SEPTEMBER 28, 1999

TEST REPORT #99447

QUALIFICATION TESTING

HPF CONNECTOR SERIES

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 in 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 ISO 10012-1 and ANSI/NCSL Z540-1, 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 test sponsor.

Max Peel
President

MP:js

SCOPE

To perform qualification testing on Connectors 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) HPF Receptacle Connectors
   b) Headers

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 product techniques common for this type of product and inspected in accordance with the quality criteria as established for the product involved.

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

5. Test samples were mounted to test boards and hand soldered in place.

6. After test lead attachments and/or soldering, all test units were cleaned prior to mating via ultrasonic degreasing process.

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

8. All equipment and measuring instruments used during testing were calibrated and traceable to NIST according to ISO 10012-1 and ANSI/NCSL Z540-1, as applicable.

TEST SELECTION

1. The following test groups were established.

   Group 1 : Gas Tight Series
   Group 2 : Vibration/Shock Series (LLCR)
   Group 3 : Vibration/Shock Series (Contact Interruptions)
   Group 4 : Thermal Shock/Cyclic Humidity Series (LLCR)
   Group 5 : Thermal Shock/Cyclic Humidity Series(IR&DWV)
   Group 6 : Thermal Aging Series

2. Supplemental Tests:

   a) Current Cycling

3. Test set ups or procedures which are normal or standard are not documented herein as long as they are certified as being performed in accordance with the applicable industry standard.

MONITORING TESTS

Throughout the test sequence selected for this evaluation one test was performed on a periodic basis. The following is the rational 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 an 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 EIA 364, TP23, with a 100 milliamps maximum test current and an open circuit voltage of 20 millivolts. Measurements are taken in the forward and reverse direction and averaged.

LOW LEVEL CIRCUIT RESISTANCE - Continued

6. In order to categorize the change occurring in the low level circuit resistance in the test sequence performed, the following guidelines are used:

   a) <+5.0 milliohms : Stable
   b) +5.1 to +10.0 : Minor change(Measurement Stable)
   c) +10.1 to +15.0 : Significant change(Measurement Stable)
   d) +15.1 to +50.0 : Marginal(Measurement Sable to Unstable)
   e) >+50.1 : Unstable

A stable measurement is one which does not fluctuate greater than ± 2.0 mΩ during the measurement period.

DATA SUMMARY

TEST	REQUIREMENTS	RESULTS
Group 1		
LLCR, Initial	Record	<0.6 mΩ
Gas Tight	No Damage	Passed
LLCR, Change	<+15.0 mΩ	<0.0 mΩ
Group 2		
LLCR, Initial	Record	<0.6 mΩ
Shock	No Damage	Passed
Vibration	No Damage	Passed
LLCR, Change	<+15.0 mΩ	<+0.4 mΩ
Group 3		
Engagement Force	Record	<4.7 lbs.
Separation Force	Record	>1.9 lbs.
Vibration	No Damage	Passed
	1.0 Microsecond	Passed
Shock	No Damage	Passed
	1.0 Microsecond	Passed
Group 4		
Mating Force	Record	<77.2 lbs.
Unmating Force	Record	>47.4 lbs.
LLCR, Initial	Record	<0.6 mΩ
Durability (100 X)	No Damage	Passed
Mating Force	Record	<66.3 lbs.
Unmating Force	Record	>37.7 lbs.
LLCR, Change	<+15.0 mΩ	<+0.7 mΩ
Thermal Shock	No Damage	Passed
LLCR, Change	<+15.0 mΩ	<+1.6 mΩ
Cyclic Humidity	No Damage	Passed
LLCR, Change	<+15.0 mΩ	<+4.7 mΩ
Group 5		
IR	>5000 Megohms	>50,000 Megohms
DWV	2500 VAC	Passed
Thermal Shock	No Damage	Passed
Humidity	No Damage	Passed
IR	>1000 Megohms	>50,000 Megohms
DWV	2500 VAC	Passed
Working Voltage	N/A	850 VAC

DATA SUMMARY - Continued

TEST	REQUIREMENTS	RESULTS
Group 6		
LLCR	Record	<0.6 mΩ
Thermal Age	No Damage	Passed
LLCR	<+15.0 mΩ ΔR	<+0.2 mΩ
Gas Tight	No Damage	Passed
LLCR	<+15.0 mΩ ΔR	<+0.4 mΩ

LLCR = Low Level Circuit Resistance
DWV = Dielectric Withstanding Voltage

ID#	Next Cal	Last Cal	Equipment Name	Manufacturer	Model #	Serial #	Accuracy	Freq.Cal
1	12/15/1999	06/15/1999	Digital Thermometer	John Fluke Mfg.	2190A	2775012	± 0.31°C	6 mon.
20			Bench Oven	Hot Pack	1303	30364	±1 0.0°C	Ea.Test
22			N2 Chamber	Hot Pack	1507-26	45214	± 2%	12 mon.
30	03/21/2000	09/21/1999	Discontinuity Monitor	Assoc. Test Lab	DM-600-01	382-1	± 50ns	6 mon.
33			Vib. Power Amp	Ling Dynamics	MPA4	149	See Specification	N/A
34			Shock Machine	Avco	SM110-3	1047	See ID# 14 & 117	Ea.Test
54			Air Fume Hood	Labconco	47701	39286	N/A	N/A
55			Air Fume Hood	Labconco	47715	61279	N/A	N/A
86			Shaker Table	MB Elect.	C10E	141	See Specification	N/A
107			Bench Oven	Blue M Co.	POM7-146C	P38-1604	±0.5%	Ea.Test
114	06/15/2000	06/15/1999	Digital Force Gage 2 lb	Chatillon	DFG-2	3985	±1%	6 mon.
117	12/15/1999	06/15/1999	Digitizing Scope	Hewlett Packard	54200	2445A 00127	See Specification	6 mon.
144			Plotter	Hewlett Packard	7470A	2250A-19081	See Specification	N/A
152			Drill Press Stand	Craftsman	25921	N/A	N/A	N/A
161	02/23/2000	08/23/1999	Random Vib. Control	Solartron	1210	3000163	<0.5 DB Error	6 mon.
199			Cycling Machine	Contech Research	PM925A11	2407	N/A	N/A
200			Power Supply	PCB Piezotronics	482A	4210	N/A	N/A
207	10/27/1999	04/27/1999	Micro-Ohm Meter	Keithley Co.	580	438208	See Manual	6 mon.
321	01/28/2000	01/28/1999	AC-DC Hipot/Megometer	Hipotronics Co.	H306B	DS16-201	N/A	12 mon.
421	02/09/2000	02/09/1999	Megohmeter	Hipotronics Co.	HM3A	031423-00	1/8"of Deflection	12 mon.
478			Computer	Twilight Co.	P111-450	N/A	N/A	N/A
486	11/18/1999	05/18/1999	Digital Force Gage 100 lbs.	Chatillon Co.	DFIS-100	23084	±.15% full scale	6 mon.
488			X-Y Table	N.E.Affiliated Tech.	N/A	932021	N/A	N/A
509			Regulator	Liquid Carbonic	SGS 160C	M2 42365	N/A	N/A
512			Bench Oven	Blue M Co.	POM 146C-1	CD9506	See Manual	Ea.Test
529			Computer	ARC Elect.	486-40	N/A	N/A	N/A
553			12 channel Power Unit	PCB Co.	483A	1303	See Manual	Ea.Test
570			PCB Power Supply	Piezotronics Co.	482A	5260	See Manual	Ea.Test
669	10/21/1999	04/21/1999	Digital Thermometer	Omega Eng.	DP116-JC2	7160424		6mon
699			Oxident Monitor	Mast Co.	1724	12732	N/A	Each Test
1040			Printer	Brother	HL1040	51L85300611	N/A	N/A
1127	01/13/2000	07/13/1999	Temp/Humid/Chamber	Thermotron	SM-8-C	29503	See Manual	6mon

TEST RESULTS

Gas Tight Series

Group 1

PROJECT NO.: 99447	SPECIFICATION: Samtec Test Plan
PART NO.: HPF Series	PART DESCRIPTION: Connectors
SAMPLE SIZE: Two (ID 1-1,1-2)	TECHNICIAN: GP/MS
START DATE: 8/9/99	COMPLETE DATE: 8/9/99
ROOM AMBIENT: 22°C	RELATIVE HUMIDITY: 48%
EQUIPMENT ID#: 1, 20, 55, 207, 529	

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 environment was performed in accordance with EIA 364, Test Procedure 36.

2. All test samples were cleaned prior to the gas exposure using vapor degreasing via an ultrasonic cleaning process.

3. Nitric acid was placed in the 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.

PROCEDURE -- Continued:

7. After exposure, the samples were removed from the test chamber and oven dried at 80°C for a minimum of 30 minutes.

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

9. Initial and final low level circuit resistance was measured in accordance with EIA 364, TP 23 with a 100 milliamps maximum test current and 20 Millville open circuit voltage.

REQUIREMENTS:

1. The initial low level circuit resistance shall be measured and recorded.

2. The change in low level circuit resistance shall not exceed +15.0 milliohms.

RESULTS:

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

LOW LEVEL CIRCUIT RESISTANCE
(Milliohms)

	Avg.	Max.	Min.	Avg. Change	Max. Change	Std. Dev.
Initial	0.6	0.6	0.5	--	--	--
Final	0.6	0.6	0.5			

2. See data file 944701 for individual data points.

LOW-LEVEL CONTACT RESISTANCE

Project #: 99447
Customer: Samtec
Product: Connectors
Description: HPF
Open circuit voltage: 20 millivolts

Spec: Samtec Test Plan
SubGroup: #1
File #: 944701.LCR

Test current: 100 milliamps

Units: milliohms
Delta values

Temp °C	+22	+22
R.H.%	48	48
Date	09Aug99	09Aug99
Pos ID	Initial	GasTight
1-1	0.6	-0.0
1-2	0.6	+0.0
1-3	0.6	-0.0
1-4	0.6	+0.0
1-5	0.6	-0.0
1-6	0.6	-0.0
1-7	0.6	-0.0
1-8	0.6	-0.1
1-9	0.6	-0.1
1-10	0.6	-0.0
1-11	0.6	+0.0
1-12	0.6	-0.0
1-13	0.6	+0.0
1-14	0.6	-0.0
1-15	0.6	-0.0
1-16	0.6	-0.0
1-17	0.6	-0.0
1-18	0.6	+0.0
1-19	0.6	+0.0
1-20	0.6	-0.0
2-1	0.6	+0.0
2-2	0.6	+0.0
2-3	0.6	-0.0
2-4	0.6	-0.0
2-5	0.5	-0.0
2-6	0.6	-0.0
2-7	0.6	-0.0
2-8	0.6	-0.0
2-9	0.6	+0.0
2-10	0.6	-0.0
2-11	0.6	+0.0
2-12	0.6	+0.0
2-13	0.5	+0.0
2-14	0.6	+0.0
2-15	0.6	-0.0

Project #: 99447
Customer : Samtec

File:944701.LCR

Date	09Aug99	09Aug99
Pos ID	Initial	GasTight
2-16	0.6	+0.0
2-17	0.6	-0.0
2-18	0.6	+0.0
2-19	0.6	+0.0
2-20	0.6	-0.0
HIGH	0.6	+0.0
LOW	0.5	-0.1
AVG	0.6	-0.0
STD DEV	0.0	0.0
OPENS	0	0
INITIALS	M S	M S

NOTES:

1 - An asterisk (*) indicates an open circuit or a value greater than 20 ohms.

TEST RESULTS

Vibration/Shock Series (LLCR)

Group 2

PROJECT NO.: 99447	SPECIFICATION: Samtec Test Plan
PART NO.: HPF Series	PART DESCRIPTION: Connectors
SAMPLE SIZE: Two (ID 2-3,2-4)	TECHNICIAN: MS/GP
START DATE: 8/9/99	COMPLETE DATE: 8/9/99
ROOM AMBIENT: 22°C	RELATIVE HUMIDITY: 48%
EQUIPMENT ID#: 207, 529	

LOW LEVEL RESISTANCE (LLCR)

PURPOSE:

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. It is also sensitive to and may detect the presence or fretting corrosion induced by mechanical or thermal environments as well as any significant loss of pressure.

PROCEDURE:

1. This test was performed in accordance with EIA 364, TP23 with a 100 milliamps maximum test current and an open circuit voltage of 20 millivolts (four wire technique).

2. The voltage probes were attached within 0.050 inch on the termination where they exit the housing.

REQUIREMENTS:

The low level circuit resistance shall be measured and recorded.

RESULTS: See next page.

RESULTS:

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

LOW LEVEL CIRCUIT RESISTANCE
(Milliohms)

Avg.	Max.	Min.	Std. Dev.
0.6	0.6	0.5	<0.0

2. See data file 944702 or individual data points.

PROJECT NO.: 99447 SPECIFICATION: Samtec Test Plan

PART NO.: HPF Series PART DESCRIPTION: Connectors

SAMPLE SIZE: Two (ID 2-3,2-4) TECHNICIAN: GP

START DATE: 8/11/99 COMPLETE DATE: 8/11/99

ROOM AMBIENT: 22°C RELATIVE HUMIDITY: 47%

EQUIPMENT ID#: 34, 117, 144, 200, 478, 570

MECHANICAL SHOCK (SPECIFIED PULSE)

PURPOSE:

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

PROCEDURE:

1. The shock test was performed in accordance with EIA 364, TP27, Test Condition A.

2. Test conditions:

   a) Peak valve : 50 G
   b) Duration : 11.0 milliseconds
   c) Wave form : Half Sine
   d) No. Of shocks : 3 shocks/direction, 3 axis (18 total)

REQUIREMENTS:

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

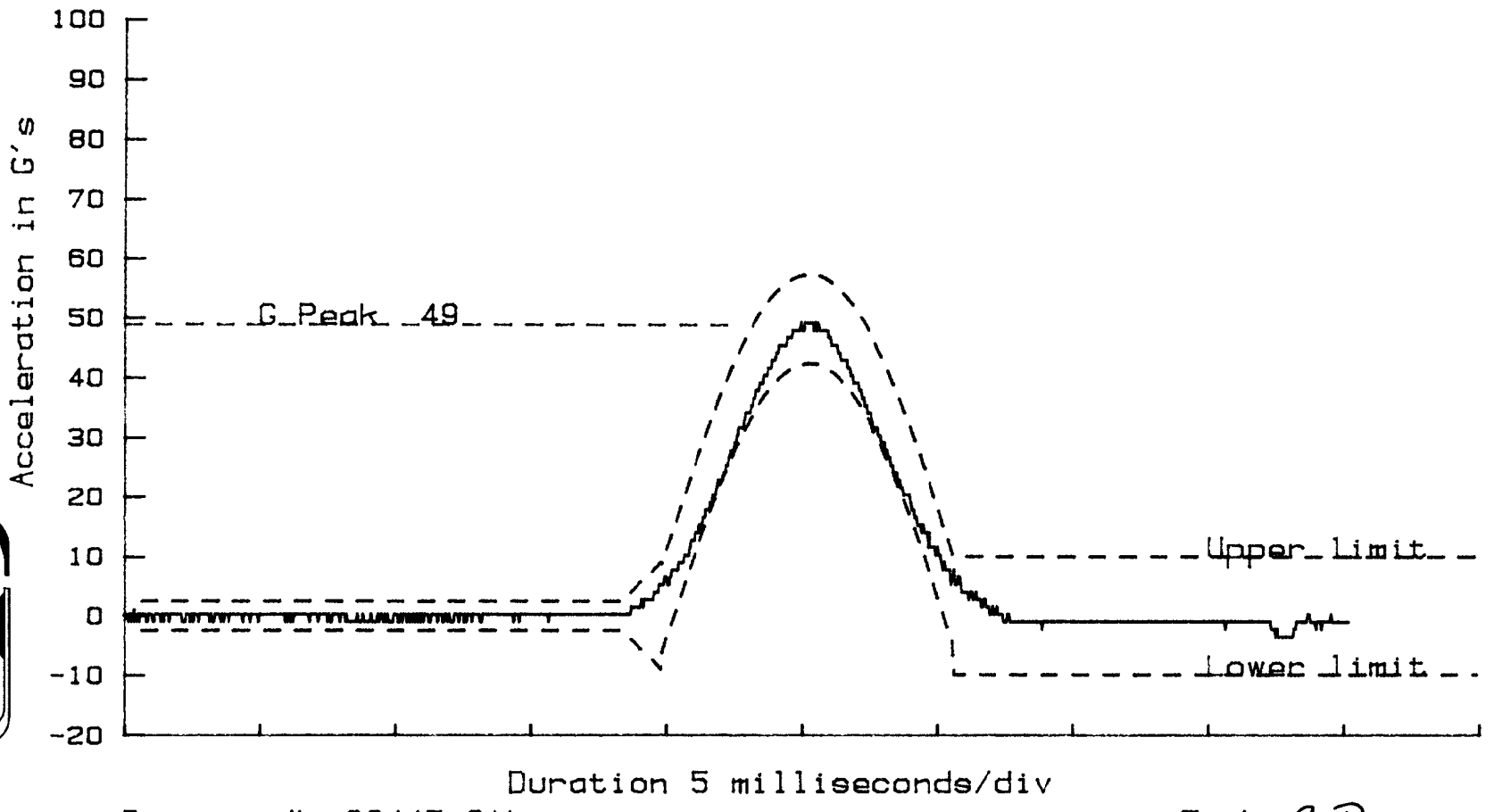
RESULTS:

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

Samtec

4 Connectors

EIA-Std 364 TC A



Project #: 99447 CAL.

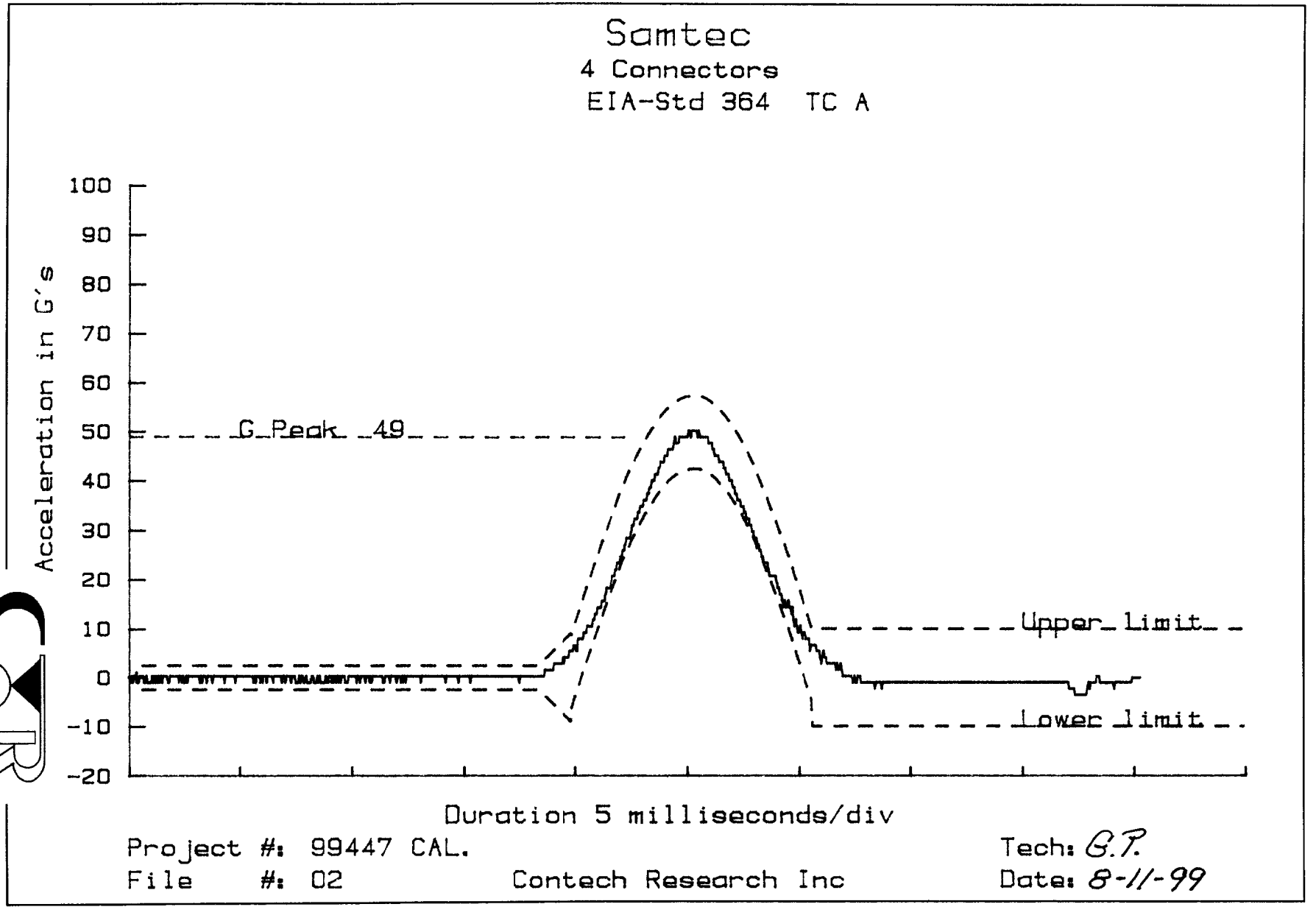
File #: 01

Contech Research Inc

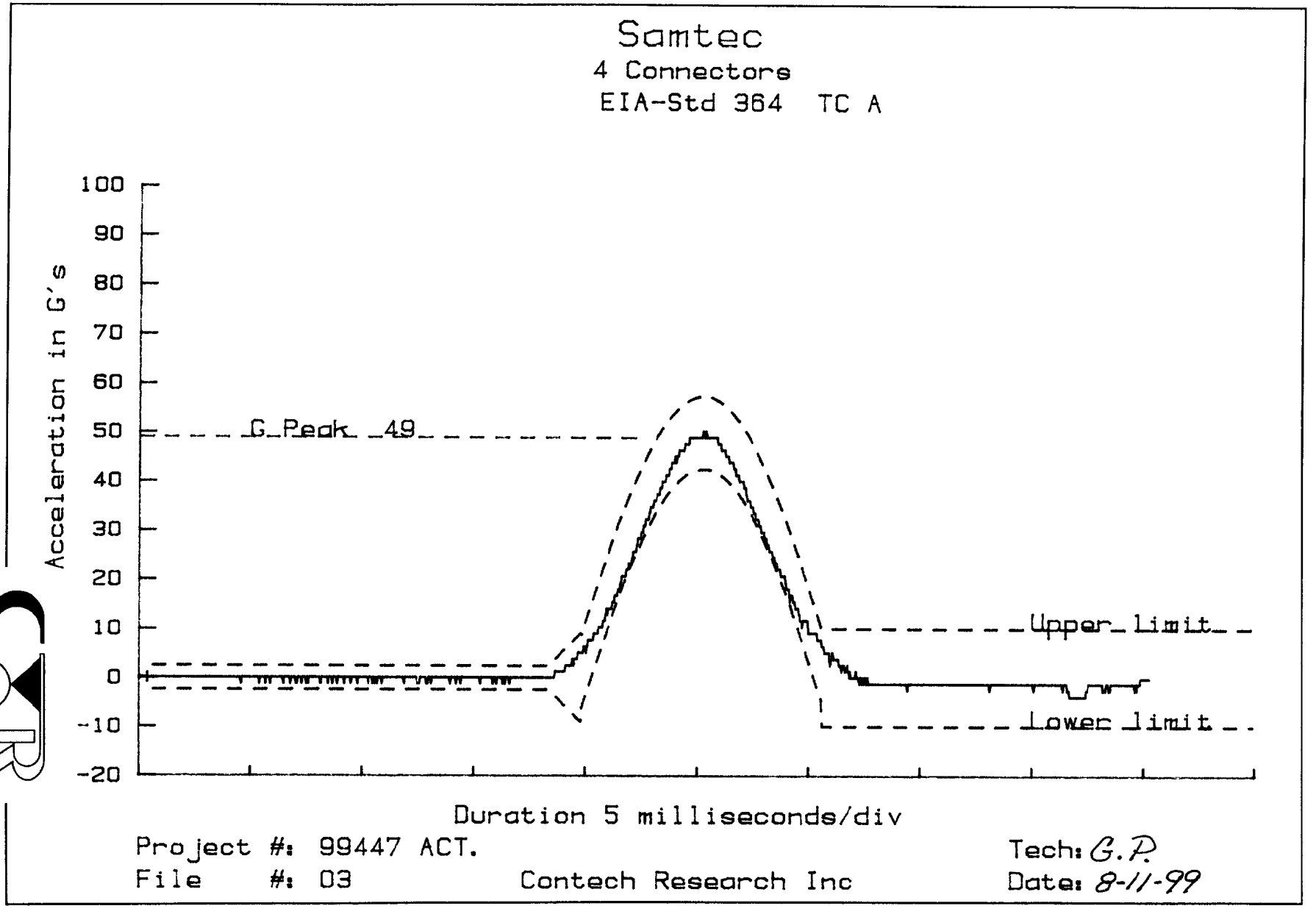
Tech: G.P.

Date: 8-11-99

Contech Research



Contech Research



Contech Research

PROJECT NO.: 99447	SPECIFICATION: Samtec Test Plan
PART NO.: HPF Series	PART DESCRIPTION: Connectors
SAMPLE SIZE: Two (ID 2-3,2-4)	TECHNICIAN: GP/MS
START DATE: 8/18/99	COMPLETE DATE: 8/19/99
ROOM AMBIENT: 23°C	RELATIVE HUMIDITY: 46%
EQUIPMENT ID#: 33, 86, 161, 207, 529, 553, 1040	

VIBRATION, RANDOM

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. Low level circuit resistance was measured and recorded in accordance with EIA 364, TP23, with a 100 milliamps maximum test current and a 20.0 millivolts open circuit voltage.

2. Vibration was performed in accordance with EIA 364, TP28.

3. Test Conditions:

   a) Frequency : 50 to 2000 Hz
   b) PSD : 0.04
   c) Duration : 1.0 hr/axis, 3 axis total
   d) G Level : 7.3 G's rms

4. All subsequent attribute monitoring was performed in accordance with procedures previously indicated.

REQUIREMENTS: See next page.

REQUIREMENTS:

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

2. The change in low level circuit resistance shall not exceed +15.0 mΩ.

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:

CHANGE IN LOW LEVEL CIRCUIT RESISTANCE
(Milliohms)

Avg. Change	Avg. Change	Std. Dev.
+0.2	+0.4	<0.0

3. See data file 944702 for individual data points.

LOW-LEVEL CONTACT RESISTANCE

Project #: 99447
Customer: Samtec
Product: Connectors
Description: HPF
Open circuit voltage: 20 millivolts

Spec: Samtec Test Plan
SubGroup: 2
File #: 944702.LCR

Test current: 100 milliamps

Units: milliohms
Delta values

Temp °C	+22	+22
R.H.%	48	44
Date	09Aug99	19Aug99
Pos ID	Initial	Vib.
1-1	0.6	+0.1
1-2	0.5	+0.2
1-3	0.5	+0.2
1-4	0.5	+0.2
1-5	0.5	+0.2
1-6	0.5	+0.2
1-7	0.5	+0.1
1-8	0.6	+0.2
1-9	0.6	+0.4
1-10	0.5	+0.2
1-11	0.6	+0.1
1-12	0.6	+0.1
1-13	0.6	+0.2
1-14	0.6	+0.1
1-15	0.5	+0.2
1-16	0.6	+0.2
1-17	0.6	+0.2
1-18	0.5	+0.2
1-19	0.5	+0.1
1-20	0.6	+0.1
2-1	0.6	+0.2
2-2	0.6	+0.2
2-3	0.6	+0.1
2-4	0.6	+0.2
2-5	0.6	+0.1
2-6	0.6	+0.2
2-7	0.6	+0.2
2-8	0.6	+0.2
2-9	0.6	+0.2
2-10	0.6	+0.2
2-11	0.6	+0.2
2-12	0.6	+0.1
2-13	0.6	+0.2
2-14	0.6	+0.2
2-15	0.5	+0.2

Project #: 99447
Customer : Samtec

File:944702.LCR

Date Pos ID	09Aug99 Initial	19Aug99 Vib.
2-16	0.6	+0.2
2-17	0.6	+0.2
2-18	0.6	+0.2
2-19	0.6	+0.2
2-20	0.6	+0.2
HIGH	0.6	+0.4
LOW	0.5	+0.1
AVG	0.6	+0.2
STD DEV	0.0	0.0
OPENS	0	0
INITIALS	M S	G.P.

NOTES:

1 - An asterisk (*) indicates an open circuit or a value greater than 20 ohms.

TEST RESULTS

Vibration/Shock Testing
(Contact Interruptions)

Group 3

PROJECT NO.: 99447 SPECIFICATION: Samtec Test Plan

PART NO.: HPF Series PART DESCRIPTION: Connectors

SAMPLE SIZE: 25 Positions TECHNICIAN: GP/MS

START DATE: 8/10/99 COMPLETE DATE: 8/10/99

ROOM AMBIENT: 22°C RELATIVE HUMIDITY: 50%

EQUIPMENT ID#: 114, 152

ENGAGEMENT AND SEPARATION FORCE

PURPOSE:

To determine the magnitude of mechanical forces required to mate and unmate an individual pin into and from a socket contact.

PROCEDURE:

1. The test was performed in accordance with Specification EIA 364, Test Procedure 37.

2. Test Conditions:

   a) Test Pin Diameter : Actual Pin (0.045 in square)
   b) No. of Observations : 20/Connector
   c) Rate : 1.0 inch/minute

3. The test samples were fixtured in a manner to minimize eccentric loading and to allow self centering.

4. All measurements were performed with the contacts in a terminated state.

REQUIREMENTS:

The force required to mate and unmate the test pin (actual) shall be measured and recorded.

RESULTS: See next page.

RESULTS:

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

ENGAGEMENT FORCE and SEPARATION FORCE
(Pounds)

	Avg.	Max.	Min.
Engagement Force	3.6	4.7	2.3
Separation Force	2.7	3.8	1.9

2. See data file 944703.INS for individual data points.

3. Connector ID 1, Pos.1-11, the engagement force was inadvertently deleted from the data base.

INSERTION/WITHDRAWAL FORCE

Project #: 99447
Customer: Samtec
Product: Connectors
Description: HPF

Spec: Samtec Test Plan
SubGroup: 3
File #: 944703.INS

Units: LBS.
Actual values

Temp °C	+22	+22
R.H.%	50	50
Date	10Aug99	10Aug99
ID #	I.F.	W.F
1-1	2.4	3.7
1-2	2.3	2.1
1-3	3.0	2.7
1-4	3.5	2.4
1-5	4.0	3.5
1-6	3.5	2.8
1-7	3.8	2.7
1-8	2.5	2.2
1-9	2.4	1.9
1-10	4.1	3.0
1-11	*	2.4
1-12	4.1	2.8
1-13	3.3	2.1
1-14	3.5	2.6
1-15	3.7	3.0
1-16	3.9	2.3
1-17	3.5	2.0
1-18	3.2	2.3
1-19	3.0	2.1
1-20	3.5	2.1
2-1	2.5	1.9
2-2	3.1	2.8
2-3	2.9	2.6
2-4	3.8	2.6
2-5	3.9	2.8
2-6	3.4	2.2
2-7	3.9	2.9
2-8	4.7	3.8
2-9	4.5	3.5
2-10	4.1	3.0
2-11	3.9	2.5
2-12	4.2	2.8
2-13	4.6	3.1
2-14	4.5	2.9
2-15	4.6	3.4
2-16	3.9	2.3
2-17	4.6	3.7
2-18	4.7	3.6
2-19	4.3	3.1
2-20	3.8	2.9

Project #: 99447
Customer : Samtec

File:944703.INS

Date	10Aug99	10Aug99
Pos ID	I.F.	W.F
HIGH	4.7	3.8
LOW	2.3	1.9
AVG	3.6	2.7
STD DEV	0.9	0.5
INITIALS	G.P.	G.P.

PROJECT NO.: 99447 SPECIFICATION: Samtec Test Plan

PART NO.: HPF Series PART DESCRIPTION: Connectors

SAMPLE SIZE: Two (ID 3-1,3-2) TECHNICIAN: GP

START DATE: 8/11/99 COMPLETE DATE: 8/11/99

ROOM AMBIENT: 22°C RELATIVE HUMIDITY: 47%

EQUIPMENT ID#: 30, 34, 117, 144, 200, 478

MECHANICAL SHOCK (SPECIFIED PULSE)

PURPOSE:

To determine the mechanical and electrical integrity of the test samples 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 EIA 364, TP27.

2. Test Conditions:

    a) Peak value : 50 G
    b) Duration : 11.0 milliseconds
    c) Wave form : Half Sine
    d) No. Of shocks : 3 shocks/direction, 3 axis (18 total)

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.

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.

PROJECT NO.: 99447 SPECIFICATION: Samtec Test Plan

PART NO.: HPF Series PART DESCRIPTION: Connectors

SAMPLE SIZE: Two (ID 3-1,3-2) TECHNICIAN: GP

START DATE: 8/18/99 COMPLETE DATE: 8/18/99

ROOM AMBIENT: 23°C RELATIVE HUMIDITY: 46%

EQUIPMENT ID#: 30, 33, 86, 161, 553, 1040

VIBRATION, RANDOM

PURPOSE:

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. Vibration was performed in accordance with EIA 364, TP28.
2. Test Conditions:

   a) Frequency : 50 to 2000 Hz
   b) PSD : 0.04
   c) Duration : 1.0 hr/axis, 3 axis total
   d) G Level : 7.3 G's rms

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.

RESULTS:

1. There was no evidence of damage to the test samples as tested.
2. There was no interruption greater than 1.0 microsecond.

TEST RESULTS

Thermal Shock/Cyclic Humidity (LLCR)

Group 4

PROJECT NO.: 99447	SPECIFICATION: Samtec Test Plan
PART NO.: HPF Series	PART DESCRIPTION: Connectors
SAMPLE SIZE: Two (ID 4-7,4-8)	TECHNICIAN: GP
START DATE: 8/9/99	COMPLETE DATE: 8/9/99
ROOM AMBIENT: 22°C	RELATIVE HUMIDITY: 48%
EQUIPMENT ID#: 486, 488	

MATING AND UNMATING FORCE

PURPOSE:

To determine the mechanical forces required to mate and unmate the test samples with all guiding and applicable hardware assembled to the test samples.

PROCEDURE:

1. The test was performed in accordance with EIA 364, TP13.

2. The test samples were fixtured to the base plate of the test stand and applicable force gauge.

3. The fixturing was accomplished to assure axial alignment and allowed self centering movement to exist.

4. The test rate was 1.0 inch/minute.

REQUIREMENTS:

The force required to mate and unmate the test samples shall be measured and recorded.

RESULTS: See next page.

RESULTS:

The following is a summary of the observed forces measured and recorded:

Sample ID#	MATING FORCE (Pounds)	UNMATING FORCE (Pounds)
4-7	76.3	47.4
4-8	77.2	49.1

PROJECT NO.: 99447 SPECIFICATION: Samtec Test Plan

PART NO.: HPF Series PART DESCRIPTION: Connectors

SAMPLE SIZE: Two (ID 4-7,4-8) TECHNICIAN: MS

START DATE: 8/9/99 COMPLETE DATE: 8/9/99

ROOM AMBIENT: 22°C RELATIVE HUMIDITY: 48%

EQUIPMENT ID#: 207, 529

LOW LEVEL CIRCUIT RESISTANCE (LLCR)

PURPOSE:

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. It is also sensitive to and may detect the presence of fretting corrosion induced by mechanical or thermal environments as well as any significant loss of pressure.

PROCEDURE:

1. This test was performed in accordance with EIA 364, TP23 with a 100 milliamps maximum test current and an open circuit voltage of 20 millivolts (four wire technique).

2. The voltage probes were attached within 0.050 inch on the termination where they exit the housing.

REQUIREMENTS:

The low level circuit resistance as measured shall be measured and recorded.

RESULTS: See next page.

RESULTS:

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

LOW LEVEL CIRCUIT RESISTANCE
(Milliohms)

Avg.	Max.	Min.	Std. Dev.
0.6	0.8	0.5	<0.0

2. See data file 944704 for individual data points.

PROJECT NO.: 99447	SPECIFICATION: Samtec Test Plan
PART NO.: HPF Series	PART DESCRIPTION: Connectors
SAMPLE SIZE: Two (ID 4-7,4-8)	TECHNICIAN: GP/MS
START DATE: 8/9/99	COMPLETE DATE: 8/9/99
ROOM AMBIENT: 22°C	RELATIVE HUMIDITY: 48%
EQUIPMENT ID#: 199, 207, 486, 488, 529	

DURABILITY

PURPOSE:

1. To determine the effects of subjecting the test samples to a predetermined number of mating and unmating cycles simulating the expected mechanical life of the product being evaluated.

2. This is a preconditioning sequence which is used to induce the type of wear on the contacting surfaces which may occur under normal service conditions. The connectors are mated and unmated a predetermined number of cycles. Upon completion, the units being evaluated are exposed to the environments as specified to asses any impact on electrical stability resulting from wear or other wear dependent phenomenon.

3. This type of preconditioning sequence is also used to mechanically stress the connector system as would normally occur in actual service. This sequence in conjunction with other tests is used to determine if a significant loss of contact pressure occurs from said stresses which in turn, may result in an unstable electrical condition to exist.

PROCEDURE:

1. The test was performed in accordance with EIA 364, TP09.

2. Test Conditions:

   a) No. of cycles : 100
   b) Rate : 500 cycles/hr

PROCEDURE - Continued:

3. The test samples were assembled to special holding devices and attached to the automatic cycling equipment.

4. The test samples were axially aligned to accomplish the mating and unmating function allowing for self-centering movement.

5. Low level circuit resistance was performed in accordance with EIA 364, TP23 using a 100 milliamps maximum test voltage and a 20.0 millivolts open circuit voltage.

REQUIREMENTS:

1. There shall be no evidence of physical damage to the test sample so tested.

2. The force required to mate and unmate the test samples shall be measured and recorded.

3. The change in low level circuit resistance shall not exceed +15.0 mΩ.

RESULTS:

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

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

CHANGE IN LOW LEVEL CIRCUIT RESISTANCE
(Milliohms)

Avg. Change	Max. Change	Std. Dev.
+0.2	+0.7	0.1

3. See data file 944704 for individual data points.

RESULTS: Continued

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

Sample ID#	MATING FORCE (Pounds)	UNMATING FORCE (Pounds)
4-7	66.3	37.7
4-8	60.3	42.4

PROJECT NO.: 99447	SPECIFICATION: Samtec Test Plan
PART NO.: HPF Series	PART DESCRIPTION: Connectors
SAMPLE SIZE: Two (ID 4-7,4-8)	TECHNICIAN: GP
START DATE: 8/12/99	COMPLETE DATE: 8/12/99
ROOM AMBIENT: 22°C	RELATIVE HUMIDITY: 50%
EQUIPMENT ID#: 1, 22, 107, 207, 509, 669	

THERMAL SHOCK

PURPOSE:

To determine the resistance of a given 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 EIA 364, TP32, except as noted.

2. Test Conditions:

   a) Number of Cycles : 5 Cycles
   b) Hot Extreme : +105°C +3°C/-0°C
   c) Cold Extreme : -55°C +0°C/-3°C
   d) Time at Temperature : 30 Minutes
   e) Mating Condition : Mated
   f) Mounting Condition : Mounted
   g) Transition Time 2 to 3 Minutes

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.

PROCEDURE: Continued

5. All subsequent attribute testing was performed in accordance with the procedures as previously indicated.

6. Prior to performing attribute measurements, the test samples were allowed to recover to room ambient conditions.

REQUIREMENTS:

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

2. The change in low level resistance shall not exceed +15.0Ω.

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:

CHANGE IN LOW LEVEL CIRCUIT RESISTANCE
(Milliohms)

Avg. Change	Avg. Change	Std. Dev.
+0.4	+1.6	0.4

3. See data file 944704 for individual data points.

4. The following are temperature ranges which occurred during the exposure:

   a) Hot Temperature : +105.2°C to +105.4°C
   b) Low Temperature : -55.2°C to -55.5°C

PROJECT NO.: 99447	SPECIFICATION: Samtec Test Plan
PART NO.: HPF Series	PART DESCRIPTION: Connectors
SAMPLE SIZE: Two (ID 4-7,4-8)	TECHNICIAN: GP
START DATE: 8/13/99	COMPLETE DATE: 8/23/99
ROOM AMBIENT: 22°C	RELATIVE HUMIDITY: 48%
EQUIPMENT ID#: 207, 529, 1127	

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: See next page.

PROCEDURE:

1. The test was performed in accordance with EIA 364, TP31 with the following conditions.

2. Test Conditions:

a)	Relative Humidity	: 90% to 95%
b)	Temperature Conditions	: 25°C to 65°C
c)	Mating Conditions	: Mated
d)	Mounting Conditions	: Mounted
e)	Duration	: 240 hours

3. Prior to performing attribute measurements, the test samples were allowed to recover to room ambient conditions.

4. All subsequent attribute testing was performed in accordance with the procedures previously indicated.

REQUIREMENTS:

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

2. The change in low level circuit resistance shall not exceed +15.0 mΩ.

RESULTS:

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

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

LOW LEVEL CIRCUIT RESISTANCE
(Milliohms)

Avg. Change	Avg. Change	Std. Dev.
+1.0	+4.7	1.2

3. See data file 921804 for individual data points.

4. Typical chart follows.

LOW-LEVEL CONTACT RESISTANCE

Project #: 99447
Customer: Samtec
Product: Connectors
Description: HFP
Open circuit voltage: 20 millivolts

Spec: Samtec Test Plan
SubGroup: #4
File #: 944704.LCR

Test current: 100 milliamps

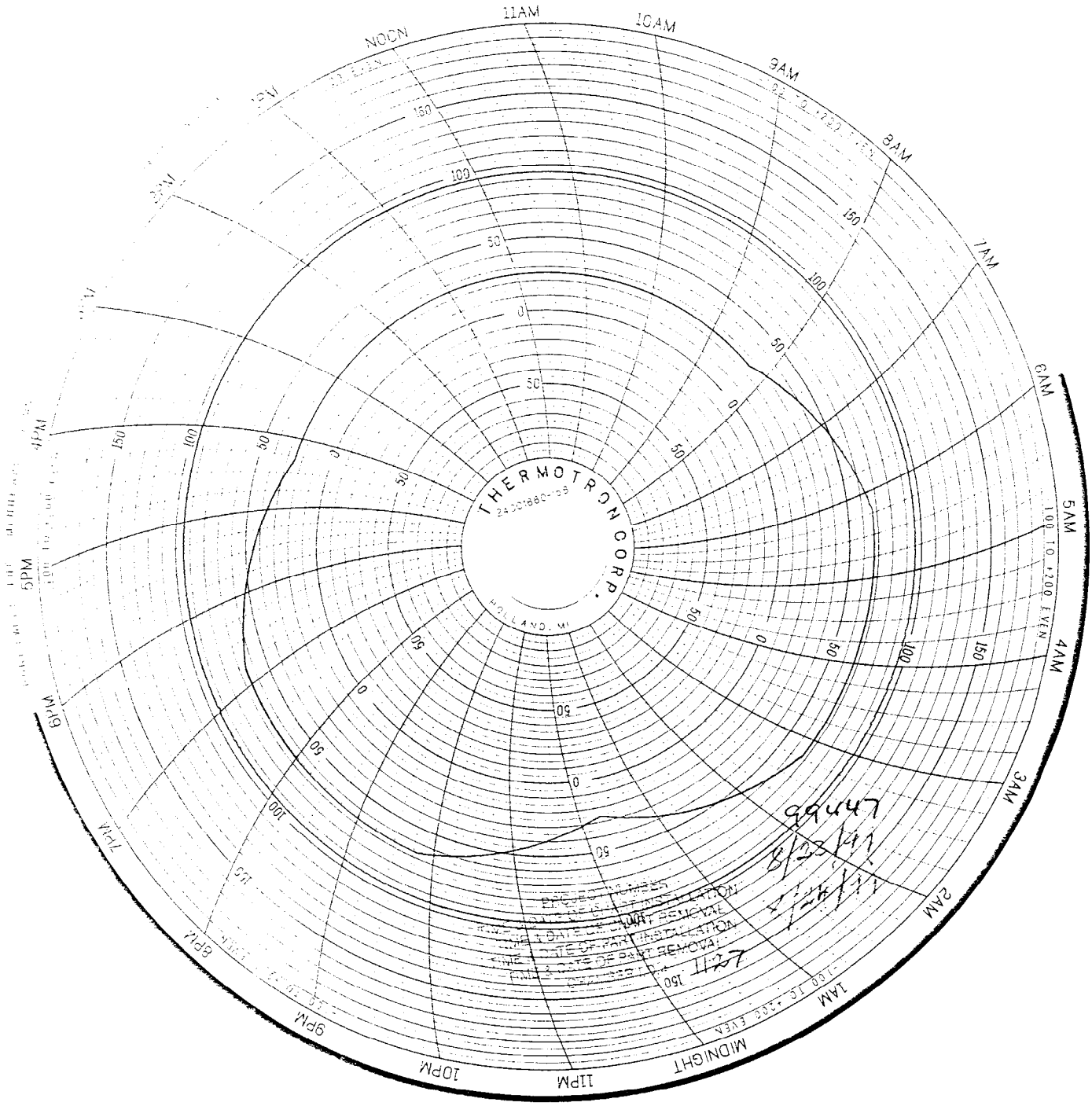
Units: milliohms
Delta values

Temp °C	+22	+22	+22	+22
R.H.%	48	48	47	48
Date	09Aug99	09Aug99	11Aug99	23Aug99
Pos ID	Unmated	Unmated	T.Shock	H.Cyclic
1-1	0.8	+0.4	+0.3	+1.2
1-2	0.6	-0.0	+0.2	+0.5
1-3	0.6	+0.0	+0.2	+0.5
1-4	0.6	+0.1	+0.1	+0.2
1-5	0.6	+0.2	+0.3	+0.6
1-6	0.6	+0.1	+0.3	+0.9
1-7	0.6	+0.1	+0.3	+0.3
1-8	0.6	+0.1	+0.4	+0.6
1-9	0.6	+0.2	+0.2	+0.3
1-10	0.6	+0.1	+0.2	+0.4
1-11	0.6	+0.1	+0.2	+0.3
1-12	0.5	+0.1	+0.3	+0.5
1-13	0.6	+0.1	+0.3	+0.4
1-14	0.6	+0.1	+0.2	+0.4
1-15	0.6	+0.0	+0.1	+0.5
1-16	0.6	+0.1	+0.2	+0.4
1-17	0.6	+0.1	+0.1	+0.3
1-18	0.6	+0.1	+0.1	+0.3
1-19	0.6	+0.1	+0.1	+0.3
1-20	0.6	+0.1	+0.1	+0.3
2-1	0.6	+0.7	+0.4	+0.4
2-2	0.6	+0.2	+0.3	+0.7
2-3	0.6	+0.2	+0.2	+0.3
2-4	0.6	+0.1	+0.4	+0.7
2-5	0.6	+0.1	+0.4	+0.5
2-6	0.6	+0.3	+1.1	+1.7
2-7	0.6	+0.2	+0.9	+1.5
2-8	0.6	+0.2	+0.7	+0.9
2-9	0.6	+0.1	+0.4	+0.6
2-10	0.6	+0.4	+0.1	+0.3
2-11	0.6	+0.1	+0.1	+0.3
2-12	0.6	+0.1	+0.1	+0.3
2-13	0.6	-0.0	+0.3	+1.3
2-14	0.6	+0.4	+0.7	+4.5
2-15	0.6	+0.3	+0.6	+1.4

Project #: 99447 File:944704.LCR
Customer : Samtec

Date	09Aug99	09Aug99	11Aug99	23Aug99
Pos ID	Unmated	Unmated	T.Shock	H.Cyclic
2-16	0.6	+0.3	+1.6	+4.4
2-17	0.6	+0.2	+0.6	+3.7
2-18	0.6	+0.2	+0.5	+1.4
2-19	0.6	+0.0	+1.6	+4.7
2-20	0.6	+0.5	+0.6	+0.7
HIGH	0.8	+0.7	+1.6	+4.7
LOW	0.5	-0.0	+0.1	+0.2
AVG	0.6	+0.2	+0.4	+1.0
STD DEV	0.0	0.1	0.4	1.2
OPENS	0	0	0	0
INITIALS	M S	M S	G.P.	G.P.

NOTES:
1 - An asterisk (*) indicates an open circuit or a value greater than 20 ohms.



CYCLIC HUMIDITY

25°C TO 65°C 90 TO 95%

TEST RESULTS

Thermal Shock/Cyclic Humidity (IR & DWV)

Group 5

PROJECT NO.: 99447 SPECIFICATION: Samtec Test Plan

PART NO.: HPF Series PART DESCRIPTION: Connectors

SAMPLE SIZE: Two (ID 5-9,5-10) TECHNICIAN: GP

START DATE: 8/9/99 COMPLETE DATE: 8/9/99

ROOM AMBIENT: 22°C RELATIVE HUMIDITY: 48%

EQUIPMENT ID#: 321

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 EIA 364, TP20.
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 2500 VAC test voltage is applied, there shall be no evidence of breakdown, arcing, etc.

RESULTS:

1. All test samples as tested met the requirements as specified.
2. One additional sample was tested until breakdown occurred. Minimum breakdown occurred at 3900 VAC. Suggested operating voltage should not exceed 850 VAC.

PROJECT NO.: 99447 SPECIFICATION: Samtec Test Plan

PART NO.: HPF Series PART DESCRIPTION: Connectors

SAMPLE SIZE: Two (ID 5-9,5-10) TECHNICIAN: GP

START DATE: 8/9/99 COMPLETE DATE: 8/9/99

ROOM AMBIENT: 22°C RELATIVE HUMIDITY: 42%

EQUIPMENT ID#: 421

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 EIA 364, TP21.

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 (500 VDC), the insulation resistance shall not be less than 5000 megohms.

RESULTS:

The insulation resistance exceeded 50,000 megohms.

PROJECT NO.: 99447 SPECIFICATION: Samtec Test Plan

PART NO.: HPF Series PART DESCRIPTION: Connectors

SAMPLE SIZE: Two (ID 5-9,5-10) TECHNICIAN: GP

START DATE: 8/12/99 COMPLETE DATE: 8/12/99

ROOM AMBIENT: 22°C RELATIVE HUMIDITY: 50%

EQUIPMENT ID#: 1, 22, 107, 669

THERMAL SHOCK

PURPOSE:

To determine the resistance of a given 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	: -55°C +0°C/-3°C
d)	Time at Temperature	: 30 minutes
e)	Mating Conditions	: Unmated
f)	Mounting Conditions	: Unmounted
g)	Transition Time	: 2 to 3 Minutes

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: See next page.

REQUIREMENTS:

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

RESULTS:

1. All test samples so tested met the requirements as specified.

2. The following are temperature ranges which occurred during the exposure:

   a) Hot Temperature : +105.2°C to +105.4°C
   b) Low Temperature : -55.2°C to -55.5°C

PROJECT NO.: 99447	SPECIFICATION: Samtec Test Plan
PART NO.: HPF Series	PART DESCRIPTION: Connectors
SAMPLE SIZE: Two (ID 5-9,5-10)	TECHNICIAN: GP
START DATE: 8/13/99	COMPLETE DATE: 8/23/99
ROOM AMBIENT: 22°C	RELATIVE HUMIDITY: 48%
EQUIPMENT ID#: 321, 421, 1127	

HUMIDITY (THERMAL CYCLING)

PURPOSE:

To evaluate the impact on the test samples stability 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 EIA 364, TP31, with the following conditions.

2. Test Conditions:

a) Relative Humidity	:	90% to 95%
b) Temperature Conditions	:	25°C to 65°C
c) Mating Conditions	:	Unmated
d) Mounting Conditions	:	Unmounted
e) Duration	:	240 hours

PROCEDURE - Continued:

3. Prior to performing attribute measurements, the test samples were allowed to recover to room ambient conditions.

4. All subsequent attribute testing was performed in accordance with the procedures previously indicated.

REQUIREMENTS:

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

2. When the specified test voltage is applied 500 VDC, the insulation resistance shall exceed 1000 megohms.

3. There shall be no evidence of arcing or breakdown when a 2500 VAC test voltage is applied.

RESULTS:

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

2. The insulation resistance exceeded 50,000 megohms.

3. There was no evidence of breakdown, arcing, etc., when a 2500 VAC test voltage was applied.

TEST RESULTS

Thermal Aging

Group 6

PROJECT NO.: 99447	SPECIFICATION: Samtec Test Plan
PART NO.: HPF Series	PART DESCRIPTION: Connectors
SAMPLE SIZE: Two (ID 6-11,6-12)	TECHNICIAN: MS/GP
START DATE: 8/9/99	COMPLETE DATE: 8/23/99
ROOM AMBIENT: 22°C	RELATIVE HUMIDITY: 48%
EQUIPMENT ID#: 54, 512, 699, Applicable Glassware	

THERMAL AGING

PURPOSE:

1. 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.

2. To determine if the potential for catastrophic diffusion or dry oxidation exists at the contact interface.

3. 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.

PROCEDURE:

1. The test was performed in accordance with EIA 364, TP17 with the following conditions:

   a) Temperature : 105°C
   b) Duration : 300 Hr.

PROCEDURE: Continued

2. Initial and subsequent low level circuit resistance was measured and recorded in accordance with EIA 364, TP17 with a 100 milliamps test current and a 20 millivolts open circuit voltage.

3. Measurements after completion of the thermal environment were performed when the test samples recovered to room ambient conditions.

4. Upon completion of the exposure and subsequent low level circuit resistance measurements, the samples were exposed to a gas tight environment as described in Group 1 and low level circuit resistance measured and recorded in accordance with item 2 above.

   Note: The final step (item #4) was performed to determine if stress relaxation resulted in the loss of the gas tight interface.

REQUIREMENTS:

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

2. The change in low level circuit resistance shall not exceed +15.0 milliohms.

RESULTS:

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

CHANGE IN LOW LEVEL CIRCUIT RESISTANCE
(Milliohms)

	Avg. Change	Avg. Change	Std. Dev.
After Thermal	+0.1	+0.2	<0.0
After Gas Tight	+0.2	+0.4	0.1

2. See data file 921806 for individual data points.

3. There was no evidence of physical damage.

LOW-LEVEL CONTACT RESISTANCE

Project #: 99447
Customer: Samtec
Product: Connectors
Description: HPF
Open circuit voltage: 20 millivolts

Spec: Samtec Test Plan
SubGroup: #6
File #: 944706.LCR

Test current: 100 milliamps

Units: milliohms
Delta values

Temp °C	+22	+22	+22
R.H.%	48	48	48
Date	09Aug99	23Aug99	23Aug99
Pos ID	Initial	T.Life	G.Tight
1-1	0.6	+0.1	+0.2
1-2	0.6	+0.1	+0.3
1-3	0.6	+0.1	+0.3
1-4	0.6	+0.1	+0.4
1-5	0.6	+0.1	+0.3
1-6	0.6	+0.0	+0.3
1-7	0.6	+0.1	+0.4
1-8	0.6	+0.0	+0.2
1-9	0.6	+0.1	+0.1
1-10	0.6	+0.2	+0.2
1-11	0.6	+0.2	+0.2
1-12	0.5	+0.2	+0.2
1-13	0.6	+0.1	+0.2
1-14	0.6	+0.1	+0.0
1-15	0.6	+0.1	+0.2
1-16	0.6	+0.1	+0.0
1-17	0.6	+0.1	+0.2
1-18	0.6	+0.2	+0.3
1-19	0.6	+0.2	+0.3
1-20	0.6	+0.1	+0.2
2-1	0.6	+0.2	+0.2
2-2	0.6	+0.1	+0.2
2-3	0.6	+0.1	+0.3
2-4	0.6	+0.1	+0.2
2-5	0.6	+0.1	+0.2
2-6	0.6	+0.1	+0.3
2-7	0.6	+0.1	+0.3
2-8	0.6	+0.1	+0.3
2-9	0.6	+0.1	+0.2
2-10	0.6	+0.1	+0.4
2-11	0.6	+0.2	+0.4
2-12	0.6	+0.1	+0.3
2-13	0.6	+0.1	+0.2
2-14	0.6	+0.1	+0.2
2-15	0.6	+0.1	+0.2

Project #: 99447
Customer : Samtec

File:944706.LCR

Date Pos ID	09Aug99 Initial	23Aug99 T.Life	23Aug99 G.Tight
2-16	0.6	+0.1	+0.3
2-17	0.6	+0.1	+0.2
2-18	0.6	+0.1	+0.2
2-19	0.6	+0.1	+0.2
2-20	0.6	+0.1	+0.2
HIGH	0.6	+0.2	+0.4
LOW	0.5	+0.0	+0.0
AVG	0.6	+0.1	+0.2
STD DEV	0.0	0.0	0.1
OPENS	0	0	0
INITIALS	M S	G.P.	G.P.

NOTES:

1 - An asterisk (*) indicates an open circuit or a value greater than 20 ohms.