Highly Accelerated Thermal Shock Reliability Report

Example Analysis Report

July 5, 2011

Customer Information

Date ..... July 5, 2011
Customer ..... Tim Estes
Company ..... Conductor Analysis Technologies, Inc.
Phone 505.797.0100
Email ..... tim.estes@cat−test.info

HATS Test Parameters

Number of Coupons 6
Cycles Requested 500
Total Cycle Time (minutes) 10.82
High Temperature (C) ..... + 145
Low Temperature (C) ..... − 40
Failure Criterion (%) 10

Coupon Design

Design Name ..... HATS_0100
Design Date ..... April 12, 2011
Coupon Width (inches) 2.0
Coupon Height (inches) 0.5
Layers 10
Soldermask Expansion (mils) 3
Minimum Clearance (mils) 5
Plane Layers 3 8
Ground Plane Relief (mils) 10

Net Number	Via Type	Hole Size (mils)	Land Size (mils)	Track Width (mils)	Grid Size (mils)	Interconnect Sequence	Vias per Net
1	Through	8.0	18.0*	8	36	1·6·2·9·5·10	125
2	Through	10.0	20.0*	8	36	1·6·2·9·5·10	125
3	Through	12.0	22.0*	8	36	1·6·2·9·5·10	125
4	Through	13.5	23.5*	8	36	1·6·2·9·5·10	125

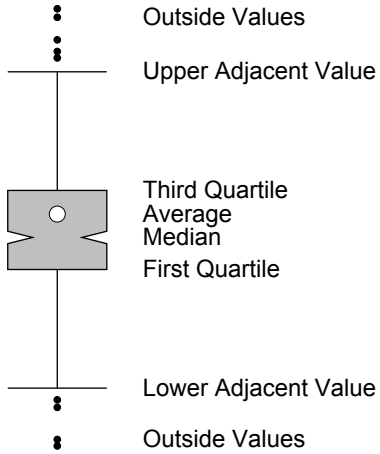
* teardrop design

Coupon Information

Coupon Number	Designation	Group Number	Thickness (mils)	Reflow Count	Reflow Cycle (C)
1	1−A	1	62	6	260
2	1−B	1	62	6	260
3	2−A	1	62	6	260
4	2−B	1	62	6	260
5	3−A	1	62	6	260
6	4−B	1	60	6	260

Notched Box Plot

Notched box plots are used to display the distribution of the data. The notch is centered at the median, and the box extends from the first quartile (25th percentile) to the third quartile (75th percentile), encompassing 50 percent of the population. A line extends from the first quartile to the lower adjacent value. This range encompasses 25 percent of the population except when there are outside values, which are plotted as individual points and reduce the population accordingly. Similarly, a line extends from the third quartile to the upper adjacent value and encompasses 25 percent of the population less any outside values at the upper bound. In some cases, the average is indicated by an open circle and is typically near the median.



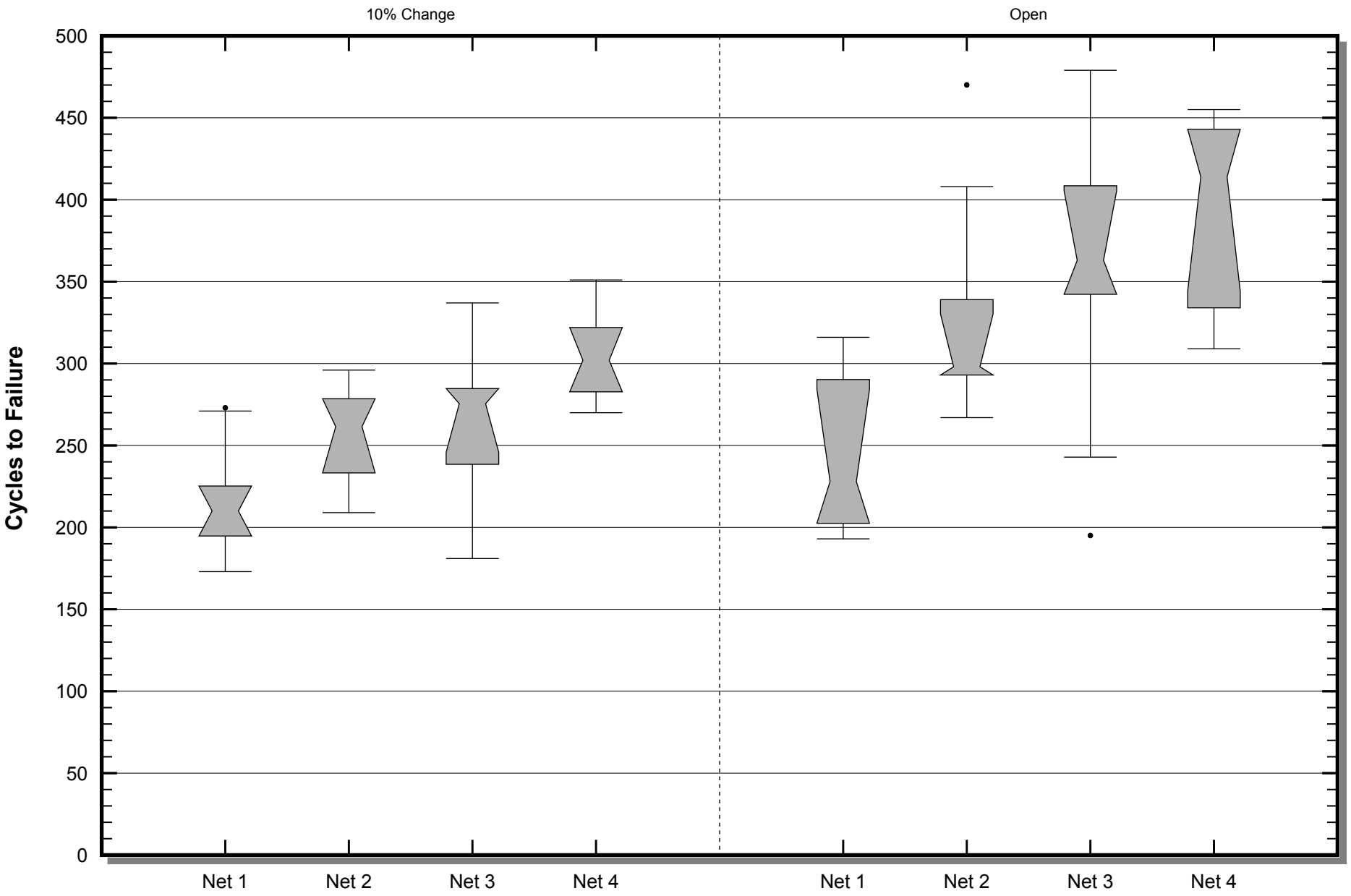
Weibull Analysis

A two−parameter log−likelihood Weibull analysis is only performed when a group includes four or more coupons having one or more thermal cycling failures. The results are presented in graphs that show "Cumulative Failure Probability" plotted vs. "Cycles to Failure" at 10% resistance change. The Weibull fit is indicated by the dotted line in the graph. The failures are plotted as white triangles while the nets that did not fail by the end of the test or were suspended prior to the end of the test are plotted as black triangles.

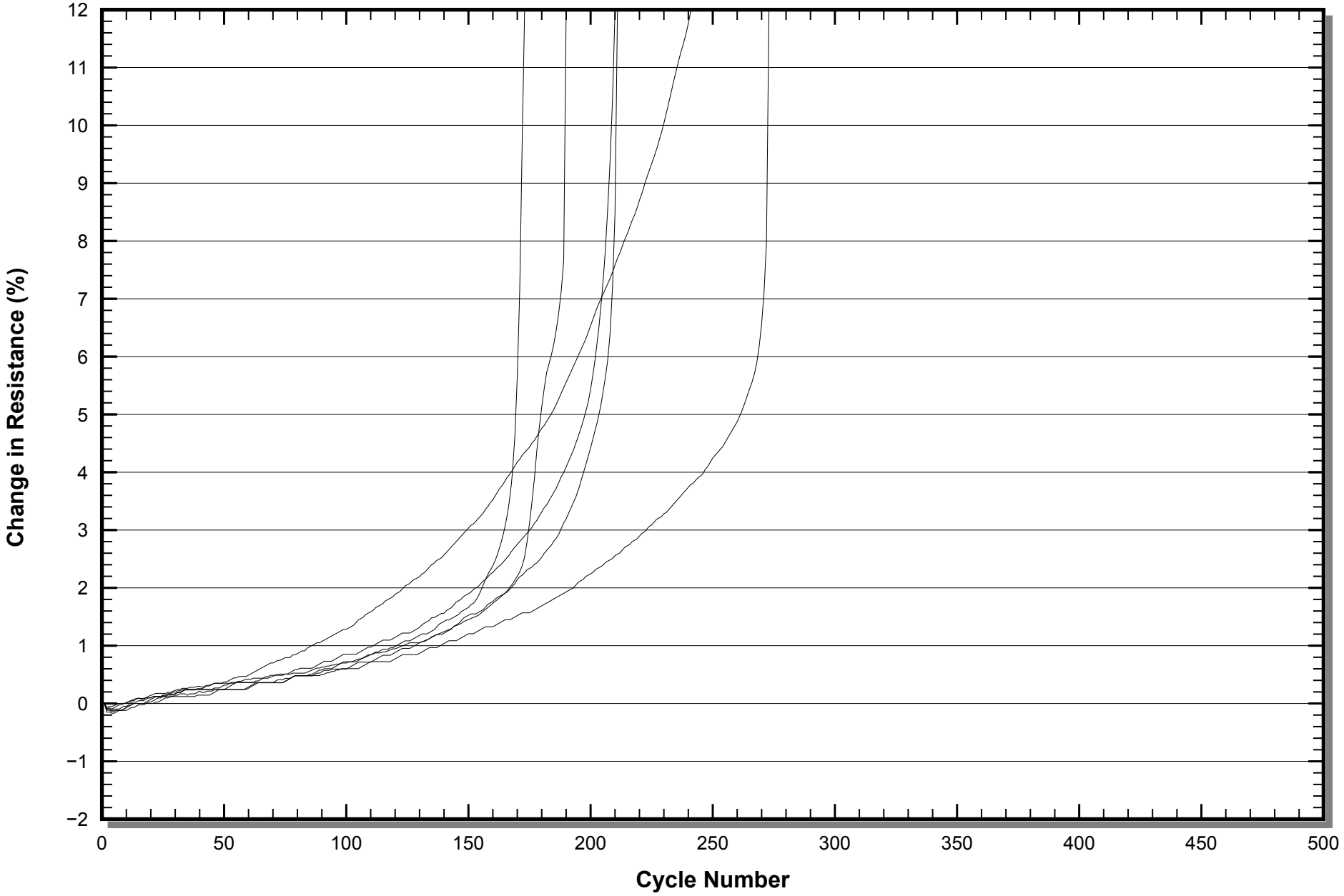
Reliability

Statistics	Cycles to 10% Change				Cycles to Open Circuit (20 ohms)			
	Net 1	Net 2	Net 3	Net 4	Net 1	Net 2	Net 3	Net 4
Count	6	6	6	6	6	6	6	6
Number Passed	0	0	0	0	0	1	0	0
Number Suspended	0	0	0	0	0	0	0	0
Number Failed	6	6	6	6	6	5	6	6
Minimum	173	209	181	270	193	267	195	309
First Quartile	195	233	238	283	202	293	342	334
Median	210	262	276	302	228	298	363	414
Third Quartile	225	278	285	322	290	339	408	443
Maximum	273	296	337	351	316	470	479	455
Mean	214	256	264	305	245	333	360	392
Range	100	87	156	81	123	203	284	146

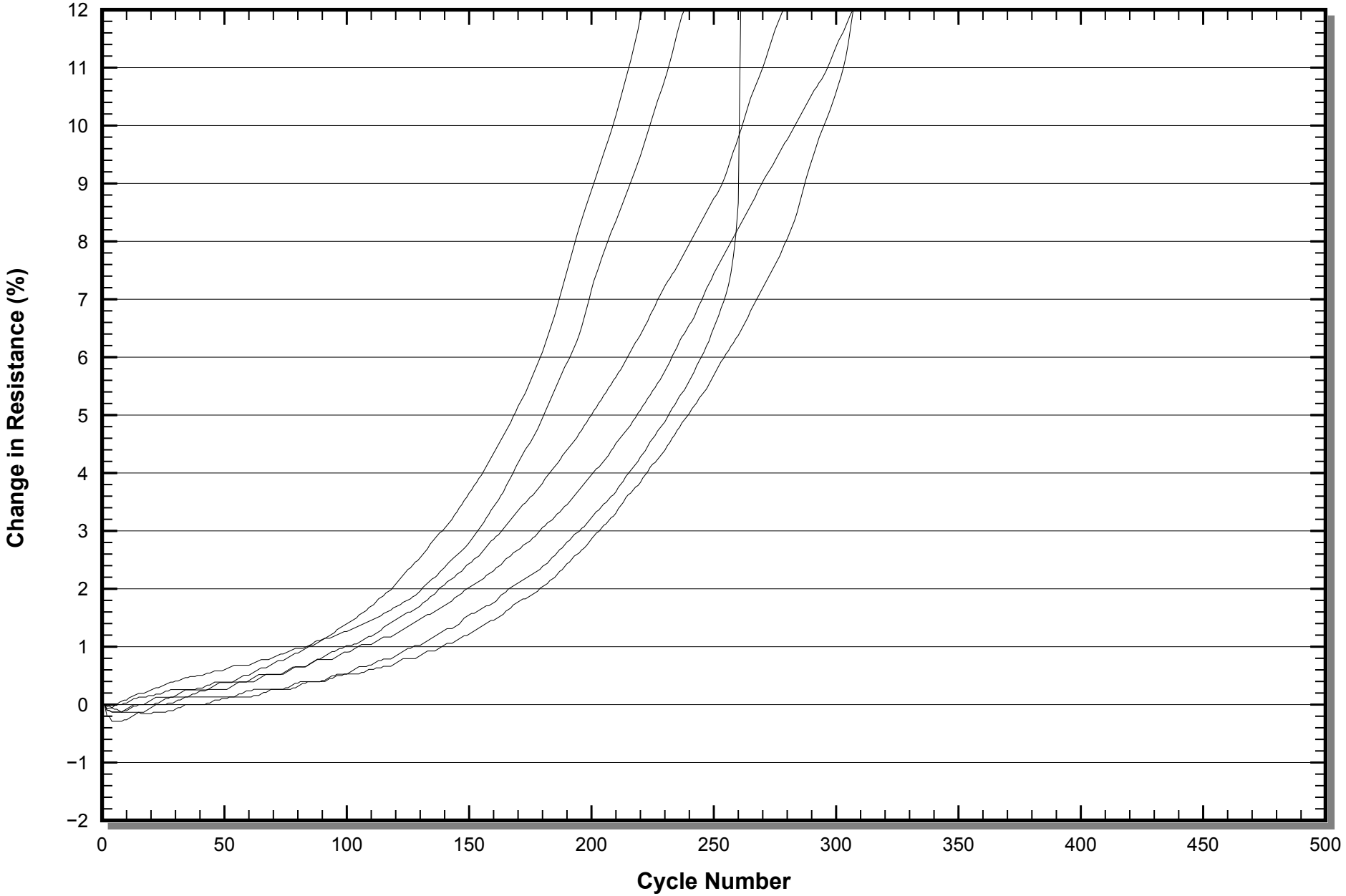
Reliability



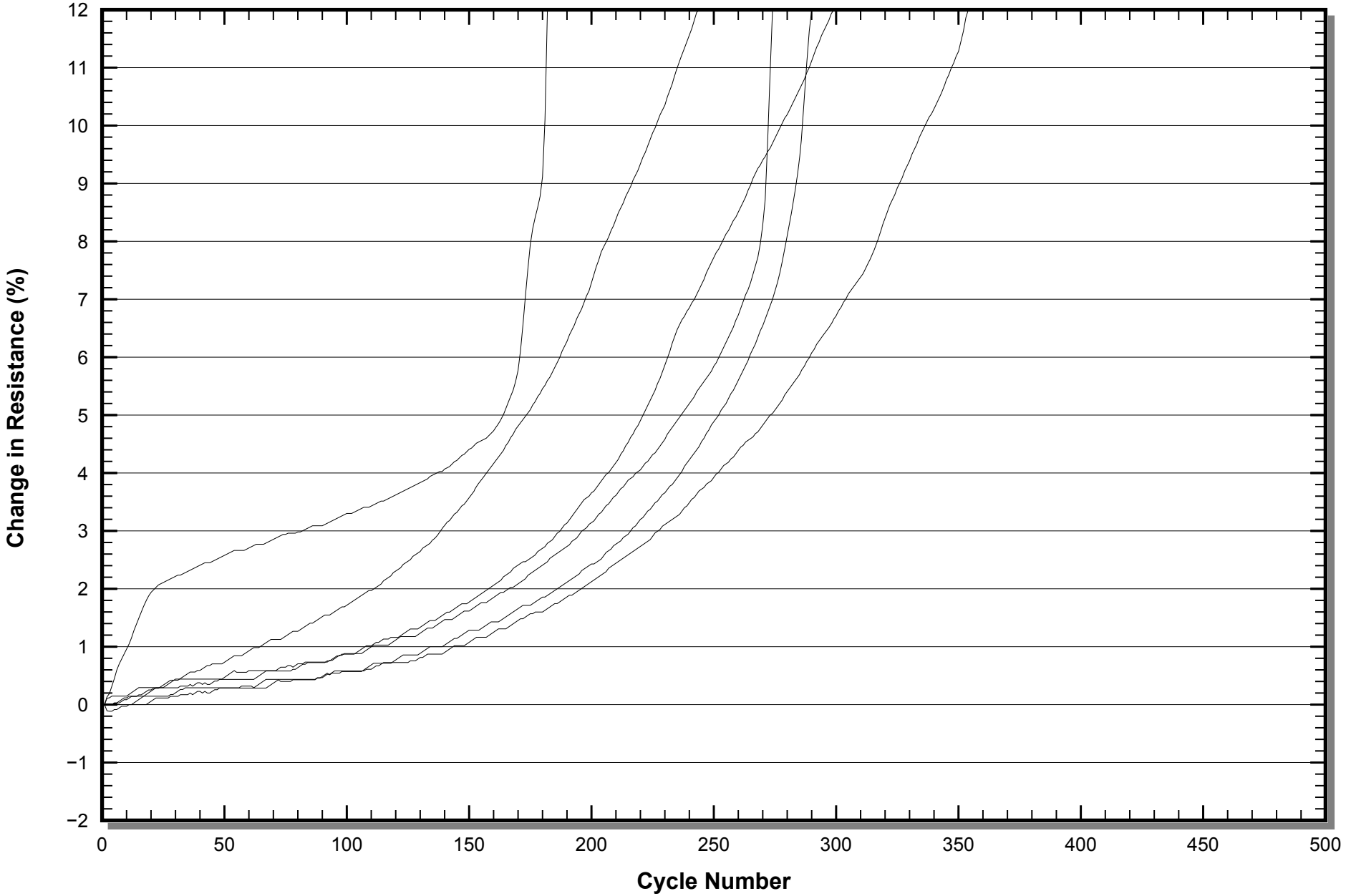
Net 1 Resistance by Cycle



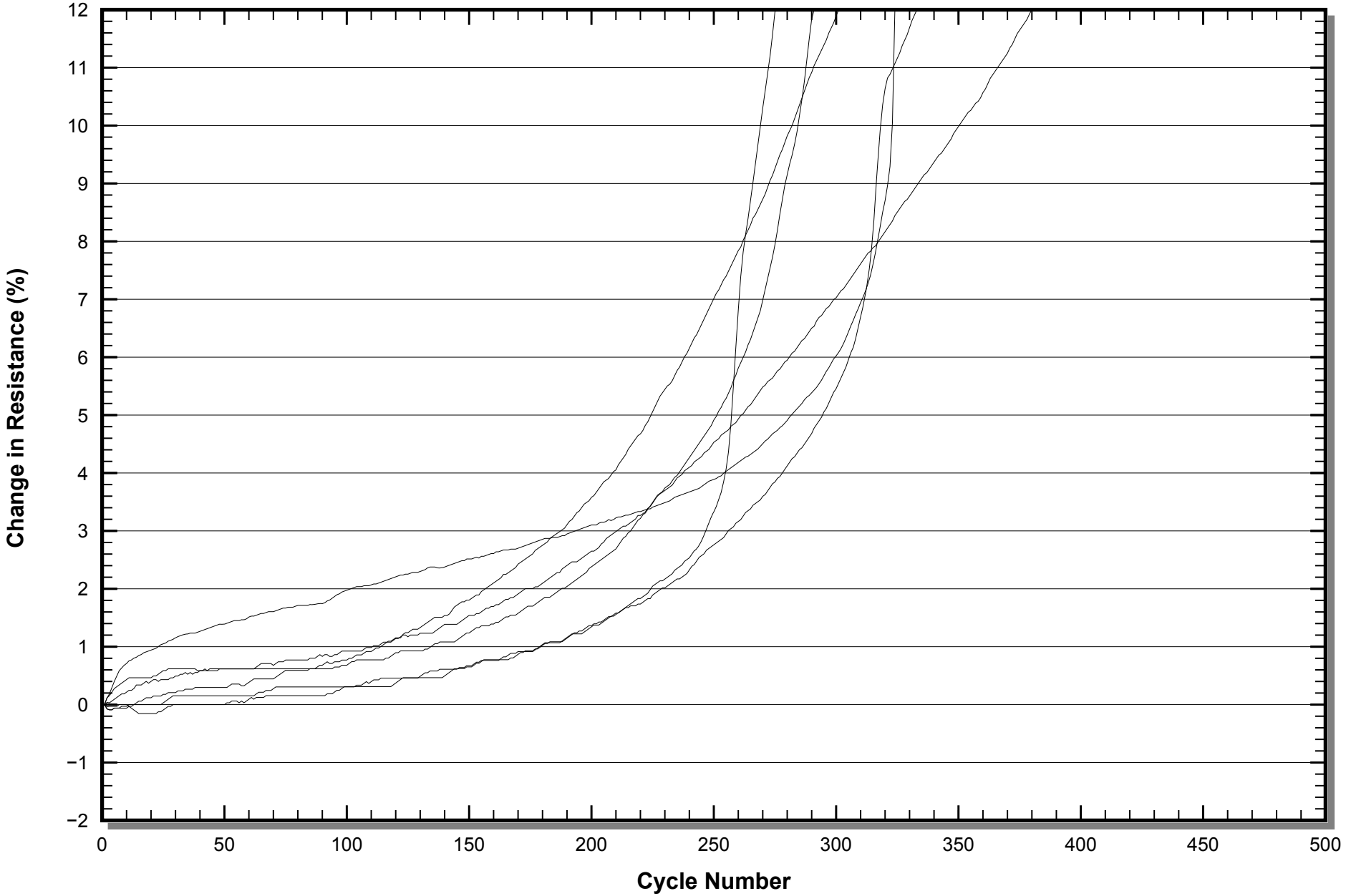
Net 2 Resistance by Cycle



Net 3 Resistance by Cycle



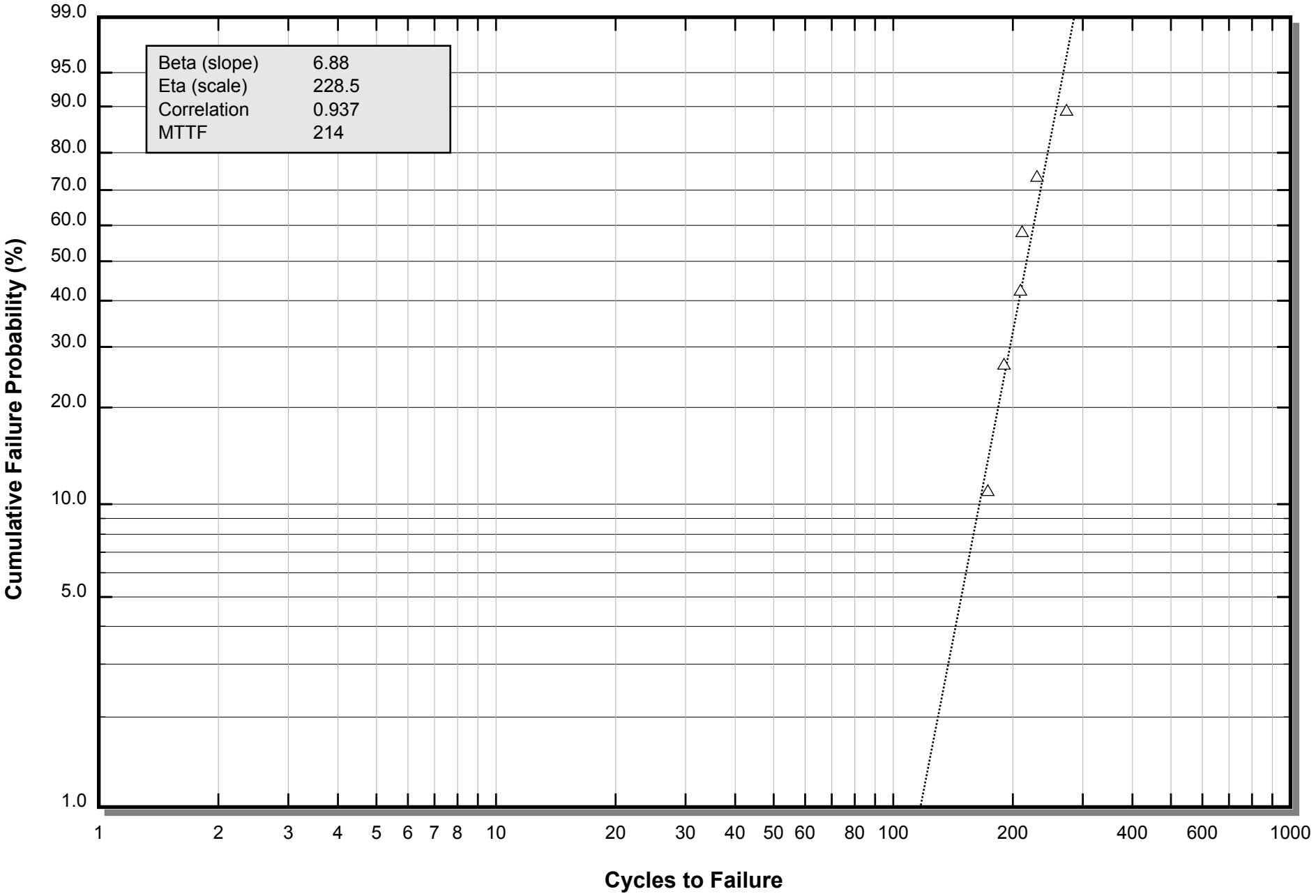
Net 4 Resistance by Cycle



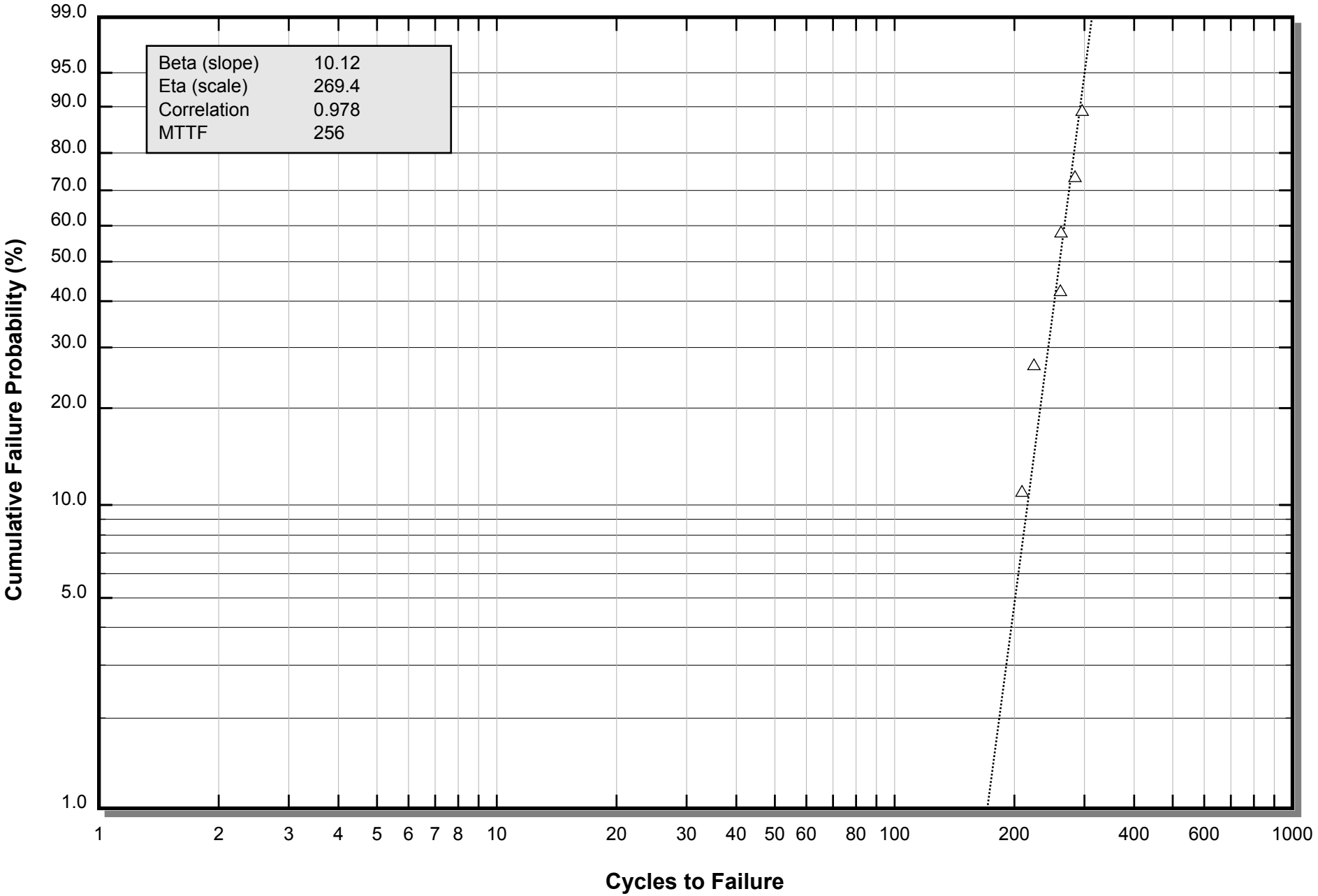
Reliability by Coupon

Coupon Number	Assembly Simulation Resistance Change (%)				Reference Resistance at 145C (ohms)				Cycles to 10% Change				Cycles to Open Circuit (20 ohms)				Percent Change at 500 Cycles			
	Net 1	Net 2	Net 3	Net 4	Net 1	Net 2	Net 3	Net 4	Net 1	Net 2	Net 3	Net 4	Net 1	Net 2	Net 3	Net 4	Net 1	Net 2	Net 3	Net 4
1	0.1	0.1	0.1	0.1	0.857	0.788	0.711	0.676	230	209	227	282	316	298	368	446	–	–	–	–
2	0.1	0.0	0.0	0.0	0.831	0.764	0.689	0.649	173	262	278	351	193	470	479	455	–	–	–	–
3	0.0	0.0	0.0	0.0	0.839	0.771	0.700	0.655	211	284	287	270	216	>500	358	314	–	74.4	–	–
4	0.2	0.1	0.1	0.1	0.829	0.762	0.688	0.647	273	261	337	285	307	267	422	309	–	–	–	–
5	1.2	0.8	0.6	0.5	1.143	1.030	0.939	1.296	190	224	181	323	198	293	195	434	–	–	–	–
6	0.2	0.2	0.1	0.1	0.821	0.756	0.681	0.645	209	296	273	319	240	339	337	394	–	–	–	–

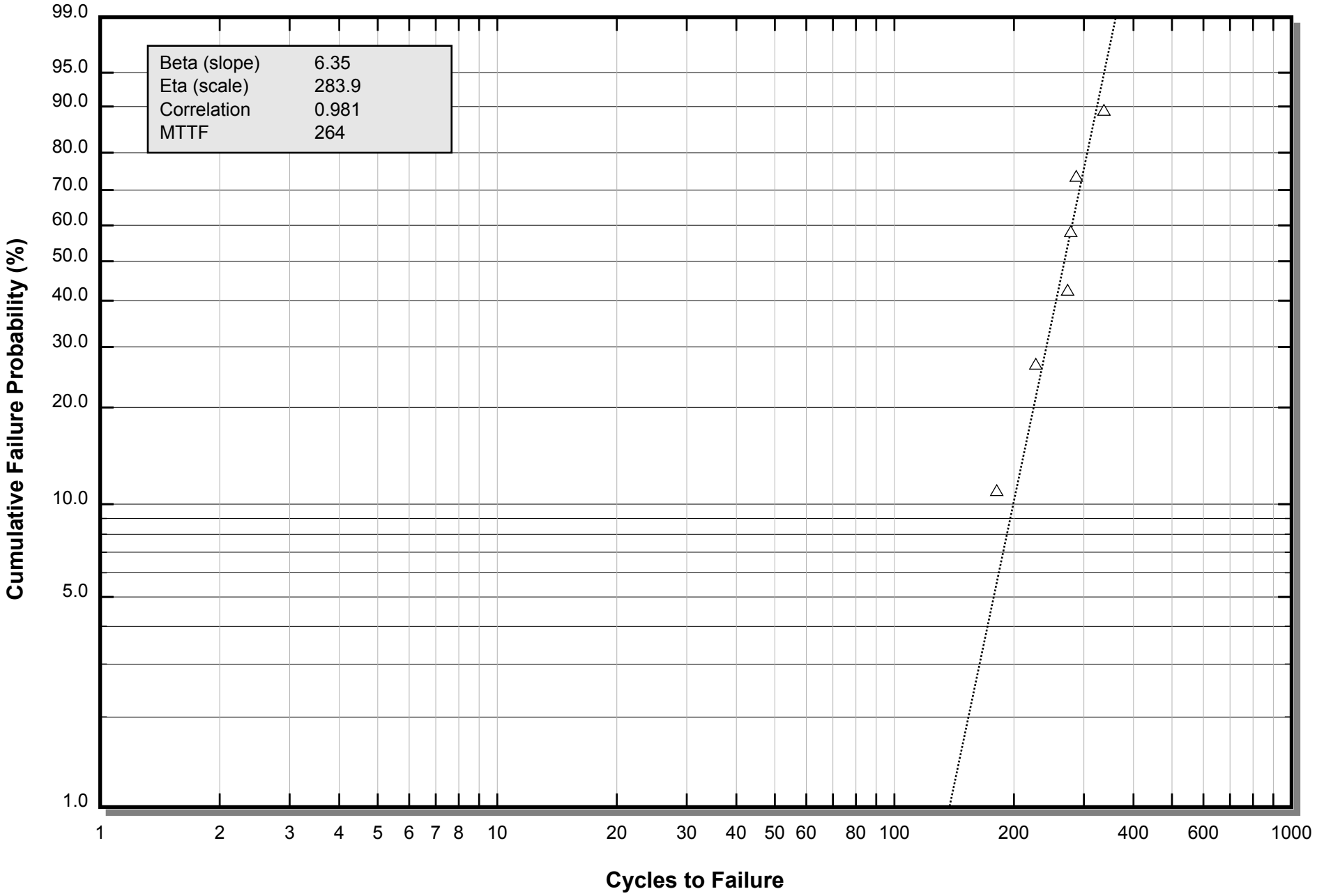
Net 1 Reliability (10% Change)



Net 2 Reliability (10% Change)



Net 3 Reliability (10% Change)



Net 4 Reliability (10% Change)