APRIL 29, 1991

TEST REPORT #91192

QUALIFICATION TESTING

68 POSITION PLCC SOCKET

SAMTEC CORPORATION

APPROVED BY: MAX PEEL
PRESIDENT AND DIRECTOR OF ADVANCED RESEARCH
CONTECH RESEARCH, INC.

Contech Research

CERTIFICATION

This is to certify that the evaluation described herein was designed and executed by personnel of Contech Research, Inc. It was performed with the concurrence of Samtec Corporation of New Albany, IN, who was the test sponsor.

All equipment and measuring instruments used during testing were calibrated and traceable to NIST according to MIL-STD-45662, as applicable.

All data, raw and summarized, analysis and conclusions presented herein are the property of the test sponsor. No copy of this report, in part or in full, shall be forwarded to any agency, customer, etc., by Contech Research without the written approval of the sponsor.

Max Peel
President

MP/lo

SCOPE

To perform qualification testing on PLCC sockets as manufactured and submitted by the test sponsor, Samtec Corporation.

TEST SAMPLES AND PREPARATION

1. The following test samples were submitted by the test sponsor, Samtec Corporation, for the evaluation to be performed by Contech Research, Inc.

   a) 68 position PLCC socket, surface mount terminations

2. Unless otherwise indicated, all materials were certified by the manufacturer to be in accordance with the applicable product specification.

3. The test samples as submitted were certified by the manufacturer as being fabricated and assembled utilizing normal production techniques common for this type of product and inspected in accordance with the quality criteria as established for the product involved.

4. Applicable mating PLCC devices were obtained by Contech Research and prepared for test accordingly.

5. All test samples were coded and identified to maintain continuity throughout the test sequences.

6. Test boards were obtained with pads located as applicable. The pad had a longitudinal length which protruded 0.100 minimum beyond the periphery of the socket outline. This was required to assure proper lead attachment for resistance measurements.

7. Socket attachment to the test board was accomplished via vapor phase soldering with the following conditions:

   a) Thickness (Paste) : 0.008 inch
   b) Primary Vapor : FC70
   c) Temperature (Primary) : 419°F ± 3°F
   d) Secondary Vapor : Freon TF
   e) Temperature (Secondary) : 117°F ± 5°F
   f) Time @ Primary : 30 to 45 seconds
   g) Time @ Secondary : 30 seconds

8. After test lead attachment and/or soldering, all test units were cleaned prior to mating via DI water wash, isopropyl alcohol rinse, and vapor degreasing (in the order indicated).

TEST SAMPLES AND PREPARATION -- Continued:

9. Unless otherwise specified in the test procedures used, no further preparation was used.

10. All equipment and measuring instruments used during testing were calibrated and traceable to NIST according to MIL-STD-45662, as applicable.

TEST SELECTION

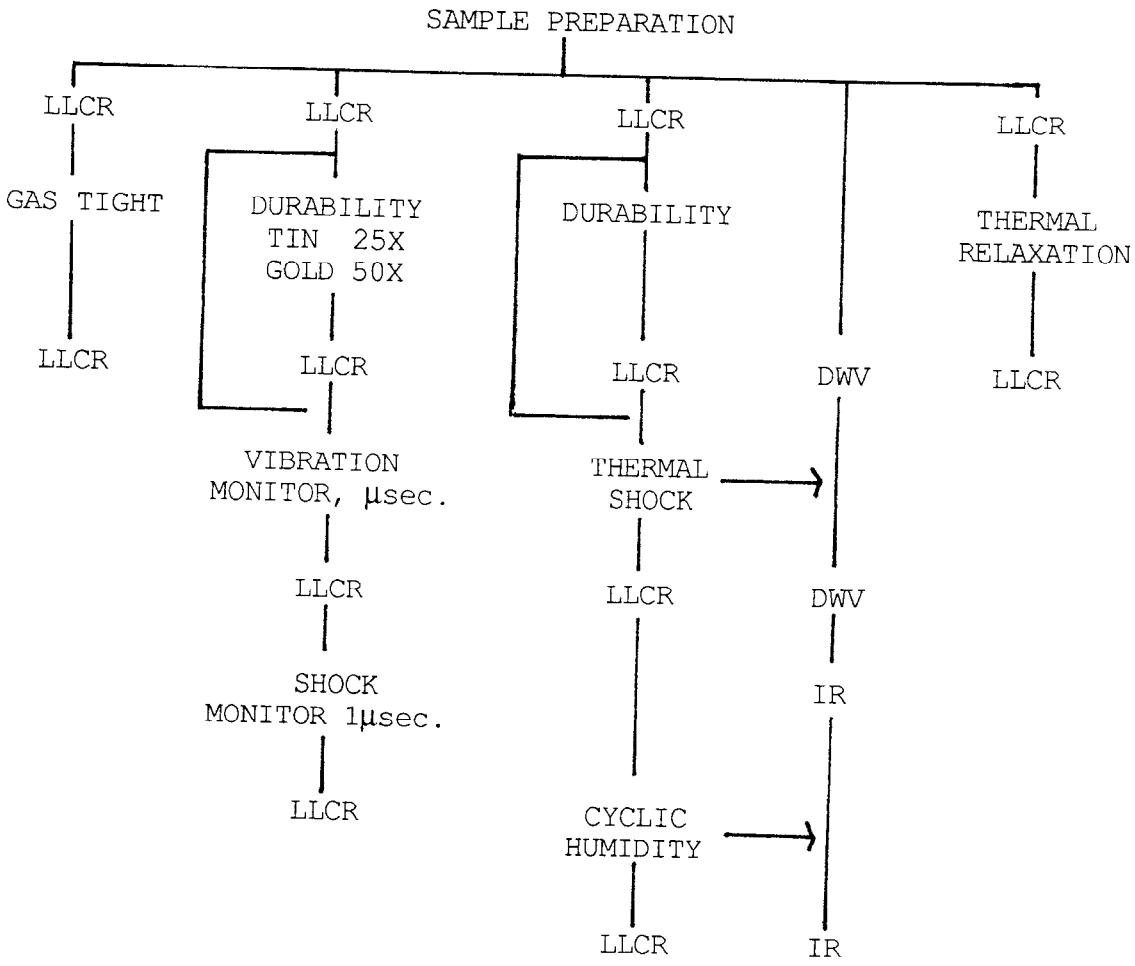
1. The following test groups were established, see Test Plan Flow Diagram, Figure #1.

   Group 1: Gas Tight Series
   Group 2: Vibration/Shock Series
   Group 3: Thermal Shock/Cyclic Humidity Series (LLCR)
   Group 4: Thermal Shock/Cyclic Humidity Series (IR & DWV)
   Group 5: Thermal Relaxation Series

2. Supplemental Tests: See Test Report

   a) Normal Force
   b) Resistance to Solder Heat, Vapor Reflow
   c) Resistance to Solder Heat, Infra Red
   d) Self Inductance
   e) Capacitance
   f) Solderability, Vapor Reflow

FIGURE #1



Group 1	Group 2	Group 3	Group 3A	Group 4
2 Samples	2 Samples, Cycled 2 Samples, Uncycled	2 Samples, Cycled 2 Samples, Uncycled	2 Samples	2 Samples

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MONITORING TESTS

Throughout the test sequences selected for this evaluation one test was performed on a periodic basis. The following is the rationale for this test which is significant and important in evaluating the data in proper perspective.

LOW LEVEL CIRCUIT RESISTANCE

1. To evaluate contact resistance characteristics of the contact systems under conditions where applied voltages and currents do not alter the physical contact interface and will detect oxides and films which degrade electrical stability.

2. The test method is also sensitive to and may detect the presence of fretting corrosion induced by mechanical or thermal environments and any significant loss of contact pressure.

3. This attribute was monitored after each preconditioning and/or test exposure in order to determine said stability of the connector material systems as they progress through the applicable test sequences.

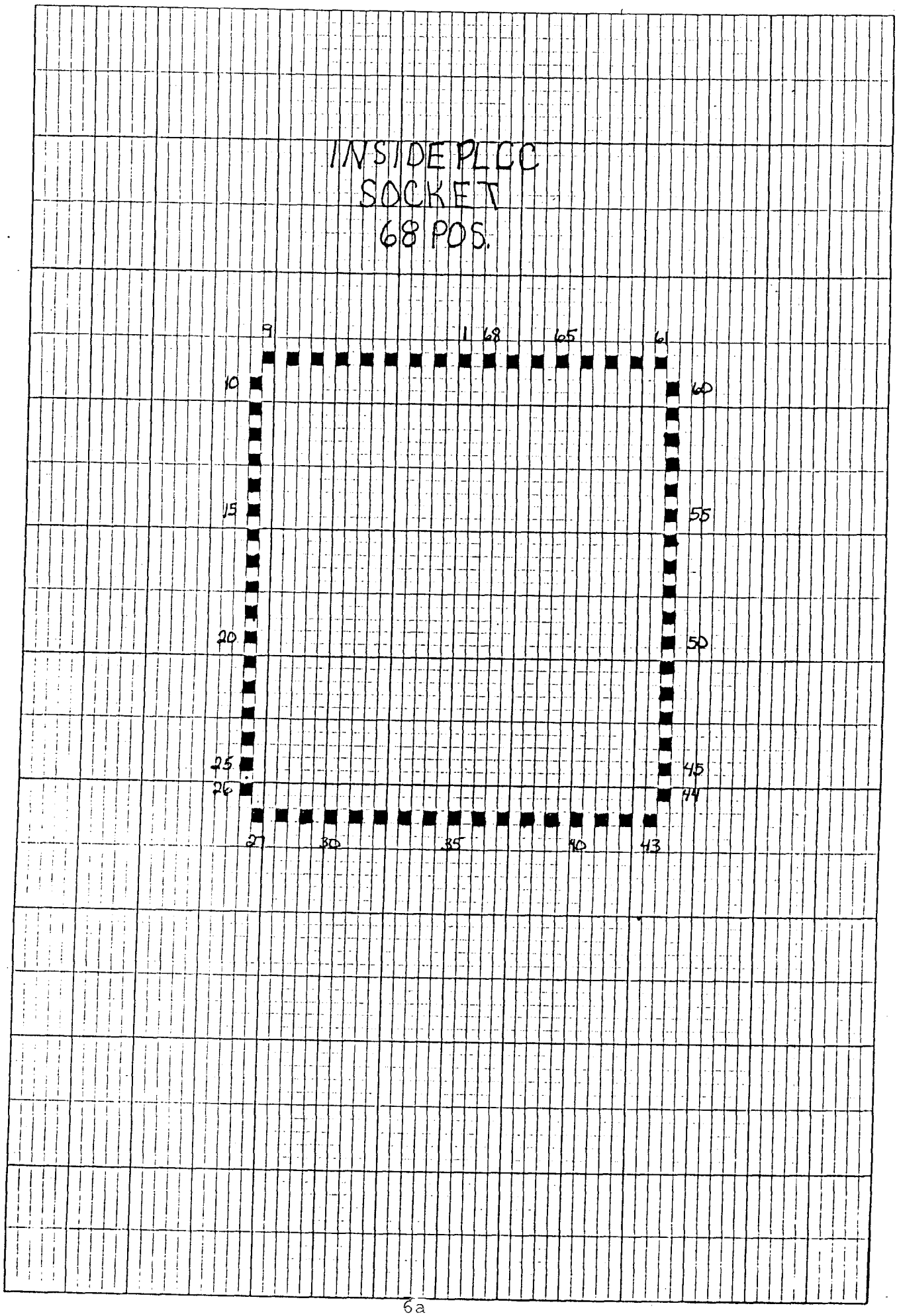
4. The electrical stability of the system is determined by comparing the resistance value after a given test exposure to its initial value (prior to any exposure). The difference is the change in resistance occurring whose magnitude establishes the stability of the interface being evaluated.

5. The test is performed with a four wire system. The test is performed in accordance with MIL-STD-1344, Method 3002 with a 100 milliamp maximum test current and an open circuit voltage of 20 millivolts. Measurements are taken in the forward and reverse direction and averaged.

6. The mating PLCC devices used in this program had adjacent contacts wired internal to the device. Thus, the resistance values measured included the interface resistance of two contacts plus the bulk resistance of these contacts, the wire bonds and wire internal to the package. The data as shown has the bulk resistance of the wire bond internal wire and the test pads subtracted. Thus, the resistance values in the individual data sheets are from the solder joint to the top of the lead frame of the PLCC test device. The data accuracy is estimated to be +0.1 to - 0.5 milliohms.

7. For purposes of orientation, the socket position location is shown in Figure #2.

Figure #2



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DATA SUMMARY

TEST	REQUIREMENTS	RESULTS
Group 1		
LLCR	<15.0 mΩ	<12.0 mΩ
Gas Tight	No damage	Passed
LLCR	<25.0 mΩ	<22.3 mΩ
Group 2		
LLCR	<15.0 mΩ	<11.8 mΩ
Mating Force	Record	<25.8 lbs.
Unmating Force	Record	>15.4 lbs.
Durability	No damage	Passed
Mating Force	Record	<17.8 lbs.
Unmating Force	Record	>12.3 lbs.
LLCR	<25.0 mΩ	<12.4 mΩ
Vibration	No damage	Passed
	1.0 microsecond	Passed
LLCR	<25.0 mΩ	<19.8 mΩ
Shock	No damage	Passed
	1.0 microsecond	Passed
LLCR	<25.0 mΩ	<19.9 mΩ
Group 3		
LLCR	<15.0 mΩ	<11.9 mΩ
Durability	No damage	Passed
LLCR	<25.0 mΩ	<11.1 mΩ
Thermal Aging	No damage	Passed
LLCR	<25.0 mΩ	<14.2 mΩ
Group 4		
LLCR	<15.0 mΩ	<11.7 mΩ
Mating Force	Record	<28.0 lbs.
Unmating Force	Record	>9.5 lbs.
Durability	No damage	Passed
Mating Force	Record	<13.3 lbs.
Unmating Force	Record	>9.5 lbs.
LLCR	<25.0 mΩ	<16.7 mΩ
Thermal Shock	No damage	Passed
LLCR	<25.0 mΩ	<15.7 mΩ
Cyclic Humidity	No damage	Passed
LLCR	<25.0 mΩ	<13.1 mΩ

DATA SUMMARY

TEST	REQUIREMENTS	RESULTS
Group 5		
Insulation Resistance	>1000 megohms	>50,000 megohms
DWV	650 VAC	Passed
Thermal Shock	No damage	Passed
DWV	650 VAC	Passed
Cyclic Humidity	No damage	Passed
Insulation Resistance	>1000 megohms	>40,000 megohms
Supplemental Test		
Capacitance	<1.0 pf	<0.4 pf
Self Inductance	<5.0 nh	<2.6 nh
Mutual Inductance	<1.0 nh	<0.28 nh
Solderability	95% coverage	Passed
Aqueous Cleaning	No damage	Passed
Solvent Resistance	No damage	Passed
Res. to Solder Heat:		
Vapor Reflow	No damage	Passed
Infra Red	No damage	Passed
Normal Force	Plot	See results

LLCR = Low Level Circuit Resistance
DWV = Dielectric Withstanding Voltage

TEST RESULTS

Gas Tight Series

Group 1

PROJECT NO.:	91192	SPECIFICATION:	N/A
PART NO.:	PLCC - SMT	PART DESCRIPTION:	68 Position PLCC SMT Socket
SAMPLE SIZE:	Two Sockets ID# 3 and 4	TECHNICIAN:	MHB
START DATE:	4/12/91	COMPLETE DATE:	4/12/91
ROOM AMBIENT:	21°C	RELATIVE HUMIDITY:	49%
EQUIPMENT ID#:	236, 252, Applicable Glassware		

GAS TIGHT

PURPOSE:

To evaluate the integrity of the contact interface by assessment of the gas tight characteristics of the contacting surfaces. The gas tight characteristic is the ability of contacting surfaces to prevent harsh environment from penetrating between them and forming oxides and/or films which will degrade electrical performance.

PROCEDURE:

1. The test was performed in accordance with EIA RS-364, TP-36, Method II.

2. All test samples were cleaned prior to the gas exposure using vapor degreasing with trichloroethane 1-1-1 and isopropyl alcohol.

3. Nitric acid was placed in the test chamber of a sufficient volume to result in saturation of the test chamber. The conditions were room ambient.

4. The solution was allowed to saturate the test chamber for a minimum of 15 minutes.

5. The test samples were placed in the test chamber and exposed for one hour ± 5.0 minutes.

6. The test samples were placed in such a manner as not to be closer than 1" (25mm) from the wall of the test chamber and not closer than 3" (76mm) from the solution surfaces.

7. After exposure, the samples were removed from the test chamber and oven dried at 50°C for a minimum of one hour.

PROCEDURE -- Continued:

8. Within 60 minutes of drying, the final low level circuit resistance was measured and recorded. Measurements were performed with the test sample at room ambient.

9. Low level circuit resistance was measured in accordance with MIL-STD-1344, method 3002 with a 100 milliamp test current and 20 millivolt open circuit voltage.

REQUIREMENTS:

1. The initial low level circuit resistance shall not exceed 15.0 milliohms.

2. The final low level circuit resistance shall not exceed 25.0 milliohms.

RESULTS:

1. The following is a summary of the data observed:

LOW LEVEL CIRCUIT RESISTANCE
(Milliohms)

Connector ID#	Avg.	Max	Min.	Avg. Change	Max Change
ID# 3, Initial	8.7	11.3	7.4	---	---
Final	9.3	14.5	6.9	+ 0.6	+ 4.9
ID# 4, Initial	9.0	12.0	7.7	---	---
Final	9.5	22.3	6.9	+ 0.5	+12.7

2. See pages 11a thru 11b for individual data points.

LOW-LEVEL CONTACT RESISTANCE

Project #: 91192
Customer: SAMTEC
Product: 68 POS. PLCC SOCKET
Description: SAMPLE #3

Spec: MIL-STD-1344 3002
SubGroup: 1
File #: 119203
Print Date: 24Apr91

Open circuit voltage: 20 millivolts

Test current: 100 milliamps

Units: milliohms
Actual values

Temp °C	+21	+26
R.H.%	49	38
Date	12Apr91	12Apr91
Pos ID	INITIAL	G.T.
2-3	7.9	8.6
4-5	8.4	8.8
6-7	7.9	7.5
8-9	8.3	8.7
10-11	11.3	13.1
12-13	9.5	11.4
14-15	9.8	10.1
16-17	8.3	7.9
18-19	9.2	8.5
20-21	8.3	7.8
22-23	7.5	6.9
24-25	7.9	7.4
26-27	7.8	7.8
28-29	9.9	11.8
30-31	9.1	10.4
32-33	9.3	10.4
34-35	9.0	8.7
36-37	7.4	8.3
38-39	8.5	7.4
40-41	8.2	7.5
42-43	8.1	8.2
44-45	9.1	9.3
46-47	8.9	8.7
48-49	8.8	11.1
50-51	8.1	7.5
52-53	8.5	7.9
54-55	8.5	7.6
56-57	8.0	7.5
58-59	8.1	8.3
60-61	7.9	9.8
62-63	10.0	14.5
64-65	9.6	12.0
66-67	8.6	13.5
68-1	8.6	10.8
HIGH	11.3	14.5
LOW	7.4	6.9
AVG	8.7	9.3
STD DEV	0.8	2.0
OPENS	0.0	0

INITIALS MHB

LOW-LEVEL CONTACT RESISTANCE

Project #: 91192
Customer: SAMTEC
Product: 68 POS. PLCC SOCKET
Description: SAMPLE #4

Spec: MIL-STD-1344 3002
SubGroup: 1
File #: 119204
Print Date: 24Apr91

Open circuit voltage: 20 millivolts

Test current: 100 milliamps

Units: milliohms
Actual values

Temp °C	+21	+26
R.H.%	49	38
Date	12Apr91	12Apr91
Pos ID	INITIAL	G.T.
2-3	8.8	9.0
4-5	8.9	10.8
6-7	8.4	12.1
8-9	8.9	10.8
10-11	12.0	11.3
12-13	9.7	9.4
14-15	9.4	11.0
16-17	8.4	10.9
18-19	9.4	11.4
20-21	8.4	7.8
22-23	8.4	9.9
24-25	8.4	8.5
26-27	8.2	8.7
28-29	10.1	10.2
30-31	9.2	9.0
32-33	9.1	8.9
34-35	9.7	9.1
36-37	7.7	6.9
38-39	8.0	7.1
40-41	8.2	7.6
42-43	8.8	7.7
44-45	9.2	9.1
46-47	9.6	9.1
48-49	9.0	8.2
50-51	8.0	7.3
52-53	8.7	8.4
54-55	9.5	9.0
56-57	9.6	22.3
58-59	8.6	8.4
60-61	8.1	8.2
62-63	9.7	9.3
64-65	9.1	8.3
66-67	8.6	8.0
68-1	9.1	8.3
HIGH	12.0	22.3
LOW	7.7	6.9
AVG	9.0	9.5
STD DEV	0.8	2.6
OPENS	0.0	0

INITIALS MHB

TEST RESULTS

Vibration/Shock Series

Group 2

PROJECT NO.:	91192	SPECIFICATION:	N/A
PART NO.:	PLCC - SMT	PART DESCRIPTION:	68 Position PLCC SMT Socket
SAMPLE SIZE:	Four Sockets ID# 2,2a,5,5a	TECHNICIAN:	MHB
START DATE:	4/12/91	COMPLETE DATE:	4/12/91
ROOM AMBIENT:	21°C	RELATIVE HUMIDITY:	49%
EQUIPMENT ID#:	236, 252, Applicable Glassware		

VIBRATION, SINUSOIDAL

PURPOSE:

1. To evaluate the test samples to determine if fretting corrosion occurs due to mechanical motion. To evaluate the integrity of the test samples relative to a severe mechanical environment.

2. To determine the effects of vibration within the predominant vibration frequency range and magnitudes that may be encountered during the life of the product being evaluated.

PROCEDURE:

1. Initial mating force was measured on all sockets tested. The socket was mounted to a holding fixture secured to an X-Y table. The X-Y table was free floating allowing for axial alignment and self centering. A special pressure plate fixed to a force transducer was attached to the top of the mating device by use of an adhesive.

2. Initial unmating force was measured on socket ID# 2 through 5.

3. Initial and all subsequent readings of low level circuit resistance was measured and recorded in accordance with MIL-STD-1344, Method 3002, with a 100 milliamp maximum test current and a 20.0 millivolt open circuit voltage (socket ID# 2 and 5).

4. Socket ID# 5 and 5a were cycled 25 times and the mating and unmating forces measured on the 25th cycle.

5. After cycling, untested devices were inserted into socket ID# 5 and 5a with low level circuit resistance measurements performed on socket ID# 5.

PROCEDURE -- Continued:

6. Socket ID# 2a and 5 were wired in series with their mating devices for contact interruption monitoring during vibration.

7. The following sockets were tested for vibration:

   a) Socket ID# 2a: Uncycled monitored for discontinuities.
   b) Socket ID# 2 : Uncycled monitored for low level circuit resistance.
   c) Socket ID# 5a: Cycled monitored for discontinuities.
   d) Socket ID# 5 : Cycled monitored for low level circuit resistance.

8. Vibration was performed in accordance with MIL-STD-1344, Method 2005, Test Condition III.

9. Test Conditions:

   a) Frequency : 10 to 2000 to 10 Hz
   b) Amplitude : 0.06" da or 15 G's
   c) Duration : 4.0 hrs/axis, 3 axis total
   d) Test Current : 100 ma
   e) Sweep Time : 20 minutes

10. After vibration, low level circuit resistance was performed on socket ID# 2 and 5.

REQUIREMENTS:

1. There shall be no evidence of physical damage to the test samples as tested.

2. There shall be no contact interruption greater than 1.0 microsecond (socket ID# 2a and 5a).

3. The low level circuit resistance resistance shall be measured on socket ID# 2 and 5 with the following requirement levels:

   Initial: <15.0 milliohms
   Final : <25.0 milliohms

4. Mating and unmating forces shall be measured and recorded.

RESULTS:

See the next page for results.

RESULTS:

1. There was no evidence of physical damage to the test samples as tested.

2. There was no interruption greater than 1.0 microsecond.

3. The following is a summary of the observed data:

	MATING FORCES (Pounds)		UNMATING FORCES (Pounds)	
	Initial	After 25X	Initial	After 25X
Socket ID# 2	23.2	----	16.3	----
Socket ID# 2a	17.6	----	15.4	----
Socket ID# 5	25.8	17.8	17.0	15.4
Socket ID# 5a	20.2	15.5	16.3	12.3

4. The following is a summary of the observed data:

	LOW LEVEL CIRCUIT RESISTANCE (Milliohms)				
Connector ID#	Avg.	Max	Min.	Avg. Change	Max Change
ID# 2, Initial	8.5	11.6	7.1	---	---
After Vib.	8.7	12.1	7.0	+ 0.2	+ 3.0
ID# 5, Initial	8.6	11.8	7.3	---	---
After 25X	8.2	12.4	7.0	- 0.4	+ 3.8
After Vib.	10.5	19.8	7.8	+ 1.9	+11.2

5. See pages 17c thru 17d for individual data points.

PROJECT NO.:	91192	SPECIFICATION:	N/A
PART NO.:	PLCC - SMT	PART DESCRIPTION:	68 Position PLCC SMT Socket
SAMPLE SIZE:	Four Sockets ID# 2,2a,5,5a	TECHNICIAN:	MHB
START DATE:	4/15/91	COMPLETE DATE:	4/16/91
ROOM AMBIENT:	26°C	RELATIVE HUMIDITY:	41%
EQUIPMENT ID#:	30, 34, 45, 117, 223, 236, 252		

MECHANICAL SHOCK (SPECIFIED PULSE)

PURPOSE:

To determine the mechanical and electrical integrity of connectors for use with electronic equipment subjected to shocks such as those expected from handling, transportation, etc.

PROCEDURE:

1. The shock test was performed in accordance with MIL-STD-1344, Method 2004, Test Condition A.

2. Test Conditions:

   a) Peak value : 50 G
   b) Duration : 11 milliseconds
   c) Wave form : Half-sine
   d) Velocity : 11.3 feet per second
   e) No. of shocks : 3 shocks/direction, 3 axis (18 total)

3. Final low level circuit resistance was measured in accordance with MIL-STD-1344, method 3002 with a 100 milliamp maximum test current and a 20.0 millivolt open circuit voltage.

REQUIREMENTS:

1. There shall be no evidence of physical damage to the test samples as tested.

2. There shall be no contact interruption greater than 1.0 microsecond (socket ID# 2a and 5a).

3. The low level circuit resistance shall not exceed 25.0 milliohms (socket ID# 2 and 5).

RESULTS:

1. There was no evidence of physical damage to the test samples as tested.

2. There was no contact interruption greater than 1.0 microsecond.

3. The following is a summary of the data observed:

LOW LEVEL CIRCUIT RESISTANCE
(Milliohms)

Connector ID#	Avg.	Max	Min.	Avg. Change	Max Change
ID# 2 (Uncycled)	8.6	12.6	6.9	+ 0.1	+ 3.5
ID# 5 (Cycled)	11.4	19.9	4.0	+ 2.8	+11.4

4. See pages 11c thru 11d for individual data points.

5. The following are the shock characteristics as shown in Figures #3 (calibration pulse), and #4 (test pulse):

	Calibration	Test
X-Axis (Duration)		
Delay 1 to 1: Duration time	11.25 ms	11.35 ms
Milliseconds per division	5.00 ms	5.00 ms
Y-Axis (G Level)		
MV/div x 0.1 G: G's/division	10.0 G's	10.0 G's
Vamp 1 x 0.1 : G level	50.3 G's	49.0 G's

Figure #3

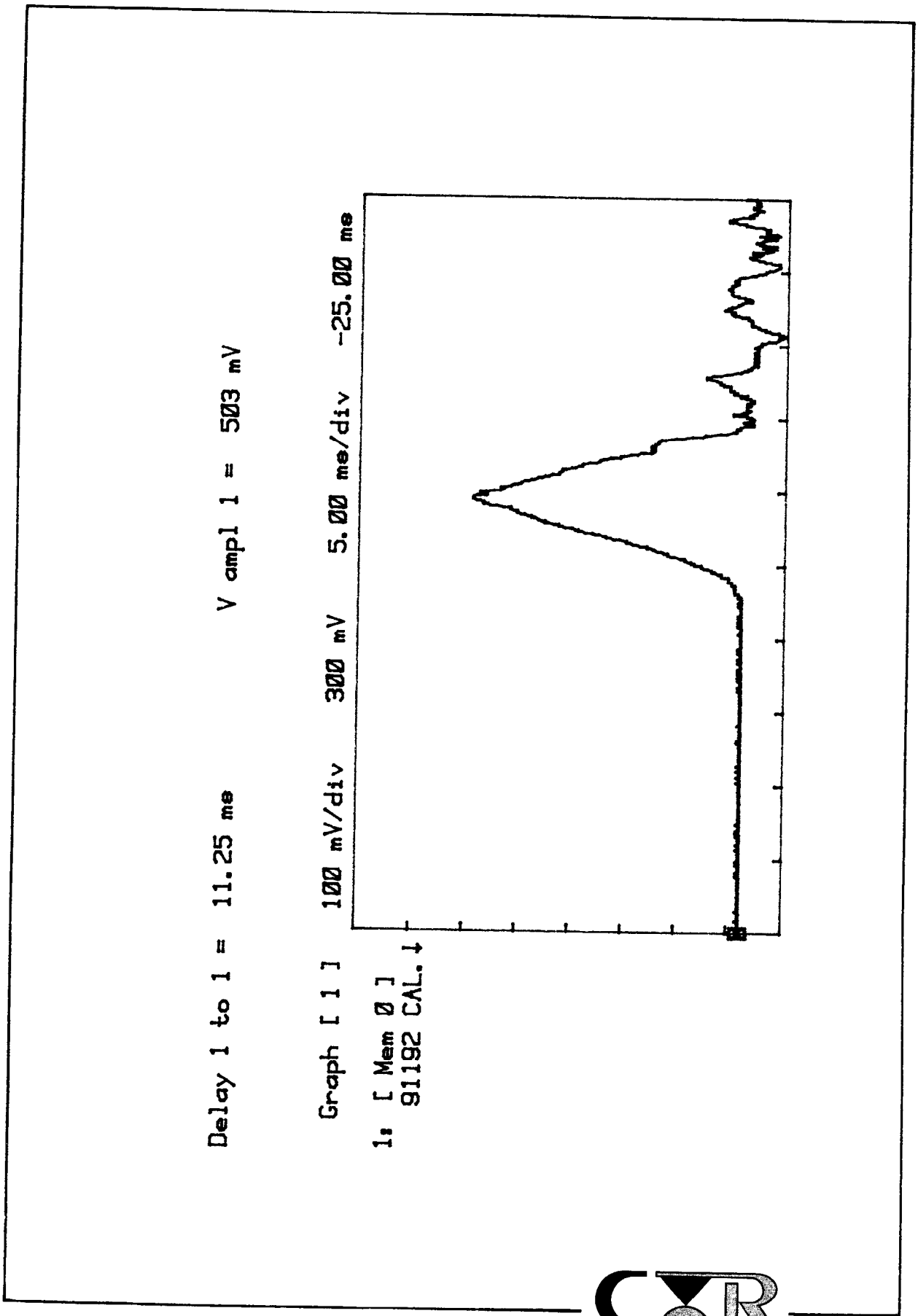

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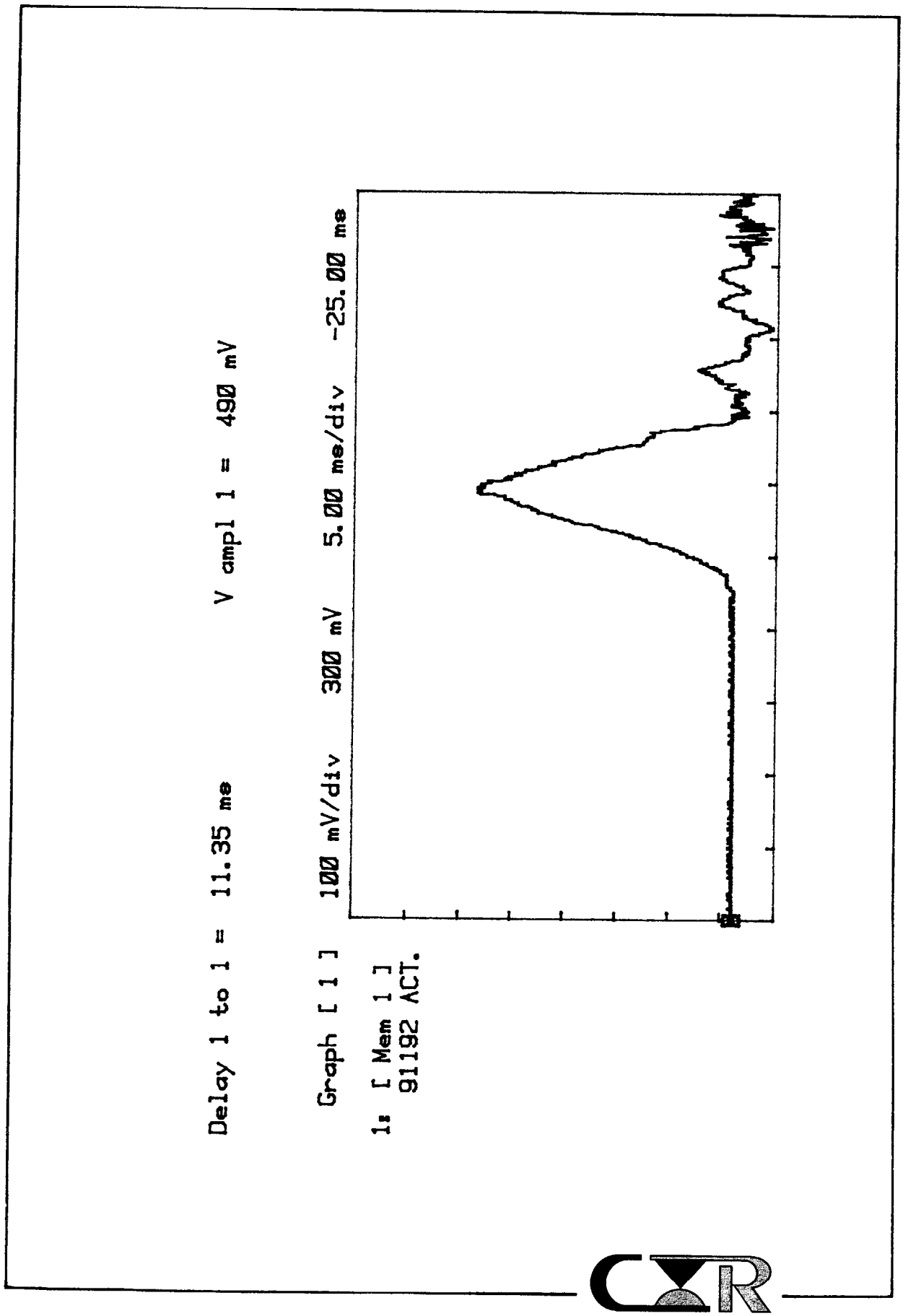
Figure #4



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LOW-LEVEL CONTACT RESISTANCE

Project #: 91192
Customer: SAMTEC
Product: 68 POS. PLCC SOCKET
Description: SAMPLE #2

Spec: MIL-STD-1344 3002
SubGroup: 2
File #: 119202
Print Date: 24Apr91

Open circuit voltage: 20 millivolts

Test current: 100 milliamps

Units: milliohms
Actual values

Temp °C	+21	+26	+26
R.H.%	49	41	41
Date	12Apr91	15Apr91	15Apr91
Pos ID	INITIAL	VIB	M.SHOCK
2-3	8.5	8.6	8.4
4-5	8.0	8.4	8.2
6-7	8.0	8.8	8.4
8-9	7.8	8.5	8.8
10-11	11.6	11.7	11.5
12-13	9.0	9.0	8.8
14-15	8.7	8.5	8.2
16-17	7.1	7.0	6.9
18-19	9.1	8.7	8.7
20-21	8.0	7.8	7.8
22-23	7.4	7.1	7.1
24-25	7.8	7.6	7.3
26-27	7.4	7.4	7.3
28-29	10.0	10.1	10.4
30-31	9.0	9.0	10.0
32-33	7.8	7.9	8.1
34-35	8.9	8.8	8.8
36-37	7.1	7.4	7.2
38-39	8.6	8.8	9.0
40-41	8.5	8.3	8.3
42-43	7.4	7.0	7.4
44-45	9.5	9.4	9.3
46-47	9.1	12.1	12.6
48-49	9.1	12.1	9.5
50-51	8.1	8.1	7.9
52-53	8.5	9.0	8.8
54-55	9.4	9.2	9.1
56-57	8.0	9.0	7.7
58-59	8.8	8.6	8.7
60-61	8.3	7.7	8.0
62-63	9.6	9.4	9.7
64-65	9.1	8.8	8.9
66-67	8.4	8.5	8.5
68-1	8.5	8.4	9.0
HIGH	11.6	12.1	12.6
LOW	7.1	7.0	6.9
AVG	8.5	8.7	8.6
STD DEV	0.9	1.3	1.2
OPENS	0.0	0	0
INITIALS	MHB	MHB	

LOW-LEVEL CONTACT RESISTANCE

Project #: 91192
Customer: SAMTEC
Product: 68 POS. PLCC SOCKET
Description: SAMPLE #5

Spec: MIL-STD-1344 3002
SubGroup: 2
File #: 119205
Print Date: 24Apr91

Open circuit voltage: 20 millivolts

Test current: 100 milliamps

Units: milliohms
Actual values

Temp °C	+26	+26	+26	+22
R.H.%	38	38	41	47
Date	12Apr91	12Apr91	15Apr91	16Apr91
Pos ID	INITIAL	25X	VIB.	M.SHOCK
2-3	8.3	8.0	9.3	10.1
4-5	7.8	7.8	8.5	9.0
8-9	8.4	8.0	10.0	13.4
10-11	11.8	11.1	12.1	15.9
12-13	8.3	8.7	9.7	9.1
14-15	7.9	7.7	10.8	10.4
16-17	7.3	9.0	9.5	11.0
18-19	9.3	8.3	14.0	17.5
20-21	8.4	8.0	18.7	18.3
22-23	8.3	7.8	19.5	16.9
24-25	8.8	7.0	8.6	18.8
26-27	9.0	7.5	8.5	4.0
28-29	10.1	9.5	10.5	12.2
30-31	9.4	8.6	10.4	13.4
32-33	8.5	8.6	11.7	19.9
34-35	8.3	8.4	9.5	10.9
36-37	8.0	7.4	14.8	13.5
38-39	8.5	7.7	9.1	10.9
40-41	8.0	7.8	8.5	8.8
42-43	8.5	8.8	9.7	11.3
44-45	8.6	12.4	19.8	10.9
46-47	9.0	9.0	10.4	12.8
48-49	8.4	7.2	7.9	7.3
50-51	7.3	7.3	8.3	7.5
52-53	8.1	8.0	9.0	8.7
54-55	8.5	7.9	8.4	9.0
56-57	8.4	7.1	8.0	10.2
58-59	9.4	7.3	7.8	7.8
60-61	7.9	7.5	8.5	9.0
62-63	9.3	9.2	10.1	11.3
64-65	9.4	8.0	8.6	8.3
66-67	8.4	7.6	7.9	8.1
68-1	9.0	7.5	8.3	8.5
HIGH	11.8	12.4	19.8	19.9
LOW	7.3	7.0	7.8	4.0
AVG	8.6	8.2	10.5	11.4
STD DEV	6.0	5.9	6.9	14.0
OPENS	0.0	0	0	0
INITIALS	MHB	MHB	MB	

TEST RESULTS

Thermal Relaxation

Group 3

PROJECT NO.:	91192	SPECIFICATION:	N/A
PART NO.:	PLCC - SMT	PART DESCRIPTION:	68 Position PLCC SMT Socket
SAMPLE SIZE:	Two Sockets ID# 1 and 6	TECHNICIAN:	MHB
START DATE:	4/12/91	COMPLETE DATE:	4/16/91
ROOM AMBIENT:	21°C	RELATIVE HUMIDITY:	49%
EQUIPMENT ID#:	1, 18, 207, 220		

THERMAL RELAXATION

PURPOSE:

1. To evaluate the magnitude of permanent set beyond that induced by mechanical stresses of contact materials when exposed to a thermal environment which may impact electrical stability.

2. Contacts in their operating mode are normally subjected to mechanical stresses and exposure to operational temperatures. The operational temperatures are generated from adjacent power sources and/or components as well as current flowing through the connector system. Contact materials under such conditions will tend to relax which results in a permanent loss of normal force. Contingent on the magnitude of this relaxation with its resultant loss of normal force, potentially unstable electrical condition may be created. All contact materials exhibit some degree of relaxation.

PROCEDURE:

1. The mated system was exposed to 105°C for 100 hours.

2. Socket ID# 6 was cycled 25 times. An untested device was mated to the socket upon completion of the durability and left in place for the duration of the test.

3. Initial and subsequent low level circuit resistance was measured and recorded in accordance with MIL-STD-1344, Method 3002 with a 100 milliamp test current and a 20 millivolt open circuit voltage.

REQUIREMENTS:

The low level circuit resistance shall be measured and recorded with the following requirements:

Initial: <15.0 milliohms
Final : <25.0 milliohms

RESULTS:

1. The following is a summary of the data observed:

LOW LEVEL CIRCUIT RESISTANCE
(Milliohms)

Connector ID#	Avg.	Max	Min.	Avg. Change	Max Change
ID# 1, Initial	8.7	11.9	7.2	---	---
Final	8.3	11.8	6.8	- 0.4	+ 0.6
ID# 6, Initial	8.7	11.9	7.8	---	---
After 25X	9.0	11.1	6.5	+ 0.3	+ 1.8
Final	10.1	14.2	8.0	+ 1.4	+ 4.9

2. See pages 20a thru 20b for individual data points.

LOW-LEVEL CONTACT RESISTANCE

Project #: 91192
Customer: SAMTEC
Product: 68 POS. PLCC SOCKET
Description: SAMPLE #1

Spec: MIL-STD-1344 3002
SubGroup: 3
File #: 119201
Print Date: 24Apr91

Open circuit voltage: 20 millivolts

Test current: 100 milliamps

Units: milliohms
Actual values

Temp °C	+21	+22
R.H.%	49	47
Date	12Apr91	16Apr91
Pos ID	INITIAL	T.RELAX
2-3	8.7	8.6
4-5	8.3	8.4
6-7	8.0	8.5
8-9	8.5	8.0
10-11	11.9	11.8
12-13	8.2	8.3
14-15	7.4	8.0
16-17	7.6	7.1
18-19	9.1	8.5
20-21	8.3	7.8
22-23	8.0	7.3
24-25	8.7	7.7
26-27	9.1	8.0
28-29	10.8	8.8
30-31	9.5	9.4
32-33	8.7	8.6
34-35	8.3	8.1
36-37	8.0	7.6
38-39	8.5	8.3
40-41	8.3	8.0
42-43	8.7	8.6
44-45	8.6	8.3
46-47	8.8	8.5
48-49	8.6	8.4
50-51	7.2	6.8
52-53	8.1	7.7
54-55	8.2	7.5
56-57	8.1	7.5
58-59	8.9	8.3
60-61	9.3	8.9
62-63	9.5	9.1
64-65	9.5	9.1
66-67	9.3	9.1
68-1	9.1	8.7
HIGH	11.9	11.8
LOW	7.2	6.8
AVG	8.7	8.3
STD DEV	0.9	0.9
OPENS	0.0	0

INITIALS MHB

LOW-LEVEL CONTACT RESISTANCE

Project #: 91192
Customer: SAMTEC
Product: 68 POS. PLCC SOCKET
Description: SAMPLE #6

Spec: MIL-STD-1344 3002
SubGroup: 3
File #: 119206
Print Date: 24Apr91

Open circuit voltage: 20 millivolts

Test current: 100 milliamps

Units: milliohms
Actual values

Temp °C	+26	+26	+22
R.H.%	38	38	47
Date	12Apr91	12APR91	16Apr91
Pos ID	INITIAL	25X	T.RELAX
2-3	8.4	9.5	10.6
4-5	8.3	10.0	9.7
6-7	8.1	9.9	10.9
8-9	8.3	7.7	8.8
10-11	11.9	10.9	12.5
12-13	9.4	9.9	13.6
14-15	9.3	9.3	14.2
16-17	8.5	8.9	9.1
18-19	8.9	9.9	10.3
20-21	8.8	10.1	10.0
22-23	7.8	9.8	9.6
24-25	8.0	7.6	8.0
26-27	8.3	7.3	8.2
28-29	9.7	10.6	10.3
30-31	8.9	9.9	10.0
32-33	9.3	10.1	12.8
34-35	9.1	11.1	10.2
36-37	7.9	8.0	8.8
38-39	8.3	9.0	10.5
40-41	8.1	9.7	9.4
42-43	7.9	8.1	8.3
44-45	9.2	8.5	9.2
46-47	9.1	8.9	11.7
48-49	8.6	8.2	9.4
50-51	8.6	7.5	10.3
52-53	8.4	7.0	8.1
54-55	7.9	7.4	8.8
56-57	8.1	8.6	8.8
58-59	8.3	8.1	8.6
60-61	7.9	6.5	8.2
62-63	9.3	9.0	9.6
64-65	9.2	8.6	10.3
66-67	8.8	9.2	12.8
68-1	8.9	10.2	12.2
HIGH	11.9	11.1	14.2
LOW	7.8	6.5	8.0
AVG	8.7	9.0	10.1
STD DEV	0.8	1.2	1.6
OPENS	0.0	0	0
INITIALS	MHB	MHB	

TEST RESULTS

Thermal Shock/Cyclic Humidity

Group 4

PROJECT NO.:	91192	SPECIFICATION:	N/A
PART NO.:	PLCC - SMT	PART DESCRIPTION:	68 Position PLCC SMT Socket
SAMPLE SIZE:	Two Sockets ID# 7 and 8	TECHNICIAN:	MHB
START DATE:	3/22/91	COMPLETE DATE:	3/25/91
ROOM AMBIENT:	25°C	RELATIVE HUMIDITY:	40%
EQUIPMENT ID#:	1, 16, 22, 251, 295		

THERMAL SHOCK

PURPOSE:

To determine the resistance of a given electrical connector to exposure at extremes of high and low temperatures and the shock of alternate exposures to these extremes, simulating the worst probable conditions of storage, transportation, and application.

PROCEDURE:

1. Initial mating force was measured on all sockets tested. The socket was mounted to a holding fixture secured to an X-Y table. The X-Y table was free floating allowing for axial alignment and self centering. A special pressure plate fixed to a force transducer was attached to the top of the mating device by use of an adhesive.

2. Initial unmating force was measured on socket ID# 7 and 8.

3. Initial and all subsequent readings of low level circuit resistance was measured and recorded in accordance with MIL-STD-1344, Method 3002, with a 100 milliamp maximum test current and a 20.0 millivolt open circuit voltage.

4. Socket ID# 8 was cycled 25 times and the mating and unmating forces measured on the 25th cycle.

5. After cycling, untested devices were inserted into socket ID# 8 with low level circuit resistance measurements performed.

6. The test was performed in accordance with MIL-STD-1344, Method 1003, Test Condition A except as noted.

PROCEDURE -- Continued:

7. Test Conditions:

a)	Number of Cycles	:	5 cycles
b)	Hot Extreme	:	+105°C +3°C/-0°C
c)	Cold Extreme	:	- 50°C +0°C/-3°C
d)	Time at Temperature	:	30 minutes
e)	Mated Condition	:	Mated
f)	Mounting Condition	:	Mounted

8. Two separate test chambers were utilized. One chamber was used for the high temperature extreme. The second chamber was used for the low temperature extreme using liquid nitrogen assist.

9. The total number of cycles were performed continuously.

REQUIREMENTS:

1. There shall be no evidence of physical damage to the test samples as tested.

2. The low level circuit resistance shall be measured and recorded with the following requirements:

   Initial: <15.0 milliohms
   Final : <25.0 milliohms.

3. The mating and unmating forces shall be measured and recorded.

RESULTS:

1. There was no evidence of physical damage to the test samples as tested.

2. The following is a summary of the observed data:

	MATING FORCES (Pounds)		UNMATING FORCES (Pounds)	
	Initial	After 25X	Initial	After 25X
Socket ID# 7	28.0	----	16.3	----
Socket ID# 8	15.5	13.3	9.5	9.5

RESULTS -- Continued:

3. The following is a summary of the observed data:

LOW LEVEL CIRCUIT RESISTANCE
(Milliohms)

Connector ID#	Avg.	Max	Min.	Avg. Change	Max Change
ID# 7, Initial	8.2	11.7	6.9	---	---
Final	8.6	12.3	7.0	+ 0.4	+ 1.4
ID# 8, Initial	8.0	11.1	6.3	---	---
After 25X	8.6	16.7	6.9	+ 0.6	+ 8.1
Final	9.9	15.7	7.3	+ 1.9	+ 8.4

4. See pages 26a thru 26b for individual data points.

PROJECT NO.:	91192	SPECIFICATION:	N/A
PART NO.:	PLCC - SMT	PART DESCRIPTION:	68 Position PLCC SMT Socket
SAMPLE SIZE:	Two Sockets ID# 7 and 8	TECHNICIAN:	MHB
START DATE:	3/26/91	COMPLETE DATE:	4/08/91
ROOM AMBIENT:	25°C	RELATIVE HUMIDITY:	42%
EQUIPMENT ID#:	1, 18, 27, 251, 295		

HUMIDITY (THERMAL CYCLING)

PURPOSE:

To evaluate the impact on electrical stability of the contact system when exposed to any environment which may generate thermal/moisture type failure mechanisms such as:

a) Fretting corrosion due to wear resulting from micromotion, thermal cycling induces micromotion between contacting surfaces and humidity accelerates the oxidation process.

b) Oxidation of wear debris resulting from induced micromotion which may have become entrapped between the contacting surfaces

c) Oxidation of particulates which may have been deposited on the contacting surfaces from the surrounding atmosphere which may have been entrapped between them due to induce micromotion.

d) Failure mechanisms resulting from a wet oxidation process.

e) This test obtains added effectiveness in employment of temperature cycling that provides a breathing action, inducing corrosion processes, and the introduction of moisture into partially sealed test samples. This condition imposes a vapor pressure on the samples which constitutes the major force behind the moisture migration and penetration.

PROCEDURE:

1. The test was performed in accordance with MIL-STD-1344, Method 1002, Procedure II with the following conditions.

PROCEDURE -- Continued:

2. Test Conditions:

a)	Preconditioning (24 hours)	:	50°C ± 2°C
b)	Relative Humidity	:	90% to 95%
c)	Temperature Conditions	:	25°C to 65°C
d)	Mating Conditions	:	Mated
e)	Mounting Conditions	:	Mounted
f)	Duration	:	240 hours

REQUIREMENTS:

1. There shall be no evidence of physical deterioration of the test samples as tested.

2. The low level circuit resistance shall not exceed 25.0 milliohms.

RESULTS:

1. The test samples as tested showed no evidence of physical deterioration.

2. The following is a summary of the data observed:

LOW LEVEL CIRCUIT RESISTANCE
(Milliohms)

Connector ID#	Avg.	Max	Min.	Avg. Change	Max Change
ID# 7 (Uncycled)	9.1	12.8	7.4	+ 0.9	+ 4.8
ID# 8 (Cycled)	10.4	13.1	7.2	+ 2.4	+ 4.5

3. See pages 26a thru 26b for individual data points.

Project #: 91192
Customer: SAMTEC
Product: PLCC SOCKET
Description: .098" CYCLED

Spec: MIL-STD-1344 3002
SubGroup: THERMAL SHOCK
File #: 119211
Print Date: 25Apr91

Open circuit voltage: 20 millivolts

Test current: 100 milliamp

Units: milliohms
Actual values

Temp °C	+25	+25	+26	+24
R.H.%	40	40	40	52
Date	22Mar91	22Mar91	25Mar91	08Apr91
Pos ID	INITIAL	25X	T.S.	HUMID
2-3	7.5	7.9	9.0	9.5
4-5	7.8	7.9	9.0	9.5
6-7	7.4	7.3	8.1	8.8
8-9	8.7	8.5	12.2	11.4
10-11	11.1	11.2	11.9	12.1
12-13	9.6	9.5	12.1	12.1
14-15	8.6	9.2	11.4	13.1
16-17	7.6	8.4	9.3	10.0
18-19	8.5	9.0	9.4	10.3
20-21	7.8	8.4	8.6	9.3
22-23	7.4	7.7	9.7	11.5
24-25	7.7	7.7	10.3	10.1
26-27	7.9	7.5	8.7	9.2
28-29	8.9	9.2	10.1	10.3
30-31	7.9	8.5	10.2	10.2
32-33	8.6	16.7	11.0	11.0
34-35	8.2	8.3	9.3	9.6
36-37	6.7	7.0	8.1	8.0
38-39	8.4	8.4	11.4	10.6
40-41	7.4	7.6	10.1	9.2
42-43	6.3	7.0	7.3	7.2
44-45	9.0	9.2	10.2	12.9
46-47	8.5	8.5	11.6	10.6
48-49	7.9	8.3	10.6	11.6
50-51	7.2	7.6	8.7	9.9
52-53	7.3	7.4	8.3	9.7
54-55	7.7	8.1	8.9	10.3
56-57	6.9	7.6	9.5	10.8
58-59	7.3	7.5	15.7	11.1
60-61	6.6	6.9	8.4	10.3
62-63	9.8	10.9	10.3	10.7
64-65	9.2	9.3	9.3	9.6
66-67	8.0	10.2	9.5	12.5
68-1	8.3	9.0	9.4	10.4
HIGH	11.1	16.7	15.7	13.1
LOW	6.3	6.9	7.3	7.2
AVG	8.0	8.6	9.9	10.4
STD DEV	1.0	1.8	1.6	1.3
OPENS	0.0	0	0	0
INITIALS	MHB	MHB	MHB	

NOTES:

1 - An asterisk (*) indicates an open circuit or resis

LOW-LEVEL CONTACT RESISTANCE

Project #: 91192
Customer: SAMTEC
Product: PLCC SOCKET
Description: .098" UNCYCLED

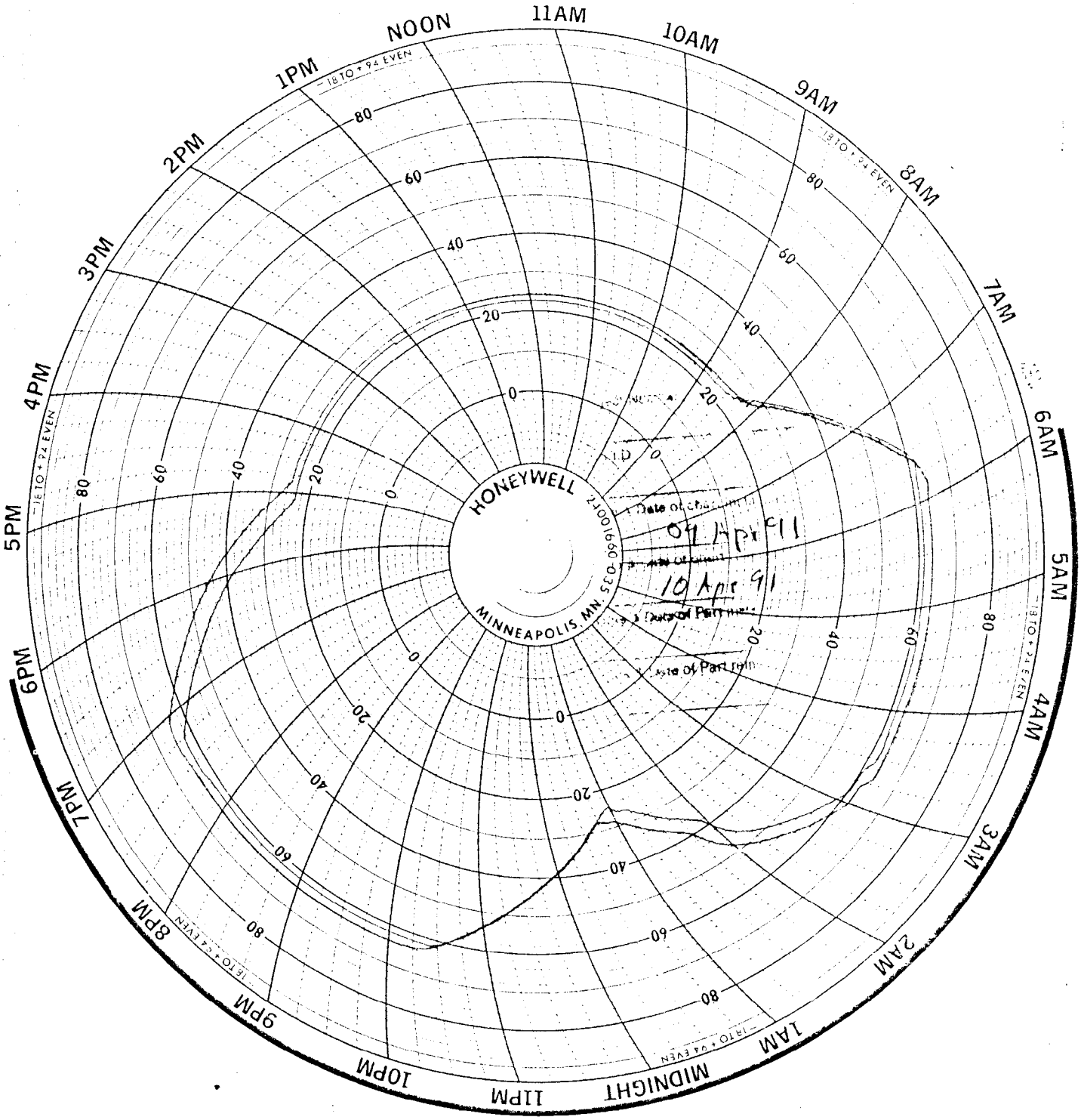
Spec: MIL-STD-1344 3002
SubGroup: THERMAL SHOCK
File #: 119210
Print Date: 25Apr91

Open circuit voltage: 20 millivolts

Test current: 100 milliamp

Units: milliohms
Actual values

Temp °C	+25	+26	+24
R.H.%	40	40	52
Date	22Mar91	25Mar91	08Apr91
Pos ID	INITIAL	T.S.	HUMID
2-3	8.4	8.9	9.0
4-5	7.8	8.1	8.4
6-7	7.8	8.3	8.6
8-9	8.0	9.1	11.8
10-11	11.7	12.3	12.7
12-13	9.8	11.2	11.8
14-15	9.4	10.3	11.2
16-17	7.5	8.3	8.8
18-19	8.3	8.6	9.4
20-21	8.2	8.2	9.0
22-23	8.6	7.7	8.7
24-25	8.0	8.3	8.2
26-27	7.5	7.7	8.1
28-29	8.8	8.9	9.7
30-31	8.2	8.4	8.8
32-33	8.3	8.5	8.5
34-35	8.4	8.4	9.0
36-37	7.2	8.0	8.0
38-39	7.6	8.2	10.0
40-41	9.2	9.1	9.1
42-43	8.1	8.3	8.1
44-45	8.4	8.5	9.0
46-47	8.0	8.4	12.8
48-49	7.6	8.2	8.8
50-51	7.5	8.0	7.7
52-53	7.2	7.5	7.6
54-55	6.9	7.0	7.4
56-57	7.3	7.6	7.5
58-59	7.9	8.2	8.3
60-61	7.1	8.0	8.1
62-63	9.2	9.9	10.1
64-65	8.7	8.8	8.9
66-67	7.8	8.0	8.3
68-1	8.2	8.5	8.6
HIGH	11.7	12.3	12.8
LOW	6.9	7.0	7.4
AVG	8.2	8.6	9.1
STD DEV	0.9	1.0	1.4
OPENS	0.0	0	0
INITIALS	MHB	MHB	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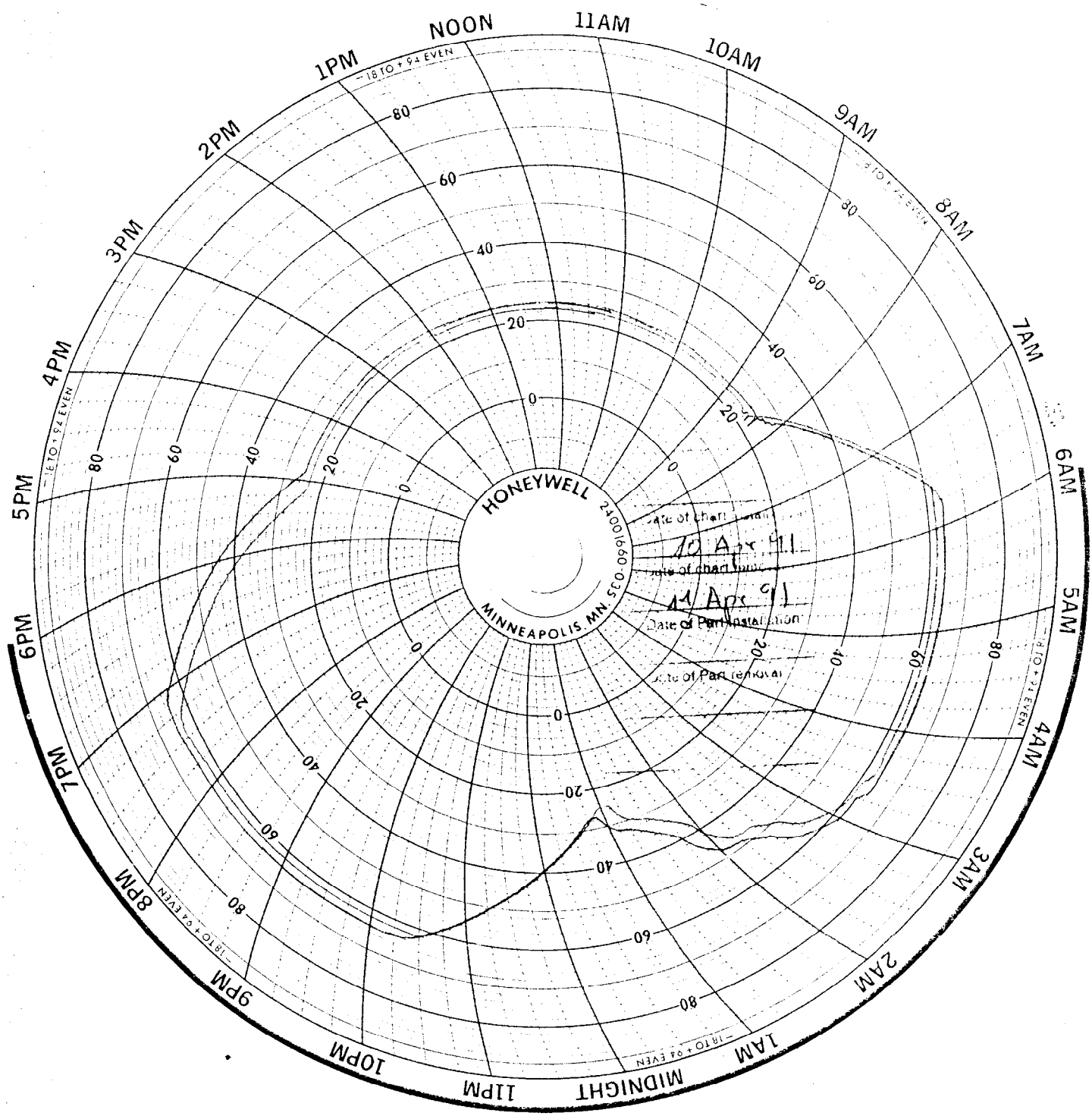
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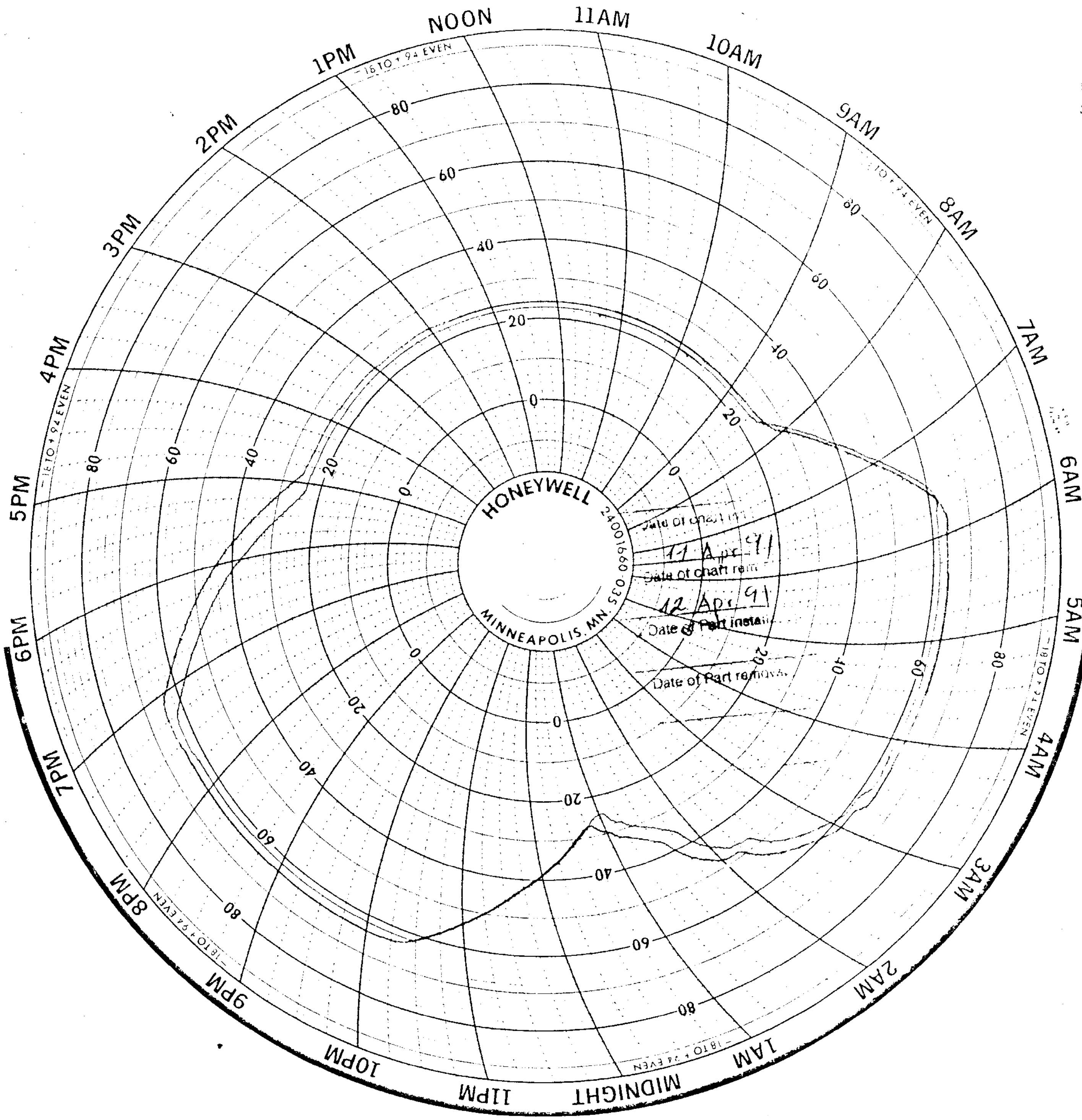
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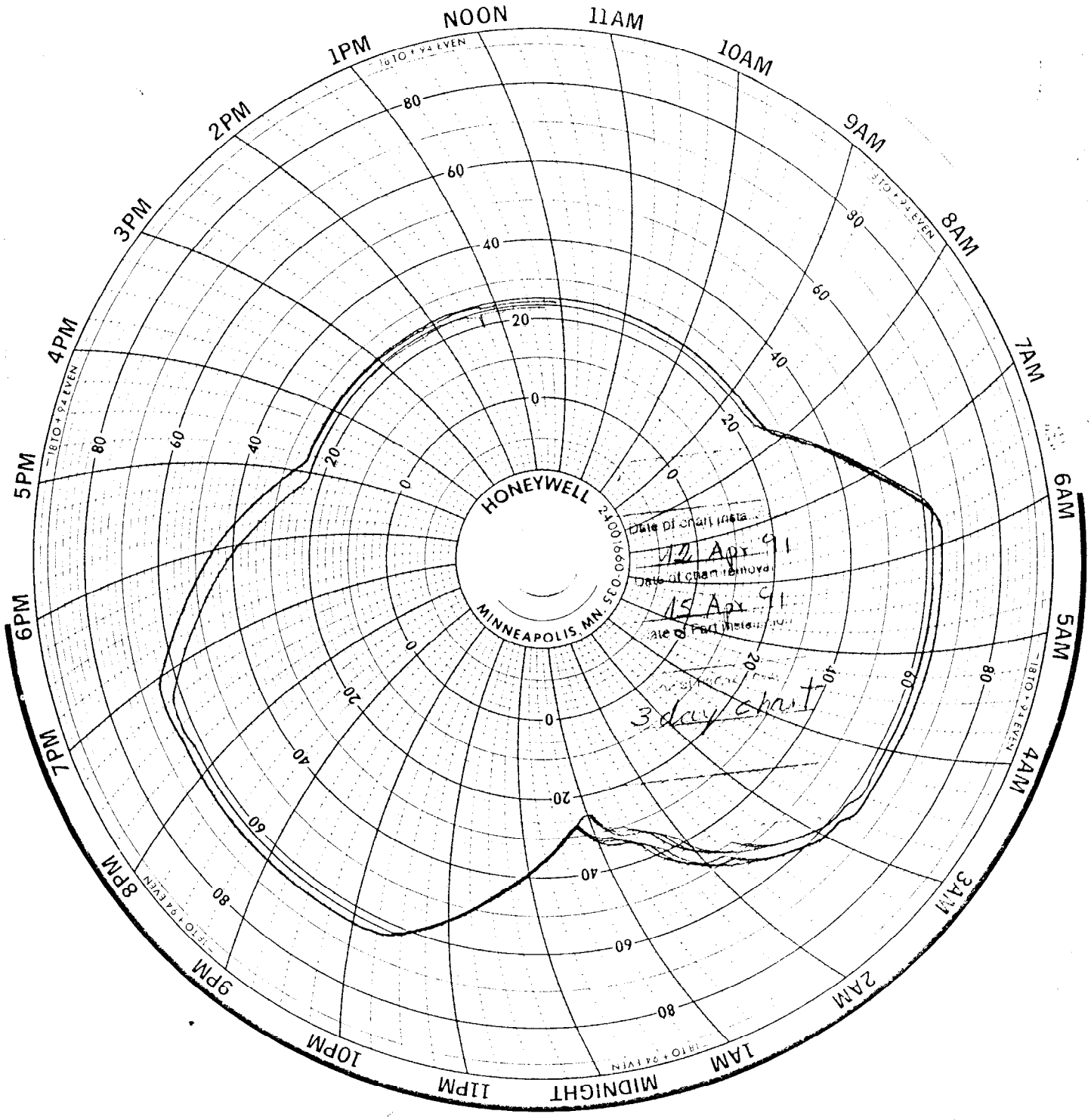
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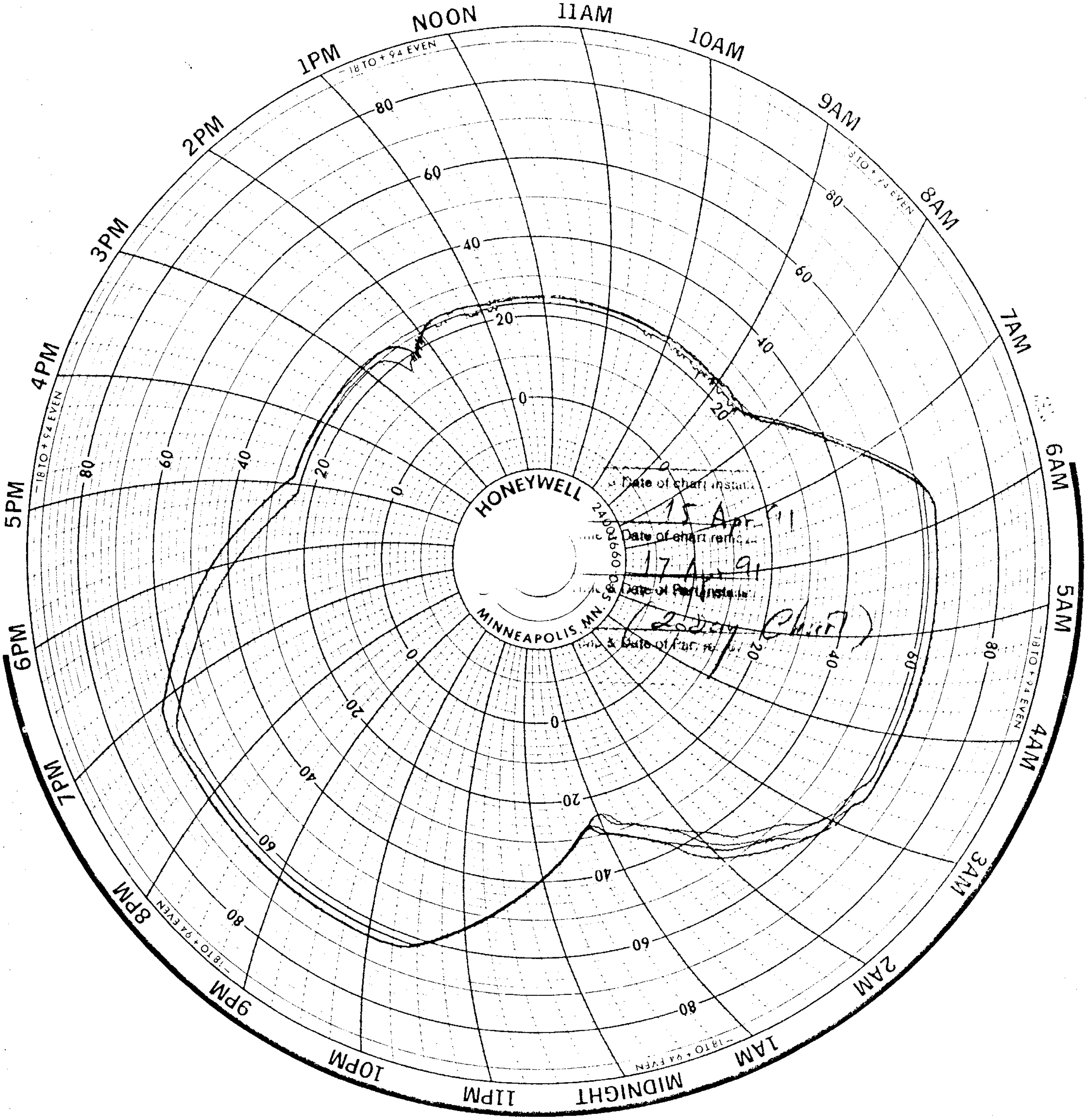
3 day chart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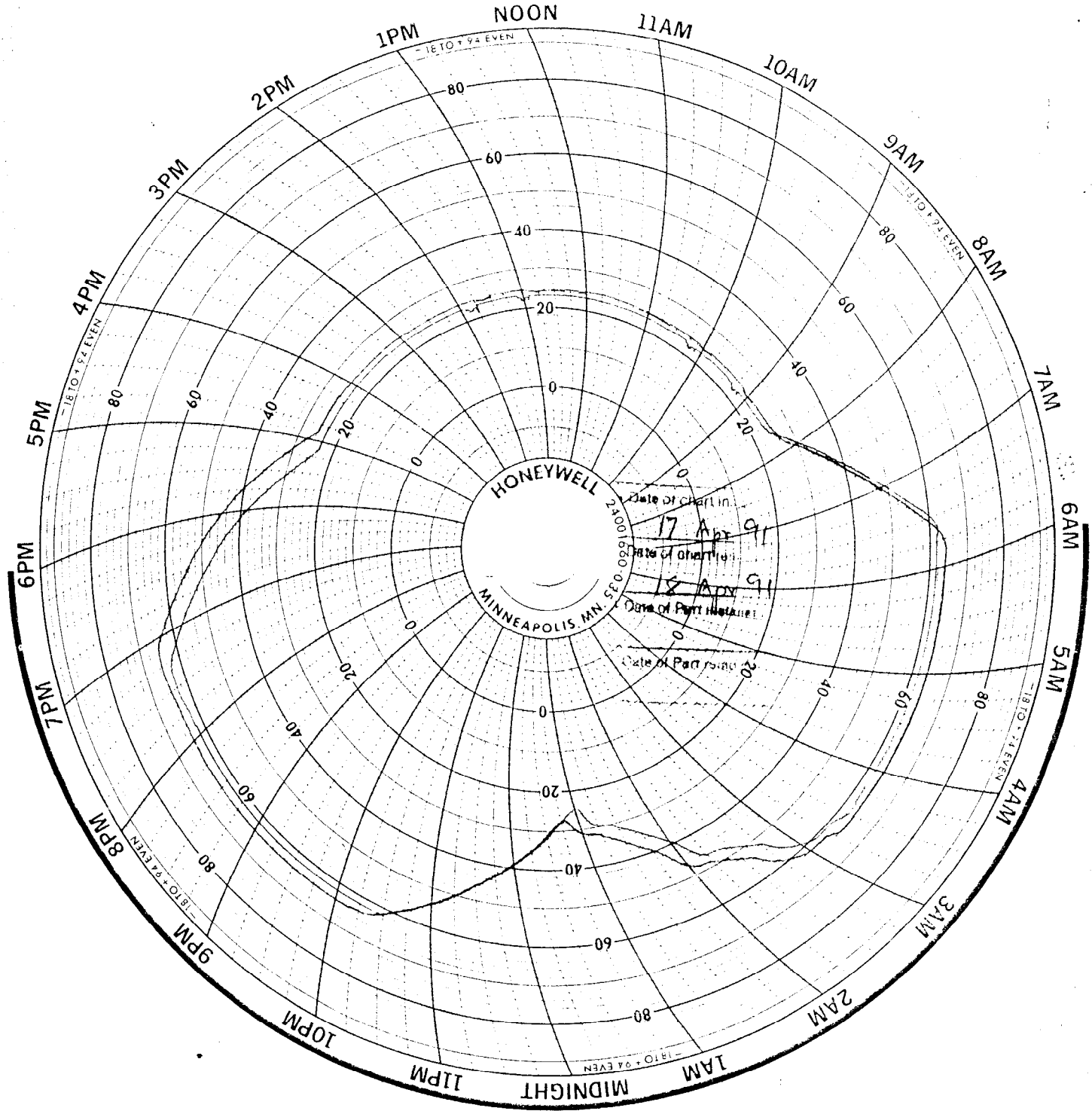
Date of Part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Date of Chart Out
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Date of Part Installed
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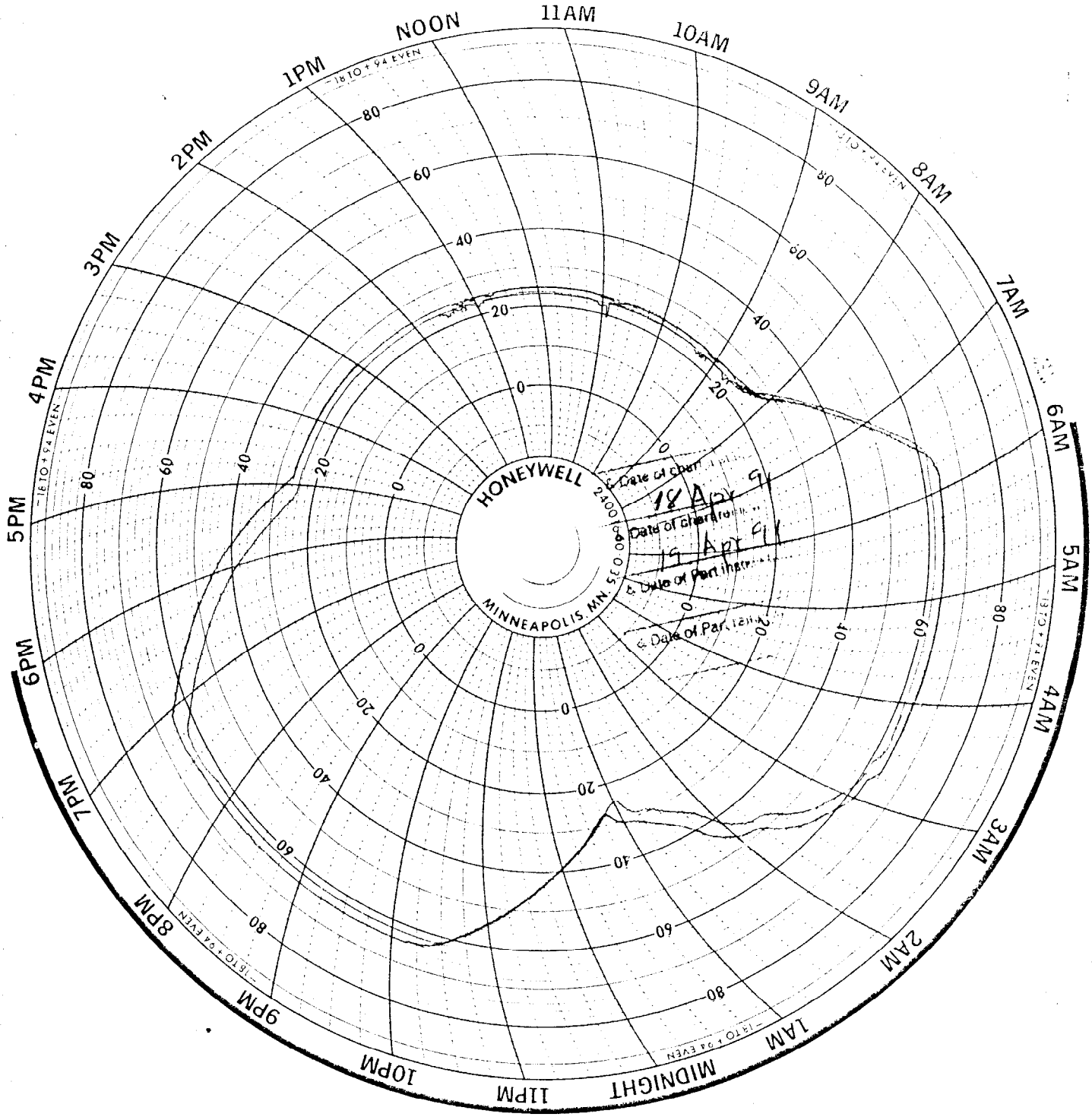
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MINNEAPOLIS, MN. U.S.A.
18 Apr 94
19 Apr 94

TEST RESULTS

Group 5

PROJECT NO.:	91192	SPECIFICATION:	N/A
PART NO.:	PLCC - SMT	PART DESCRIPTION:	68 Position PLCC SMT Socket
SAMPLE SIZE:	Two Sockets ID# 9 and 10	TECHNICIAN:	MHB
START DATE:	3/22/91	COMPLETE DATE:	3/22/91
ROOM AMBIENT:	25°C	RELATIVE HUMIDITY:	40%
EQUIPMENT ID#:	2		

INSULATION RESISTANCE (IR)

PURPOSE:

To determine the resistance of insulation materials to leakage of current through or on the surface of these materials when a DC potential is applied.

PROCEDURE:

1. The test was performed in accordance with MIL-STD-1344, Method 3003.

2. Test Conditions:

a)	Between adjacent contacts	:	Yes
b)	Mated condition	:	Unmated
c)	Mounting condition	:	Unmounted
d)	Electrification time	:	2.0 minutes

REQUIREMENTS:

When the specified test voltage is applied (100 VDC), the insulation resistance shall not be less than 1000 megohms.

RESULTS:

The insulation resistance exceeded 50,000 megohms.

PROJECT NO.:	91192	SPECIFICATION:	N/A
PART NO.:	PLCC - SMT	PART DESCRIPTION:	68 Position PLCC SMT Socket
SAMPLE SIZE:	Two Sockets ID# 9 and 10	TECHNICIAN:	MHB
START DATE:	3/22/91	COMPLETE DATE:	3/22/91
ROOM AMBIENT:	25°C	RELATIVE HUMIDITY:	40%
EQUIPMENT ID#:	95		

DIELECTRIC WITHSTANDING VOLTAGE (SEA LEVEL)

PURPOSE:

To determine if the sockets can operate at its rated voltage and withstand momentary overpotentials due to switching, surges and other similar phenomenon.

PROCEDURE:

1. The test was performed in accordance with MIL-STD-1344, Method 3001.

2. Test Conditions:

a)	Between adjacent contacts	:	Yes
b)	Mated condition	:	Unmated
c)	Mounting condition	:	Unmounted
d)	Hold time	:	60 seconds
e)	Rate of application	:	500 volts/sec.

REQUIREMENTS:

When a 650 VAC test voltage is applied, there shall be no evidence of breakdown, arcing, etc.

RESULTS:

All test samples as tested met the requirements as specified.

PROJECT NO.:	91192	SPECIFICATION:	N/A
PART NO.:	PLCC - SMT	PART DESCRIPTION:	68 Position PLCC SMT Socket
SAMPLE SIZE:	Two Sockets ID# 9 and 10	TECHNICIAN:	MHB
START DATE:	3/25/91	COMPLETE DATE:	3/25/91
ROOM AMBIENT:	22°C	RELATIVE HUMIDITY:	42%
EQUIPMENT ID#:	1, 16, 22, 95		

THERMAL SHOCK

PURPOSE:

To determine the resistance of a given electrical connector to exposure at extremes of high and low temperatures and the shock of alternate exposures to these extremes, simulating the worst probable conditions of storage, transportation, and application.

PROCEDURE:

1. The test was performed in accordance with MIL-STD-1344, Method 1003, Test Condition A except as indicated.

2. Test Conditions:

   a) Number of Cycles : 5 cycles
   b) Hot Extreme : +105°C +3°C/-0°C
   c) Cold Extreme : - 30°C +0°C/-3°C
   d) Time at Temperature : 30 minutes
   e) Mating Conditions : Unmated
   f) Mounting Conditions : Unmounted

3. Two separate test chambers were utilized. One chamber was used for the high temperature extreme. The second chamber was used for the low temperature extreme using liquid nitrogen assist.

4. The total number of cycles were performed continuously.

REQUIREMENTS:

1. There shall be no evidence of physical damage to the test samples as tested.

REQUIREMENTS -- Continued:

2. When a 650 VAC test voltage is applied, there shall be no evidence of arcing, breakdown, etc.

RESULTS:

All test samples so tested met the requirements as specified.

PROJECT NO.:	91192	SPECIFICATION:	N/A
PART NO.:	PLCC - SMT	PART DESCRIPTION:	68 Position PLCC SMT Socket
SAMPLE SIZE:	Two Sockets ID# 9 and 10	TECHNICIAN:	MHB
START DATE:	3/26/91	COMPLETE DATE:	4/08/91
ROOM AMBIENT:	25°C	RELATIVE HUMIDITY:	42%
EQUIPMENT ID#:	1, 2, 18, 27		

HUMIDITY (THERMAL CYCLING)

PURPOSE:

To evaluate the impact on electrical stability of the contact system when exposed to any environment which may generate thermal/moisture type failure mechanisms such as:

a) This test imposes a vapor on the material under test that constitutes the force behind the moisture migration and penetration. Hygroscopic materials are sensitive to moisture and deteriorate rapidly under humidity conditions. Absorption of moisture may result in swelling that would destroy functioning utility, and cause loss of physical strength and changes in other important mechanical properties. Degradation of electrical properties may also occur.

PROCEDURE:

1. The test was performed in accordance with MIL-STD-1344, Method 1002, Procedure II with the following conditions.

2. Test Conditions:

a)	Preconditioning (24 hours)	:	50°C ± 2°C
b)	Relative Humidity	:	90% to 95%
c)	Temperature Conditions	:	25°C to 65°C
d)	Mating Conditions	:	Unmated
e)	Mounting Conditions	:	Unmounted
f)	Duration	:	240 hours

REQUIREMENTS:

1. There shall be no evidence of physical deterioration of the test samples as tested.

REQUIREMENTS -- Continued:

2. The final insulation resistance shall not be less than 1000 megohms.

RESULTS:

The final insulation resistance exceeded 40,000 megohms.

TEST RESULTS

Supplemental Testing

PROJECT NO.:	91192	SPECIFICATION:	N/A
PART NO.:	PLCC - SMT	PART DESCRIPTION:	68 Position PLCC SMT Socket
SAMPLE SIZE:	Two Sockets	TECHNICIAN:	MHB
START DATE:	1/16/91	COMPLETE DATE:	1/16/91
ROOM AMBIENT:	26°C	RELATIVE HUMIDITY:	34%
EQUIPMENT ID#:	157		

CAPACITANCE

PURPOSE:

To determine the capacitance characteristic between contacts and/or other metallic components assembled to socket housings.

PROCEDURE:

1. The test was performed in accordance with MIL-STD-202, Method 305.

2. Test Conditions:

a)	Frequency	:	1 KHz
b)	Polarization	:	N/A
c)	Mounting Conditions	:	Unmounted
d)	Adjacent Contacts	:	Yes
e)	Mating Conditions	:	Unmated
f)	No. of Observations	:	Eight adjacent positions/socket

REQUIREMENTS:

The capacitance shall not exceed 1.0 pF at the specified frequency.

RESULTS:

See the next page for results.

RESULTS:

The following is a summary of the data observed:

CAPACITANCE (pF)	
Socket #1	Socket #2
0.3	0.2
0.2	0.3
0.4	0.3
0.3	0.3
0.3	0.3
0.3	0.3
0.3	0.3
0.3	0.3

PROJECT NO.:	91192	SPECIFICATION:	N/A
PART NO.:	PLCC - SMT	PART DESCRIPTION:	68 Position PLCC SMT Socket
SAMPLE SIZE:	Two Sockets	TECHNICIAN:	MHB
START DATE:	1/17/91	COMPLETE DATE:	1/17/91
ROOM AMBIENT:	26°C	RELATIVE HUMIDITY:	42%
EQUIPMENT ID#:	140		

INDUCTANCE

PURPOSE:

To determine the inductance characteristics of a contact removed from the socket body.

PROCEDURE:

1. A fixture was fabricated to hold the contacts under test.

2. The inductance of the fixture was "zeroed" out without the contacts in place and the test system calibrated.

3. The contacts were inserted into the fixture and the self inductance measurements.

4. Following the self inductance measurements, the socket was attached to the fixture. The test signal was injected through one contact and the transfer signal was measured on the adjacent contact.

REQUIREMENTS:

1. The self inductance shall not exceed 5.0 nh at 400 MHz.

2. The mutual inductance shall not exceed 1.0 nh at 400 MHz.

RESULTS:

See the next page for results.

RESULTS:

The following is a summary of the data observed:

	Self Inductance (nH)		Mutual Inductance (nH)	
Measurement No.	Socket #1	Socket #2	Socket #1	Socket #2
1	1.9	2.6	0.237	0.241
2	2.3	2.5	0.216	0.217
3	1.9	2.4	0.243	0.221
4	2.2	2.3	0.227	0.231
5	1.9	3.1	0.193	0.270
6	2.5	2.5	0.277	0.212
7	1.7	2.5	0.217	0.198
8	2.1	1.8	0.222	0.241

PROJECT NO.:	91192	SPECIFICATION:	N/A
PART NO.:	PLCC - SMT	PART DESCRIPTION:	68 Position PLCC SMT Socket
SAMPLE SIZE:	Two Sockets	TECHNICIAN:	MHB
START DATE:	1/17/91	COMPLETE DATE:	1/17/91
ROOM AMBIENT:	26°C	RELATIVE HUMIDITY:	42%
EQUIPMENT ID#:	1, 167		

SOLDERABILITY

PURPOSE:

1. To determine the solderability of solder terminations. This determination is made on the basis of the ability of these terminations to be wetted by a new coating of solder, or to form a suitable fillet when dip soldered. These procedures will verify that the treatment used in the manufacturing process to facilitate soldering is satisfactory and that it has been applied to the required portion of the part which is designed to accommodate a solder connection.

2. An accelerated aging test is included in this test method which simulates a minimum of one year natural aging under a combination of various storage conditions that have different deleterious effects.

PROCEDURE:

1. The test was performed in accordance with MIL-STD-202, Method 208.

2. Test Conditions:

a)	Pre-clean	:	No
b)	Steam Aging	:	8.0 hours
c)	Flux	:	Type R (Alpha 100)
d)	Dwell Time (Solder)	:	5 ± 1/2 seconds
e)	Solder Composition	:	63/37
f)	Solder Temperature	:	246°C
g)	Post Clean	:	Yes

REQUIREMENTS:

The dipped portion of the termination shall be 95% covered by a continuous new solder coating.

RESULTS:

The specimens as tested met the requirements as specified.

PROJECT NO.:	91192	SPECIFICATION:	N/A
PART NO.:	PLCC - SMT	PART DESCRIPTION:	68 Position PLCC SMT Socket
SAMPLE SIZE:	Two Sockets	TECHNICIAN:	MHB
START DATE:	1/29/91	COMPLETE DATE:	1/29/91
ROOM AMBIENT:	24°C	RELATIVE HUMIDITY:	32%
EQUIPMENT ID#:	1, 55		

AQUEOUS CLEANING

PURPOSE:

To determine if the socket can withstand a typical cleaning process without any detrimental damage being caused.

PROCEDURE:

The test samples were exposed to the following cleaning cycle:

a) Pressure: 30 psi maximum
b) Under the pressure indicated, the samples were exposed to DI water at a temperature between 54°C to 66°C for 60 seconds followed by;
c) An exposure to DI water at a temperature between 93°C to 121°C for 60 to 90 seconds.
d) Repeat steps a) through c) three times.

REQUIREMENT:

There shall be no evidence of physical damage to the sockets as tested.

RESULTS:

1. All samples tested met the requirements as specified.

2. The test conditions used were:

    a) Pressure: 25 psi
    b) Step b) temperature 62.4°C for 60 ± 2 seconds
    c) Step c) temperature 96.8°C for 75 ± 2 seconds

PROJECT NO.:	91192	SPECIFICATION:	N/A
PART NO.:	PLCC - SMT	PART DESCRIPTION:	68 Position PLCC SMT Socket
SAMPLE SIZE:	Two Sockets	TECHNICIAN:	MHB
START DATE:	1/24/91	COMPLETE DATE:	1/24/91
ROOM AMBIENT:	27°C	RELATIVE HUMIDITY:	32%
EQUIPMENT ID#:	Applicable Glassware		

SOLVENT RESISTANCE

PURPOSE:

To determine the ability of the plastic housing to withstand normal cleaning solvents without damage. The solvent used is considered severe. If, however, the plastic remains stable and undamaged when so exposed it is considered to be immune to all the common solutions available.

PROCEDURE:

1. An appropriate size beaker large enough to accept the connectors to be tested was selected.

2. The beaker was filled to half capacity or to a level which completely covered the connectors, with trichloroethylene per O-T-534, type II.

3. The solution was heated to its boiling point for a 15 minute time period prior to exposing the connectors and was maintained at that level for the duration of the test.

4. The test samples were placed in a wire mesh basket of an appropriate size.

5. The wire mesh basket was subjected to the following schedule:

   a) Exposed to fumes for 18 seconds.
   b) Immediately lowered into the solution for 42 seconds.
   c) Re-exposed to fumes for 18 seconds.
   d) Remove basket from the test beaker.

6. The test samples were allowed to cool to room temperature.

REQUIREMENTS:

There shall be no evidence of discoloration, degradation, or physical damage to the plastic housing.

RESULTS:

All samples so tested met the requirements specified.

PROJECT NO.:	91192	SPECIFICATION:	N/A
PART NO.:	PLCC - SMT	PART DESCRIPTION:	68 Position PLCC SMT Socket
SAMPLE SIZE:	Two Sockets	TECHNICIAN:	MHB
START DATE:	1/24/91	COMPLETE DATE:	1/24/91
ROOM AMBIENT:	27°C	RELATIVE HUMIDITY:	32%
EQUIPMENT ID#:	See Procedure		

RESISTANCE TO SOLDER HEAT -- VAPOR PHASE

PURPOSE:

1. To determine if the test samples can withstand exposure to vapors normally used in vapor phase soldering. The heat and vapor from said process can affect the mechanical integrity of the plastic housing, such as loosening of terminations, softening or melting of the insulation, reflow of finishes at the contact areas and/or housing distortion or blistering.

2. The vapor phase process is a heat/chemical environment.

PROCEDURE:

1. The test samples were not assembled to printed circuit boards during exposure.

2. All sockets were exposed to the vapor phase soldering process as follows:

   a) The vapor phase unit used was the Phase Four Vapor Phase System, manufactured by HTC.
   b) The primary vapor was FC70, manufactured by the 3M Company. The vapor was maintained at a temperature of 419°F (215°C).
   c) The secondary vapor was Freon TF which was maintained at a temperature of approximately 117°F (47°C).
   d) The sockets were lowered through the secondary vapor into the primary vapor and allowed to dwell for 60 seconds.
   e) During the removal cycle, the sockets were allowed to dwell for 30 seconds in Freon vapor and then removed totally.
   f) The connectors were allowed to dwell for 60 seconds in the entrance area of the chamber.
   g) After removal, the connectors were cleaned in hot vapors for 30 seconds (trichloroethane 1-1-1) followed by a 15 second spray.

REQUIREMENTS:

There shall be no evidence of damage, distortion, etc., to the samples so evaluated.

RESULTS:

All sockets as tested met the requirements as specified.

PROJECT NO.:	91192	SPECIFICATION:	N/A
PART NO.:	PLCC - SMT	PART DESCRIPTION:	68 Position PLCC SMT Socket
SAMPLE SIZE:	Two Sockets	TECHNICIAN:	MHB
START DATE:	1/22/91	COMPLETE DATE:	1/22/91
ROOM AMBIENT:	20°C	RELATIVE HUMIDITY:	48%
EQUIPMENT ID#:	See Procedure		

RESISTANCE TO SOLDER HEAT -- INFRA RED

PURPOSE:

To evaluate the impact of a reflow soldering process which utilizes conductive and radiated heat. To assure that the design configuration and/or color additives are compatible to the process.

PROCEDURE:

1. The test samples were placed on a glass epoxy pcb with the terminations resting on said pcb.

2. The test samples were placed on the conveyor system of a Vitronic, Model X107 soldering unit.

3. Figure #1 indicates the typical temperature/time profile of the samples evaluated.

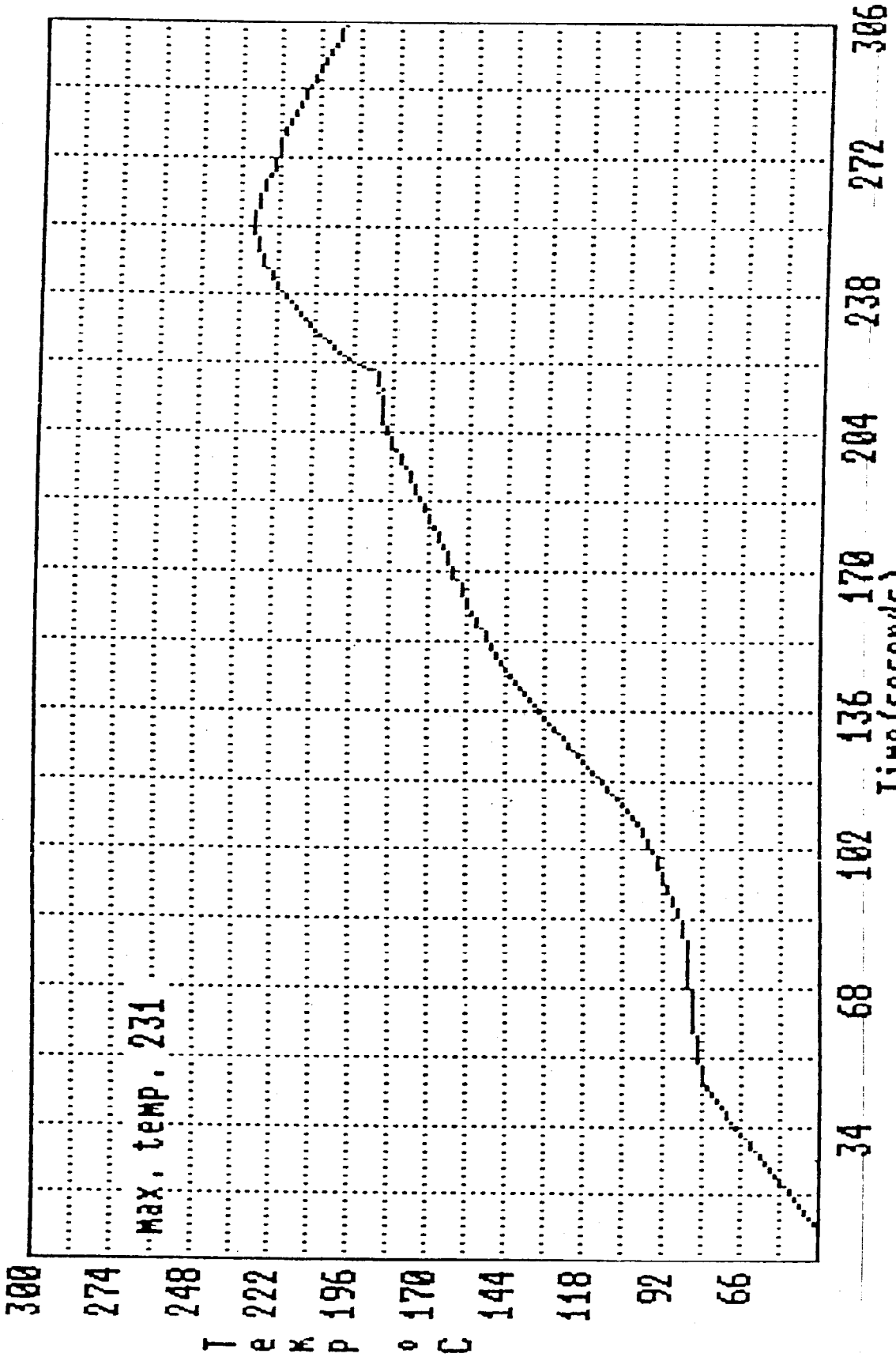
REQUIREMENTS:

There shall be no evidence of physical damage, distortion, melting, etc. of the test samples so exposed.

RESULTS:

All test samples met the requirements as specified.

Figure #1


Max. temp. 231
300
274
248
222
196
170
144
118
92
66
T e m p ° C
34
68
102
136
170
204
238
272
306
Time(seconds)

PROCEDURE -- Continued:

5. The test was performed with the contacts assembled in their housing.

REQUIREMENTS:

The force/deflection characteristic shall be plotted.

RESULTS:

1. The force/deflection characteristic is shown in Figure #5.

2. The spring rate of the contact system tested was 14.0 to 15.0 grams/0.001" deflection.

3. Permanent set as measured at the maximum deflection level tested is considered negligible being less then 0.0002 inches.

PROJECT NO.:	91192	SPECIFICATION:	N/A
PART NO.:	PLCC - SMT	PART DESCRIPTION:	68 Position PLCC SMT Socket
SAMPLE SIZE:	Two Sockets	TECHNICIAN:	MHB
START DATE:	8/14/90	COMPLETE DATE:	8/14/90
ROOM AMBIENT:	20°C	RELATIVE HUMIDITY:	52%
EQUIPMENT ID#:	40, 53, 92, 93, 102, 111, 144		

NORMAL FORCE

PURPOSE:

1. To determine the magnitude of normal force generated at any given deflection level within the normal operating levels of the contact system. To determine the magnitude of permanent set, if any, and its impact on loss of normal force. This data and its relationship to contact interface is then evaluated in proper perspective when reviewed with other attributes.

2. Normal force is one of the basic attributes of a contact system. It is a direct indication of contact pressure as well as contact integrity. The magnitude of said force can establish the gas tight condition between contacting surfaces. A gas tight interface prevents harsh environments and oxide or film growth from penetrating between surfaces which may cause degradation of electrical stability. It will also influence fretting motion and wear.

PROCEDURE:

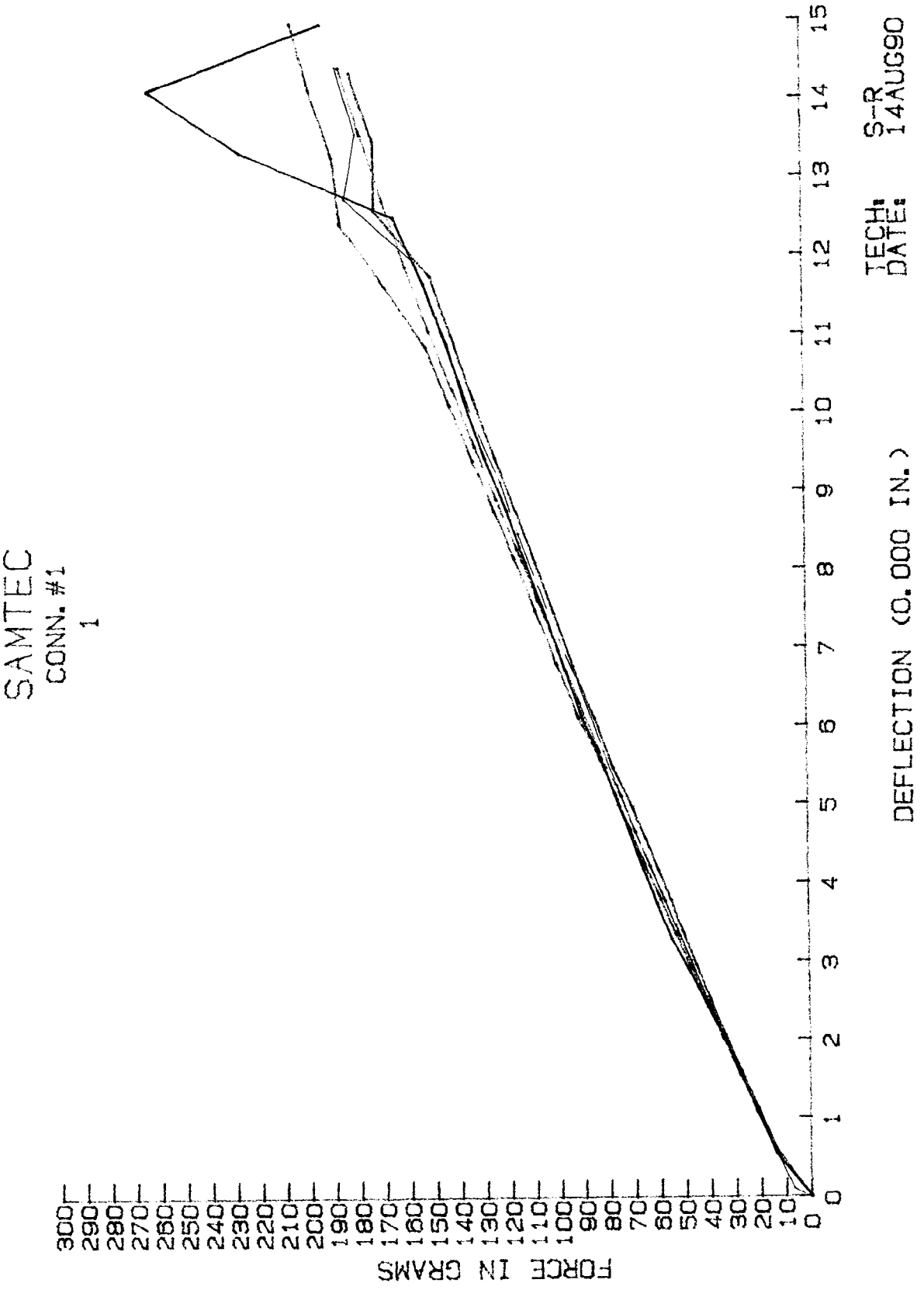
1. The prepared sample was placed in a special holding fixture on a X-Y moveable table.

2. The sample was positioned in such a manner so as to allow a special probe attached to a force transducer to deflect the contact element to a given distance as specified.

3. The probe/force transducer is interconnected with a linear transducer, amplifier, data acquisition/computer system and recorder.

4. As the contact element is deflected to the level desired, the normal force characteristic is plotted directly and simultaneously.

Figure #5


SAMTEC
CONN. #1
1
FORCE IN GRAMS
DEFLECTION (0.000 IN.)
TECH: S-R
DATE: 14AUG90

Equipment List

ID#	Last Cal	Next Cal	Equipment Name	Manufacturer	Accuracy	Model #	Serial #	Freq Cal
1	1/17/91	7/17/91	Digital Thermometer	John Fluke MFG	±0.31°C	2190A	2775012	6 months
2	2/21/91	2/21/92	Megohm Meter	Gen Rad Inc.	Voltage ±2%	1864	9700 FS8892	12 months
16			High Vac Chamber	Edwards Company	N/A	EIM8	01092	N/A
18			Bench Oven	Blue M	±0.5°C	POM7-256C	P38-1452	Each Test
22			N2 Chamber	Hot Pack	±2°C	1507-26	45214	N/A
27	11/9/90	5/9/91	Temp/Hum Cycle	Blue M	±1% of span	FR-256PC-1	F2-249	6 months
30	1/3/91	7/3/91	Discontinuity Monitor	Associated Test Lab	Uncertainty ± 50	DM-600-10	382-1	6 months
34			Shock Machine	Avco	See ID# 14 & 117	SM110-3	1047	Each Test
40	2/15/91	8/15/91	LVDT COND/IND	Daytronic	See specification	3230	204	6 months
45			Plotter	Hewlett Packard	N/A	7225B	2106A03238	N/A
53	3/14/91	9/14/91	Load Cell	Daytronic	±0.1% Full Scale	152A-10	182	6 months
55			Air Fume Hood	Labconco	N/A	47715	61279	N/A
92			NF Fixture	BK Tool & MFG	±.0005"	N/A	N/A	N/A
93			6 Volt Power Supply	Contech Research	N/A	N/A	N/A	N/A
95	4/18/91	10/18/91	AC Hypot	Peschell Instrument	See specification	P10*3/15/8	5570	6 months
102	4/24/91	10/24/91	Data Acquisition Unit	Hewlett Packard	See specification	3421A	2338A02027	6 months
111			IBM Computer	IBM	See specification	5151001	0401256	N/A
117	3/14/91	9/14/91	Oscilloscope	Hewlett Packard	See specification	54200	2445A 00127	6 months
140	12/20/90	6/20/91	LCR Meter	Hewlett Packard	See manual	4275A	2148501564	6 months
144			Plotter	Hewlett Packard	See specification	7470A	2250A-19081	N/A
157	3/7/91	9/7/91	Digibridge	Genrad Inc.	See specification	1657	7131004010	6 months
167			Solder Pot	Bell Technology	N/A	RS-P2-13-2	N/A	N/A
207	10/25/91	4/25/91	Micro-ohm Meter	Keithley	See manual	580	438208	6 months
220			Computer	IBM	N/A	PC	N/A	N/A
223			PCB Power Supply	PCB Company	N/A	482	4356	N/A
236	1/31/91	7/31/91	Micro-ohm Meter	Keithley Company	See Manual	580-1	462173	6 months
251			Computer System	Packard Bell	N/A	286	105670	N/A
252			Computer System	Packard Bell	N/A	286	105673	N/A
295	2/21/91	8/21/91	Micro Ohm Meter	Keithley Company	See manual	580	480781	6 months