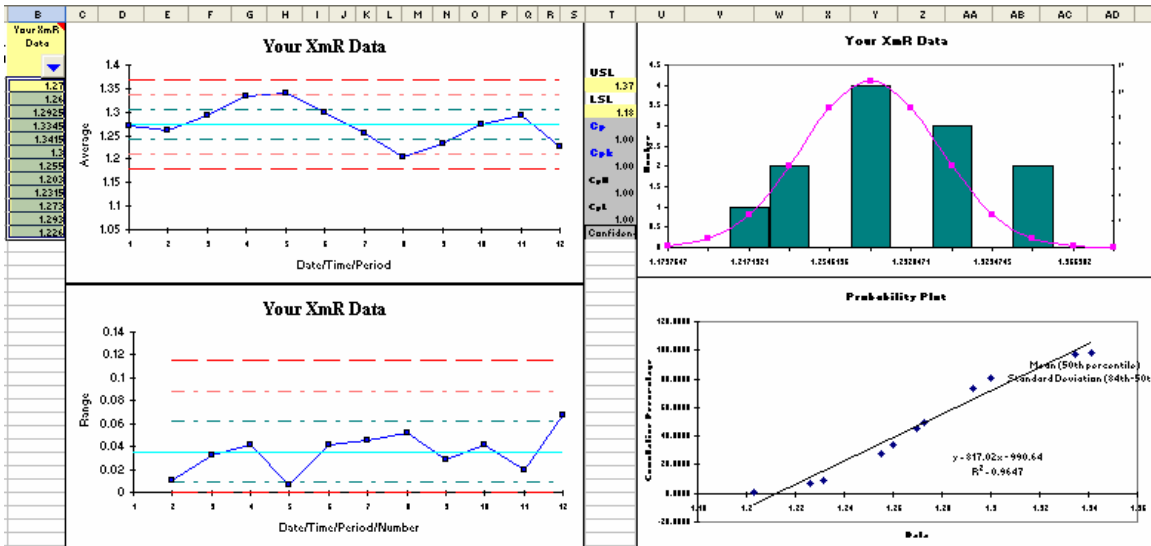
Single gage SPC just doesn't get much easier than that!

Real Time SPC For Multiple Gages

The QI Macros Real Time SPC for Excel tool, parses your data, gage by gage, and automatically performs statistical analysis. It populates control charts, histograms and calculates Cp and Cpk for each gage.

Open the QI Macros Real Time SPC worksheet in Excel. There is room for four fields: 1) an alphanumeric gage name/number, 2) current date, 3) current time, and the actual measurement. A blank Real Time SPC worksheet looks like this:

There are three ways to enter gage data into this worksheet:

1. **Type:** Click on Cell A2 and type in your gage, date, time and values.

2. **Button:** Let your gage software's keyboard interface type the data.

3. **Paste:** Or open your gage data file (.csv, .txt or .xls) and copy and paste it into the yellow input area of the Real Time SPC for Excel worksheet.

The software will determine which fields (gage, date, time, measure) reside in which of the columns (see below). Notice that these four measures are in a different order. The default labels offer a suggested order, but the template will use whatever you give it. The worksheet will then sort your data by gage and populate the columns to the right.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Measure	Gage	Date	Time			m1			m2			m3
2	0.405	m1	1-Jan	10:15		Jan 01 10:15	0.405		Jan 01 10:17	0.403		Jan 01 10:19	0.403
3	0.403	m2	1-Jan	10:17		Jan 01 10:18	0.402		Jan 01 10:20	0.407		Jan 01 10:24	0.401
4	0.402	m1	1-Jan	10:18		Jan 01 10:21	0.404		Jan 01 10:22	0.408		Jan 01 10:27	0.409
5	0.403	m3	1-Jan	10:19		Jan 01 10:23	0.402		Jan 01 10:25	0.405			
6	0.407	m2	1-Jan	10:20		Jan 01 10:26	0.403		Jan 01 10:28	0.406			
7	0.404	m1	1-Jan	10:21									
8	0.408	m2	1-Jan	10:22									
9	0.402	m1	1-Jan	10:23									
10	0.401	m3	1-Jan	10:24									
11	0.405	m2	1-Jan	10:25									
12	0.403	m1	1-Jan	10:26									
13	0.409	m3	1-Jan	10:27									
14	0.406	m2	1-Jan	10:28									

The Real Time SPC for Excel worksheet will also automatically create control charts, histograms and calculate Cp and Cpk for each gage.

If you click on XmR Gage 1-8, you can view the control charts and histograms.
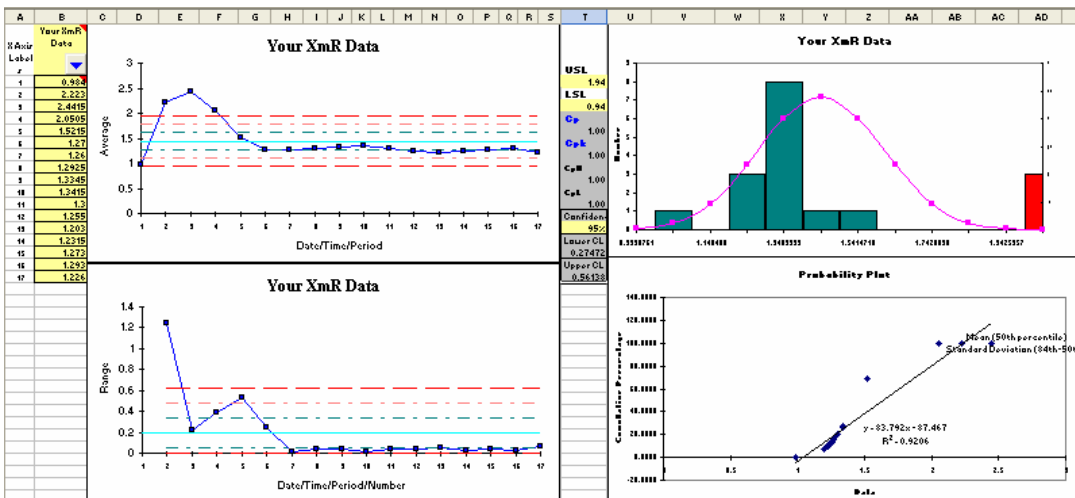
As you add new data to the bottom of the Real Time SPC for Excel worksheet your charts and calculations will automatically update.

If you click on Cp Cpk worksheet, you can view the calculations for all of the gages.

Hint: Don't switch worksheets while you're still adding data unless you want a mess.

	A	B	C	D
1				
2	Part Number	12345		
3	Characteristic	m1	m2	m3
4	Target	0.400	0.400	0.400
5	+ Tol	0.010	0.010	0.010
6	- Tol	0.010	0.010	0.010
7	USL	0.410	0.410	0.410
8	LSL	0.390	0.390	0.390
9	AVE	0.403	0.406	0.404
10	MAX	0.405	0.408	0.409
11	MIN	0.402	0.403	0.401
12	USL-LSL	0.020	0.020	0.020
13	σ	0.001	0.002	0.004
14	σ est	0.002	0.002	0.004
15	Cp	1.880	1.671	0.752
16	Cpk	1.278	0.702	0.426
17	CpU	1.278	0.702	0.426
18	CpL	2.482	2.640	1.078
19	Pp	2.557	1.733	0.801
20	Ppk	1.738	0.728	0.454
21	PpU	1.738	0.728	0.454
22	PpL	3.375	2.738	1.148
23				
24	Sample #	m1	m2	m3
25	1	0.405	0.403	0.403
26	2	0.402	0.407	0.401
27	3	0.404	0.408	0.409
28	4	0.402	0.405	
29	5	0.403	0.406	

The QI Macros Real Time SPC worksheet will handle up to 65,500 data points from 2-8 gages. Control charts will graph up to 50 data points per gage. The Cp and Cpk worksheet will handle up to 225 data points per gage. These can be expanded as needed.

QI Macros Real Time SPC Worksheet for 2-8 Gages $199

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Measure	Gage	Date	Time		m1			m2			m3	
2	0.405	m1	1-Jan	10:15		Jan 01 10:15	0.405		Jan 01 10:17	0.403		Jan 01 10:19	0.403
3	0.403	m2	1-Jan	10:17		Jan 01 10:18	0.402		Jan 01 10:20	0.407		Jan 01 10:24	0.401
4	0.402	m1	1-Jan	10:18		Jan 01 10:21	0.404		Jan 01 10:22	0.408		Jan 01 10:27	0.409
5	0.403	m3	1-Jan	10:19		Jan 01 10:23	0.402		Jan 01 10:25	0.405			
6	0.407	m2	1-Jan	10:20		Jan 01 10:26	0.403		Jan 01 10:28	0.406			
7	0.404	m1	1-Jan	10:21									

QI Macros SPC Software for Single Gages $229 plus S&H.