

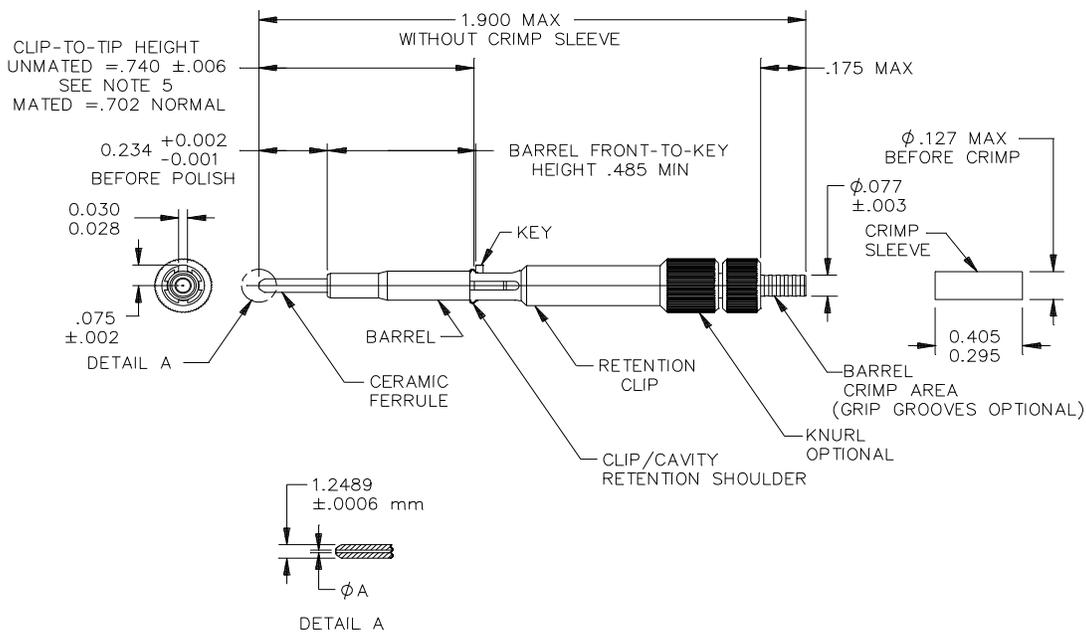
PERFORMANCE SPECIFICATION SHEET

TEST TERMINUS, FIBER OPTIC, KEYED, REMOVABLE, USE IN OPTICAL LOSS AND OPTICAL CONTINUITY TESTING, REAR INSERT/REAR RELEASE THROUGH A TEST TERMINUS ADAPTER, 1.25 MM CERAMIC FERRULE, (FOR MIL-PRF-64266 CONNECTORS)

This specification is approved for use by all Departments and Agencies of the Department of Defense

The requirements for acquiring the product described herein shall consist of this specification sheet and MIL-PRF-29504.

SCOPE. The Measurement Quality Jumper (MQJ) is a fiber optic test jumper or cable that conforms to the low loss optical requirements. The MQJ is used with test equipment including the performance of optical loss measurements using an optical source and power meter and including Optical Time Domain Reflectometer (OTDR) measurements. The MQJ consists of a single fiber cable with a connector at one end which mates to the test equipment (such as an optical source and power meter) and a connector (test terminus) at the other end which mates to the link/segment under test. For mating to a link/segment with a MIL-PRF-64266 multiple termini connector, a test terminus adapter is used to interface with the multiple termini connector plug or the connector receptacle under test. The test terminus adapter contains the insert cavity configuration to mate with and lock a test terminus in place. This specification sheet specifies the test terminus. The test terminus adapter is specified under MIL-PRF-64266/32 and MIL-PRF-64266/33.



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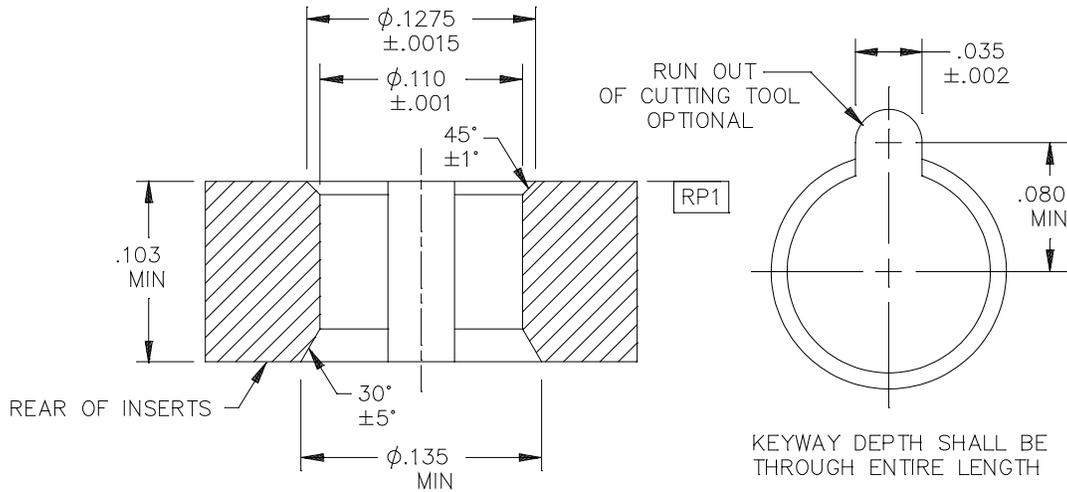
FIGURE 1. Interface dimensions, test terminus.

NOTES:

	<u>Inches</u>	<u>mm</u>
1. Ferrule shall be the same one as used for the MIL-PRF-64266/18 and /20 termini. Ferrule requirements specified in MIL-PRF-29504/18 and /20 apply.	.0006	0.015
2. Metric equivalents are given for general information only.	.001	0.03
3. All diameters are to be concentric within .002 inch (0.05 mm), except as noted.	.006	0.15
4. Dimensions apply to plated/finished part.	.050	1.27
5. Dimension .740 inch (18.80 mm) is to be measured when installed in connector equivalent gauge fixture and when subjected to minimal compressive force. See figure 2. The intent is to provide a force to ensure a minimum deflection of the mating MIL-PRF-29504/18 or /20 terminus.	.097	2.46
	.126	3.20
	.129	3.28
	.234	5.94
6. The TICC marking shall be at the front of the terminus. The TICC marking may be represented directly as an alpha-numeric or by the associated color bands. An alternative location of the marking shall be allowed only in the case of insufficient surface area and only if approved by the qualifying activity.	.679	17.3
	.702	17.8
	.835	21.2
	1.160	29.5
7. The individual bag or container shall have the MIL-PRF-29504 Part Identifying Number (PIN) marking on container or on a tag inside the container.		
8. All terminus metal parts are to be corrosion resistant. Crimp sleeve is to be metal.		
9. The dimension shown is effective prior to the application of the TICC marking.		
10. Crimp grooves are permissible on the crimp diameter.		
11. Manufacturer's symbol or trademark location is in front of the first TICC band (see figure 1 of MIL-PRF-29504). An alternate location of the marking shall be allowed only in the case of insufficient surface area and only if approved by the qualifying activity. The manufacturer shall list the symbol or trademark in accordance with SAE AIR 1351.		

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12. Barrel is the metallic portion of the terminus that accepts the ferrule at one end and the fiber optic cable (barrel crimp area) at the other end. The barrel can be comprised of multiple pieces.
13. If using epoxy to bond ferrule, no epoxy meniscus is permitted at ferrule-to-barrel interface.
14. One of the standardized strip dimensions of this terminus is based on a buffer insertion of the optical fiber to the back of the ferrule. Also, the intent is to allow insertion of a 20 gauge dispensing tip (syringe needle) to make contact with the ferrule (no neck down or dead zone/expansion zone at ferrule interface) and to have fiber supported with buffer up to entry into the ferrule. Compliance is conformance to the standardized strip length (see figure 4).
15. Test terminus barrel shall interface with the insert cavity in MIL-PRF-64266/32 and MIL-PRF-64266/33.



<u>Inches</u>	<u>mm</u>	<u>Inches</u>	<u>mm</u>	<u>Inches</u>	<u>mm</u>	<u>Inches</u>	<u>mm</u>
.001	0.03	.005	0.13	.110	2.79	.130	3.30
.002	0.05	.097	2.46	.125	3.18		

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. All diameters are to be concentric within .002 inch (0.05 mm).
4. Dimensions apply to plated/finished part.
5. Tolerance on all angles is ± 1 degrees, unless otherwise noted.

FIGURE 2. Insert equivalent fixture for terminus spring working height measurement (see note 5 of figure 1).

REQUIREMENTS:

Temperature ranges:

Storage temperature range of -40 to 185° F (-40 to 85 °C).

Design and construction:

Dimensions and configuration: See figures 1, 2, and 3 and table I. Test terminus shall meet the

requirements of this specification when terminated using the procedures specified in requirement 4103 of MIL-STD-1678-4 except that test terminus standardized strip dimensions shall conform to figure 4.

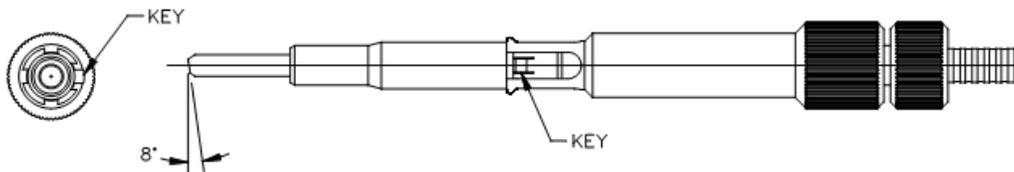
Ferrule end face geometry shall be either domed or flat before polishing and shall be domed after polishing. End face geometry shall be on an 8 +/- 0.2 degree angle and in accordance with figure 3 after polishing. The apex offset shall be 35 microns or less before polishing (as supplied by the terminus vendor) and 50 microns or less after all polishing procedures have been completed by the user/installer. The radius of curvature shall be between 5 to 12 mm after polishing.

TABLE I. TICC numbers and dimensions for ferrules.

Fiber size (core/cladding) or (core/cladding /polyimide coat) (um)	Ferrule hole "A" diameter (um)	"A" Diameter tolerance (um)	Circular run-out (um)	TICC ^{1/}
Single mode 9/125	125.5	+1/-0	0.75 <u>2/</u>	02
50/125, 62.5/125	126.0			26
100/140	142.0			42

Notes:

- 1/ The two positions indicate the ferrule hole diameter (two digits of diameter for multimode sizes, consecutive values for single mode sizes).
- 2/ Circular runout of 0.5 micron preferred as it becomes more standard in industry.

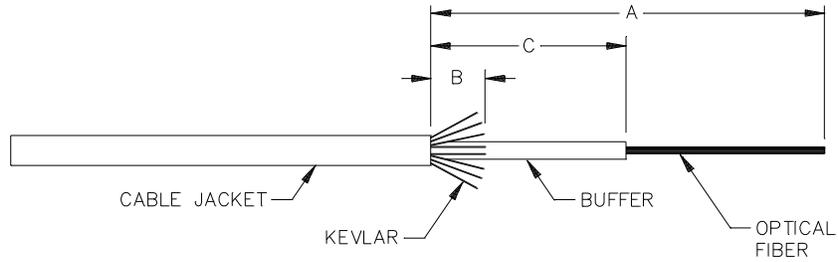


NOTE:

- 1. Standardized angle placed on the ferrule end face relative to the key applied only when an APC polish is applied during termination. Termination is the process of placing the test terminus onto the end of a fiber optic cable. Test terminus can be either PC (physical contact) polished or APC (angle physical contact) polished during termination. No angle is placed on the ferrule surface relative to the key as part of the finished un-terminated test terminus.

FIGURE 3. Orientation of end face angle relative to key for an APC polish.

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Cable stripping dimensions <u>1/</u> , <u>2/</u>					
A		B		C	
inches	mm	inches	mm	inches	mm
2.46	62.4	.18	4.5	1.6	40.6

- 1/ Tolerances on all dimensions are ± 0.03 in (0.8 mm), where feasible, use vendor preferred tolerance of $\pm .002$ in (.5 mm).
- 2/ Dimension B assumes a non-braided Kevlar strength member is used.

FIGURE 4. Cable stripping dimensions for the test terminus.

Weight: 0.0066 lb (3.0 gram) maximum.

Adhesives: Use MIL-PRF-24792 or as approved by the qualifying activity.

Material:

Ferrule: Ferrule materials shall have performance similar to that of zirconia. Test termini shall meet all of the requirements of this specification when mated to qualified termini utilizing a qualified MIL-PRF-64266/9 alignment sleeve retainer (ASR) in a qualified MIL-PRF-64266 connector.

Adhesive compounds: Adhesive compounds which may flow at the maximum specified storage temperature or exhibit cracking at the minimum specified storage temperature shall not be used.

Barrel: The barrel (also referred to as housing or body) shall be metal. Stainless steel is one acceptable material.

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Mating termini: Same and MIL-PRF-29504/18 & /20.

Crimp sleeve: The crimp sleeve shall accept single fiber cable with a maximum outer diameter of .094 inch (2.4 mm). The terminus shall meet all requirements when the crimp sleeve is assembled to the terminus using a hex crimp die with flats measuring $.0945 \pm .001$ inch ($2.400 \text{ mm} \pm .025 \text{ mm}$) across and .285 inch (7.2 mm) maximum long or as approved by the qualifying activity. Crimp sleeve is to be supplied with the test terminus unless specified in PIN.

Circular runout: The circular runout of the ferrule bore to the ferrule outer diameter shall be not greater than the value specified for applicable hole size in table I.

Tools: Insertion and removal of the test terminus into and from the test terminus adapter shall be performed without the need for tools. The test terminus shall include a mechanism that allows for insertion and removal without the need for insertion and removal tools. Tool used for polishing of the ferrule end face shall be in conformance with Requirement 4103 of MIL-STD-1678-4.

Qualification:

Qualification shall consist of performing testing specified as listed in table II.

To qualify or re-qualify test termini to this specification sheet, a qualified test terminus adapter in accordance with MIL-PRF-64266/32 and MIL-PRF-64266/33 shall be used.

MIL-PRF-64266 connector: For qualification, connector to mate with the test terminus adapter shall be a qualified MIL-PRF-64266 connector.

Test specimens:

Configuration. The test terminus MQJ consists of a MIL-PRF-85045/16 single mode, fiber optic cable with an instrument connector terminated at one end and a test terminus terminated at the other end. The multiple termini connector assembly consists of the connector with terminus-to-instrument connector jumpers. The multiple termini connector is fully populated and each cavity position is tested. A qualified test terminus adapter is mated to a multiple termini connector assembly.

Fabrication. Fabrication of the test terminus MQJ shall be performed in accordance with Requirement 4103 of MIL-STD-1678-4 except that the stripping dimensions shall be in accordance with figure 4. Test terminus MQJ shall be constructed using the ferrule end face polish specified in table II. Separate test samples shall be constructed for interoperability. Fabrication of the multiple termini connector assembly shall be performed in accordance with MIL-STD-1678-4. Each cavity position of the multiple termini connector assembly shall meet the optical performance requirement when tested in accordance with MIL-STD-2042-6 Method 6F1.

Optical performance:

Insertion loss (initial).

Method.

(1) Initial insertion loss. Applicable except first perform by cutting the center of a previous uncut cable assembly (a cable terminated with instrument end connections), inserting two test termini onto each end of the cut cable, mating the now two test terminus MQJ's with an alignment sleeve and determining the insertion loss of the two test terminus MQJ's in comparison with that of the uncut cable. An alignment sleeve or a suitable test terminus-to-test terminus adapter shall be used to position the ferrule end faces for this measurement. When only the test terminus adapter is being tested, the initial insertion is not applicable.

(2) Optical loss. After this initial insertion, perform an optical loss test on each of the two test terminus MQJ's. Perform the MQJ selection test for optical loss by mating the test terminus end of the MQJ to a MIL-PRF-64266 connector assembly through a test terminus adapter. Perform the MQJ selection test in accordance with MIL-STD-2042-6 Method 6F1. When only the test terminus is being tested, a shell size 11 test terminus adapter and multiple termini connector assembly shall be used.

Requirement. Initial insertion loss of the test terminus MQJ mated pair shall not exceed 0.35 dB from that of the uncut cable. Optical loss measured through the test terminus adapter shall not exceed 0.50 dB with a maximum standard deviation of 0.10 dB.

Insertion loss verification.

Method. Perform an optical loss test on each test terminus MQJ. Perform the MQJ selection test for optical loss by mating the test terminus end of the MQJ to a MIL-PRF-64266 connector assembly through a test terminus adapter. Perform the MQJ selection test in accordance with MIL-STD-2042-6 Method 6F1. When only the test terminus is being tested, a shell size 11 test terminus adapter and multiple termini connector assembly shall be used.

Requirement. Optical loss measured through the test terminus adapter shall not exceed 0.50 dB with a maximum standard deviation of 0.10 dB.

Change in optical transmittance.

Method. Optical loss testing in accordance with the MIL-STD-2042-6 Method 6F1 MQJ selection test shall be performed in lieu of change in optical transmittance.

Requirement. Optical loss measured through the test terminus adapter shall not exceed 0.50 dB with a maximum standard deviation of 0.10 dB.

Optical signal discontinuity. Not Applicable.

Material performance:

Salt spray: Test samples (test termini on single fiber cable) shall be tested in accordance with TIA-455-16, test condition C. Test terminus ferrule may be covered up to half way from the end face to the shoulder with plastic protective (dust) covers. No corrosive effects shall be seen on the external connector parts that would be detrimental to the operation of the connector. No optical degradation shall occur as a result of this test. The criterion for insertion loss verification shall be used to determine if this optical requirement is met. Insertion loss verification, with termini inserted into a MIL-PRF-64266 shell size 11 test terminus adapter, shall be performed both prior to and after the salt spray test.

Fluid immersion: Not Applicable.

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Environmental/mechanical:

Terminus insertion and removal forces. Applicable except insertion and removal shall be performed using a test terminus adapter in accordance with MIL-PRF-64266/32 and MIL-PRF-64266/33 and performed without the use of any tools. The terminus insertion force (force required to insert and lock the test terminus into the test terminus adapter) shall not exceed 5.0 pounds (22 N) and the terminus removal force (force required to remove or unlock the test terminus from the test terminus adapter) shall not exceed 22.0 pounds (98 N).

Fiber pull out force: Not Applicable.

Cable pull out force: Applicable. When testing the test terminus only, testing may be performed using only a shell size 11 test terminus adapter.

Cable seal flexing: Applicable. When testing the test terminus only, testing may be performed using only a shell size 11 test terminus adapter.

Twist: Applicable. When testing the test terminus only, testing may be performed using only a shell size 11 test terminus adapter.

Maintenance aging: Applicable except one cavity shall be selected at random with 250 insertions and removals of the test terminus performed. An optical transmittance measurement shall be performed after the 250 insertions. Test shall be repeated in three additional cavities for a total of 1000 cycles. Each of the repeated 250 insertions and removals may be done in different cavities for multiple test terminus adapters of the same or different shell sizes. The return loss test shall be performed after the conclusion of the maintenance aging test. The test terminus shall meet the optical loss during and after the test. The test terminus shall meet the return loss after the test.

Mating durability. Not Applicable.

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TABLE II. Qualification inspections (except interoperability).

Test performed <u>2/</u> , <u>12/</u> Test terminus adapter shell size Test terminus adapter # of cavities Test terminus fiber size Test terminus end face polish	Test sample configurations <u>1/</u>					
	Test terminus adapter				Test terminus	
	15	23	11	13		
	8	36	4	6	9/125	9/125
				PC	APC	
Group 1 (4 mated pairs) <u>3/</u> , <u>15/</u>						
Interoperability <u>4/</u> , <u>5/</u> , <u>6/</u>	X	X	X	X	X	
Visual & Mechanical						
Size	X	X	X	X	X	
Weight	X	X	X	X	X	
Identification marking	X	X	X	X	X	
Workmanship	X	X	X	X	X	
Screw thread	X	X	X	X		
Functional (Group 2 parts only)						
Insert retention radial strength <u>7/</u>	X					
Insert retention axial strength	X					
Terminus insert & removal forces	X					
Terminus retention force	X					
Maintenance aging	X				X	
Shell to shell conductivity						
Con coup engage & disengage torque						
Backshell & backshell accessory attach						
Optical						
Insertion loss <u>12/</u>	X	X	X	X	X	X
Return loss (SM only)	X	X	X	X	X	X
Crosstalk						
Group 2 (2 mated pairs) <u>15/</u>						
Fiber pull out force						
Cable pull out force (retention)					X	
External bending moment						
Cable seal flexing <u>14/</u>					X	
Twist					X	
Mating durability <u>13/</u>	X					
Return loss (SM only) <u>11/</u>					X	
Impact						
Crush						
Vibration						
Swept sine (TR1)						
Swept sine (TR2)						
Random at temperature (TR2 only)						
Random at ambient (TR1)						
Random at ambient (TR2)						
Return loss						
Shock						
MIL-S-901 (TR1 & TR2)						
Half-sine pulse (TR2 only)						
Insertion loss (verification)						
Water pressure						
Modified SO ₂ /salt spray						

See notes at end of table.

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TABLE II. Qualification inspections (except interoperability)- Continued.

Test performed <u>2/</u> , <u>12/</u> Test terminus adapter shell size Test terminus adapter # of cavities Test terminus fiber size Test terminus end face polish	Test sample configurations <u>1/</u>					
	Test terminus adapter				Test terminus	
	15	23	11	13		
	8	36	4	6		
					9/125	9/125
					PC	APC
Group 3 (2 mated pairs)						
Thermal shock (TR1)						
Thermal shock (TR2) <u>16/</u>					X	
Temperature/humidity cycling						
Temperature cycling (TR1)						
Temperature cycling (TR2)						
Altitude immersion						
Life aging (Temperature Life) (TR1)						
Life aging (Temperature Life) (TR2)						
Insert retention radial str						
Insert retention axial str						
Freezing water						
Insertion loss (verification)						
Return loss						
Sand & dust						
Con coup engage-disengage torque						
Terminus cleaning						
Identification marking						
Group 4 (2 mated pair + parts) <u>3/</u> , <u>15/</u>						
Electromagnetic effects (2 mp)						
Fluid immersion (2 mated pair)						
Salt spray (2 mated pair) <u>9/</u> , <u>10/</u>	X				X	
Con coupling engage-disengage torque						
Shell to shell conductivity						
Flammability (1 mated pair)						
Fungus resistance (parts) <u>8/</u>	X				X	
Ozone exposure (parts) <u>8/</u>	X				X	

NOTES:

1/ Qualification consist of performing tests in this table for test terminus adapters of each shell size and for test termini with different end face polishes. If only test termini are to be qualified, then perform qualification with previously qualified test terminus adapters.

2/ "X" indicates test applies for particular part(s).

3/ Group 1 test samples are to be used for Groups 2 and 4 tests. Group 4 can be done before Group 1 with separate samples.

4/ Interoperability test samples. Separate samples are required for interoperability testing. Optical loss testing shall be performed between qualified test termini and the test terminus adapters under test and between qualified test terminus adapters and the test terminus under test. Qualified MIL-PRF-64266 connectors shall be used to mate to the test terminus adapters.

5/ Interoperability test source. This testing will be performed by DLA Land and Maritime - TEB which maintains/retains the interoperability standards. Please note that separate test samples are required for interoperability testing. These test samples will then be retained by DLA Land and Maritime as interoperability standards.

6/ Interoperability fiber types. Interoperability is performed on test terminus terminated on single mode fiber optic cable and on test terminus adapters for each shell size.

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7/ Configuration requiring testing. To be performed for test terminus adapters with multiple piece inserts only.

8/ Parts required. Polymeric parts only.

9/ Samples for salt spray: Test samples from group 1 shall be used.

10/ Salt spray. Perform test for 48 hours. Perform salt spray test for this test terminus adapter in an unmated configuration only.

11/ Return loss after mating durability. If failure occurs, ferrule end faces may be re-polished and test redone.

12/ Optical measurements. Optical measurements are to be obtained as specified using the test setup and procedures in MIL-STD-1678-2 except that optical loss test is to be performed per MIL-STD-2042-6.

13/ Mating durability. The optical loss shall be met after the test. The test terminus shall meet the return loss after the test.

14/ Cable seal flexing shall be performed on the test terminus transition piece to ensure adequate bend limiter from the cable entry end of the test terminus barrel (body) to the fiber optic cable.

15/ Each mated pair consists of the test terminus MQJ, test terminus adapter, and multiple termini connector assembly. See "Fabrication" for the configuration of the multiple termini connector assembly. The device under test can be the test terminus, the test terminus adapter or both.

16/ Thermal shock shall be done at the storage temperature limits of -40 to 185 °F (-40 to 85 °C). Test terminus shall meet the optical loss requirements after the test.

Marking. See 3.7 of MIL-PRF-29504.

Qualification by similarity.

Qualification inspection shall be performed on test termini with a ferrule hole diameter of 125.5 microns when test termini with both 125.5, 126 and the 142 micron ferrule hole diameters are offered. Manufacturers who qualify under this specification sheet for the 125.5 micron ferrule hole diameter are qualified under this specification sheet for the 126 and 142 micron ferrule hole diameters.

Constraint for qualification by similarity case listed above. This qualification by similarity case is valid if the only difference between the qualified test termini (single mode 125.5 micron) and the other 126 and 142 micron ferrule hole diameters is a change in the terminus ferrule hole diameter and TICC markings.

Part or identifying number (PIN): See table I herein and 6.2 of MIL-PRF-29504.

<u>M29504/21</u>	-	<u>XX</u>	<u>X</u>
Basic specification and specification sheet		TICC Code (see table I)	Crimp sleeve Y = Yes, N = No

Mating counterpart: Test terminus mates with the MIL-PRF-64266/32 plug style, test terminus adapter and with the MIL-PRF-64266/33 receptacle style, test terminus adapter.

Intended use:

This test terminus is intended for use on the measurement end of an MQJ.

Application restriction. Test termini produced under this specification sheet are intended for an MQJ application only. This test terminus is not to be used in a connection application.

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Optical performance with multimode fiber. When the test terminus is used with multimode fiber, the optical loss and the maximum standard deviation shall not exceed the values listed in table 6207-I of MIL-STD-1678-6. For Navy shipboard applications, the optical loss shall not exceed 0.50 dB with a maximum standard deviation of 0.05 dB.

Referenced documents. In addition to MIL-PRF-29504, this specification sheet references the following documents:

MIL-S-901
MIL-PRF-29504/18
MIL-PRF-29504/20
MIL-STD-1678-2
MIL-STD-1678-4
MIL-STD-2042-6
MIL-PRF-24792
MIL-PRF-64266
MIL-PRF-64266/18
MIL-PRF-64266/20
MIL-PRF-64266/9
MIL-PRF-64266/32
MIL-PRF-64266/33
MIL-PRF-85045/16
TIA-455-16
SAE AIR 1351

CONCLUDING MATERIAL

Custodians:

Army - CR
Navy - SH
Air Force - 85
DLA CC

Preparing activity:

DLA - CC

(Project 6060-2014-004)

Review activities:

Navy - AS
Air Force - 13, 19, 93, 99
NASA - NA

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