VITA 66.4 (Half-Size) Fiber-Optic Connector for Use with Multi-Mode MT Ferrules

1. INTRODUCTION

1.1. Purpose

Testing was performed on the TE Connectivity VITA 66.4 (Half-Size) Fiber-Optic Connector for Use with Multi-Mode MT Ferrules to determine its conformance to the requirements of Product Specification 108-2467-1 Revision A.

1.2. Scope

This report covers the optical and mechanical performance of the VITA 66.4 (Half-Size) Fiber-Optic Connector for Use with Multi-Mode MT Ferrules. Testing was performed at the Harrisburg Fiber Optic Components Test Laboratory between 30-Mar-2015 and 16-Apr-2015. The test file number for this testing is PRJ-13-000000010-004. This documentation is on file at and available from the Harrisburg Fiber Optic Components Test Laboratory.

1.3. Conclusion

The VITA 66.4 (Half-Size) Fiber-Optic Connectors for Use with Multi-Mode MT Ferrules listed in paragraph 1.5. conformed to the optical and mechanical performance requirements of Product Specification 108-2467-1 Revision A.

1.4. Product Description

The VITA 66.4 connector system provides a high-density, blind-mate optical interconnect in a backplane/card configuration. The fiber-optic ribbon cable interconnect is fed through the backplane to removable systems modules using standard-grade, Multi-Mode MT ferrules having up to 12 positions. The plug and receptacle connector kits consist of housings accepting a single MT ferrule. The MT ferrules/cable assemblies are easily secured within the connector housings using the retainer plates provided with connector kits.

1.5. Test Specimens

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

Part Number	Description	Test Group 2 Quantity per Test Group
2226880-1	Connector Kit, Receptacle, Backplane, Fiber Optic, MT, VITA 66.4 Style	5
2226881-1	Connector Kit, Plug, Module, Fiber Optic, MT, VITA 66.4 Style	5
1938482-3	Cable Assembly, Fiber Optic, MT-to-MT, 12-Fiber Ribbon, MM, 50/125 µm	5
492077-2	LIGHTRAY MPO Pin Holder, MM	5

Figure 1

1.6. Qualification Test Sequence

Test or Examination	Test Group (a)
	1
	Test Sequence (b)
Visual and mechanical inspection	1
Attenuation	2
Return loss	3
Vibration, sinusoidal	4
Vibration, random	5
Shock	6
End of service life	7

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

Figure 2

1.7. Environmental Conditions

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

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

2. SUMMARY OF TESTING

2.1. Visual and Mechanical Inspection

A Certificate of Conformance (C of C) was issued by Product Assurance 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. The samples were visually examined and no damage or defects were found that would prevent them from performing their intended function. Endface geometry of the cable assemblies was measured and confirmed within TE specification limits for production-grade, multimode, single-row MT ferrules.

2.2. Initial Attenuation of All Channels

All Initial Attenuation measurements met the requirements for maximum average attenuation of any channel, sample average attenuation, and group average attenuation. Summary data for Initial Attenuation performance at 850 nm and 1300 nm are presented in Table 2.2-1.

Table 2.2-1 Initial Attenuation Performance

Wavelength	850 nm	1300 nm
Attenuation Statistics		
Group Maximum	0.83	0.80
Sample Average, Maximum	0.49	0.46
Group Average	0.46	0.43
Channel Pass – Fail Count	60 - 0	60 - 0
Sample Pass – Fail Count	5 - 0	5 - 0
Attenuation Requirements		
Maximum, Any Channel	≤ 1.2	≤ 1.2
Sample Average	≤ 0.7	≤ 0.7
Group Average	≤ 0.65	≤ 0.65

NOTE All units in dB.

2.3. Return Loss

All Return Loss measurements were greater than 20 dB per channel. Summary data for Return Loss performance at 850 nm and 1300 nm are presented in Table 2.3-1.

Table 2.3-1 Initial Return Loss Performance

Wavelength	850 nm	1300 nm
Return Loss Statistics		
Group Minimum	21.5	22.7
Group Average	27.5	29.6
Channel Pass – Fail Count	60 - 0	60 - 0
Sample Pass – Fail Count	5 - 0	5 - 0
Return Loss Requirements		
Minimum, Any Channel	≥ 20	≥ 20

NOTE All units in dB.

2.4. Vibration, Sinusoidal

All samples met the 850 nm and 1300 nm requirements for Attenuation, Attenuation Increase, and Return Loss after testing Sinusoidal Vibration in each of three mutually perpendicular planes. Summary performance data are provided in Table 2.4-1, which include interim optical measurements (after exposure in each axis) and final measurements after Sinusoidal Vibration. Following Sinusoidal Vibration testing, no cracks, breaks, or loose parts were visible on the samples.

Table 2.4-1 Optical Performance after Sinusoidal Vibration

Wavelength	850 nm			1300 nm		
Optical Test	Attenuation	Attenuation Increase	Return Loss	Attenuation	Attenuation Increase	Return Loss
Max*/Min*	0.70	0.01	24.7	0.70	0.06	27.0
Average	0.45	0.00	27.6	0.43	0.00	29.6
Sample Pass – Fail Count	5 - 0	5 - 0	5 - 0	5 – 0	5 - 0	5 - 0
Requirements	≤ 1.2	≤ 0.5	≥ 20	≤ 1.2	≤ 0.5	≥ 20

NOTE All units in dB.
* Worst case criteria - Maximum Attenuation, Maximum Attenuation Increase, or Minimum Return Loss

2.5. Vibration, Random

All samples met the 850 nm and 1300 nm requirements for Attenuation, Attenuation Increase, and Return Loss after testing Random Vibration in each of three mutually perpendicular planes. Summary performance data are provided in Table 2.5-1, which include interim optical measurements (after exposure in each axis) and final measurements after Random Vibration. Following Random Vibration testing, no cracks, breaks, or loose parts were visible on the samples.

Table 2.5-1 Optical Performance after Random Vibration

Wavelength	850 nm			1300 nm		
Optical Test	Attenuation	Attenuation Increase	Return Loss	Attenuation	Attenuation Increase	Return Loss
Max*/Min*	0.72	0.01	24.9	0.72	0.01	27.0
Average	0.46	0.00	27.6	0.43	0.00	29.6
Sample Pass – Fail Count	5 - 0	5 - 0	5 - 0	5 - 0	5 - 0	5 - 0
Requirements	≤ 1.2	≤ 0.5	≥ 20	≤ 1.2	≤ 0.5	≥ 20

NOTE All units in dB.
* Worst case criteria - Maximum Attenuation, Maximum Attenuation Increase, or Minimum Return Loss

2.6. Shock

All samples met the 850 nm and 1300 nm requirements for Attenuation, Attenuation Increase, and Return Loss after testing Shock in each of three mutually perpendicular planes. Summary performance data are provided in Table 2.6-1, which include interim optical measurements (after exposure in each axis) and final measurements after Shock. Following Shock testing, no cracks, breaks, or loose parts were visible on the samples.

Table 2.6-1 Optical Performance after Shock

Wavelength	850 nm			1300 nm		
Optical Test	Attenuation	Attenuation Increase	Return Loss	Attenuation	Attenuation Increase	Return Loss
Max*/Min*	0.70	0.04	25.1	0.71	0.04	27.1
Average	0.45	0.00	27.6	0.43	0.00	29.6
Sample Pass – Fail Count	5 - 0	5 - 0	5 - 0	5 - 0	5 - 0	5 - 0
Requirements	≤ 1.2	≤ 0.5	≥ 20	≤ 1.2	≤ 0.5	≥ 20

NOTE All units in dB.
* Worst case criteria - Maximum Attenuation, Maximum Attenuation Increase, or Minimum Return Loss

2.7. End of Service Life

End of Service Life optical performance was measured at 850 nm and 1300 nm. All measurements met the End of Service Life requirements for maximum average attenuation of any channel, sample average attenuation, group average attenuation, maximum attenuation increase, and return loss. Attenuation summary data are presented in Table 2.7-1; Attenuation Increase summary data are presented in Table 2.7-2; Return Loss summary data are presented in Table 2.7-3.

Table 2.7-1 End of Service Life, Attenuation Performance

Wavelength	850 nm	1300 nm
Attenuation Statistics		
Group Maximum	0.75	0.71
Sample Average, Maximum	0.51	0.47
Group Average	0.46	0.43
Channel Pass – Fail Count	60 - 0	60 - 0
Sample Pass – Fail Count	5 - 0	5 - 0
Attenuation Requirements		
Maximum, Any Channel	≤ 1.2	≤ 1.2
Sample Average	≤ 0.7	≤ 0.7
Group Average	≤ 0.65	≤ 0.65

NOTE All units in dB.

Table 2.7-2 End of Service Life, Attenuation Increase Performance

Wavelength	850 nm	1300 nm
Attenuation Increase Statistics		
Group Maximum	0.07	0.07
Group Average	0.01	0.01
Channel Pass – Fail Count	60 - 0	60 - 0
Sample Pass – Fail Count	5 - 0	5 - 0
Attenuation increase Requirements		
Maximum, Any Channel	≤ 0.5	≤ 0.5

NOTE All units in dB.

Table 2.7-3 End of Service Life, Return Loss Performance

Wavelength	850 nm	1300 nm
Return Loss Statistics		
Group Minimum	25.4	27.1
Group Average	27.8	29.8
Channel Pass – Fail Count	60 - 0	60 - 0
Sample Pass – Fail Count	5 - 0	5 - 0
Return Loss Requirements		
Minimum, Any Channel	≥ 20	≥ 20

NOTE All units in dB.

3. TEST METHODS

3.1. Visual and Mechanical Inspection

The specimens were examined visually, dimensionally and functionally per the product drawings and inspection plans per FOTP-13. A C of C 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. Initial Attenuation of All Channels

Attenuation (multi-mode) was measured in accordance with FOTP-171, Method D1, processes. All fiber paths were measured initially and at the end of the test sequence at both 850 nm and 1300 nm. Attenuation was measured at the minimum connector mating engagement distance as defined per VITA 66.0. This distance was maintained using the mechanical test fixture. See figure 3 for set up at end of document.

Initial Attenuation measurements were recorded using encircled flux compliant launch conditions, and a build-up Insertion Loss procedure was applied. Reference optical measurements (P_0) were recorded for MPO to MT launch lead cable assemblies at 850 nm and 1300 nm for all channels of each sample. Then, optical measurements (P_1) were made with the MT end of the launch lead installed in the VITA 66.4 plug connector and one end of an MT to MT test cable assembly installed in the VITA 66.4 receptacle connector. The Attenuation values were calculated by subtracting P_1 from P_0 and compensating for any change in the test system sources.

3.3. Initial Return Loss of All Channels

Return Loss (multi-mode) was measured in accordance with FOTP-107, at both 850 nm and 1300 nm. Optical Return Loss was recorded concurrently with the initial Attenuation measurements, likewise at the minimum connector engagement distance as defined per VITA 66.0. The reflected optical power reference measurement for the MPO to MT launch lead was equated to an open-air loss of 14.7 dB per channel. The reflected power measurements were then recorded with the launch lead and test cable mated in the VITA 66.4 plug and receptacle connectors, respectively. Optical Return Loss was calculated as the difference between the reference scan (open to air) and the current scan (mated) and adding 14.7 to that difference. See figure 3 for set up at end of document.

3.4. Attenuation Increase

Increase in Attenuation was calculated by taking the difference between the initial measurement before test and the during/after measurements for each test as applicable. Attenuation Increase represents a change in attenuation that results from a decrease in optical power (degraded performance).

3.5. Vibration, Sinusoidal

Sinusoidal Vibration was performed per FOTP-11, Test Condition I. The samples were mounted in the mechanical test fixtures, with the connectors likewise mated at the minimum connector engagement distance as defined per VITA 66.0. The fixtures were then mounted to the vibration table and baseline optical measurements were recorded. Each mated sample pair was subjected to sinusoidal vibration from 10 Hz to 55 Hz and back to 10 Hz, with a maximum acceleration level of 9 g, two hours duration in each of three mutually perpendicular directions. The optical Attenuation and Return Loss performance of fiber paths 1, 2, 6, 7, 11 and 12 was recorded before the test and after exposure in each plane, with the test fixtures secured to vibration table. See figure 4 for set up at end of document.

3.6. Vibration, Random

Random Vibration was performed per FOTP-11, Test Condition VI, Test Condition Letter D (having a vibration profile equivalent to that of EIA-364-28D, TP-28D, Test Condition V, Letter D). After Sinusoidal Vibration the samples remained secured to the vibration table, mounted in the mechanical test fixtures at the minimum connector engagement distance. Baseline optical measurements were recorded before each axis. Each mated sample pair was subjected to 11.95 G_{RMS} between 50 and 2000 Hz of random vibration for 15 minutes in each of three mutually perpendicular directions. The optical Attenuation and Return Loss performance of fiber paths 1, 2, 6, 7, 11 and 12 was recorded after exposure in each plane, with the test fixtures remaining secured to vibration table. See figure 4 for set up at end of document.

3.7. Shock

Shock testing was performed per FOTP-14, Condition E. After Random Vibration the samples remained secured to the vibration table, mounted in the mechanical test fixtures at the minimum connector engagement distance. Baseline optical measurements were recorded before each axis. Each mated sample pair was subjected to three sawtooth shock pulses in each of three mutually perpendicular directions, each pulse having a 50 G amplitude and an 11 millisecond duration. The optical Attenuation and Return Loss performance of fiber paths 1, 2, 6, 7, 11 and 12 was recorded after exposure in each plane, with the test fixtures remaining secured to vibration table. See figure 4 for set up at end of document.

3.8. End of Service Life of All Channels

Final Attenuation and Return Loss were recorded per FOTP-20 for all fiber paths following the shock test. Attenuation increase data were calculated by subtracting the Initial Attenuation data from the End of Service Life Attenuation data.

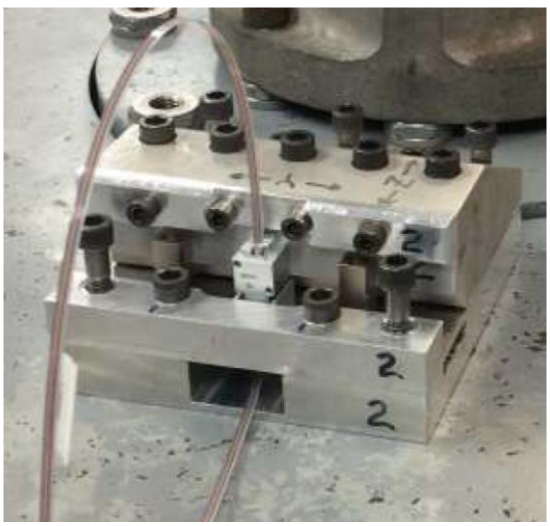

Figure 3

Attenuation and Return Loss

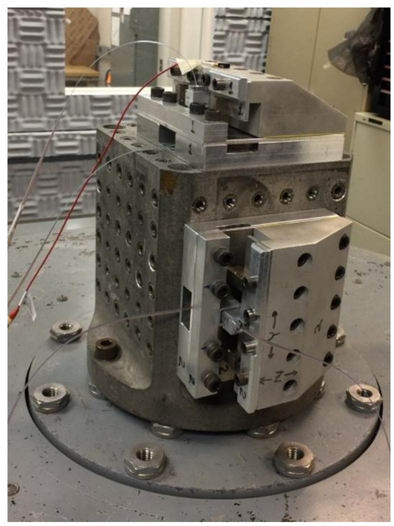

Figure 4

Vibration and Mechanical Shock