CC 8000 Etch Capability – 2 mil (50 µm) Lines and Spaces

Introduction

This Technical Information bulletin is an addendum to the one entitled CC 8000 Etch Capability and presents etched line width data for 2 mil lines and spaces in ½ oz. (17 µm) foil, which was not available at the time the previous bulletin was posted. The test background and procedures for the 2 mil line and space tests are the same as those outlined in the above document so please refer to it if you want more detail on how the tests were done. Otherwise, we will go directly to the etch test results.

Evaluating Etch Test Results

The etched line width results represent 2 mil (50 µm) lines with 2 mil spaces etched in ½ oz. (17 µm) foil using a Conductor Analysis Technologies 2, 3, 4, 5 mil line and space multi-pitch test pattern. The data are presented in tables and as 3-D surface charts. Included in the tables and charts will be information on average line widths, standard deviation, process capability potentials and high and low measurements. The average line width and high and low values are self-explanatory but the standard deviation and process capability potential (Cp) may need some explanation in order to make sense of the results.

The Standard Deviation is a common statistical calculation to express the amount of variation found in a group of numbers. The smaller the standard deviation the less the variation. When using the CATs method for evaluating etch results Chemcut uses the following guidelines:

For Test Results Expressed in mils

Standard Deviation between 0.125 and 0.150 – Satisfactory etching, capable of 4 mil lines and spaces in volume.

Standard Deviation between 0.100 and 0.125 – Good etching, capable of 3 mil lines and spaces in volume.

Standard Deviation less than 0.100 – Excellent etching, capable of any line and width combination down to the limits of the process.

For Test Results Expressed in microns

Standard Deviation between 3.175 and 3.810 – Satisfactory etching, capable of 100 µm lines and spaces in volume.

Standard Deviation between 2.540 and 3.175 – Good etching, capable of 75 µm lines and spaces in volume.

Standard Deviation less than 2.540 – Excellent etching, capable of any line and width combination down to the limits of the process.

The Process Capability Potential, Cp, measures the potential of the process to meet specifications and is calculated by dividing the range between the upper and lower set limits of the line width variation by six times the standard deviation. The upper and lower set limits for these tests is ±20% of the average etched line width. A process with a Cp of 1.33 or greater is considered to be a fully viable process that can meet and maintain specifications reliably.

The 3-D surface chart is simply the average line width of the 2 mil (50 µm lines) in each test module plotted against its position on the panel.

Etch Results with Standard Conveyor

The standard conveyor is designed to transport rigid panels down to a substrate thickness similar that of 3 mil (75 µm) fiberglass with minimum shadowing by the conveyor wheels of the lower side of the panels. The test results are for 2 mil (50µm) lines and spaces on 18" x 24" (457 mm x 610 mm) panels with ½ oz. (17 µm) foil and a 5 mil (125 µm) fiberglass core.

US Units (mils)

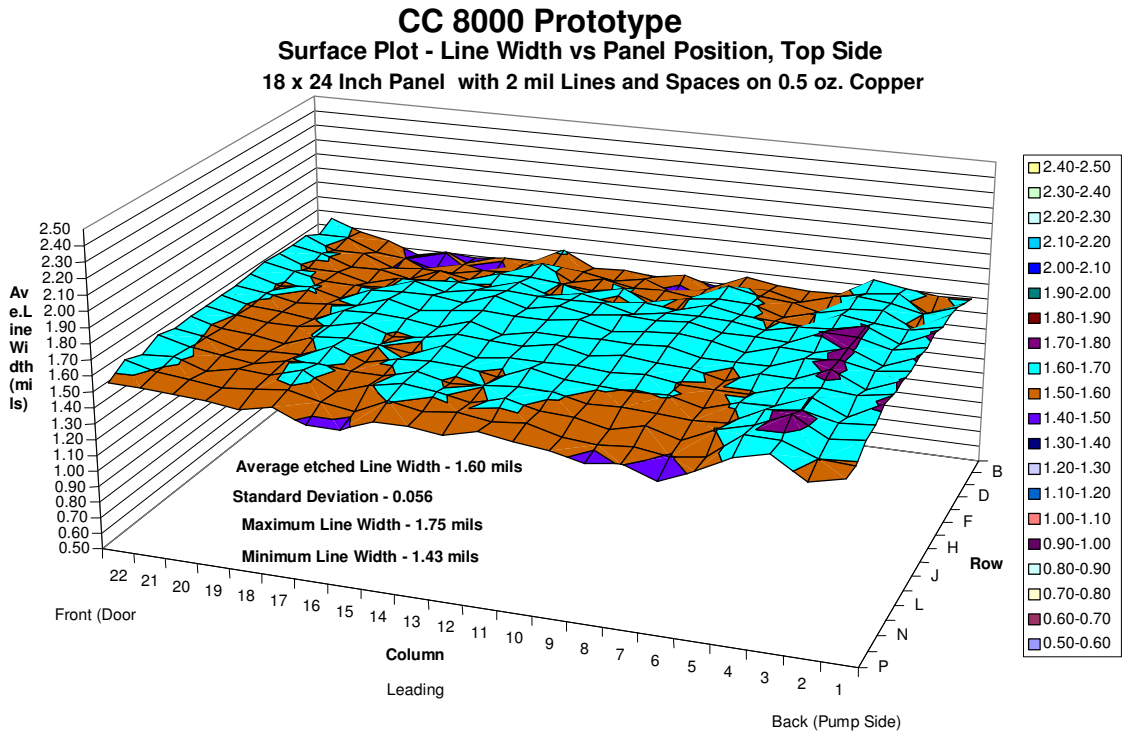
	Ave. LW	Standard Deviation	Cp	High	Low
Top Side	1.60 mils	0.056	1.90	1.75 mils	1.43 mils
Bottom Side	1.73 mils	0.038	3.04	1.85 mils	1.62 mils

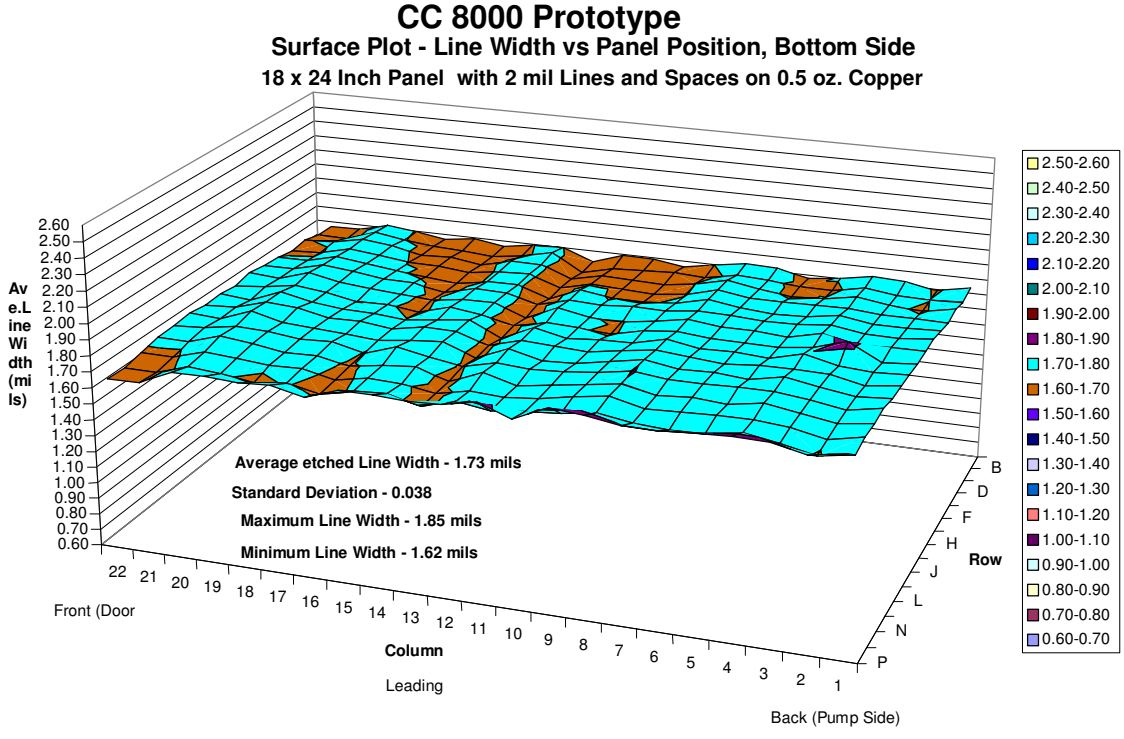
Metric Units (microns)

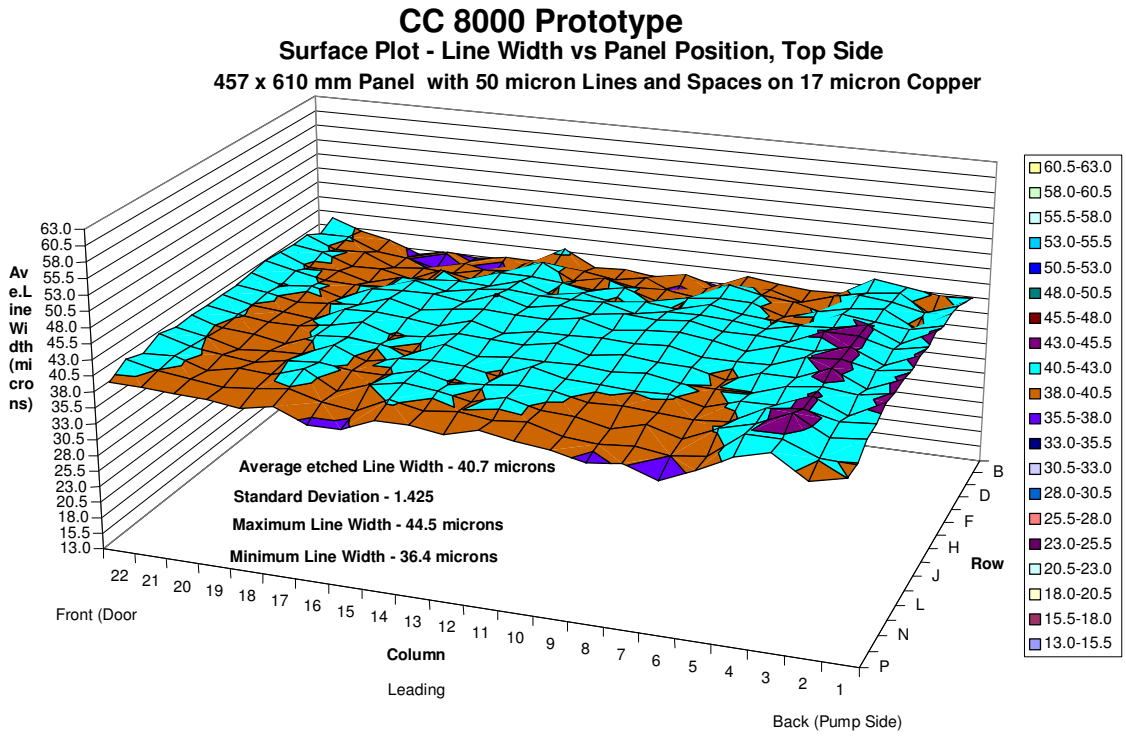
	Ave. LW	Standard Deviation	Cp	High	Low
Top Side	40.7 µm	1.425	1.90	44.5 µm	36.4 µm
Bottom Side	43.9 µm	0.957	3.04	47.1 µm	41.1 µm

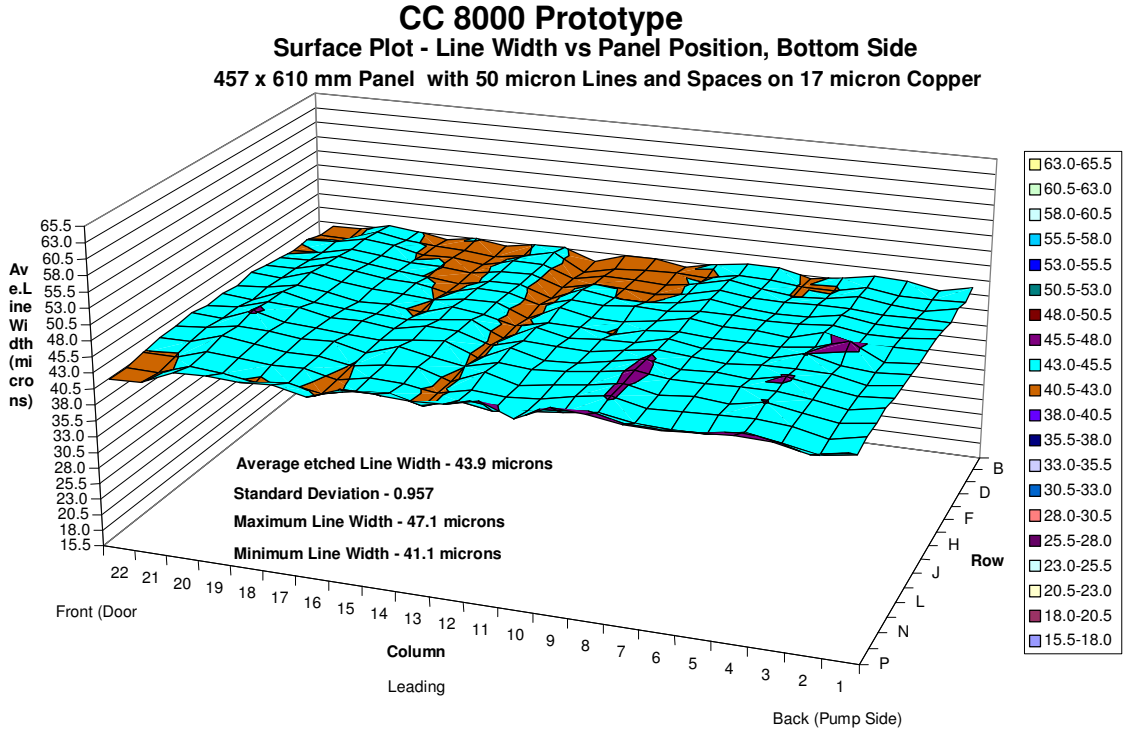
3-D surface charts in US units are on the next page. Each color represents a difference of 0.1 mils in the average line width.

3-D surface charts in metric units are page 4. Each color represents a difference of 2.5 µm in the average line width.


CC 8000 Prototype
Surface Plot - Line Width vs Panel Position, Top Side
18 x 24 Inch Panel with 2 mil Lines and Spaces on 0.5 oz. Copper
Ave.Line Width (mils)
Average etched Line Width - 1.60 mils
Standard Deviation - 0.056
Maximum Line Width - 1.75 mils
Minimum Line Width - 1.43 mils
Front (Door Column Leading
Back (Pump Side)
Row
2.40-2.50
2.30-2.40
2.20-2.30
2.10-2.20
2.00-2.10
1.90-2.00
1.80-1.90
1.70-1.80
1.60-1.70
1.50-1.60
1.40-1.50
1.30-1.40
1.20-1.30
1.10-1.20
1.00-1.10
0.90-1.00
0.80-0.90
0.70-0.80
0.60-0.70
0.50-0.60


CC 8000 Prototype
Surface Plot - Line Width vs Panel Position, Bottom Side
18 x 24 Inch Panel with 2 mil Lines and Spaces on 0.5 oz. Copper
Ave.Line Width (mils)
Average etched Line Width - 1.73 mils
Standard Deviation - 0.038
Maximum Line Width - 1.85 mils
Minimum Line Width - 1.62 mils
Front (Door Column Leading
Back (Pump Side)
Row
2.50-2.60
2.40-2.50
2.30-2.40
2.20-2.30
2.10-2.20
2.00-2.10
1.90-2.00
1.80-1.90
1.70-1.80
1.60-1.70
1.50-1.60
1.40-1.50
1.30-1.40
1.20-1.30
1.10-1.20
1.00-1.10
0.90-1.00
0.80-0.90
0.70-0.80
0.60-0.70


CC 8000 Prototype
Surface Plot - Line Width vs Panel Position, Top Side
457 x 610 mm Panel with 50 micron Lines and Spaces on 17 micron Copper
Ave.Line Width (microns)
63.0
60.5
58.0
55.5
53.0
50.5
48.0
45.5
43.0
40.5
38.0
35.5
33.0
30.5
28.0
25.5
23.0
20.5
18.0
15.5
13.0
Average etched Line Width - 40.7 microns
Standard Deviation - 1.425
Maximum Line Width - 44.5 microns
Minimum Line Width - 36.4 microns
22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
Front (Door
Column
Leading
B D F H J L N P
Row
Back (Pump Side)
60.5-63.0
58.0-60.5
55.5-58.0
53.0-55.5
50.5-53.0
48.0-50.5
45.5-48.0
43.0-45.5
40.5-43.0
38.0-40.5
35.5-38.0
33.0-35.5
30.5-33.0
28.0-30.5
25.5-28.0
23.0-25.5
20.5-23.0
18.0-20.5
15.5-18.0
13.0-15.5


CC 8000 Prototype
Surface Plot - Line Width vs Panel Position, Bottom Side
457 x 610 mm Panel with 50 micron Lines and Spaces on 17 micron Copper
Ave.Line Width (microns)
65.5
63.0
60.5
58.0
55.5
53.0
50.5
48.0
45.5
43.0
40.5
38.0
35.5
33.0
30.5
28.0
25.5
23.0
20.5
18.0
15.5
Average etched Line Width - 43.9 microns
Standard Deviation - 0.957
Maximum Line Width - 47.1 microns
Minimum Line Width - 41.1 microns
22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
Front (Door
Column
Leading
B D F H J L N P
Row
Back (Pump Side)
63.0-65.5
60.5-63.0
58.0-60.5
55.5-58.0
53.0-55.5
50.5-53.0
48.0-50.5
45.5-48.0
43.0-45.5
40.5-43.0
38.0-40.5
35.5-38.0
33.0-35.5
30.5-33.0
28.0-30.5
25.5-28.0
23.0-25.5
20.5-23.0
18.0-20.5
15.5-18.0