LIGHTRAY MPX* Singlemode Array Connector

1. SCOPE

1.1. Content

This specification covers the performance, tests and quality requirements for the singlemode LIGHTRAY MPX* array connector.

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 2 shall be used. All inspections shall be performed using the applicable inspection plan(s) and product drawing(s).

1.3. Qualification Test Results

Successful qualification testing on the subject product line was completed on 30Jun98. The Qualification Test Report number for this testing is 501-466. This documentation is on file at and available from Engineering Practices and Standards (EPS).

2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. In the event of conflict between requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between requirements of this specification and referenced documents, this specification shall take precedence.

2.1. Tyco Electronics Documents

- 102-1099: Quality Specification
- 501-466: Qualification Test Report

2.2. Commercial Standards

- EIA-455: Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices and Other Fiber Optic Components
- GR-1435-CORE, Issue 1: Generic Requirements for Multi-Fiber Optical Connectors Performance Testing

3. REQUIREMENTS

3.1. Design and Construction

Product shall be of the design, construction and physical dimensions specified on the applicable product drawing(s).

3.2. Optical Power Source

The optical power source shall be 1310 ± 30 nm and/or 1550 ± 30 nm or as stated in the Test Report.

* Trademark
I Indicates change

LOC B

3.3. Ratings

Performance	Value	Units
Insertion Loss, Typical See Note (a)	0.5	dB
Reflectance	<-45	dB
Storage Temperature	-40 to 85	°C
Operating Temperature	-5 to 70	°C
Cable Retention	44 [10]	Newtons [Pounds force]
Durability	500	Cycles
Flex Cycling See Note (b)	200	Cycles

NOTE *(a) See Figure 4 for maximum values.*
(b) Type II Media only.

Figure 1

3.4. Fiber Optic Cable Types

A. Type I Media - Multiple fibers arranged in a linear array bound with a matrix material into a single unit (i.e., fiber ribbon). Typically the ribbon thickness is approximately 0.3 mm.

B. Type II Media - Fiber ribbon or ribbonized fiber enclosed in a reinforced outer jacket.

C. Type III Media - Single fiber with a buffer or coating of approximately 0.9 mm. (Single buffered fibers that are not bundled into a group)

NOTE *A reinforced jacket is a structure in which if a user pulls on the jacket, the fiber should be under minimal additional stress.*

3.5. Performance and Test Description

Product is designed to meet the mechanical, environmental and optical transmittance performance requirements specified in Figure 2. Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

3.6. Test Requirements and Procedures Summary

Test Description	Requirement	Procedure
Examination of product.	Meets requirements of product drawing.	EIA-455-13. Visual, dimensional and functional per applicable quality inspection plan.
Insertion loss.	See Figure 4. See Note.	AMP Spec 109-1068. See Figure 5 for cable length.

Figure 2 (cont)

Test Description	Requirement	Procedure
Reflectance	See Figure 4. See Note.	AMP Spec 109-1068.
Temperature cycling.	Maximum change in optical transmittance during testing is 0.7 dB for any single sample. Reflectance shall be <-45 dB between the range of -5 and 70°C. See Note.	EIA-455-3A, Test Condition C3. Subject mated samples to 42 cycles between -40 and 80°C. Measure optical transmittance and reflectance before and after test with samples in place in the test chamber and at 10 minute intervals during exposure. Take final readings after samples have been inspected and cleaned. See Figure 6. See paragraphs 5.2. and 5.3.
Humidity, steady state.	Maximum change in optical transmittance during testing is 0.8 dB for any single sample. Reflectance shall be <-45 dB. See Note.	EIA-455-5A, Method A, Test Condition C. Subject mated samples to steady state humidity at 90 to 95% RH at 60°C for 150 hours. Measure initial optical transmittance and reflectance at least 1 hour after preconditioning with samples in place in the test chamber. Measure optical transmittance and reflectance once every 6 hours. Take final readings after samples have been inspected and cleaned. See paragraphs 5.2. and 5.3.
Thermal aging.	Maximum change in optical transmittance during testing is 0.7 dB for any single sample. Reflectance shall be <-45 dB. See Note.	EIA-455-4B. Expose mated samples to a steady state temperature of 85°C for 336 hours. Measure optical transmittance and reflectance initially and once every 6 hours. Take final readings after samples have been inspected and cleaned. See paragraphs 5.2 and 5.3.
Impact.	Maximum change in optical transmittance before and after testing is 0.5 dB for any single sample. Reflectance shall be <-45 dB after testing. Type II Media only. See Note.	EIA-455-2, Method B. Drop terminated connector plug from a height of 1.5 m [5 ft] for a total of 8 times. Measure optical transmittance and reflectance before and after test. Take final readings after samples have been inspected and cleaned.

Figure 2 (cont)

Test Description	Requirement	Procedure
Durability.	Maximum change in optical transmittance before and after testing is 0.5 dB for any single sample. Reflectance shall be <-45 dB after testing. Type II Media only. See Note.	EIA-455-21A. Mate and unmate samples 500 times. Measure optical transmittance and reflectance every 25 cycles, cleaning the optical interface before each measurement.
Twist.	Maximum change in optical transmittance before and after testing is 0.5 dB for any single sample. Reflectance shall be <-45 dB after testing. Type II Media only. See Note.	GR-1435-CORE. Apply load of 13 N [3 lbf] at a point 356 mm [14 in] from sample. Rotate capstan 2.5 revolutions about the axis of the fiber. Reverse direction and rotate 5 revolutions. Reverse direction again, and rotate 5 revolutions. Repeat last step 9 times. Measure optical transmittance and reflectance before and after test. Take final readings after samples have been inspected and cleaned.
Cable flexing.	Maximum change in optical transmittance before and after testing is 0.5 dB for any single sample. Reflectance shall be <-45 dB after testing. Type II Media only. See Note.	EIA-455-1A, Figure 2 apparatus. Using a 76.2 mm [3 in] mandrel, apply 4.4 N [1 lbf] tensile load to cable of mated sample. Flex 1 side ± 90 degrees per cycle for 100 cycles at maximum rate of 30 cycles per minute. Measure optical transmittance and reflectance before and after test with load removed.
Cable retention.	Maximum change in optical transmittance before and after testing is 0.5 dB for any single sample. Reflectance shall be <-45 dB after testing. Type II Media only. See Note.	EIA-455-6B, Method 1. Fixture behind the latching mechanism of the unmated test sample. Using a 7.6 cm [3 in] mandrel, apply 44 N [10 lbf] tensile load to the cable for 1 minute. Measure optical transmittance and reflectance before and after test. Take final readings after samples have been inspected and cleaned.

Figure 2 (cont)

Test Description	Requirement	Procedure
Vibration.	Maximum change in optical transmittance before and after testing is 0.5 dB for any single sample. Reflectance shall be <-45 dB after testing. Type II Media only. See Note.	EIA-455-11, Test Condition I. Vibrate the mated connector pairs for 2 hours at an amplitude of 1.5 mm [0.06 in] (peak-to-peak) with the frequency sweeping continuously between 10 and 55 Hz at a rate of 45 Hz per minute. Without disconnecting the connector assemblies, remount the connectors along a second and third principle axis. Measure optical transmittance and reflectance at the end of each of the 3 axis.
Change in optical transmittance.	Maximum of 0.6 dB for any single sample after completion of sequence.	EIA-455-20. Measure optical transmittance after all tests have been performed. Calculate change from the last measurement taken in the insertion loss test. See paragraph 5.2.

NOTE *Shall meet visual requirements, show no physical damage and shall meet requirements of additional tests as specified in Test Sequence in Figure 3.*

Figure 2 (end)

3.7. Product Qualification and Requalification Test Sequence

Test or Examination	Test Group (a)		
	1	2	3
	Test Sequence (b)		
Examination of product	1	1	1
Reflectance	2	2	2
Insertion loss	3	3	3
Temperature cycling			4
Humidity, steady state			5
Thermal aging			6
Impact	4		
Durability	5		
Twist		4	
Cable flexing		5	
Cable retention		6	
Vibration		7	
Change in optical transmittance	6	8	7

NOTE *(a) See paragraph 4.1.A.*
(b) Numbers indicate sequence in which tests are performed.

Figure 3

Insertion Loss (9/125)	dB
Maximum allowed average of all values per test group	0.5
Maximum allowed individual value for any single sample	1.0

Figure 4

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

A. Sample Selection

Samples shall be prepared in accordance with applicable Instruction Sheets and shall be selected at random from current production per Figure 5. Cable used for qualification shall be of type and length specified in Figure 5 and terminated with connectors on each end as required for equipment interfacing.

Test Group	1	2	3
Fiber size (microns/microns)	9/125	9/125	9/125
Cable Type	Type II	Type II	Type II
Cable Assembly PN	492545-1 492545-2	492545-1 492545-2	492545-1 492545-2
Coupling Bushing PN	492305-1	492305-1	492305-1
Test Samples Required	6	6	6
Control Cable (fibers) Required	0	0	2

Figure 5

B. Test Sequence

Qualification inspection shall be verified by testing samples as specified in Figure 3.

4.2. Requalification Testing

If changes significantly affecting form, fit or function are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.

4.3. Acceptance

Acceptance is based on verification that the product meets requirements of Figure 2. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. When product failure occurs, corrective action shall be taken and samples resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

4.4. Quality Conformance Inspection

Applicable quality inspection plan will specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing(s) and this specification.

5. SPECIAL INSTRUCTIONS

5.1. Cleaning

If at any time, a connector sample is uncoupled during qualification testing, the optical interfaces shall be cleaned according to Bellcore GR-1435-CORE 5.4.1, Issue 1 prior to any subsequent optical measurements. Additional cleaning techniques deemed necessary by Product Engineering shall be described in the Test Report. If, after cleaning the connector as prescribed, loss performance exceeds the specified limit, or, if the operator suspects the presence of debris at the optical interface, perform the cleaning procedure a second time. If the resultant optical reading still exceeds the specification, clean the interface a third time and accept that reading.

5.2. Control cables.

Control cables shall be subjected to climatic environmental tests. Transmittance shall be recorded each time a sample transmittance is made. Changes in control cable power of less than 0.05 dB may be neglected in the test sample power and loss calculations. If control cable power changes by more than 0.05 dB during the duration of the test or sequence of tests, change in control cable power shall be included in power and loss calculations per EIA-455-20.

5.3. Fiber Joints

If the multi-fiber connector has more than 5 fiber joints, then loss measurements through 5 of the fiber joints in the optical connector are measured. The 5 joints shall be selected as follows:

The 2 fiber joints farthest from each other.
. The fiber joints closest to the midpoint between the 2 aforementioned fibers.
A randomly selected fiber joint.

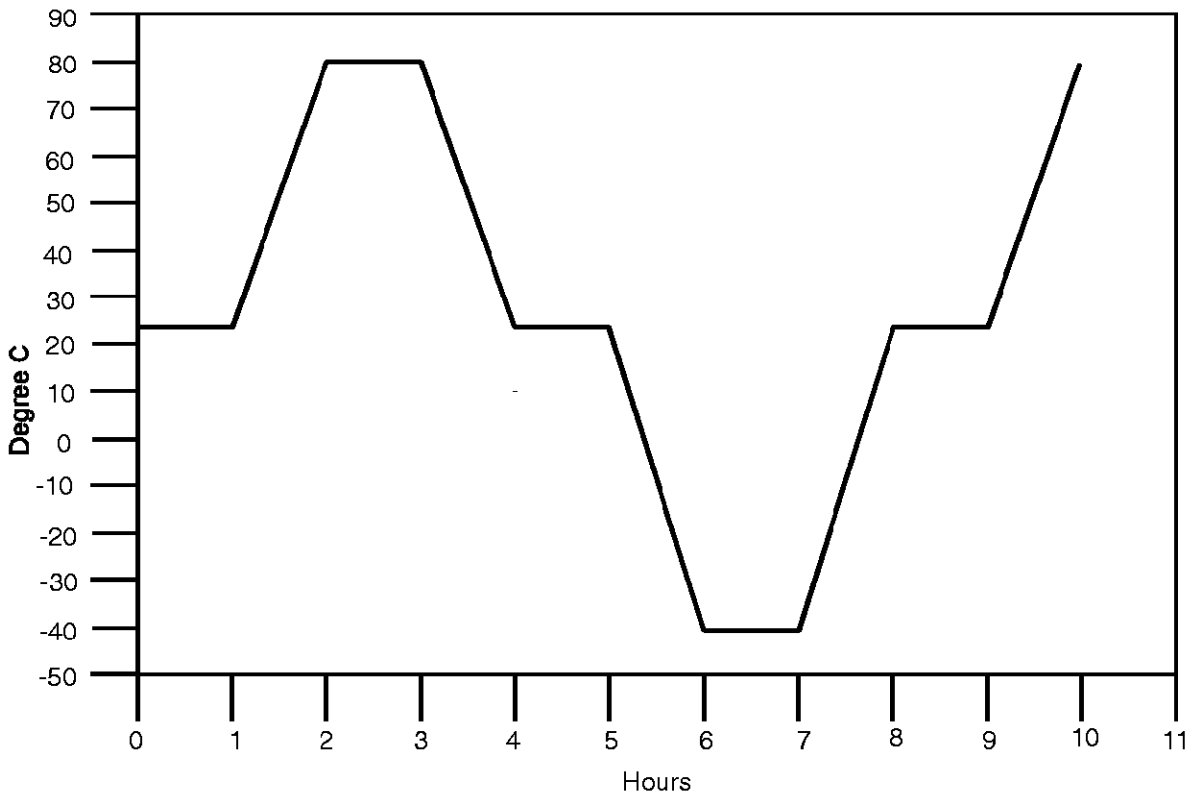

Figure 6
Temperature Cycling Profile