

# TENTATIVE

1. SCOPE

1.1. Content

This specification contains the performance and qualification testing requirements for OPTIMATE\* fiber optic multimode couplers.

1.2. Qualification

The objectives of this specification are to describe specific test procedures and conditions, and performance requirements for qualification of the product within the scope of this specification.

2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the reference documents, this specification shall take precedence

2.1. Commercial Specification (s)

EIA-455: Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Connecting and Terminating Devices

2.2. AMP Specifications

109- : Test Specification for Multimode Fiber Optic Couplers

3. REQUIREMENTS

3.1. Design and Construction

The OPTIMATE fiber optic multimode coupler shall be of the design, construction and physical dimensions specified on the applicable product drawings.

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<p><b>TENTATIVE</b></p> <p>This specification is based on design objectives and is strictly tentative. Although preliminary test data may exist the specification is subject to change based on the results of additional testing and evaluation.</p> <p>Accordingly, AMP Incorporated makes no representation or warranty expressed or implied that the product described herein will comply with this specification.</p>				DR		<p><b>AMP</b>   AMP INCORPORATED Harrisburg, Pa. 17105</p>	
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LTR	REVISION RECORD	APP	DATE	PAGE 1 OF 7	TITLE COUPLERS, OPTIMATE, MULTIMODE, FIBER OPTIC		

### 3.2 Cable and Fiber

Test cables used for insertion loss tests shall be of the same fiber size as the device to be qualified.

The control cable used for qualification of product under this specification shall be of the same type as the device under test. If the device to be qualified has medium duty leads (500  $\mu\text{m}$  buffer fiber), the control cable shall be 500 $\mu\text{m}$  buffer fiber of the same type as the device under test. If the device had heavy duty leads (3mm cable), the control cable shall be OPTIMATE loose tube buffer cable, AMP Part Number 501882-2 with the same type as the device under test.

All test cables (except those used for insertion loss tests) are to be 2 meter lengths of cabled fiber, and terminated with AMP connectors on each end as required for equipment interfacing. The core diameter of the test cable fiber shall be equal to or larger than the fiber core diameter of the device under test.

### 3.3. Mating Hardware

The hardware to be used in all qualification tests which require test sample connectors to be mated shall be the OPTIMATE 2.5 mm Bayonet connector, see Figure 1 for AMP Part Number, and the OPTIMATE 2.5 Bayonet coupling bushing, AMP Part Number 501381-1.

### 3.4. Mounting Hardware

For the vibration and physical shock tests, the test samples shall be mounted on a rigid fixture suitable for mounting on the test equipment.

### 3.5. Optical Power Source

The optical power source(s) used for qualification testing shall have a peak wavelength of  $850 \pm 30$  nanometers.

Coupler Fiber Size	2.5 mm Bayonet Connector Part Number
50/125 $\mu\text{m}$	501380-1
62.5/125 $\mu\text{m}$	
85/125 $\mu\text{m}$	
100/140 $\mu\text{m}$	501380-2
200/240 $\mu\text{m}$	502160-3

Figure 1  
Mating Hardware

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### 3.6. Test Description and Performance Requirements

The test specimens shall be subjected to each climatic and physical test separately as described in Para 3.7 of this document and shall meet the performance requirements for each test as listed in the relevant test description.

For a given input port of the device to be qualified, the corresponding dominant output port (thru-port) and any other non-dominant output port (cross-port) shall be chosen for monitoring during climatic and physical tests. These ports shall be connectorized as described in Para 3.3.

The connectors between the test cables and device under test shall not be subject to the climatic or physical tests.

### 3.7. Test Requirements and Procedures Summary

Test Description	Requirement	Procedure
Product Examination	Meet all requirements of product drawing.	Visual, dimensional and functional per applicable inspection plan.
<b>OPTICAL CHARACTERISTICS</b>		
Transmission Matrix	Maximum port-to-port loss and uniformity values as specified in Figure 2.	EIA-455-171, Method B1. (Launch with overfilled mandrel-wrap mode-filter Equilibrium Mode-Simulation (EMS) condition according to appendix A of EIA-455-50.) A duplicate mandrel wrap shall also be used between the coupler output and detector. All fiber ends shall be cleaved with endface angles of 2° or less. For an NxM coupler, the port-to-port between all N input ports and all M output ports shall be measured. See Figure 3.
Change of Transmission	Values as specified per individual test requirements.	EIA-455-20. Measure change in transmission of one dominant (through) port and one non-dominant (cross) port.

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**CLIMATIC ENVIRONMENT**

<p><b>Thermal Shock</b></p>	<p>Maximum change in transmission during or after testing is 0.2 dB average and 0.3 dB for any single sample. No evidence of physical damage which would result in a degradation of optical performance beyond the specified limit.</p>	<p>EIA-455-71. Test schedule A-0 (5 cycles); high temperature 85°C; low temperature -40°C; 1/2 hour dwell time at each extreme. Measure transmission once before and after test with samples in place in the test chamber. Measure transmission once at each temperature extreme, 5 to 10 minutes before end of cycle.</p>
<p><b>Humidity, Steady State</b></p>	<p>Maximum change in transmission during or after testing is 0.2 dB average and 0.3 dB for any single sample. No cosmetic or mechanical damage such as swelling which would result in a degradation of optical performance beyond the specified limits.</p>	<p>EIA-455-5. Test Type 1. (Steady state, 90-95% RH at 40°C. Test condition A (96 hours). Measure initial transmission at least 1 hour after preconditioning with samples in place in the test chamber. Measure transmission once every 24 hours. Measure transmission 1-2 hours after humidity exposure is completed with samples in place in test equipment.</p>
<p><b>Heat Age</b></p>	<p>Maximum change in transmission during or after testing is 0.2 dB average and 0.3 dB for any single sample. No evidence of physical damage which would result in a degradation of optical performance beyond the specified limits.</p>	<p>EIA-455-4. Test Condition 3 (85°C). Test Condition A (96 hours). Measure transmission before and after test with samples in place in the test chamber. Measure transmission once every 24 hours.</p>

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**PHYSICAL**

<p><b>Vibration</b></p>	<p>Maximum change in transmission during or after testing is 0.2 dB average and 0.3 dB for any single sample. No evidence of physical damage such as broken, loose, or deformed parts or other damage which would result in degradation of optical performance beyond the specified limits</p>	<p>EIA-455-11. Test cond. 3 (10-2000-10 Hz, 20 minute sweep, 15 G's peak acceleration). Cables to fixed to a non-vibrating surface at least 8 inches behind the strain relief. Measure transmission before and after test.</p>
<p><b>Physical Shock</b></p>	<p>Maximum change in transmission during or after testing is 0.2 dB average and 0.3 dB for any single sample. No evidence of physical damage such as broken, loose, or deformed parts or other damage which would result in degradation of optical performance beyond the specified limits.</p>	<p>EIA-455-14. Test Cond. H. (30 G's peak acceleration half-sine waveform, 11 millisecond duration). Measure transmission before and after test.</p>

Coupler Configuration	Maximum Port-to-Port Loss* (dB)	Uniformity (dB)
1 x 2	4.0	0.5
1 x 4	7.5	0.8
1 x 8	11.0	1.0
1 x 16	15.0	2.0
1 x 32	18.0	2.5
2 x 2	4.0	1.0
4 x 4	8.0	1.0
8 x 8	11.5	1.5
16 x 16	15.5	2.5
32 x 32	19.0	3.0

\* The maximum port-to-port loss values are the same for all fiber sizes.

Note: The above data does not include the loss due to the temporary joint between the launch cable and the coupler input.

Figure 2  
Transmission Matrix Requirements



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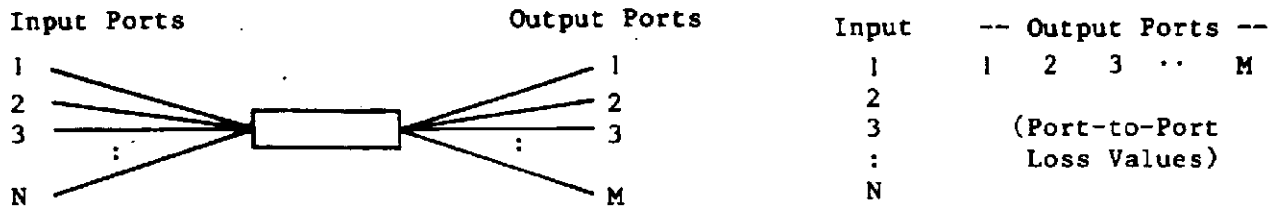


Figure 3  
Description of Coupler Port-to-Port Loss Matrix

#### 4. QUALITY ASSURANCE PROVISIONS

##### 4.1. Qualification Testing

###### A. Sample Requirements

The number of samples for each of the qualification tests shall be 5. Samples shall be selected at random from current production.

###### B. Test Sequence

The test samples shall be subjected to the tests described in Para 3.7 and in the following sequence:

- (1) Product Examination
- (2) Transmission Matrix
- (3) Specific Climatic or Physical Test
- (4) Change of Transmission
- (5) Transmission Matrix

###### C. Acceptance

Pass and failure criteria for the tests required for qualification are:

- (1) All samples tested shall meet the stated requirements
- (2) Evidence of mechanical or physical damage which would render any test specimen or sample unsuitable for future testing as required per this specification shall be cause for failure.
- (3) Failures which are found to be due to equipment and/or operator malfunction or error shall not be cause for denial of qualification.

##### 4.2. Qualification by Similarity

The only provision for qualification by similarity within the scope of this document is as follows. See Figure 4:

- A. A coupler of configuration 2x2 with a fiber size of 50/125  $\mu\text{m}$  may be used to qualify other couplers of 2x2 and 1x2 configurations with fiber sizes of 50/125  $\mu\text{m}$ , 62.5/125  $\mu\text{m}$ , 85/125  $\mu\text{m}$ , 100/140  $\mu\text{m}$  and 200/240  $\mu\text{m}$ .

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- B. A coupler of configuration 32x32 with a fiber size of 50/125  $\mu\text{m}$  may be used to qualify other 1xN or NxN couplers (excluding 1x2 and 2x2) with fiber sizes of 50/125  $\mu\text{m}$ , 62.5/125  $\mu\text{m}$ , 85/125  $\mu\text{m}$ , 100/140  $\mu\text{m}$  and 200/240  $\mu\text{m}$ .

Coupler to be Tested		Coupler to be Qualified by Similarity	
Configuration	Fiber Size	Configuration	Fiber Size
2 x 2	50/125 $\mu\text{m}$	1 x 2 2 x 2	50/125 $\mu\text{m}$ 62.5/125 $\mu\text{m}$ 85/125 $\mu\text{m}$ 100/140 $\mu\text{m}$ 200/240 $\mu\text{m}$
32 x 32	50/125 $\mu\text{m}$	1 x 4 1 x 8 1 x 16 1 x 32 4 x 4 8 x 8 16 x 16 32 x 32	50/125 $\mu\text{m}$ 62.5/125 $\mu\text{m}$ 85/125 $\mu\text{m}$ 100/140 $\mu\text{m}$ 200/240 $\mu\text{m}$

Figure 4  
Qualification by Similarity

#### 4.3. Requalification Testing

The cognizant divisional engineering function shall establish requalification and it may consist of all or any part of the overall qualification program provided that it is conducted within the required time period.

#### 4.4. Quality Conformance Inspection

The applicable Quality Inspection Plan (QIP) shall specify the sample acceptable quality level (AQL) to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.

### 5. Special Instructions

#### 5.1. Cleaning Provisions

If at any time a connectorized test specimen is uncoupled during qualification testing the optical interface shall be cleaned with alcohol or water and a clean lens tissue or cotton swab prior to any subsequent optical measurements.

#### 5.2. Control Cables

The number of control cables used shall be two.

The control cables shall be subjected to all tests. The transmission should be recorded each time a sample transmission measurement is made. Changes in control cable power of less than 0.1 dB may be neglected in the power and loss calculations of the test samples. If the control cable power changes by more than 0.1 dB over a test, the change in control cable power shall be included in the power and loss calculation as described in EIA-455-20.

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