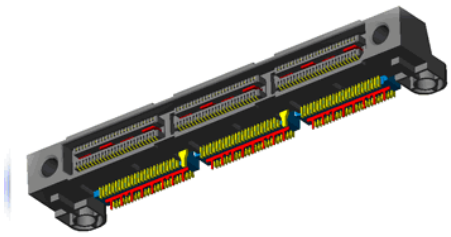
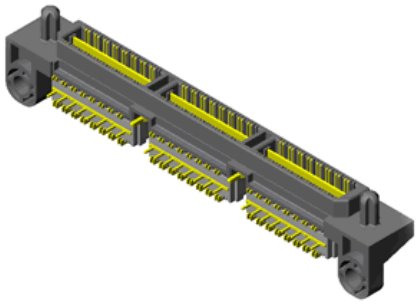
Project Number: NA	Tracking Code: TC0328--0236		
Requested by: Mark Shireman	Date: 7/8/2003	Product Rev: current	
Part #: QTS-100-01-L-D-RA / QSS-100-01-L-D-RA	Lot #: 589082	Tech: Troy Cook	Eng: John Tozier
Part description: QTS/QSS-RA			Qty to test: 15
Test Start: 07/16/2003	Test Completed: 7/17/2003		



QSS-RA



QTS-RA

1000 Cycle Mechanical Durability
Summary Report

PART DESCRIPTION

QSS-100-01-L-D-RA /QTS-100-01-L-D-RA

CERTIFICATION

All instruments and measuring equipment were calibrated to National Institute for Standards and Technology (NIST) traceable standards according to IS0 10012-l and ANSI/NCSL 2540-1, as applicable.

SCOPE

To perform the following tests: 1000 cycle durability

APPLICABLE DOCUMENTS

Standards: EIA Publication 364

TEST SAMPLES AND PREPARATION

1) All materials were manufactured in accordance with the applicable product specification.
2) All test samples were identified and encoded to maintain traceability throughout the test sequences.
3) After soldering, the parts to be used for LLCR testing were cleaned according to TLWI-0001:
   a) Sample test boards are to be ultrasonically cleaned after test lead attachment, preparation and/or soldering using the following process.
   b) Sample test boards are immersed into Branson 3510 cleaner containing Kyzen Ionox HC1 (or equivalent) with the following conditions:
      i) Temperature: ----------55° C+/- 5° C
      ii) Frequency:----------40 KHz
      iii) Immersion Time: ----------5 to 10 Minutes
      iv) Sample test boards are removed and placed into the Branson 3510 cleaner containing deionized water with the following conditions:
      v) Temperature: ----------55° C +/- 5° C
      vi) Frequency:----------40 KHz
      vii) Immersion Time: ----------5 to 10 Minutes
      viii) Sample test boards are removed and placed in a beaker positioned on a hot plate with a magnetic stirrer containing deionized water warmed to 55° C +/- 5° C for 1/2 to 1 minute
   c) Upon removal, the sample test boards are rinsed for 1/2 to 1 minute in room temperature free flowing deionized water.
   d) After the final rinse, the sample test boards are dried in an air-circulating oven for 10 to 15 minutes at 50° C +/- 5° C
   e) Sample test boards are then allowed to set and recover to room ambient condition prior to testing.
4) Parts not intended for testing LLCR and DWV/IR are visually inspected and cleaned if necessary.
5) Any additional preparation will be noted in the individual test procedures.

Tracking Code: TC0328--0236	Part #: QTS-100-01-L-D-RA / QSS-100-01-L-D-RA
Part description: QTS/QSS-RA	

FLOWCHART

TEST STEP	GROUP A 200 Points 1000 Cycles
01	GAPS-1
02	LLCR-1
03	Data Review
04	250 Cycles
05	LLCR-2
06	Data Review
07	250 Cycles
08	LLCR-3
09	Data Review
10	250 Cycles
11	LLCR-4
12	250 Cycles
13	LLCR-5

LLCR = EIA-364-23, LLCR

use Keithley 580 in the dry circuit mode, 10 mA Max

Tracking Code: TC0328--0236	Part #: QTS-100-01-L-D-RA / QSS-100-01-L-D-RA
Part description: QTS/QSS-RA	

ATTRIBUTE DEFINITION

Following is a brief, simplified description of attributes.

MATING/UNMATING (for durability cycling):

1) Reference document: EIA-364-13, *Mating and Unmating Forces Test Procedure for Electrical Connectors*.
2) The full insertion position was to within 0.003" to 0.004" of the plug bottoming out in the receptacle to prevent damage to the system under test.
3) One of the mating parts is secured to a floating X-Y table to prevent damage during cycling.

LLCR:

1) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
2) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
3) The following guidelines are used to categorize the changes in LLCR as a result from stressing
   a) <= +5.0 mOhms: ---------- Stable
   b) +5.1 to +10.0 mOhms:---------- Minor
   c) +10.1 to +15.0 mOhms: ---------- Acceptable
   d) +15.1 to +50.0 mOhms: ---------- Marginal
   e) +50.1 to +2000 mOhms: ---------- Unstable
   f) >+2000 mOhms:---------- Open Failure

Tracking Code: TC0328--0236	Part #: QTS-100-01-L-D-RA / QSS-100-01-L-D-RA
Part description: QTS/QSS-RA	

RESULTS

LLCR Durability (200 LLCR test points)

- **Initial ---------- 38.8 mOhms Max**
- **Durability, 250 Cycles**
  - **<= +5.0 mOhms ---------- 200 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**
- **Durability, 500 Cycles**
  - **<= +5.0 mOhms ---------- 200 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**
- **Durability, 750 Cycles**
  - **<= +5.0 mOhms ---------- 199 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 1 Point ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**
- **Durability, 1000 Cycles**
  - **<= +5.0 mOhms ---------- 199 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ---------- 1 Point ---------- Minor**
  - **+10.1 to +15.0 mOhms ---------- 0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ---------- 0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms ---------- 0 Points ---------- Unstable**
  - **>+2000 mOhms ---------- 0 Points ---------- Open Failure**

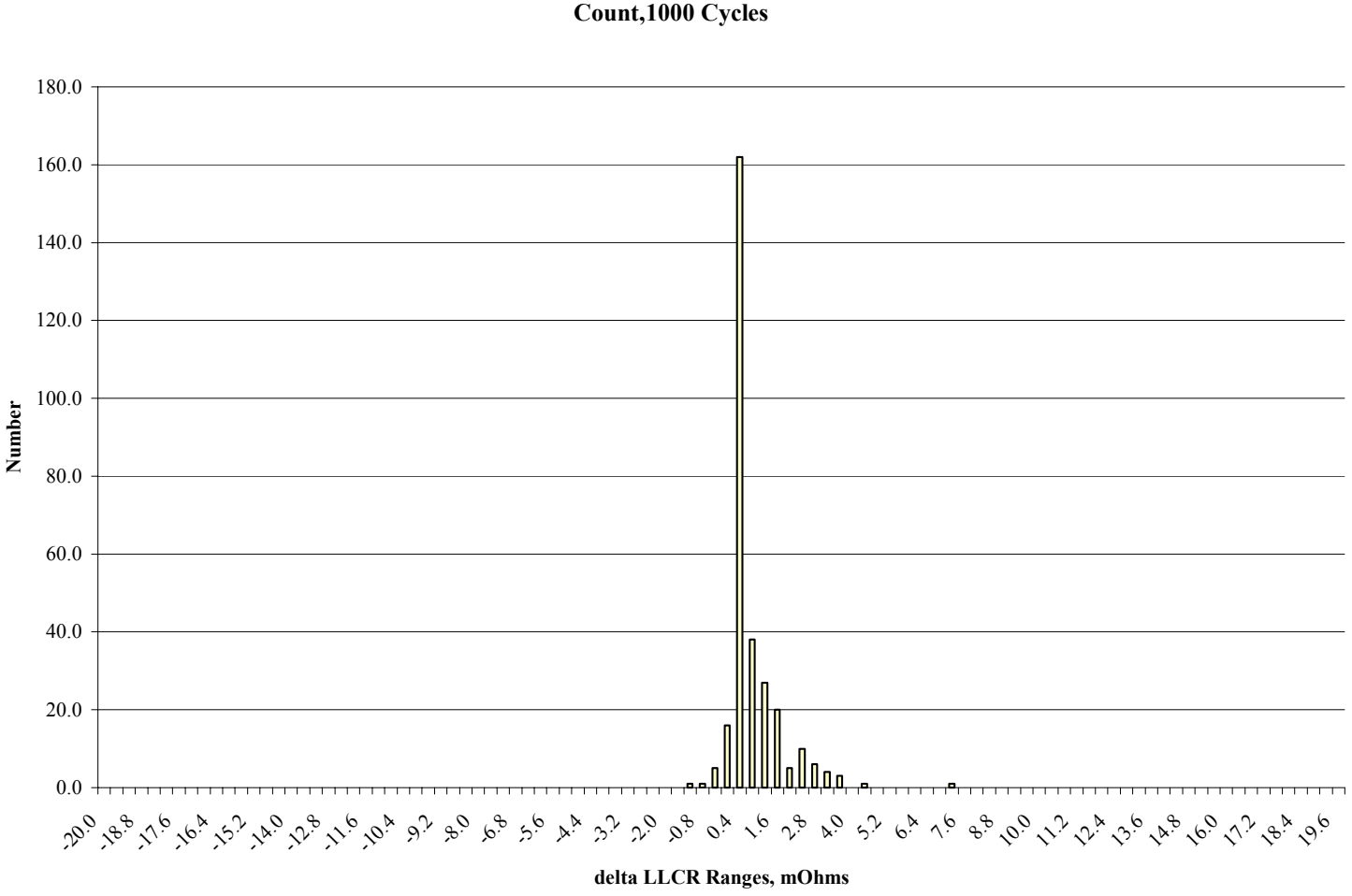
Tracking Code: TC0328--0236	Part #: QTS-100-01-L-D-RA / QSS-100-01-L-D-RA
Part description: QTS/QSS-RA	

DATA SUMMARIES

LLCR:

1) A total of 200 points were measured.
2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a) <= +5.0 mOhms: ---------- Stable
   b) +5.1 to +10.0 mOhms:---------- Minor
   c) +10.1 to +15.0 mOhms: ---------- Acceptable
   d) +15.1 to +50.0 mOhms: ---------- Marginal
   e) +50.1 to +2000 mOhms ---------- Unstable
   f) >+2000 mOhms:---------- Open Failure

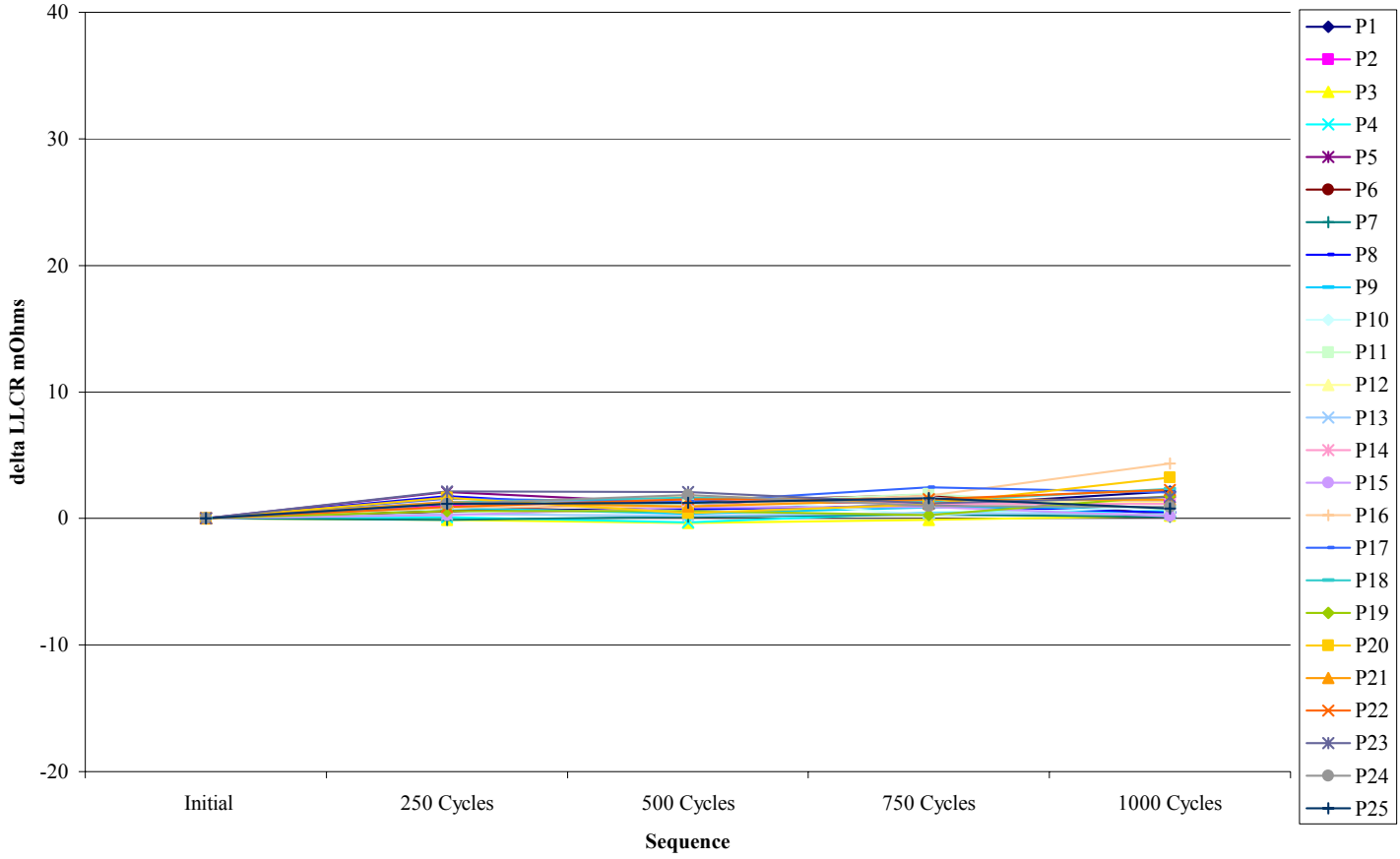
mOhm values	Actual Initial	Delta 250 Cycles	Delta 500 Cycles	Delta 750 Cycles	Delta 1000 Cycles
Average	35.9	0.3	0.7	0.7	0.8
St. Dev.	2.8	0.6	0.8	0.9	1.0
Min	30.4	-1.7	-1.4	-2.0	-1.5
Max	38.8	2.2	4.1	6.9	6.9
Count	200	200	200	200	200



Tracking Code: TC0328--0236	Part #: QTS-100-01-L-D-RA / QSS-100-01-L-D-RA
Part description: QTS/QSS-RA	

DATA SUMMARIES Continued

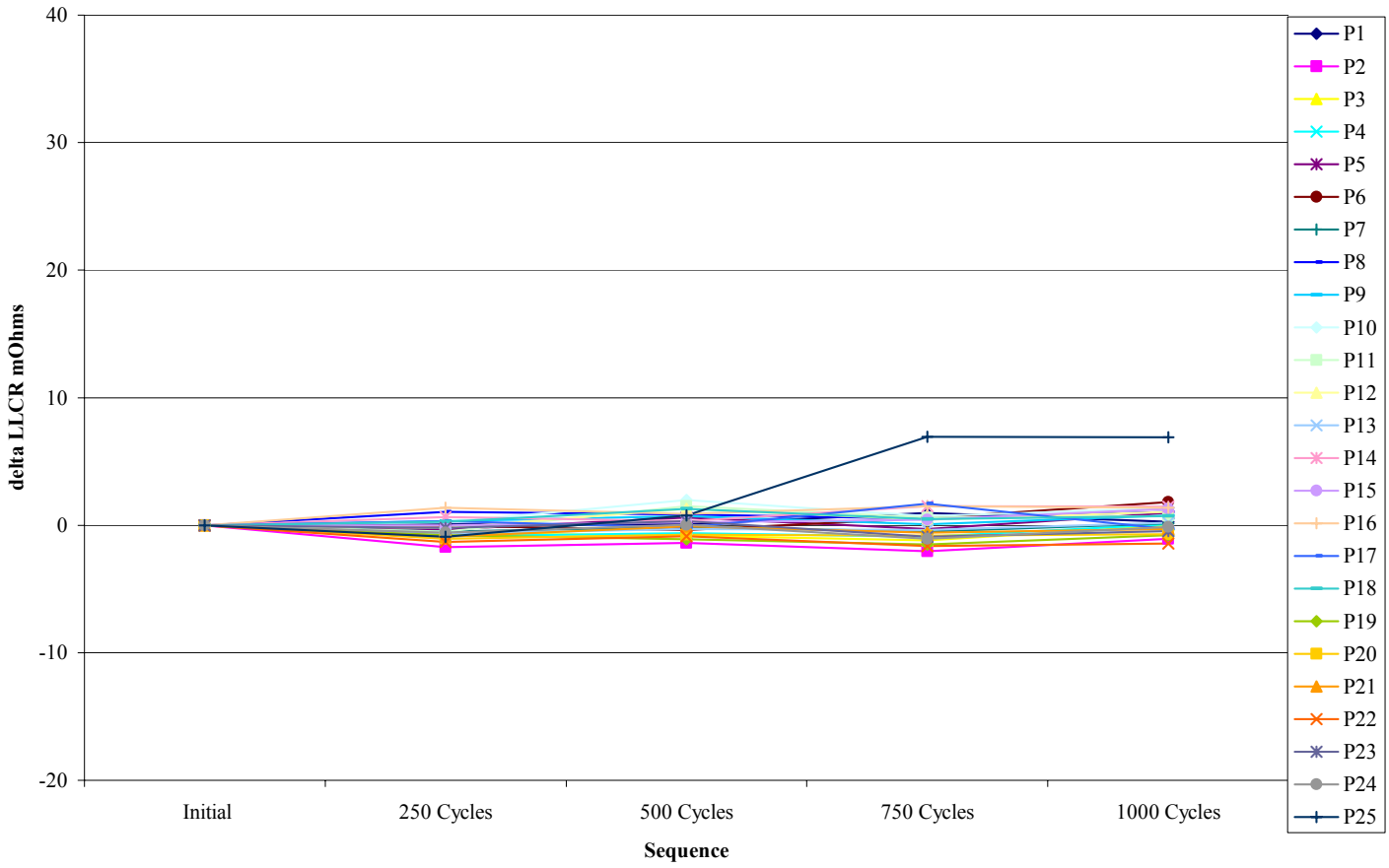
Board #1



Tracking Code: TC0328--0236	Part #: QTS-100-01-L-D-RA / QSS-100-01-L-D-RA
Part description: QTS/QSS-RA	

DATA SUMMARIES Continued

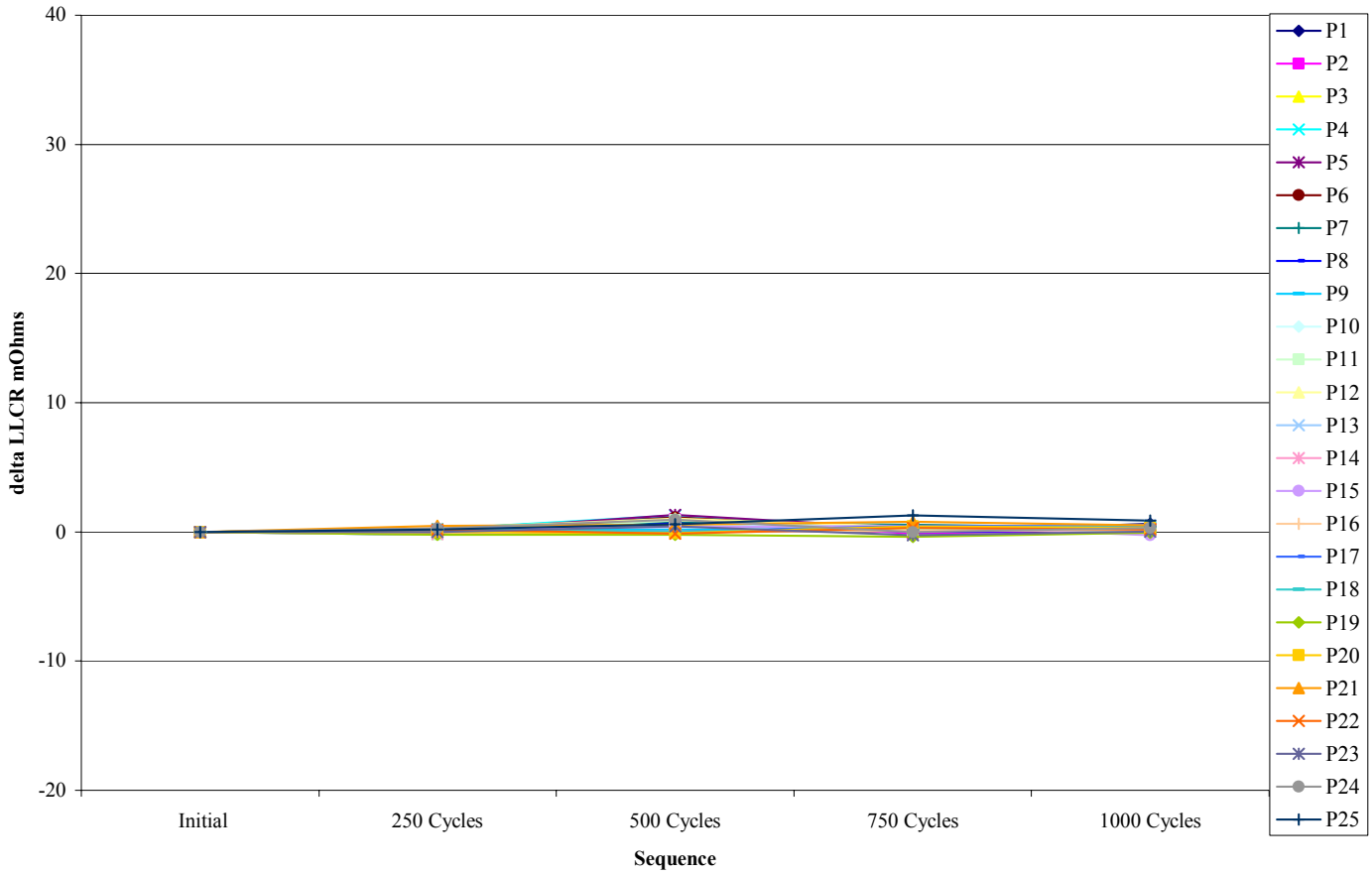
Board #2



Tracking Code: TC0328--0236	Part #: QTS-100-01-L-D-RA / QSS-100-01-L-D-RA
Part description: QTS/QSS-RA	

DATA SUMMARIES Continued

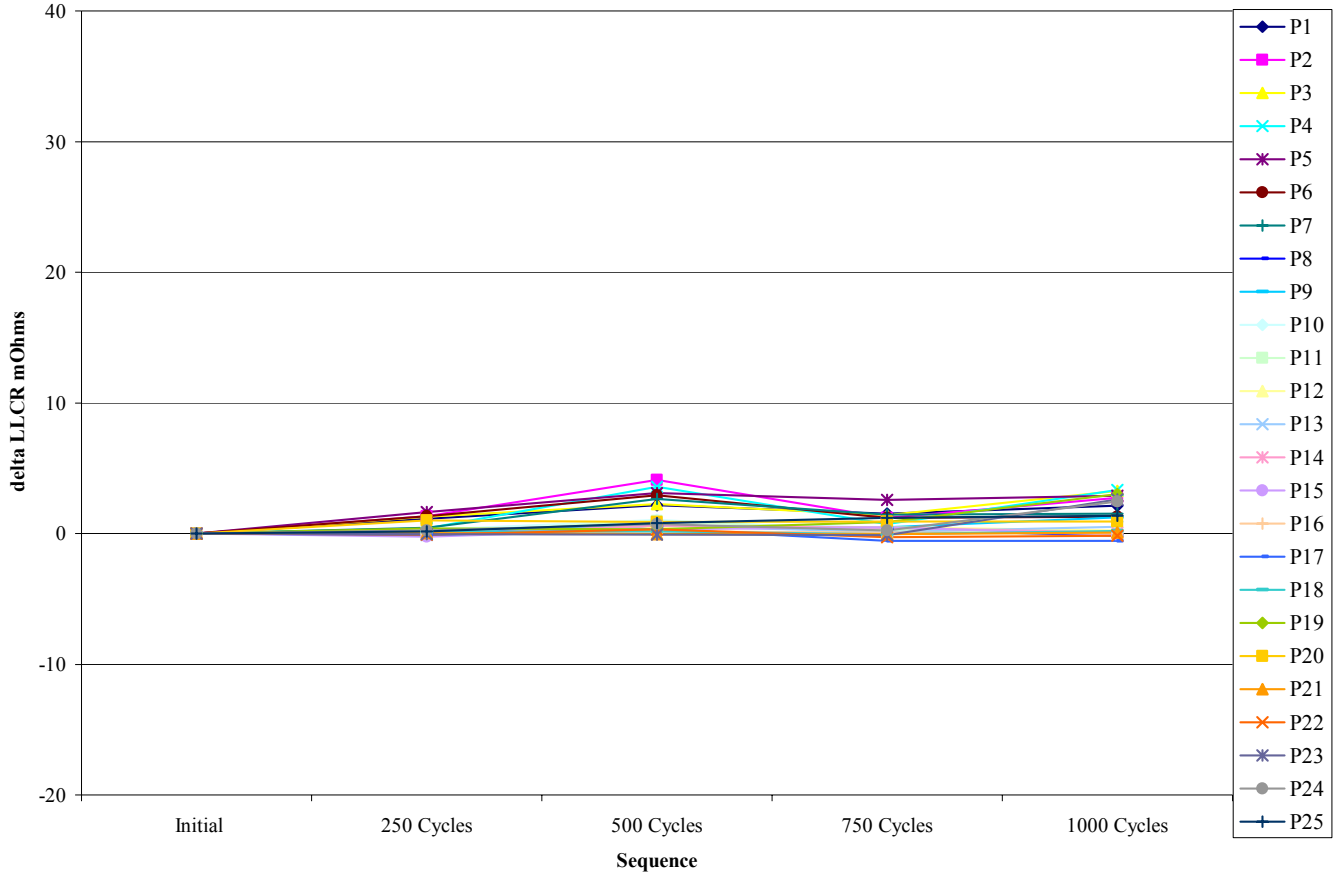
Board #3



Tracking Code: TC0328--0236	Part #: QTS-100-01-L-D-RA / QSS-100-01-L-D-RA
Part description: QTS/QSS-RA	

DATA SUMMARIES Continued

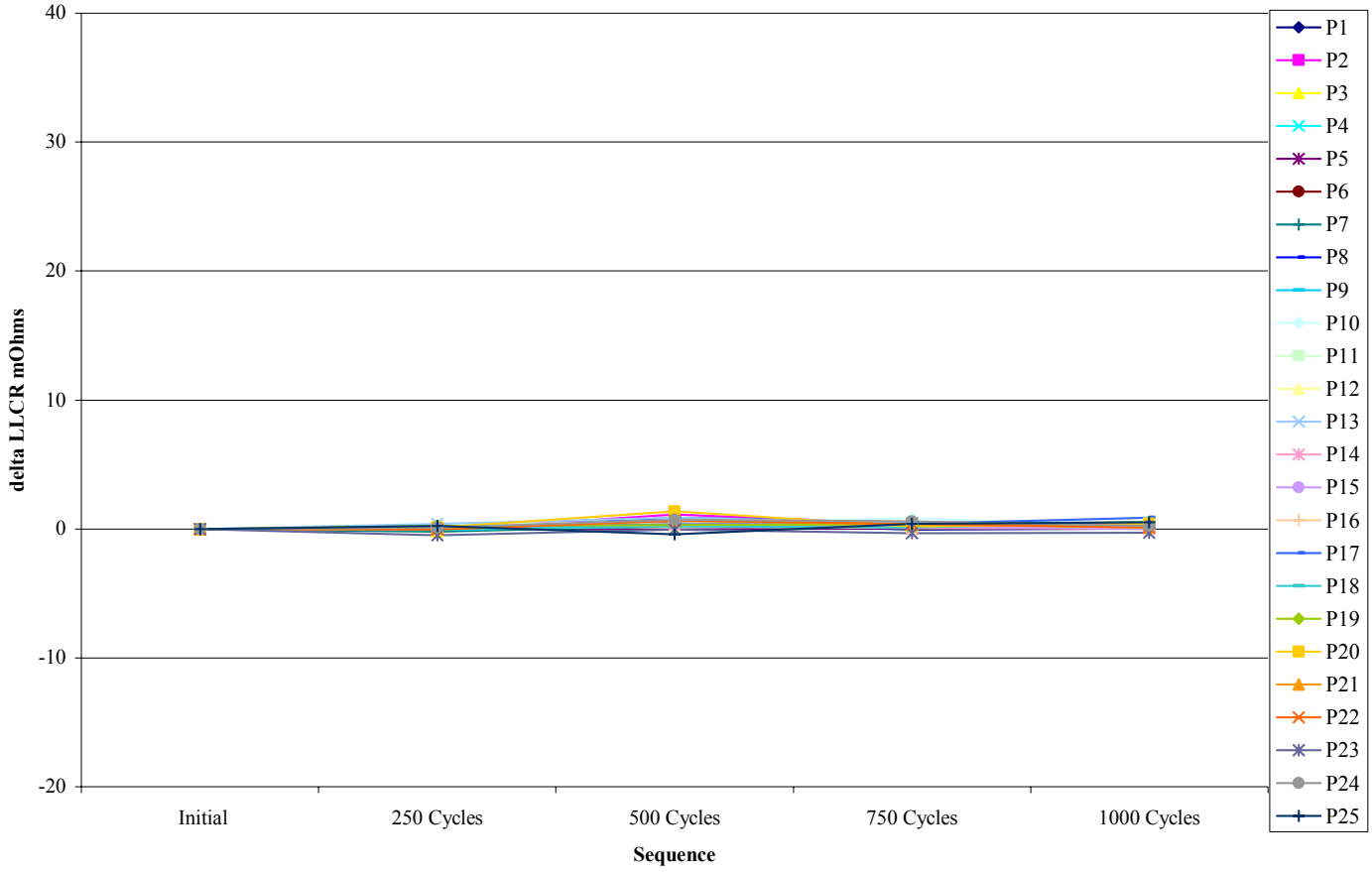
Board #4



Tracking Code: TC0328--0236	Part #: QTS-100-01-L-D-RA / QSS-100-01-L-D-RA
Part description: QTS/QSS-RA	

DATA SUMMARIES Continued

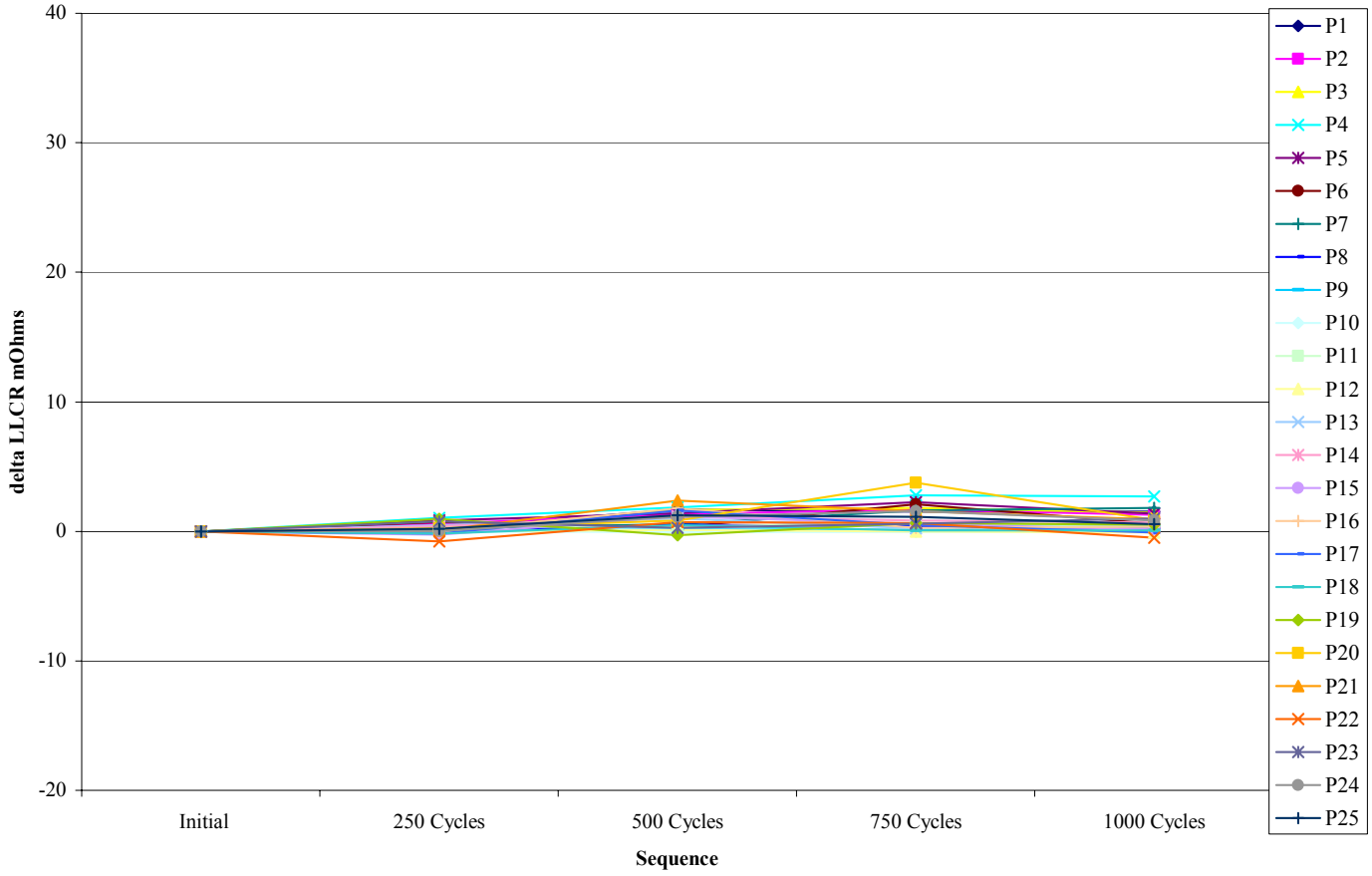
Board #5



Tracking Code: TC0328--0236	Part #: QTS-100-01-L-D-RA / QSS-100-01-L-D-RA
Part description: QTS/QSS-RA	

DATA SUMMARIES Continued

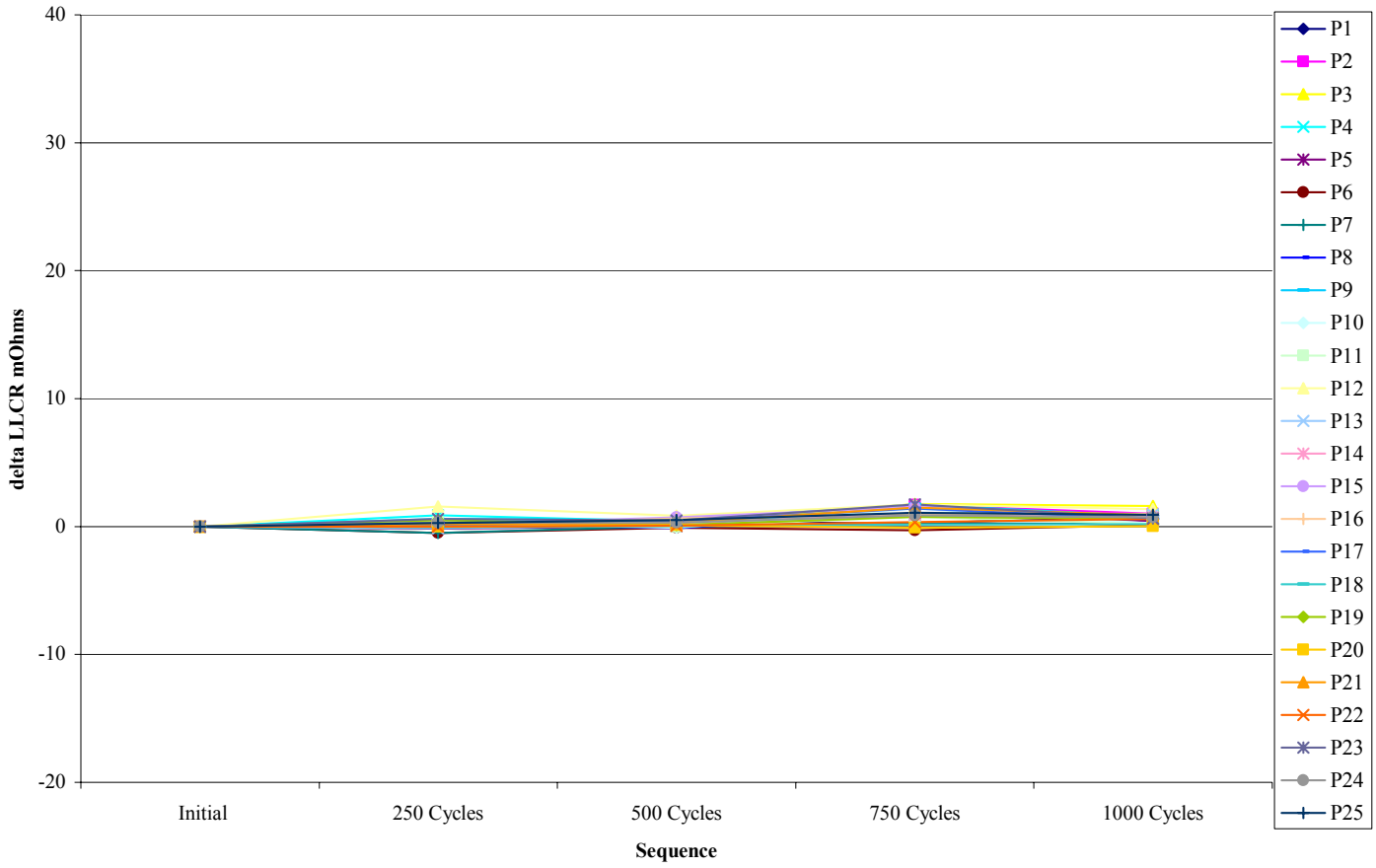
Board #6



Tracking Code: TC0328--0236	Part #: QTS-100-01-L-D-RA / QSS-100-01-L-D-RA
Part description: QTS/QSS-RA	

DATA SUMMARIES Continued

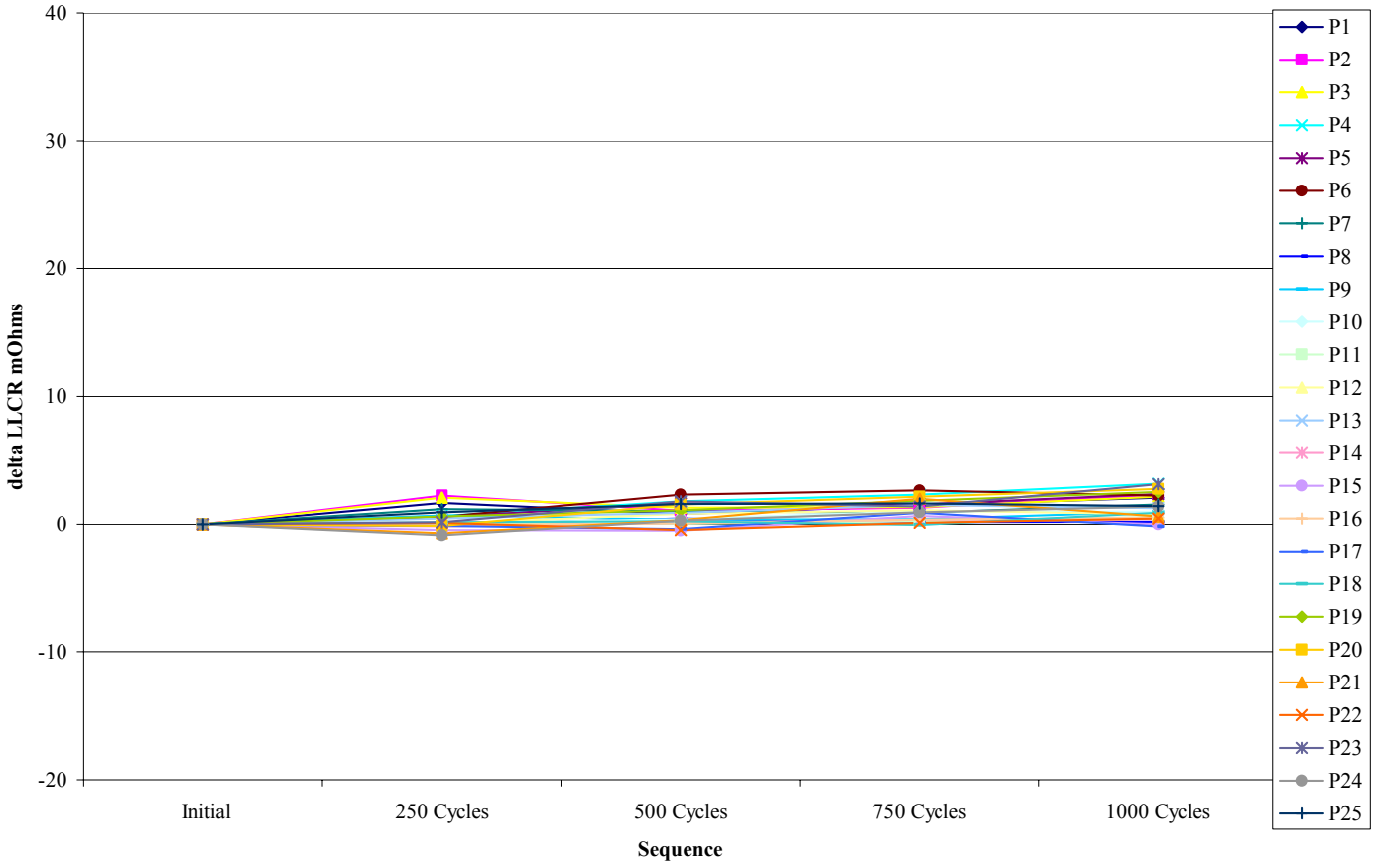
Board #7



Tracking Code: TC0328--0236	Part #: QTS-100-01-L-D-RA / QSS-100-01-L-D-RA
Part description: QTS/QSS-RA	

DATA SUMMARIES Continued

Board #8



Tracking Code: TC0328--0236	Part #: QTS-100-01-L-D-RA / QSS-100-01-L-D-RA
Part description: QTS/QSS-RA	

DATA

LLCR:

Date	Jul. 16 2003	Jul. 16 2003	Jul. 16 2003	Jul. 16 2003	Jul. 16 2003
Room Temp C	22	21	22	22	22
RH	54%	50%	53%	48%	48%
Name	Troy Cook	Troy Cook	Troy Cook	Troy Cook	Troy Cook

mOhm values		Actual	Delta	Delta	Delta	Delta
Board	Position	Initial	250 Cycles	500 Cycles	750 Cycles	1000 Cycles
1	P1	38.0	0.6	0.8	1.0	2.1
1	P2	38.4	1.0	1.4	1.2	1.2
1	P3	38.1	-0.1	-0.4	-0.1	0.2
1	P4	37.2	0.1	-0.3	0.5	0.6
1	P5	37.9	2.1	1.2	1.3	1.3
1	P6	37.4	0.5	1.4	1.8	0.3
1	P7	37.7	-0.1	0.1	0.3	0.1
1	P8	37.5	1.8	0.7	1.0	0.5
1	P9	37.5	0.8	0.4	0.9	0.9
1	P10	37.1	0.9	1.8	0.3	1.0
1	P11	37.1	1.2	1.2	1.9	0.7
1	P12	37.5	0.8	1.8	1.3	1.3
1	P13	37.3	0.3	0.2	0.4	0.4
1	P14	38.3	1.3	1.5	1.2	1.1
1	P15	37.0	0.3	0.9	0.9	0.2
1	P16	37.9	0.9	1.0	1.8	4.4
1	P17	37.1	1.6	1.3	2.5	2.1
1	P18	37.5	1.3	1.6	1.4	2.3
1	P19	37.7	0.6	0.6	0.3	1.8
1	P20	38.1	1.7	0.4	1.1	3.2
1	P21	37.4	1.3	0.9	1.5	1.5
1	P22	37.5	0.9	1.5	1.5	2.3
1	P23	37.4	2.1	2.1	1.2	1.7
1	P24	37.6	1.2	1.9	1.0	0.9
1	P25	37.6	1.1	1.2	1.6	0.8
2	P1	31.5	0.1	0.1	0.9	0.3
2	P2	33.3	-1.7	-1.4	-2.0	-1.1
2	P3	32.6	-0.6	-0.8	-1.2	0.0
2	P4	32.2	-0.9	-0.6	-0.9	0.1
2	P5	31.8	-0.3	0.6	-0.3	1.0
2	P6	32.5	-0.1	-0.4	0.6	1.8
2	P7	31.5	-0.5	-0.1	-0.5	0.1
2	P8	38.8	1.1	0.8	0.5	1.0
2	P9	38.4	0.3	0.7	0.1	0.7
2	P10	37.9	0.2	2.0	0.7	1.3
2	P11	38.0	-0.5	1.5	0.6	0.7
2	P12	37.8	-0.2	1.3	0.4	1.1

2	P13	38.6	-0.7	-0.3	-0.4	0.2
2	P14	38.1	0.6	0.3	1.5	1.5
2	P15	38.0	0.0	0.2	0.4	1.3
2	P16	38.1	1.4	0.9	1.5	1.4
2	P17	38.6	0.3	-0.2	1.7	-0.3
2	P18	38.1	0.3	1.3	0.5	0.7
2	P19	31.6	-0.8	-1.1	-1.5	-0.8
2	P20	32.2	-1.1	-0.7	-0.8	-0.7
2	P21	31.3	-0.9	-0.1	-0.6	-0.3
2	P22	32.2	-1.3	-0.9	-1.6	-1.5
2	P23	32.2	-0.2	0.3	-0.9	-0.4
2	P24	32.3	-0.6	0.0	-1.1	-0.2
2	P25	31.9	-0.9	0.8	6.9	6.9
3	P1	37.5	0.2	1.2	0.0	0.6
3	P2	37.6	0.1	1.0	-0.1	0.2
3	P3	37.5	0.2	0.9	0.3	0.3
3	P4	36.7	0.2	1.3	0.2	0.3
3	P5	37.7	0.0	1.3	0.3	0.2
3	P6	37.6	-0.1	1.1	0.2	0.0
3	P7	37.2	0.2	0.7	0.6	0.3
3	P8	37.3	-0.2	0.7	0.0	0.1
3	P9	37.6	0.1	0.2	0.2	0.1
3	P10	37.0	0.3	0.5	0.5	0.3
3	P11	37.1	-0.2	0.9	0.2	0.1
3	P12	37.4	0.3	1.0	0.4	0.5
3	P13	37.0	0.2	0.4	0.4	0.5
3	P14	37.1	-0.2	0.0	0.1	0.2
3	P15	36.9	0.3	0.4	0.5	-0.2
3	P16	37.6	0.0	0.0	0.1	0.1
3	P17	37.6	0.1	0.0	0.5	0.4
3	P18	37.5	0.2	0.0	0.4	0.4
3	P19	37.8	-0.2	-0.2	-0.4	0.0
3	P20	37.6	0.0	-0.1	0.4	0.3
3	P21	37.2	0.5	0.5	0.8	0.5
3	P22	37.3	0.2	-0.1	0.3	0.2
3	P23	37.7	0.0	0.4	-0.2	0.0
3	P24	37.5	0.3	0.9	0.0	0.3
3	P25	37.3	0.2	0.6	1.3	0.9
4	P1	31.5	1.1	2.2	1.5	2.1
4	P2	32.1	1.3	4.1	1.2	2.8
4	P3	31.2	1.3	2.3	1.4	3.3
4	P4	31.3	0.4	3.6	0.7	3.3
4	P5	31.8	1.7	3.1	2.6	2.9
4	P6	31.4	1.3	3.0	1.2	1.3
4	P7	31.3	0.4	2.7	1.4	1.5
4	P8	38.5	0.1	0.5	0.3	-0.2
4	P9	37.9	0.2	0.6	0.5	1.3
4	P10	38.3	0.3	1.1	0.2	0.1
4	P11	37.3	0.0	1.0	0.3	0.1
4	P12	37.6	-0.1	0.5	0.5	0.3

4	P13	37.9	-0.1	0.6	0.1	0.5
4	P14	38.5	-0.1	0.6	0.5	0.1
4	P15	37.2	-0.2	0.3	0.5	-0.1
4	P16	38.0	0.0	0.2	0.1	0.0
4	P17	37.9	-0.1	0.4	-0.6	-0.6
4	P18	37.6	0.2	0.2	0.0	0.2
4	P19	30.4	0.4	0.3	0.9	3.0
4	P20	30.8	1.0	0.9	0.9	0.9
4	P21	31.1	0.0	0.0	0.0	0.1
4	P22	31.5	-0.1	0.3	-0.3	-0.2
4	P23	31.8	0.0	-0.1	-0.1	2.6
4	P24	31.4	0.2	0.7	0.2	2.5
4	P25	31.2	0.2	0.8	1.2	1.4
5	P1	37.4	-0.1	0.5	0.0	0.0
5	P2	37.8	-0.1	1.1	0.4	0.2
5	P3	37.6	-0.2	0.2	0.3	0.3
5	P4	36.9	-0.1	0.2	0.3	0.2
5	P5	38.1	0.0	-0.1	0.1	0.1
5	P6	37.7	0.0	0.3	0.3	0.0
5	P7	37.4	-0.2	0.2	0.3	0.1
5	P8	37.6	-0.1	0.9	0.5	0.3
5	P9	38.0	-0.1	0.2	0.5	0.4
5	P10	37.5	0.1	0.4	0.8	0.2
5	P11	37.1	0.2	0.7	0.4	0.4
5	P12	37.6	0.1	0.2	0.1	0.1
5	P13	37.1	0.4	0.9	0.5	0.5
5	P14	37.5	0.1	0.3	0.1	0.0
5	P15	37.1	0.1	0.3	0.2	0.0
5	P16	37.4	0.0	0.4	0.2	0.4
5	P17	37.6	0.1	0.4	0.4	0.9
5	P18	37.1	0.0	0.2	0.1	0.5
5	P19	37.4	0.2	0.3	0.4	0.5
5	P20	37.5	0.1	1.4	0.2	0.4
5	P21	37.1	0.0	0.6	0.3	0.1
5	P22	37.1	-0.1	0.6	0.4	0.1
5	P23	38.0	-0.5	-0.1	-0.3	-0.3
5	P24	37.6	0.1	0.7	0.6	0.2
5	P25	37.9	0.2	-0.4	0.4	0.5
6	P1	30.8	0.2	1.7	1.5	1.5
6	P2	31.2	0.6	1.3	1.7	1.3
6	P3	31.4	0.1	1.7	1.8	1.5
6	P4	30.9	1.1	1.9	2.8	2.7
6	P5	30.6	0.9	1.4	2.2	1.3
6	P6	31.6	0.7	0.3	2.1	0.6
6	P7	30.9	0.2	0.5	1.6	1.8
6	P8	38.2	-0.1	0.5	0.4	0.2
6	P9	38.2	0.0	0.2	0.1	0.4
6	P10	37.8	0.0	0.0	-0.1	0.0
6	P11	37.4	0.4	0.4	0.6	0.4
6	P12	37.8	0.0	0.1	0.0	-0.1

6	P13	38.2	0.5	1.0	0.2	0.4
6	P14	37.6	0.4	1.1	0.8	0.7
6	P15	37.3	-0.2	1.2	0.6	0.2
6	P16	37.8	0.0	1.8	0.3	0.4
6	P17	38.0	-0.2	1.6	0.5	-0.1
6	P18	37.5	-0.2	0.5	0.0	0.0
6	P19	30.7	1.0	-0.3	0.7	0.5
6	P20	30.7	0.2	0.9	3.8	0.9
6	P21	31.0	0.1	2.4	1.6	0.9
6	P22	32.1	-0.8	0.7	0.6	-0.5
6	P23	31.2	0.8	0.3	0.6	1.0
6	P24	31.2	0.0	1.1	1.5	0.8
6	P25	30.9	0.2	1.2	1.1	0.6
7	P1	37.2	0.4	0.4	0.2	0.9
7	P2	36.7	0.2	0.2	1.7	1.0
7	P3	37.0	0.4	0.1	1.8	1.6
7	P4	38.1	0.9	0.4	0.9	0.8
7	P5	37.5	-0.2	0.0	1.0	0.4
7	P6	38.4	-0.5	-0.1	-0.3	0.1
7	P7	37.8	-0.5	0.0	0.3	0.2
7	P8	37.1	0.3	-0.1	1.0	0.6
7	P9	37.3	0.6	0.5	1.7	0.8
7	P10	37.6	0.3	-0.1	1.4	0.2
7	P11	37.2	0.3	0.0	0.8	0.2
7	P12	37.7	1.6	0.8	1.7	1.4
7	P13	37.6	-0.1	0.1	0.9	1.0
7	P14	37.3	0.1	0.3	0.9	0.7
7	P15	38.0	0.1	0.7	1.5	0.8
7	P16	37.6	0.1	0.6	1.0	1.0
7	P17	37.3	0.0	0.4	1.4	0.6
7	P18	37.6	-0.1	0.0	0.2	0.2
7	P19	37.0	0.5	0.1	0.8	0.6
7	P20	38.0	0.0	0.1	-0.1	0.0
7	P21	38.0	0.2	0.3	1.5	0.9
7	P22	37.7	0.0	0.1	0.3	0.6
7	P23	37.4	0.6	0.5	1.7	0.6
7	P24	37.3	0.3	0.3	0.9	0.7
7	P25	37.6	0.3	0.5	1.1	0.9
8	P1	31.5	1.7	0.8	1.4	2.1
8	P2	31.0	2.2	1.0	1.3	2.3
8	P3	31.0	2.1	1.3	1.3	2.2
8	P4	31.0	0.6	1.8	2.3	3.2
8	P5	31.2	0.6	1.6	1.6	2.3
8	P6	31.2	0.6	2.3	2.6	2.2
8	P7	31.5	1.2	1.0	0.9	1.5
8	P8	37.9	0.0	0.4	0.2	0.2
8	P9	37.4	0.7	0.3	0.4	1.0
8	P10	37.4	0.1	0.4	1.0	1.0
8	P11	37.5	0.1	0.0	0.2	0.6
8	P12	37.5	0.0	0.8	1.1	0.7

8	P13	37.2	0.4	0.9	1.5	1.2
8	P14	37.0	-0.2	0.1	0.4	0.4
8	P15	37.6	-0.5	-0.5	0.6	0.0
8	P16	37.6	-0.1	0.1	0.3	0.5
8	P17	37.5	-0.1	-0.4	0.9	-0.2
8	P18	37.6	0.1	0.2	0.0	0.9
8	P19	30.8	0.6	1.1	1.8	2.5
8	P20	30.8	-0.1	1.5	2.1	2.7
8	P21	31.4	-0.7	0.3	2.0	0.6
8	P22	31.1	0.1	-0.5	0.1	0.4
8	P23	30.7	0.1	1.8	1.4	3.1
8	P24	31.5	-0.9	0.3	0.9	1.4
8	P25	30.9	0.9	1.6	1.6	1.4

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: THL-01
Description: Temperature/Humidity Chart Recorder
Manufacturer: Dickson
Model: THDX
Serial #: 9316255
Accuracy: Temp: +/- 1C; Humidity: +/-2% RH (0 - 60%) +/- 3% RH (61 - 95%).
… Last Cal: 7/15/02, Next Cal: 7/15/03

Equipment #: MO-01
Description: Micro-Ohmeter
Manufacturer: Keithley
Model: 580
Serial #: 0772740
Accuracy: See Manual
… Last Cal6/12/03, Next Cal: 6/12/04

Equipment #: MO-03
Description: Multimeter /Data Acquisition System
Manufacturer: Keithley
Model: 2700
Serial #: 0791975
Accuracy: See Manual
… Last Cal: 6/12/03, Next Cal: 6/12/04

Equipment #: TCT-01
Description: Test Stand
Manufacturer: Chatillon
Model: TCD-1000
Serial #: 05 23 00 02
Accuracy: Speed Accuracy: +/-5% of max speed; Displacement: +/-.5% or +/-.005, whichever is greater.
… Last Cal: 6/06/03, Next Cal: 6/06/04

Equipment #: LC-1000
Description: Chatillon 1000 Lb Load Cell
Manufacturer: Chatillon
Model: Remote-1000
Serial #: E31399
Accuracy: +/- 0.3% of Full Scale +/- 1 LSC
… Last Cal: 6/09/03, Next Cal: 6/09/04