METRIC

MIL-DTL-49292B
30 March 2006
SUPERSEDING
MIL-C-49292A
23 June 1989

DETAIL SPECIFICATION

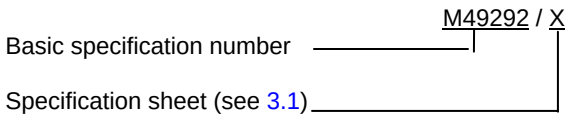
CABLE ASSEMBLIES, NONPRESSURE PROOF, FIBER OPTIC, METRIC, GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope. This specification covers the requirements for fabrication and test of fiber optic nonpressure proof cable assemblies intended for use with connectors specified in MIL-PRF-28876, MIL-C-83522, and MIL-C-83526, and with cables specified in MIL-PRF-85045.

1.2 Part or Identifying Number (PIN). The PIN is in the following format (see 3.1).



2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the Issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-5624	-	Turbine Fuel, Aviation, Grades JP-4 and JP-5.
MIL-PRF-17331	-	Lubricating Oil, Steam Turbine and Gear, Moderate Service.
MIL-PRF-17672	-	Hydraulic Fluid, Petroleum, Inhibited.
MIL-PRF-28876	-	Connectors, Fiber Optic, Circular, Plug and Receptacle Style, Multiple, Removable Termini, General Specification for.
MIL-DTL-49292/4	-	Cable Assemblies, Nonpressure Proof, Fiber Optic, Metric.
MIL-DTL-49292/7	-	Cable Assemblies, Nonpressure Proof, Fiber Optic, Test, Metric.
MIL-C-83522	-	Connectors, Fiber Optic, Single Terminus, General Specification for.

Comments, suggestions or questions on this document should be addressed to Defense Supply Center Columbus, ATTN: VAT, Post Office Box 3990, Columbus, OH 43218-3990), or emailed to (FiberOpticsGroup@dscc.dla.mil). Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at http://assist.daps.dla.mil.

MIL-C-83526	-	Connectors, Fiber Optic, Circular, Environmental Resistant, Hermaphroditic, General Specification For.
MIL-PRF-85045	-	Cable, Fiber Optics (Metric), General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-130	-	Identification Marking of U.S. Military Property.
MIL-STD-202	-	Electronic and Electrical Component Parts.
MIL-STD-810	-	Environmental Engineering Considerations sand Laboratory Tests.
DOD-STD-1678	-	Fiber Optics Test Methods and Instrumentation.

(Copies of these documents are available online at http://assist.daps.dla.mil/quicksearch/ or from the Standardization Document Order Desk, 700 Robins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents are those cited in the solicitation or contract.

EIA/TIA-455	-	Standard Test Procedures for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices, and Other Fiber Optic Components. (DOD Adopted)
TIA/EIA-455-1	-	Cable Flexing for Fiber Optic Interconnecting Devices.
EIA/TIA-455-6	-	Cable Retention Test Procedure for Fiber Optic Cable Interconnecting Devices
TIA-455-13	-	Visual and Mechanical Inspection of Fiber Optic Components, Devices, and Assemblies (DOD Adopted)
EIA/TIA-455-42	-	Optical Crosstalk in Fiber Optic Components.
TIA/EIA-455-51	-	Pulse Distortion Measurement of Multimode Glass Optical Fiber Information Transmission Capacity. (DOD Adopted)
TIA/EIA-455-171	-	Attenuation by Substitution Measurement for Short-Length Multimode Graded-Index and Single-Mode Fiber Optical Cable Assemblies.

(Application for copies of publications should be addressed to Electronic Industries Association, Engineering Dept./Telecommunications Industry Association, Standards and Technology Dept., 2500 Wilson Blvd., Arlington, VA 22201, http://www.tiaonline.org or http://www.eia.org/.)

ASTM-E595	-	Total Mass Loss and Collected Volatile Condensable Materials From Outgassing in a Vacuum Environment. (DOD Adopted)

(Application for copies of ASTM publications should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, P. O. Box C700, West Conshohocken, PA 19428-2959, http://www.astm.org/)

NCSL Z540.1	-	Calibration Laboratories and Measuring and Testing Equipment – General Requirements.

(Application for copies of NCSL publications should be addressed to the National Conference of Standards Laboratories, 1800 30th Street, Suite 305B, Boulder, CO 80301, http://www.ncsli.org)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 First article. When specified in the contract or purchase order, a sample shall be subjected to first article inspection (see 4.4 and 6.3).

3.3 Materials. The fiber optic cable assemblies shall be constructed of materials as specified herein and in the specification sheets (see 3.1). All materials used shall be ozone resistant, non-toxic, non-nutrient to fungus, and manufactured to good workmanship quality. Materials, which are not specifically described herein, shall be materials approved by the contracting agency.

3.3.1 O-ring lubrication. When O-rings are required (see 3.1), the O-rings shall be accordance with the connector specification (see 3.1).

3.3.2 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.4 Construction, and physical dimensions. Unless otherwise specified (see 3.1), the construction, and physical dimensions and weight of cable assemblies shall be as specified herein. Tolerances shall be as specified (see 3.1).

3.4.1 Connectors. The fiber optic connectors shall conform to MIL-PRF-28876, MIL-C-83522, and MIL-C-83526 (see 3.1).

3.4.2 Fiber optic cable. The fiber optic cables shall conform to MIL-PRF-85045.

3.4.3 Cable boot. When a cable boot is required (see 3.1), it shall be molded or constructed in accordance with the individual connector specification.

3.5 Interchangeability. Fiber optic cable assemblies, having the same specification PIN shall be completely interchangeable with each other with respect to installation (physical) and performance (function) as specified.

3.6 Performance. Performance relates to the ability of the cable harness to provide satisfactory optical signal transmissions.

3.6.1 Insertion loss. Unless otherwise specified (see 3.1), when tested in accordance with 4.6.2, the maximum insertion loss per channel shall be as specified (see 3.1).

3.6.2 Bandwidth. When tested in accordance with 4.6.3, the bandwidth shall be as specified (see 3.1).

3.6.3 Crosstalk. Unless otherwise specified (see 3.1), when tested In accordance with 4.6.4, the signal optical power level (or sum of levels for devices with three or more channels) of the passive channels shall be below the output signal level of the active channel by at least 60 dB.

3.6.4 Cable seal flexing. Unless otherwise specified (see 3.1), when tested in accordance with 4.6.5, there shall be no loss of environmental sealing or other damage which may impair operation. After the test, insertion loss characteristics shall meet the requirements of 3.6.1.

3.6.5 Thermal shock. Unless otherwise specified (see 3.1), when tested in accordance with 4.6.6, cable assemblies subjected to the high and low temperature extremes shall reveal no evidence of connector part dimensional change, apparent loss of sealing capability, surface or identification marking impairment which affects legibility, coupling-thread binding, evidence of mating/unmating incapability, or other damage detrimental to the operation of the assembly. During and after the test, insertion loss characteristics shall meet the requirements of 3.6.1.

3.6.6 Water pressure. When specified (see 3.1), the cable assembly shall withstand the test specified in 4.6.7. The insertion loss characteristics shall meet the requirements of 3.6.1 during and after the test.

3.6.7 Low pressure (altitude). Unless otherwise specified (see 3.1), when tested in accordance with 4.6.8, cable assemblies shall exhibit no deterioration of seals or a buildup deposit that would be detrimental to the operation of the assemblies. After the test, the insertion loss characteristics of 3.6.1 shall be met.

3.6.8 Cable retention. When tested in accordance with 4.6.9, there shall be no evidence of cable jacket damage, cable clamp failure, cable to connector seal damage, distortion or bending of metallic connector parts, or cable disengagement from the clamp. Unless otherwise specified (see 3.1), the minimum cable to connector pullout strength shall be 182 kilograms.

3.6.9 Fluid immersion. Unless otherwise specified (see 3.1), when tested in accordance with 4.6.10, cable assemblies shall not show any cracks, splits, voids or other damage detrimental to the operation of the assembly. After the test, the insertion loss characteristics of 3.6.1 shall be met.

3.6.10 Temperature cycling. Unless otherwise specified (see 3.1), when tested in accordance with 4.6.11, cable assemblies shall exhibit no deterioration of the assembly that is detrimental to operation. After the test, the insertion loss characteristics of 3.6.1 shall be met.

3.6.11 Dust. Unless otherwise specified (see 3.1), when tested in accordance with 4.6.12, cable assemblies shall not exhibit any scratches or other damage, which is detrimental to operation. After the test, the insertion loss characteristics of 3.6.1 shall be met.

3.6.12 Storage temperature. Unless otherwise specified (see 3.1), when tested in accordance with 4.6.13, cable assemblies shall not exhibit any deterioration of the assembly that is detrimental to operation such as congealing of lubricants in low temperatures and cracking or melting in high temperatures. After the test, the insertion loss characteristics of 3.6.1 shall be met.

3.6.13 Humidity. Unless otherwise specified (see 3.1), when tested in accordance with 4.6.14, cable assemblies shall not exhibit any deterioration of the assembly that would cause binding due to corrosion or that is detrimental to operation. After the test, the insertion loss characteristics of 3.6.1 shall be met.

3.6.14 Vibration. Unless otherwise specified (see 3.1), when tested in accordance with 4.6.15, cable assemblies shall exhibit no visual evidence of loosening parts, relative motion between connectors and cable parts or other damage that can produce physical distortion and result in fatigue of the mechanical parts. During and after the test, insertion loss characteristics shall meet the requirements of 3.6.1.

3.6.15 Life. Unless otherwise specified (see 3.1), when tested in accordance with 4.6.16, cable assemblies subjected to these specified aging exposures shall not exhibit visual evidence of dimensional change, opening or leaking of seals, cracking or crazing of components or finishes, identification marking impairment which affects legibility, or other defects detrimental to their operation. After the test, the insertion loss characteristics of 3.6.1 shall be met.

3.6.16 Salt fog. Unless otherwise specified (see 3.1) when tested in accordance with 4.6.17, cable assemblies shall not exhibit any abnormal nicks, cracks, or scratches that indicate the removal of the normal protective coatings. After the test, the insertion loss characteristics of 3.6.1 shall be met.

3.6.17 Bonding (see 4.6.18).

3.6.17.1 Nondestructive. When specified (see 3.1), bond test shall be performed in accordance with 4.6.18.1 (nondestructive), cable assemblies shall not exhibit evidence of materials peeling back from the connector surface to reveal bare metal.

3.6.17.2 Destructive. When specified (see 3.1), bond test shall be performed in accordance with 4.6.18.2 (destructive), cable assemblies shall not exhibit evidence of materials peeling back from the connector surface to reveal bare metal or cable surfaces.

3.6.18 Outgassing. When specified (see 3.1), the Total Mass Loss (TML) shall not exceed 1.0 percent and the Collected Volatile Condensable Material (CVCM) shall not exceed 0.1 percent when tested in accordance with 4.6.19.

3.7 Marking. Manufacturer's markings shall be heat shrinkable and shall consist of the military PIN, date code (month and year), and manufacturers symbol. Markings shall be in accordance with MIL-STD-130, 3 mm minimum height lettering, legible and located 305 $\pm$ 76 mm from each end of the assembly.

3.8 Workmanship. The cable harness assemblies shall be dimensionally uniform and free of flaws that would degrade performance after installation, inhibit proper connection to interfacing elements or otherwise yield an inferior product. The following shall be a minimum level of visual inspection to be performed and is not intended to restrict other pertinent workmanship inspections deemed necessary by the contractor.

a. Cable assemblies shall conform to the dimensional and interchangeability requirements of this specification.

b. Loose termini, poor molding, poor fabrication, loose materials, defective bonding, damaged or improperly assembled terminal, and physical defects in the seals shall not be permitted.

c. Peeling or chipping of plating or finish, galling of mated parts, nicks or burrs of metal parts, and postmolding warpage shall not be permitted.

4. VERIFICATION

4.1 Test equipment and Inspection facilities. Requirements for test equipment and inspection facilities shall be in accordance with NCSL Z540.1 and as specified herein.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.4).

b. Conformance inspection (see 4.5).

4.3 Inspection conditions. Unless otherwise specified (see 3.1), all inspections shall be performed in accordance with the test conditions specified in EIA/TIA-455 or as specified herein.

4.4 First article inspection. First article inspection shall be performed at a laboratory acceptable to the Government (see 6.3) on sample units produced with equipment and procedures normally used in production.

4.4.1 Sample. Unless otherwise specified (see 3.1), the first article sample shall consist of six finished fiber optic cable assemblies.

4.4.2 Inspection routine. The sample shall be subjected to the first article inspection specified in table I in the order shown. All sample units shall be subjected to the inspections of groups I and II. The sample shall then be divided into two and subjected to the inspections of groups III and IV of table I; however, each test specimen shall be subjected to only one group of test In addition to groups I and II. Optical test shall be performed on the sample when specified in table I and as specified in the individual test in section four.

4.4.3 Failures. One or more failures shall be cause for refusal to grant first article approval.

4.4.4 Disposition of sample units. The sample units that have been subjected to the first article inspection shall be delivered to the contracting activity as a part of the test report and shall not be delivered as part of a contract or purchase order.

TABLE I. First article inspection.

Inspection	Requirement paragraph	Test paragraph	Sample quantity
Group I			
Visual and mechanical	3.1, 3.3, 3.4, 3.5, 3.7, and 3.8	4.6.1	6
Group II			
Insertion loss	3.6.1	4.6.2	6
Bandwidth	3.6.2	4.6.3	6
Crosstalk	3.6.3	4.6.4	6
Group III			
Cable seal flexing	3.6.4	4.6.5	3
Thermal shock	3.6.5	4.6.6	3
Water pressure	3.6.6	4.6.7	3
Low pressure (altitude)	3.6.7	4.6.8	3
Cable retention	3.6.8	4.6.9	3
Fluid immersion	3.6.9	4.6.10	3
Temperature cycling	3.6.10	4.6.11	3
Dust	3.6.11	4.6.12	3
Storage temperature	3.6.12	4.6.13	3
Humidity	3.6.13	4.6.14	3
Group IV			
Vibration	3.6.14	4.6.15	3
Life	3.6.15	4.6.16	3
Salt fog	3.6.16	4.6.17	3
Bonding	3.6.17	4.6.18	3

4.5 Conformance inspection.

4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of groups A and B inspections.

4.5.1.1 Unit of product. A unit of product shall be one fiber optic cable assembly.

4.5.1.1.1 Inspection lot. The inspection lot shall consist of the number of units of product, offered for inspection at one time. All of the units of product in the inspection lot submitted shall have been produced during the same production period with the same materials and processes.

4.5.1.1.2 Sample unit. A sample unit shall be a unit of product selected at random from the inspection lot without regard to quality.

4.5.1.1.3 Sample plan. Unless otherwise specified, the sample unit size shall consist of that number of sample units required by the inspection lot size, as determined by table II. If one or more defects are found, the lot shall be rejected (see 4.5.1.2.1).

TABLE II. Sampling plans.

Lot size	Group A sample size	Group B sample size
1 to 5	All	all
6 to 13	All	5
14 to 150	13	5
151 to 280	20	20
281 to 500	29	20
501 to 1,200	34	20
1,201 to 3,200	42	32
3,201 to 10,000	50	32
10,000 to 35,000	60	50

4.5.1.2 Group A inspection. Group A inspection shall consist of the inspections specified in table III.

TABLE III. Group A inspection.

Inspection	Requirement paragraph	Test paragraph
Visual and mechanical inspection	3.1, 3.3, 3.4, 3.5, 3.7, and 3.8	4.6.1
Insertion loss	3.6.1	4.6.2

4.5.1.2.1 Sampling plan. The sampling plan shall be in accordance with table II. If one or more defects are found, the lot shall be rejected (see 4.5.1.2.2).

4.5.1.2.2 Rejected lots. If an Inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. Resubmitted lots shall be inspected using the next larger sample size in accordance with table III and shall not thereafter be tendered for acceptance unless the former rejection or requirement of correction is disclosed. Such lots shall be separate from new lots, and shall be clearly identified as reinspected lots. If one or more defects are found in the second sample, the lot shall be rejected and shall not be submitted to this specification.

4.5.1.2.3 Disposition of sample units. Sample units from which a specimen has failed any of the group A inspection tests shall not be delivered on any order, even though the inspection lot submitted is accepted.

4.5.1.3 Group B inspection. Group B inspection shall consist of the inspections specified in table IV.

TABLE IV. Group B inspection.

Inspection	Requirement paragraph	Test paragraph
Bandwidth	3.6.2	4.6.3
Crosstalk	3.6.3	4.6.4

4.5.1.3.1 Sampling plan. The sampling plan shall be in accordance with table II. If one or more defects are found, the lot shall be rejected (see 4.5.1.3.2).

4.5.1.3.2 Rejected lots. If an inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. Resubmitted lots shall be inspected using the next larger sample size in accordance with table II and shall not thereafter be tendered for acceptance unless the former rejection or requirement of correction is disclosed. Such lots shall be separate from new lots, and shall be clearly identified as reinspected lots. If one or more defects are found in the second sample, the lot shall be rejected and shall not be submitted to this specification.

4.5.1.3.3 Disposition of sample units. Sample units from which a specimen has failed any of the group B inspection tests shall not be delivered on any order, even though the inspection lot submitted is accepted.

4.6 Methods of Inspection. Unless otherwise specified herein (see 3.1), cladding mode stripping devices shall be used when making optical measurements. The mode stripper shall be installed in the test circuit between the source and the connector. In devices with one, two, or three optical channels, optical measurements shall be made simultaneously on each channel. Unless otherwise specified (see 3.1), in devices with four or more channels, optical measurements shall be made simultaneously on three randomly selected channels.

4.6.1 Visual and mechanical inspection (see 3.1, 3.3, 3.4, 3.5, 3.7, and 3.8). The cable harness assemblies shall be inspected to verify the materials, construction, interchangeability, marking, and workmanship are in accordance with TIA-455-13.

4.6.2 Insertion loss (see 3.6.1). Insertion loss characteristics for the cable assemblies shall be tested in accordance with TIA/EIA-455-171. The appropriate test method shall be as specified (see 3.1).

4.6.3 Bandwidth (see 3.6.2). The bandwidth characteristics of the cable assembly shall be tested in accordance with TIA/EIA-455-51.

4.6.4 Crosstalk (see 3.6.3). The cable assembly crosstalk characteristics shall be determined in accordance with EIA/TIA-455-42.

4.6.5 Cable seal flexing (see 3.6.4). The cable assemblies shall be tested in accordance with TIA/EIA-455-1. Instead of optical transmittance specified, insertion loss shall be measured (see 3.6.1).

4.6.5.1 Cable seal flexing: Manual operation. For manual operation, use the following:

a. Mandrel OD shall be approximately but not less that 2-1/2 times the maximum cable OD.

b. The distance from the pivot point to the centers of the mandrels shall be 50 millimeters ±10 millimeters.

4.6.5.2 Cable seal flexing: Motor driven operation. For motor driven operation, the distance from the back of the connector to the point of the weight attachment shall be 30 millimeters ± 5 millimeters

4.6.6 Thermal shock (see 3.6.5). The cable assembly, including mated connector assemblies shall be subjected to the thermal shock test as specified in method 503, of MIL-STD-810. Test shall include 5 cycles of exposure with each exposure consisting of 4 hours exposure at each temperature listed in table V.

TABLE V. Thermal shock test conditions.

Step	Temperature -°C
1	-30 + 0, -5
2	+4 ± 5
3	+ 60 + 5, -0
4	+ 15 ± 5

4.6.7 Water pressure. Mated cable assemblies shall be tested for water pressure susceptibility as follows: Jam-nut connectors shall be mounted on a 101.6 mm (4 inch) sealed tube. No ingress of water into the tube is allowed. Test shall be accomplished using three sets of samples: In-line connectors mated with dust caps, jam-nut connectors mated with dust caps, and in-line connectors mated with jam-nut connectors. The assemblies shall be immersed to a minimum depth of 1.00 m for a period of not less than 48 hours. The temperature shall be maintained between 10°C and 35°C during the exposure period. The assemblies shall be externally cleaned, unmated, examined for water penetration into the connector, mated and optically tested (see 3.6.6).

4.6.8 Low pressure (altitude) (see 3.6.7). The cable assembly shall be subjected to the test procedures contained in MIL-STD-810, method 500, procedure III. The test altitudes shall be 3.05 km and 12.20 km.

4.6.9 Cable retention (see 3.6.8). Mated cable assemblies shall be tested In accordance with TIA/EIA-455, method 2009. Instead of optical transmittance specified, insertion loss shall be measured (see 3.6.1). The axial load of 182 kilograms shall be applied and maintained for 5 minutes.

4.6.10 Fluid immersion (see 3.6.9). The cable assemblies shall be tested In accordance with DOD-STD-6, method 1. Table VI provides a list of fluids, test temperatures, and test times to be followed.

TABLE VI. Fluid immersion, fluids, temperatures and times.

Fluids	Temperature (°C)	Immersion time (hours)
Lubricating oil (MIL-PRF-17331)	48 - 50	20
Hydraulic fluid (see 6.5 and MIL-PRF-17672)	48 - 50	20
Isopropyl alcohol (See 6.4)	20 - 25	168
Turbine fuel (JP-4, and JP-5 in accordance with MIL-DTL-5624)	20 - 25	168
Coolant (Monsanto Coolanol or equivalent)	20 - 25	168

4.6.11 Temperature cycling (see 3.6.10). The cable assembly shall be tested in accordance with DOD-STD-1678, method 4010. Table VII provides a list of test steps, test temperatures, and test times applicable. Indicated attenuation measurements shall be taken during the last 15 minutes of each step for each cycle (including step 1 of the first cycle).

TABLE VII. Temperature cycling steps, temperatures and durations.

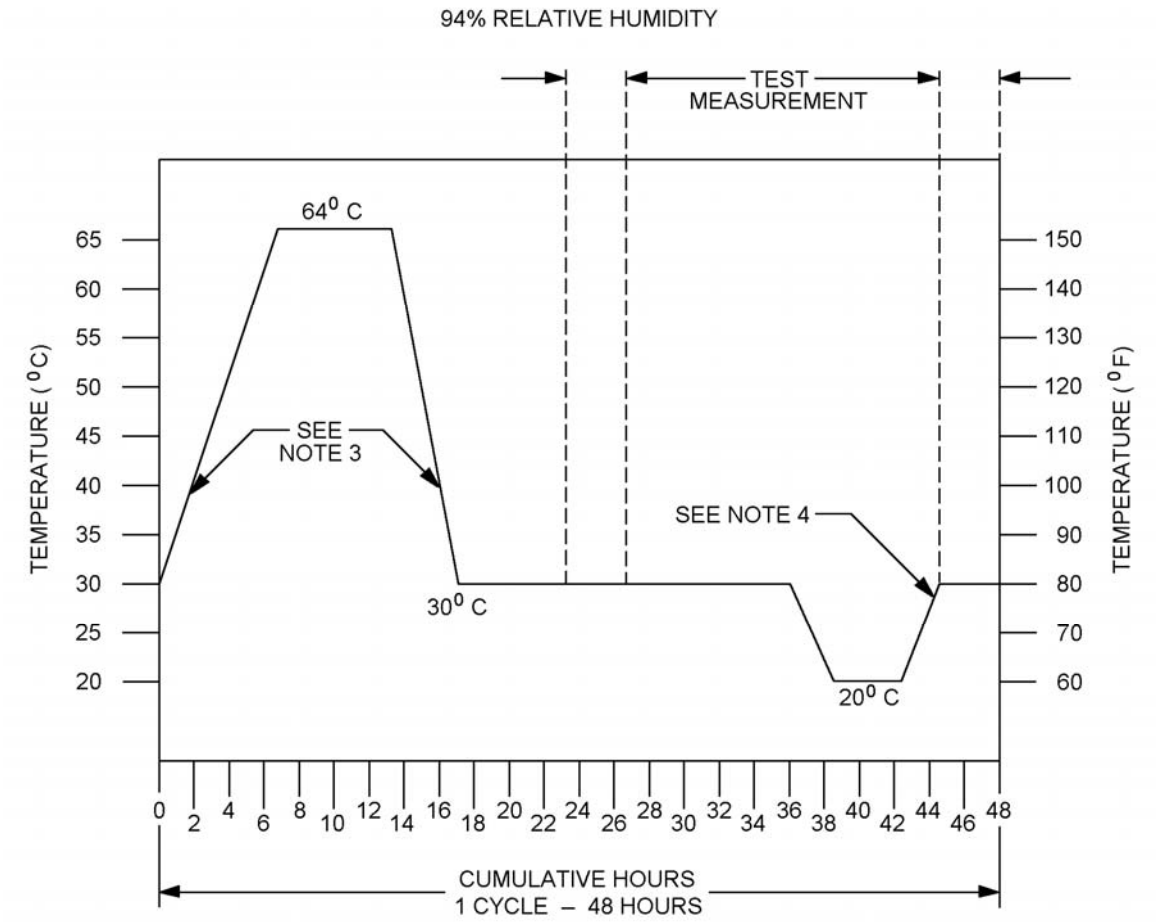
Step	Temperature (°C)	Duration (hours)
1	Room ambient	24
2	Ramp to -46ºC ±2ºC	2
3	-46ºC ±2ºC	8
4	Ramp to +25ºC ±2ºC	2
5	+25ºC ±2ºC	6
6	Ramp to +71ºC ±2ºC	1
7	+71 C ±2ºC	6
8	Ramp to +25ºC ±2ºC	1
9	+25ºC ±2ºC	6
10	Repeat steps 2 through 9 four times for a total of five cycles.	

4.6.12 Dust (see 3.6.11). The cable assembly shall be tested in accordance with MIL-STD-810, method 510, procedure 1. The assembly shall be oriented in the test chamber so that the blowing air stream intersects the longitudinal axis. The assembly shall be rotated 90 degrees at least two times.

4.6.13 Storage temperature (see 3.6.12). The cable shall be tested in accordance with MIL-STD-810, method 501, high temperature and method 502, low temperature. The procedures of both tests shall be followed.

4.6.14 Humidity (see 3.6.13). The cable shall be tested in accordance with DOD-STD-1678, method 4030. The number of test cycles shall be five. Exposure cycle for humidity shall be as specified on figure 1.

4.6.15 Vibration (see 3.6.14). The cable assemblies shall be vibrated in accordance with MIL-STD-810, method 514, category 3. Test duration shall be 30 minutes minimum with three test Items on RS-453 reels.



NOTES:

1. Tolerance during temperature change shall be not greater than 3ºC (5ºF).
2. Relative humidity shall be maintained at 94±4 percent at all times, except that during the descending temperature period, the relative humidity may be permitted to drop as low as 85 percent.
3. Rate of temperature change between 30ºC and 65ºC (86ºF and 149ºF) shall be not less than 8ºC (14.4ºF) per hour.
4. The temperature increase In this portion of the curve shall be not less than 10ºC (18ºF).
5. Test measurements shall be taken only at the period specified in the applicable equipment or system specification.

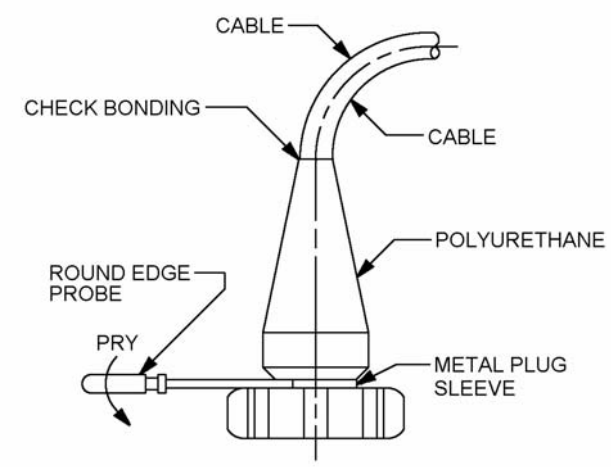
FIGURE 1. Humidity cycling.

4.6.16 Life (see 3.6.15). The life test shall be performed in accordance with MIL-STD-202, method 108, test condition B. The temperature shall be 110ºC ± 5ºC, -0ºC, with a relative humidity of 95 percent. The cable assembly shall be installed In the mating receptacles. The receptacle fiber optic cables shall exit the test chamber and be sealed to the chamber wall at the exit point.

4.6.17 Salt fog (see 3.6.16). The cable assembly shall be tested in accordance with MIL-STD-810, method 509, test procedure I. The samples shall not be mounted but shall be suspended from the top of the chamber using waxed twine or string.

4.6.18 Bonding (see 3.6.17).

4.6.18.1 Nondestructive (see 3.6.17.1). A nondestructive bond test shall be conducted on each fiber optic cable-to-connector boot seal. The polyurethane boot seal shall be tested with a round edge probe at four different locations along the circumference as specified on figure 2. A force of 2 pounds minimum shall be applied at a distance of 127 mm (5 inches) from the tip of the probe for 30 seconds minimum.

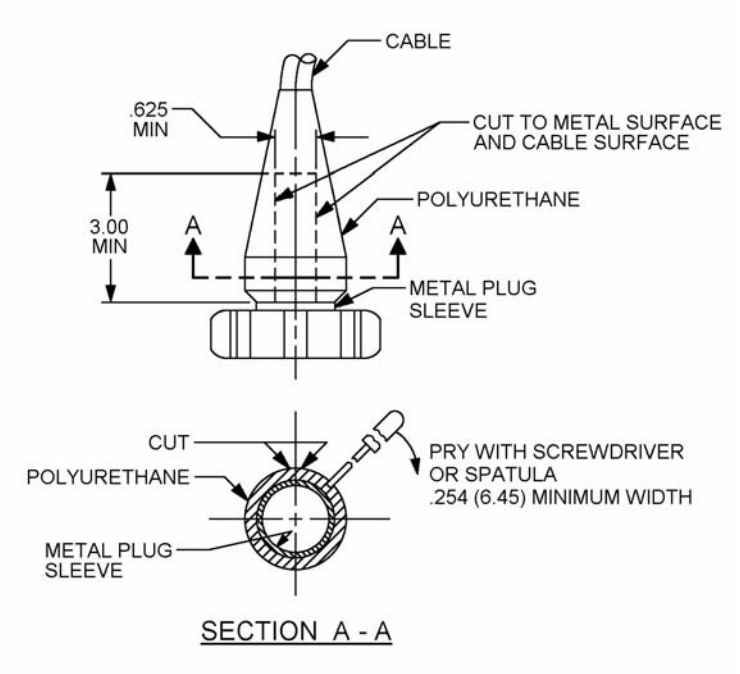


NOTE: Use round edge probe (rigid plastic or metal) with no sharp edges or corners, do not use screwdriver.

FIGURE 2. Nondestructive bond test.

4.6.18.2 Destructive (see 3.6.17.2). The destructive bonding test shall be conducted on the assembly in a fully cured condition as determined by checking the durometer and shall be tested with a sharp knife, making two 15.9 mm (.625 inch) and 76.2 mm (3 inches) long as shown on figure 3. Cut to metal surface and cable surface. Place a screwdriver or spatula (minimum width of 6.25 mm (.250 inch)) approximately midway between the polyurethane surface and the metal sleeve surface in one of the cuts as shown on figure 3. Pry back the polyurethane material in this manner until the polyurethane breaks or the bond releases. Repeat this probing process along the 76.2 mm (3 Inch) cut. If necessary, use pliers to pull polyurethane compound as determined by the durometer tests of both inside and outside surfaces.

4.6.19 Outgassing (see 3.6.18). The cable assembly outgassing characteristics shall be determined in accordance with ASTM E595 test method.



mm	Inches
.254	6.45
.625	15.88
3.00	76.2

NOTES:
1. Dimensions are in metric.
2. Standard measurements are given for general information only.

FIGURE 3. Destructive bond test.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Service or Defense Agency, or within the Military Service's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The fiber optic cable assemblies described in this specification are intended for use in Army Tactical and Long Haul Communications Systems; similar Navy and Air Force Communications Systems.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.

b. Title, number, and date of the applicable specification sheet and the complete PIN (see 1.2).

c. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1).

d. Special wiring requirements.

e. Length of cable assembly required.

6.3 First article. When a first article inspection is required, the fiber optic cable assemblies should be a first article sample. The first article should consist of six units. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract.

6.4 Isopropyl alcohol. TT-I-735 has provided satisfactory results when utilized in the past.

6.5 Hydraulic fluid. MIL-PRF-5606 has been utilized successfully in the past.

6.6 Definitions.

6.6.1 Cable boot (see 3.4.3). The molded or vulcanized member of a cable assembly forming the seal between the fiber optic cable and the fiber optic connector.

6.6.2 Crosstalk (see 3.6.3). Crosstalk, as used herein, refers to unwanted, coupled optical energy from an optical circuit (the active channel) into another optical signal circuit or group of signal circuits (the passive channels). The purpose of this requirement is to ensure that the circuits of the device in question have adequate optical channel Isolation.

6.6.3 Fiber optic cable (see 3.4.2). A single fiber or group of optical fibers enclosed by a common protective jacket and usually including an Aramid strength member.

6.6.4 Fiber optic cable assembly (see 3.4.1 and 3.4.2). A fiber optic cable with connector plugs or receptacles connected and sealed to each end of the cable.

6.6.5 Insertion loss test (see 3.6.1). Insertion loss, as used herein, is the total optical signal power loss in an optical circuit. The purpose of this test is to confirm the device does not excessively attenuate the optical signal.

6.7 Subcontracted material and parts. The preparation for delivery requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.8 Subject term (key word) listing.

Cable assembly
Cable boot
Fiber optic
Insertion loss
Nonpressure proof
Optical cable

6.9 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. Table VIII lists the Environmental Protection Agency (EPA) top seventeen hazardous materials targeted for major usage reduction. Use of these materials should be minimized or eliminated unless needed to meet the requirements specified herein (see section 3).

TABLE VIII. EPA top seventeen hazardous materials.

Benzene	Dichloromethane	Tetrachloroethylene
Cadmium and Compounds	Lead and Compounds	Toluene
Carbon Tetrachloride	Mercury and Compounds	1,1,1 - Trichloroethane
Chloroform	Methyl Ethyl Ketone	Trichloroethylene
Chromium and Compounds	Methyl Isobutyl Ketone	Xylenes
Cyanide and Compounds	Nickel and Compounds	

6.10 Changes from previous issue. Marginal notations are not used in this revision to identity changes with respect to the previous issue due to the extent of the changes.

Custodians:
Army - CR
Navy - SH
Air Force - 11
DLA - CC

Review activities:
Army - AR, AV, MI
Navy - AS, CG, EC, MC
Air Force - 99

Preparing activity:
DLA - CC

(Project 6020-0006)

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using ASSIST Online database at http://assist.daps.dla.mil.