1. INTRODUCTION

1.1. Purpose

Testing was performed on one Small Form-factor Pluggable (SFP) cage assemblies to determine their conformance to the requirements of Product Specification 108-1950 Revision D.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the SFP cage assembly. Testing was performed on one piece cage assemblies at the Engineering Assurance Product Testing Laboratory between 31Oct13 and 20Nov13. The test file number for this testing is SECT13-0975-TGALL/ SECT13-0975-TG3/TP-14-00842-RECORD, This Documentation is on file at and available from the Engineering Assurance Product Testing Laboratory.

1.3. Conclusion

The SFP 20 one piece cage assemblies listed in paragraph 1.5., conformed to the electrical and mechanical performance requirements of Product Specification 108-1950 Revision D.

1.4. Product Description

The one -piece SFP cage assemblies are designed to enclose the SFP 20 position connector which is designed to interconnect SFP fiber optic or copper transceivers to printed circuit boards. The cage assembly offers a ground plane around the transceiver module and is designed to latch the transceiver to the printed circuit board.

1.5. Test Specimens

Test specimens were representative of normal production lots. Specimens identified with the following part numbers were used for test:

Test Group	Quantity	Part Number	Description
	5 each	2227302-1	One-piece press-fit cage, 11 pins
1,3	5 each	1367073-1	SFP connector
4,5,6	5 each	2227302-1	One-piece press-fit cage, 11 pins
2	5	2227303-1	One-piece press-fit cage, solder pin

1.6. Environmental Conditions

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

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

1.7. Qualification 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
Dry circuit resistance			2,4			
Solderability		2				
Cable pull	6					
Durability	4		3			
Height of latch	2,5					
Insertion force	3					
Press-fit insertion force.				2	2	2
Press-fit extraction force.				3	4	4
Module retention	7					
Humidity-temperature cycling.					3	
Temperature life.						3
Final examination of product	8	3	5	4	5	5

NOTE

(a) See paragraph 1.5.
(b) Numbers indicate sequence in which tests are performed.

2. SUMMARY OF TESTING

A. Initial Examination of Product - All Test Groups

All specimens submitted for testing were representative of normal production lots. A Certificate of Conformance was issued by the Product Assurance Department. Where specified, specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

B. Dry Circuit Resistance - Test Group 3

All termination resistance measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 35 milliohms initially and had a change in resistance (ΔR) of less than 1.6 milliohms after testing.

Test Group	Number of Data Points	Condition	Termination Resistance		
			Min	Max	Mean
3	100	Initial	14.13	19.28	16.70
		After durability	13.66	19.77	16.43

NOTE *All values in milliohms.*

C. Solderability - Test Group 2

All contact leads had a minimum of 95% solder coverage.

D. Cable Pull - Test Group 1

There was no physical damage to, or failure of, the latch mechanism as a result of applying a 100 N [22.5 lbf] static load to the cable and rotating it 45 degrees from the cable axis.

E. Durability - Test Groups 1 and 3

No physical damage was sustained by the cage assembly latch mechanism as a result of mating and unmating the specimens 200 times with the latch retention feature operational.

F. Height of Latch - Test Group 1

The height of the latch mechanism from the top of the cage assembly, when measured after testing, did not change more than 0.8 mm [.031 in] from the initial measurement.

G. Insertion Force - Test Group 1

The force required to insert the test module into the cage assembly to the fully latched position was less than 35 N.

H. Press-fit Insertion Force - Test Groups 4, 5 and 6
The force required to insert the cages into the printed circuit boards was less than 500 N.

I. Press-fit Extraction Force - Test Groups 4, 5 and 6

The force required to extract the cages from the printed circuit boards was greater than 80 N.

J. Module Retention - Test Group 1

The latches did not release when an axial load of 180 N was applied to the cage assembly with the latch engaged.

K. Humidity-Temperature Cycling - Test Group 5

No evidence of physical damage was visible as a result of exposure to humidity-temperature cycling.

L. Temperature Life - Test Group 6

No evidence of physical damage was visible as a result of exposure to temperature life.

M. Final Examination of Product - All Test Groups

Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

3. TEST METHODS

3.2. One Piece Cage Assemblies

A. 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.

B. Dry Circuit Resistance

Dry circuit resistance measurements at low level current were made using a 4 terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage.

C. Solderability

The areas of the specimens to be evaluated were immersed in type “R” flux (non-activated water white rosin) maintained at room temperature, for 5 to 10 seconds. After removal from the flux, the specimens were allowed to drain for 5 to 20 seconds. The specimens were then attached to a dipping machine. Any dross and oxidized flux were skimmed away before the specimens were immersed at a rate of approximately 1 inch per second into the solder bath filled with molten 60% tin and 40% lead maintained at 245 ± 5°C [473°F] and held for 4 to 5 seconds until the entire surface to be evaluated was coated. The specimens were then removed from the bath at a rate of approximately 1 inch per second and cleaned for 5 minutes using isopropyl alcohol. The specimens were then examined under 10X magnification.

D. Cable Pull

A module with cable was loaded into a cage soldered to a test board with an attached bezel. The specified load was applied to the cable and the cable rotated 45 degrees from the cable axis.

E. Durability

Specimens were mated and unmated 200 times at a maximum rate of 600 cycles per hour with latch retention feature operable.

F. Height of Latch

The height of the latch mechanism from the top of the cage assembly was measured using a toolmakers microscope.

G. Insertion Force

The force required to mate individual specimens with the latch engaged was measured using a tensile/compression device with a free floating fixture and a rate of travel of 12.7 mm [.5 in] per minute.

H. Press-fit Insertion Force

The force required to mate individual specimens into a printed circuit board was measured using a tensile/compression device with a free floating fixture and a rate of travel of 12.7 mm [.5 in] per minute.

I. Press-fit Extraction Force

The force required to extract individual specimens from a printed circuit board was measured using a tensile/compression device with a free floating fixture and a rate of travel of 12.7 mm [.5 in] per minute.

J. Module Retention

The force required to unmate individual specimens with the latch engaged was measured using a tensile/compression device with a free floating fixture and a rate of travel of 12.7 mm [.5 in] per minute.

K. Humidity-temperature Cycling

Mated specimens were subjected to 24, 3 hour cycles of humidity-temperature cycling between 25 ± 3°C at 80 ± 3% RH, and 65 ± 3°C at 50 ± 3% RH. Ramp times were .5 hour and dwell times were 1 hour at each extreme.

L. Temperature Life

Mated specimens were exposed to a temperature of 115°C for 432 hours.

M. Final Examination of Product

Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.