CXP Receptacle Connectors

1. INTRODUCTION

1.1 Purpose

Testing was performed on the TE Connectivity (TE) CXP Receptacle Connectors to determine its conformance to the requirements of Product Specification 108-2426, Revision A1.

1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the CXP Receptacle Connectors. Testing was performed at the Harrisburg Electrical Components Test Laboratory, and documentation is on file under EA20130156T, EA20120194T, EA20120497T, and EA20110744T. Testing was performed between October 11, 2011 and May 29, 2013.

1.3 Conclusion

All part numbers listed in paragraph 1.5 conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-2426, Revision A1.

1.4 Product Description

CXP Receptacle Connectors are printed circuit board mounted and designed for intra-building use only.

1.5 Test Specimens

The test specimens were representative of normal production lots, and the following part numbers were used for test:

Test Group	Qty	Part Number	Description
1	5	2149152-1	Standard CXP Receptacle
2	5	2149152-1	Standard CXP Receptacle
3	5	2149152-1	Standard CXP Receptacle
4	5	2149731-1	CXP Belly-Belly Extended
5	5	2149152-1	Standard CXP Receptacle
6	4	2149152-1	Standard CXP Receptacle
1,2,3,6	5 each	N/A	CXP Cable
1,2,3,5	5 each	60-1042812-2 Rev A	CXP Test Printed Circuit Board
4	5 each	60-1042884-1	CXP Belly-Belly and Extended Receptacle Test Board
5	4 each	60-1042884-1	CXP Test Printed Circuit Board

1.6 Qualification Test Sequence

Specimens were subjected to the following qualification test sequences (See Table 2).

Table 2 - Test Sequence

Test or Examination	Test Group (a)					
	1	2	3	4	5	6
	Test Sequence (b)					
Initial Examination of Product	1	1	1	1	1	1
LLCR	4(e),6,8(f),11	2(e), 5	2(e), 5			
Insulation Resistance				2,6		
Withstanding voltage				3,7		
Random vibration	9					
Mechanical shock	10					
Durability, 100 cycles total	7(c)					
Durability, 250 cycles total						5(g),9(g)
Mating force	2,12					
Unmating force	3,13					
Retention, axial						2,6,10
Retention, perpendicular						3,7,11
Latch strength						4,8,12
Press fit insertion force					2	
Press fit extraction force					3	
Thermal shock		3(d)		4		
Humidity/temperature cycling		4		5		
Temperature Life	5					
Mixed flowing gas			3(d)			
Thermal Disturbance			4			
Final examination of product	14	6	6	8	4	13

Note:
(a) See paragraph 1.5
(b) Numbers indicate sequence which tests were performed.
(c) Mate and unmate specimens for 43 cycles, measure LLCR (baseline), change transceivers and mate and unmate for an additional 50 cycles.
(d) Precondition specimens with 25 durability cycles with latches engaged.
(e) Precondition specimens with 5 durability cycles with latches engaged.
(f) Measure using original transceiver.
(g) Mate and unmate specimens for 125 durability cycles.

1.7 Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:

Temperature:	15°C to 35°C
Relative Humidity	20% to 80%

2. SUMMARY OF TESTING

2.1 Initial Examination of Product – All Test Groups

A Certificate of Conformance stating that all specimens submitted for testing were representative of normal production lots and met the requirements of the applicable drawing was provided. Where specified, specimens were visually examined, and no evidence of physical damage detrimental to product performance was observed.

2.2 Low Level Contact Resistance (LLCR) – Test Groups 1, 2, 3

All initial low level contact resistance measurements were less than the maximum initial requirement of 80 milliohms, and all subsequent resistance measurements were less than the maximum delta (ΔR) requirement of 20 milliohms.

2.3 Insulation resistance – Test Group 4

All insulation resistance measurements were greater than the minimum requirement of 1000 megohms.

2.4 Withstanding voltage – Test Group 4

There was no dielectric breakdown or flashover, and the leakage current did not exceed 5 milliamperes, when subjected to a test potential of 300 VAC for 60 seconds.

2.5 Random vibration – Test Group 1

There were no discontinuities detected during random vibration testing. Following the testing, no cracks, breaks, or loose parts on the specimens were visible.

2.6 Mechanical shock – Test Group 1

There were no discontinuities detected during mechanical shock testing. Following the testing, no cracks, breaks, or loose parts on the specimens were visible.

2.7 Durability, 100 cycles – Test Group 1

There were no signs of physical damage to the specimens as a result of mating and unmating the specimens 100 times manually.

2.8 Durability, 250 cycles total – Test Group 6

There were no signs of physical damage to the specimens as a result of mating and unmating the specimens 125 times manually.

2.9 Mating Force – Test Group 1

All initial and final mating force measurements were less than the maximum requirement of 150 Newtons (33.7 lbf).

2.10 Unmating Force – Test Group 1

All initial and final unmating force measurements were less than the maximum requirement of 65 Newtons (14.5 lbf).

2.11 Retention, Axial – Test Group 6

All specimens met the minimum axial retention force requirement of 100 Newtons (22.5 lbf) with no functional damage to the mated pair without unmating on all three rounds of testing.

2.12 Retention, Perpendicular – Test Group 6

All specimens met the minimum perpendicular retention force requirement of 70 Newtons (15.5 lbf) with no functional damage to the mated pair without unmating on all three rounds of testing.

2.13 Latch Strength – Test Group 6

All specimens met the minimum latch strength requirement of 180 Newtons (40.5 lbf) with no functional damage to the latch.

2.14 Press fit insertion force – Test Group 5

All press fit insertion force measurements were less than the maximum requirement of 24.5 Newtons (5.5 lbf) per pin.

2.15 Press fit extraction force – Test Group 5

All press fit extraction force measurements were greater than the minimum requirement of 93.4 Newtons (21 lbf).

2.16 Thermal Shock – Test Group 2

No evidence of physical damage detrimental to product performance was visible as a result of exposure to a thermal shock environment.

2.17 Humidity/temperature cycling – Test Groups 2, 4

No evidence of physical damage detrimental to product performance was visible as a result of exposure to a humidity/temperature cycling environment.

2.18 Temperature Life – Test Group 1

No evidence of physical damage detrimental to product performance was visible as a result of exposure to a temperature life environment.

2.19 Mixed Flowing Gas – Test Group 3

No evidence of physical damage detrimental to product performance was visible as a result of exposure to the pollutants of a Class IIA mixed flowing gas environment.

2.20 Thermal Disturbance – Test Group 3

No evidence of physical damage detrimental to product performance was visible as a result of exposure to a thermal disturbance environment.

2.21 Final Examination of Product – All Test Groups

Where specified, specimens were visually examined, and no evidence of physical damage detrimental to product performance was observed.

3. TEST METHODS

3.1. Initial Examination of Product

A Certificate of Conformance was issued stating that all specimens in this test package were produced, inspected, and accepted as conforming to product drawing requirements, and were manufactured using the same core manufacturing processes and technologies as production parts.

3.2 LLCR

Low level contact resistance measurements were taken using a four wire measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage. The negative voltage and current leads were connected to the wire leads of the plug and the positive voltage and current leads were attached to the headers on the receptacle PCB.

Prior to the initial low level contact resistance measurement the parts were cycled five times manually.

3.3 Insulation Resistance

Insulation resistance was measured between adjacent contacts of unmated specimens. A test voltage of 500 volts DC was applied for two minutes before the resistance was measured.

3.4 Withstanding Voltage

A test potential of 300 volts AC was applied between adjacent contacts of unmated specimens. The potential was applied for one minute and then returned to zero.

3.5 Random Vibration

The test specimens were subjected to a random vibration test. See Figures 1 and 2 below for vibration setup photographs. The parameters of this test condition are specified by a random vibration spectrum with excitation frequency bounds of 20 and 500 Hertz (Hz). The spectrum remains flat at 0.02 G^2/Hz from 20 Hz to the upper bound frequency of 500 Hz. The root-mean square amplitude of the excitation was 3.10 GRMS. The test specimens were subjected to this test for 15 minutes in each of the three mutually perpendicular axes, for a total test time of 45 minutes per test specimen. The test specimens were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes.

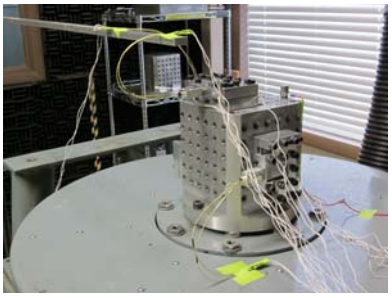

Figure 1- Vibration Setup

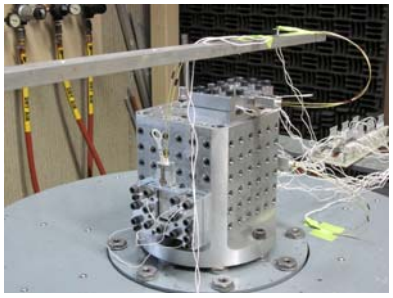

Figure 2- Vibration Setup

3.6 Mechanical Shock

The test specimens were subjected to a mechanical shock test. See Figures 1 and 2 for shock setup photographs. The parameters of this test condition are a half-sine waveform with an acceleration amplitude of 30 gravity units (g's peak) and a duration of 11 milliseconds. Three shocks in each direction were applied along the three mutually perpendicular axes of the test specimens, for a total of eighteen shocks. The test specimens were monitored for discontinuities of 1 microsecond or greater using an energizing current of 100 milliamperes.

3.7 Durability, 100 cycles

Specimens were mated and unmated a total of 100 times: 1 cycle initially to measure mating and unmating forces; 5 cycles prior to measuring initial LLCR; 1 cycle to measure LLCR; an additional 43 cycles with the original transceiver and 50 cycles with a new transceiver at a maximum rate of 300 cycles per hour with the latches engaged.

3.8 Durability, 250 cycles total

Specimens were mated and unmated a total of 250 times (two 125 cycle intervals) with the original transceiver at a maximum rate of 300 cycles per hour with the latches engaged.

3.9 Mating Force

Mating force testing was performed with a tensile/compression machine. The mounted receptacle was secured to a right angle fixture attached to the moveable load cell of the machine. The plug was aligned with the receptacle and secured in a vice attached to a rotational table and an x-y table at the base of the machine. Force was applied in the downward direction at a rate of 0.25 inches per minute until the plug was fully seated in the receptacle (this was obvious when the latches engaged). Refer to Figure 3 for a detailed image of the test setup.

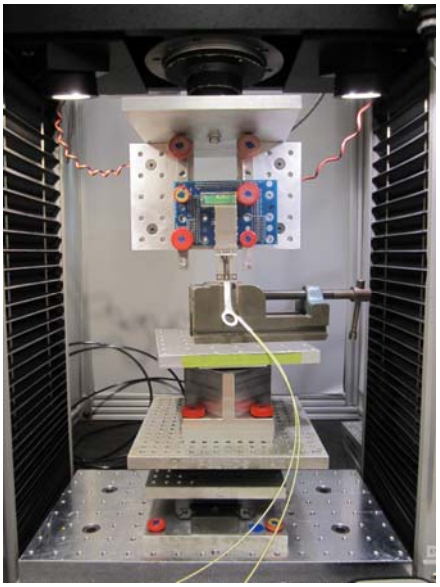

Figure 3 - Mating/ Unmating Setup

3.10 Unmating Force

Unmating force testing was performed on a tensile/compression machine. The mounted receptacle was secured to a right angle fixture connected to the moveable load cell. The plug was secured in a vice attached to a rotational table and an x-y table at the base of the machine. Force was applied in the upward direction at a rate of 0.25 inches per minute until the plug was unmated from the receptacle. Testing was performed with the latches disengaged. The maximum force was recorded. Refer to Figure 3 for a detailed image of the test setup.

3.11 Retention, axial

Specimens submitted for testing were mounted to the vibration fixtures. The vibration fixture was secured to a tool maker's knee mounted to a floating X-Y table and the cable end was secured in an air jaw. The cable was pulled at a rate of 0.5 in/min until a load of 22.5 lbs was reached. See Figure 4 for detailed images of the test set up.

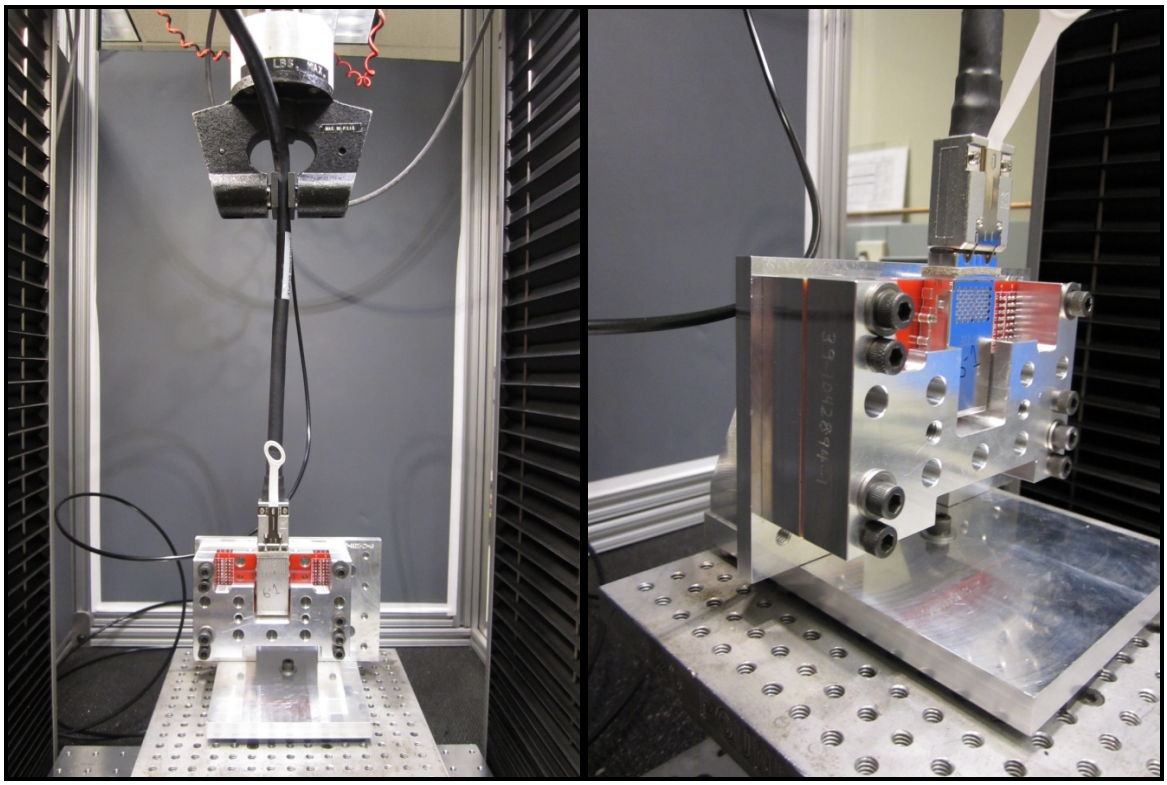

Figure 4 – Retention, Axial Test Setup

3.12 Retention, perpendicular

Specimens submitted for testing were mounted to vibration fixtures. The vibration fixtures were mounted to a floating X-Y table for pull testing perpendicular to the PCB. For pull testing parallel to the PCB, the vibration fixture was secured to a tool maker's knee mounted to a floating X-Y table. The cable end was secured in an air jaw and the pulled at a rate of 0.5 in/min until a load of 15.5 pounds was reached. See Figure 5 for a detailed image of the test set up.

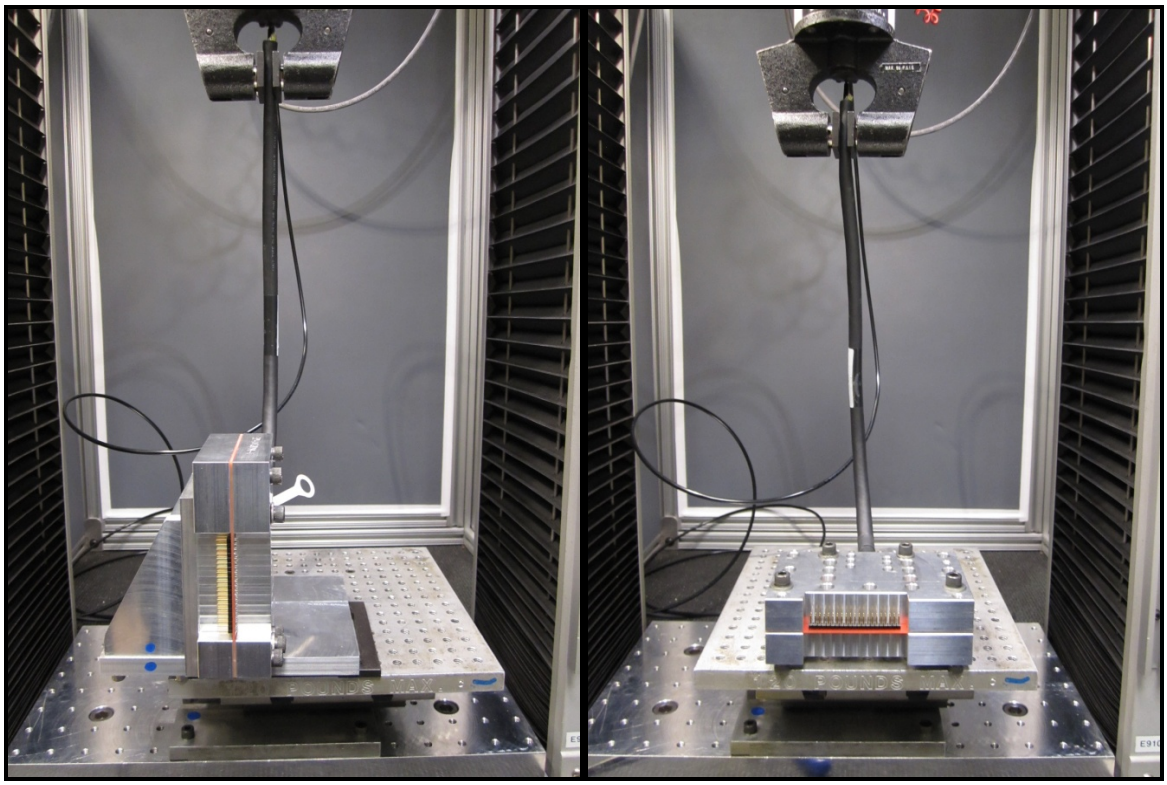

Figure 5 – Retention, Perpendicular Test Setup

3.13 Latch Strength

Specimens submitted for testing were mounted to vibration fixtures. The vibration fixture was secured to a tool maker's knee mounted to a floating X-Y table and the cable end was secured in an air jaw. The cable was pulled at a rate of 0.5 in/min until a load of approximately 40.5 pounds was reached. See Figure 6 for detailed images of the test set up.

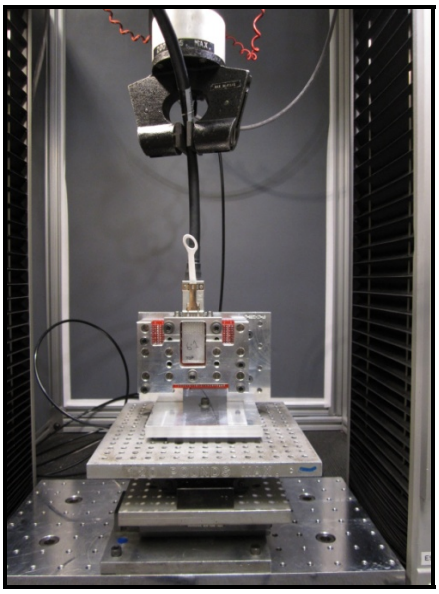

Figure 6 – Latch Strength Test Setup

3.14 Press fit insertion force

The specimen was placed on a flat plate at the bottom of the tensile/compression machine. A second test board was place under the test board in order to provide clearance for the alignment pins. A flat block was placed on top of the specimen and the crosshead from the tensile/compression machine was brought down on the flat block at 0.50 inches per minute until the press fit pins were inserted in the test board (Figure 7). The maximum force was recorded from the generated graph.

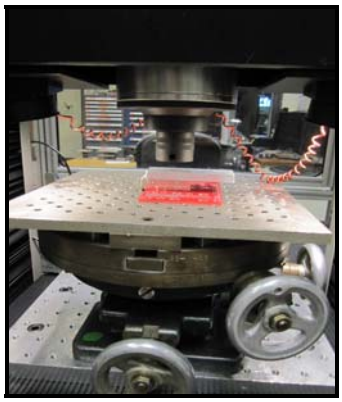

Figure 7 – Pres Fit Insertion Force Test Setup

3.15 Press fit extraction force

Specimens were held with the vibration fixtures mounted to a floating X-Y table for testing. See Figure 8 for a detailed image of the test set up. Specimens were pulled at a rate of 0.50 in/min until the receptacle was extracted from the PCB.

Figure 8 – Press Fit Extraction Force Test Setup

3.16 Thermal Shock

The mated test specimens were subjected to 10 cycles of thermal shock testing between -55°C and 85°C with 30 minute dwells at each temperature extreme, and a transition rate of one minute.

3.17 Humidity/temperature Cycling

The mated test specimens were subjected to 10 cycles of humidity/temperature cycling. Each cycle lasted 24 hours, and consisted of cycling the temperature between 25°C and 65°C twice while maintaining high humidity per the humidity/temperature cycling profile illustrated in Figure 9.

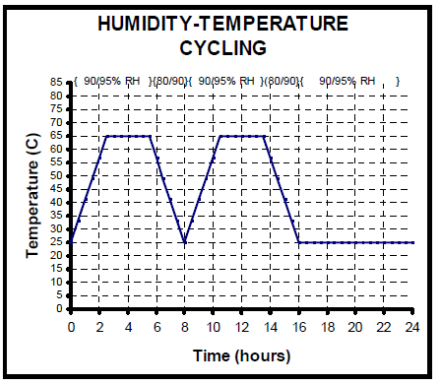

Figure 9 – Typical Humidity/temperature Cycling Profile

3.18 Temperature Life

The mated test specimens were subjected to a temperature of 85°C for a period of 500 hours.

3.19 Mixed Flowing Gas

The specimens were subjected to a mixed flowing gas test in accordance with EIA-364-65B. The test parameters are listed in Table 3 below. The test specimens were exposed in the unmated condition for the first 10 days of exposure (receptacles only) and then mated and exposed for the final 10 days.

Table 3 – MFG Test Parameters

Environment	Class IIA
Temperature (°C)	30 ± 1
Relative Humidity (%)	70 ± 2
Chlorine (Cl2) Concentration (ppb)	10 ± 3
Hydrogen Sulfide (H2S) Concentration (ppb)	10 ± 5
Nitrogen Dioxide (NO2) Concentration (ppb)	200 ± 50
Sulfur Dioxide (SO2) Concentration (ppb)	100 ± 20
Exposure Period	20 Days

3.20 Thermal Disturbance

Mated specimens were subjected to 10 temperature cycles between 15°C and 85°C with 30 minute dwells at each temperature extreme and a 14 minute transition time between the two temperatures.

3.21 Final Examination of Product

Specimens were visually examined for evidence of physical damage detrimental to product performance.