MILITARY SPECIFICATION

CONNECTORS, FIBER OPTIC, CIRCULAR, PLUG AND RECEPTACLE STYLE, MULTIPLE REMOVABLE TERMINI, GENERAL SPECIFICATION FOR

This amendment forms a part of MIL-C-28876D, dated 9 July 1992, and is approved for use by all Departments and Agencies of the Department of Defense.

PAGE 3

3.3.1, first sentence: Delete "connectors" and substitute "connectors, backshells, and accessory hardware."

3.3.1, last sentence: Delete "is being considered" and substitute "are being considered".

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3.3.2.b: Delete "Stainless steel components, passivate in accordance with QQ-P-35" and substitute "Unless otherwise specified (see 3.1), all exposed corrosion resistant steel parts of the connector, backshell, and accessory hardware shall be passivated in accordance with QQ-P-35."

3.3.4: Delete "connectors" and substitute "connectors, backshells, and accessory hardware".

3.3.5: Delete in its entirety.

3.3.5.2: Delete "terminus cleaning procedure with each connector" and substitute "connector cleaning procedure with each connector".

3.3.7: Delete in its entirety.

3.3.8, first sentence: Delete "connectors" and substitute "connectors, backshells, and accessory hardware". In second sentence: Delete "connector" and substitute "connector, backshell, or accessory hardware".

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After 3.4.1, add:

"3.4.2 <u>Sealing</u>."

3.5: Delete and substitute:

"3.5 <u>Connectors (receptacles, plugs, inserts, backshells, and insert retention nuts)</u>."

3.5.1.3, first sentence: Delete "rear of plug" and substitute "the rear of the plug."

3.5.1.3: Delete the last two sentences and substitute:

"If the coupling threads must be lubricated to meet the requirements contained herein, the lubricant shall meet all of the requirements specified herein (see 3.3.1)."

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3.5.1.4: Delete in its entirety and substitute:

"3.5.1.4 Plug and receptacle shell polarization (keying). Polarization keying shall be incorporated in the shells of plugs and receptacles to assure correct alignment of the inserts before mating is permitted. The polarization shall be accomplished by integral keys (see figure 6) in the shells. The keying shall be designed to prevent physical contact of the mating optical termini, or of the termini with the insert surface of the counterpart connector until the keyways are properly aligned for engagement and coupling mechanisms are engaged."

3.5.2: Delete in its entirety and substitute:

"3.5.2 Termini. Removable, environment resisting, butt mating, crimp, or epoxy type fiber optic termini shall be used with these connectors for interconnecting fiber optic cables. The termini are not supplied with connectors acquired to this specification. Termini, for use with the connectors specified herein, shall be in accordance with MIL-T-29504 (see 3.1)."

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Figure 1, note 2: Delete "M28876/15 ceramic" and substitute "M29504/15 ceramic".

3.5.3.2: Delete the first sentence in its entirety and substitute:

"Optical terminus insertion shall be accomplished by inserting the terminus, using a terminus insertion tool, into the rear of the connector insert. A means for locking the terminus in place shall be provided."

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Add at top of page:

"3.5.4 Assembly instructions. Upon qualification, the manufacturer shall provide to the qualifying activity the recommended assembly instructions for each qualified connector or backshell."

3.6: Delete in its entirety and substitute:

"3.6 Backshells and insert retention nuts."

After 3.6, add as new paragraphs:

"3.6.1 Backshells. Backshells shall conform to the requirements as specified (see 3.1). The backshells shall be provided with cable strain relief as specified (see 3.1). The backshells shall be free of any sharp edges or other configurations that could cause damage to optical fibers extending through them.

"3.6.2 Insert retention nuts. Insert retention nuts shall conform to the requirements as specified (see 3.1). The insert retention nuts shall be provided without cable strain relief as specified (see 3.1). The insert retention nuts shall be free of any sharp edges or other configurations that could cause damage to optical fibers extending through them."

3.7, first sentence: Delete "a throwaway protective cap or cover" and substitute "throwaway caps or covers".

3.10.3, first sentence: Delete "0.040 inch" and substitute "1.0 mm (.04 inch)".

3.10.3.3: Delete "Serial number" and substitute "2 to 5 character alpha-numeric".

3.10.3.3: Delete "backshell nut" and substitute "insert retention nut".

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3.10.4, first sentence: Delete "in accordance with the high grade fiber optic connector manufacturing practice" and substitute "as specified herein".

3.10.4, second sentence: Delete "Connectors" and substitute "Connectors, backshells,".

3.10.6: Delete in its entirety.

3.10.7: Delete in its entirety.

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3.10.8: Delete in its entirety.

3.11.2, second sentence: Delete "of strength" and substitute "in optical transmittance".

3.11.3: Delete "devices" and substitute "connectors".

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3.12.2, second sentence: Delete "22.0 pounds" and substitute "10.0 kg (22.0 pounds)".

3.12.3, first sentence: Delete "22.0 pounds" and substitute "10.0 kg (22.0 pounds)".

3.12.4, first sentence: Delete "100 pounds per square inch" and substitute "0.69 MPa (100 pounds per square inch)".

Table II: Delete in its entirety and substitute:

Connector shell size	Maximum radial torque (N-m (inch-pounds))
11	1.7 (15)
13	2.3 (20)
15	2.8 (25)
23	3.4 (30)

3.12.6: Delete in its entirety and substitute:

" 3.12.6 Cable retention (connectors with backshells only). When tested in accordance with 4.8.6, the minimum cable to connector pullout strength shall be 73.5 kg (162 pounds). There shall be no evidence of cable jacket damage, cable strain relief failure, cable to backshell seal damage, distortion or bending of metallic connector parts, or cable disengagement from the cable strain relief. The connector shall meet the requirements of 3.11.4 during and after the test."

3.12.7: Add "(connectors with backshells only)" at the end of the title.

3.12.7: Delete "connectors" and substitute "connectors and backshells".

3.12.8, title: Delete "Coupling" and substitute "Connector coupling".

Table III: Delete in its entirety and substitute:

Connector shell size	Connector coupling engagement and disengagement torque (N-m (inch-pounds))
11	1.5 (13)
13	1.7 (15)
15	1.9 (17)
23	2.1 (19)

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PAGE 10

3.12.9, title: Delete in its entirety and substitute "Temperature ranges".

Table IV: Delete in its entirety and substitute:

"TABLE IV. Temperature range.

Operating extremes (°C)	Storage extremes (°C)	Non-operating Extremes (°C)
-28 to +65	-40 to +70	-40 to +70

3.12.11, third sentence: Delete "22.0 pounds (see 3.11.2)" and substitute "10.0 kg (22.0 pounds) (see 3.12.2)".

3.12.15: Delete in its entirety and substitute:

" 3.12.15 Backshell and insert retention nut attachment. When tested in accordance with 4.8.14, the minimum backshell or insert retention nut disengagement torque shall be as specified in table III. No evidence of excessive thread binding, seal pinching, or any contamination buildup shall be observed."

PAGE 12

3.13.10: Delete "and shall have insertion losses and coupling torques within the requirements of 3.11.4 during and after the test, and 3.12.8 after the test" and substitute "and shall have insertion losses within the requirements of 3.11.4 during and after the test, and coupling torques within the requirements of 3.12.8 after the test".

3.13.14: Delete in its entirety.

PAGE 13

4.4.1: After the first sentence, add the following:

"The parts submitted for qualification shall be selected from units produced on typical manufacturing lines."

4.4.1.1, second sentence: Delete "strain reliefs" (2 places) and substitute "backshells" (2 places).

4.4.1.2, fourth sentence: Delete "cable clamp".

Add as a new paragraph, 4.4.1.2.1:

"4.4.1.2.1 Termini. The minimum number of active termini required for testing for each shell size shall be as follows: A minimum of two termini shall be active in connectors of shell size 11. A minimum of four termini shall be active in connectors of shell sizes 13 and 15. A minimum of 8 termini shall be active in connectors of shell size 23. For shell sizes 15 and 23, the active termini shall be placed at different locations in each of the six samples."

4.4.2: Delete the second sentence in its entirety and substitute:

"Manufacturers desiring qualification for only backshells or dust covers shall, at a minimum, test connectors as specified in 4.4.1 in those tests indicated in table V."

Table V, Group II: Move "Insert retention axial strength" and "Insert retention radial strength" to bottom of table after "Temperature humidity cycling."

Table V: Delete "See footnote at end of table."

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Table V: Insert an "x" in the "Dust cover" column of the "Coupling engagement and disengagement torque" row.

Table V: Delete "Coupling engagement and disengagement torque" and substitute "Connector coupling engagement and disengagement torque"

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Table V: Delete the "x" in the "Dust covers" column of the "Backshell and dust cover attachment" row.

Table V: Delete "Backshell and dust cover attachment" and substitute "Backshell and insert retention nut attachment".

Table V: Insert an "x" in the "Backshell" column of the "Vibration" and "Shock" rows.

PAGE 15

4.4.5, third sentence: Delete "the same shell size" and substitute "the same shell size and design".

4.5.1.1: Delete "connectors" and substitute "units".

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Table VI: Delete the "x" in the "Dust covers" column of the "Backshell and dust cover attachment" row.

Table VI: Delete "Backshell and dust cover attachment" and substitute "Backshell and insert retention nut attachment".

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Table VII: Insert an "x" in the "Dust cover" column of the "Coupling engagement and disengagement torque" row.

Table VII: Delete "Coupling engagement and disengagement torque" and substitute "Connector coupling engagement and disengagement torque".

Table VIII: Add the following at the end of the "group II" test sequence:

Insert retention radial strength	x			3.12.5	4.8.5

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4.5.3.1.1, fourth sentence: Delete "strain relief cable clamp" and substitute "or insert retention nut".

PAGE 19

4.7.1.2, first sentence: Delete in its entirety and substitute "The connector shall be tested in accordance with EIA-455-32 using test equipment having a time resolution sufficient to resolve discontinuities of duration not less than 50 μs."

4.7.1.3: Delete "EIA-455-42)" and substitute "EIA-455-42".

PAGE 20

4.8.4, third sentence: Delete "100 pounds psi" and substitute "0.69 MPa (100 pounds per square inch)".

4.8.7, fifth sentence: Delete "300 inch-pounds" and substitute "33.9 N-m (300 inch-pounds)".

4.8.7, sixth sentence: Delete "(see figure 1)" and substitute "(see figure 2)".

4.8.8, title: Delete "Coupling engagement and disengagement torque" and substitute "Connector coupling engagement and disengagement torque".

4.8.11, fourth sentence: Delete "11.0 pounds" and substitute "5.0 N (11.0 pounds)".

4.8.12: Add the following after the first sentence:

"The assemblies shall be visually inspected in accordance with 4.6 after the test."

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4.8.14, title: Delete "and dust cover" and substitute "and insert retention nut".

4.8.14: Add the following after the first sentence:

"The torque required to remove the backshell or insert retention nut shall be measured on the last unmating."

4.8.15: Add the following after the third sentence:

"The connector shall be visually examined in accordance with 4.6 after the test."

PAGE 22

4.8.16, first sentence: Delete "Connectors" and substitute "Mated connectors".

4.8.16, third sentence: Delete "shall be 10" and substitute "shall be 5".

4.8.16: Add the following after the fourth sentence:

"The connector shall be visually examined in accordance with 4.6 after the test."

Table X: Fluid column, after "Turbine fuel," delete "JP-4" and substitute "JP-4 and JP-5."

Table X: Applicable specification column, delete "MIL-H-5606" and substitute "MIL-H-5606 and MIL-H-17672."

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4.9.3: Add the following after the third sentence:

"For connectors of shell sizes 15 and 23, a minimum of four terminal shall be monitored for discontinuity. The connector shall be visually examined in accordance with 4.6 after the test."

4.9.4: Add the following after the fourth sentence:

"For connectors of shell sizes 15 and 23, a minimum of four terminal shall be monitored for discontinuity. The connector shall be visually examined in accordance with 4.6 after the test."

4.9.6, first sentence: Delete "immersed in water to an equivalent depth of 32 feet" and substitute "immersed in fresh water to an equivalent depth of 9.8 m (32 feet)".

4.9.6, third sentence: After "cleaned, unmated," add "the backshell removed,".

4.9.7: Delete the second sentence in its entirety.

4.9.7, fourth sentence: Delete "moderate service class" and substitute "the eight highest drops specified for the moderate service class".

4.9.7: Delete the sixth sentence and substitute:

"The connector terminal may be cleaned after exposure and prior to mating."

4.9.8, title: Delete "(see 3.12.8)" and substitute "(see 3.13.8)".

4.9.8: Add the following after the third sentence:

"For the unmated connector assembly, the connector terminal may be cleaned after exposure and prior to mating."

4.9.8, third sentence: Delete "after the test" and substitute "during and after the test".

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4.9.10: Delete in its entirety and substitute:

"4.9.10 Sand and dust (see 3.13.10). Mated cable connector assemblies shall be tested in accordance with method 110 of MIL-STD-202. The change in optical transmittance shall be measured after the test (see 4.7.1.4). The connector shall be visually examined in accordance with 4.6 and the connector coupling engagement and disengagement torque (see 4.8.6) shall be measured after the test. The connector shall be visually examined in accordance with 4.6 after the test."

PAGE 24

4.9.12, second sentence: Delete "three-fourths" and substitute "19 mm (0.75 in)".

4.9.12, fourth sentence: Delete "one and one-half" and substitute "38.1 mm (1.50 in)".

4.9.12, fourth sentence: Delete "backshell-strain relief" and substitute "backshell-cable".

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4.9.14: Delete in its entirety.

PAGE 26

6.4.1: Delete the first sentence in its entirety and substitute:

"The backshell attaches to the rear of the connector shell, provides for environmental sealing of the connector, and provides for cable strain relief. The backshell also holds the connector insert in position within the connector shell."

6.4.2: Delete in its entirety and substitute:

"6.4.2 Connector. The connector is the entire cable termination assembly and is composed of the connector shell, connector insert, and backshell or insert retention nut."

6.4.4: Delete in its entirety and substitute:

"6.4.4 Insert. The insert is the interior portion of the connector which holds and align the optical termini."

6.4.5: Delete in its entirety and substitute:

"6.4.5 Insert retention nut. The insert retention nut attaches to the rear of the connector shell and holds the connector insert in position in the connector shell when the connector is used without a backshell."

6.4.11: Delete in its entirety and substitute:

"6.4.11 Shell. The shell is the front portion of the connector which holds the connector insert and contains the connector coupling mechanism. Shells are either of the plug or receptacle configuration."

PAGE 30

Figure 4, note 5. Delete "shown on figure 5" and substitute "shown on figure 6".

Figure 4, note 7. Delete "strain relief hardware and is shown on figure 8" and substitute "backshell is shown on figure 9".

Figure 4. Add the following note:

"10. See figures 10 and 11 for backshell and insert retention nut mating dimensions."

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Figure 5, note 7. Delete "strain relief hardware and is shown on figure 8" and substitute "backshell is shown on figure 9".

Figure 5, note 9. Delete "appropriate plug outer" and substitute "appropriate receptacle outer".

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Figure 5: Add the following note:

"10. See figures 10 and 11 for backshell and insert retention nut mating dimensions."

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Figure 9, title: Delete "Connector" and substitute "Connector shell".

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Figure 9, note 5: Delete "strain relief assembly" and substitute "backshell".

Figure 9: Add the following notes:

"6. When properly seated, the rear of the connector insert to be 0.272 ±0.020 from rear of connector shell.
7. Minimum inside diameter of connector back end shall be 10.46 mm (.412 in) for shell size 11, 13.56 mm (.534 in) for shell size 13, 18.08 mm (.712 in) for shell size 15, and 28.40 mm (1.118 in) for shell size 23"

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Figure 10: Delete the dimensioning arrows for the "K" dimension.

Figure 10, title: Delete "strain relief assembly" and substitute "backshell".

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Figure 10, note 5: Delete "strain relief assembly" and substitute "backshell".

Figure 10: add the following notes:

"6. Backshell insert retention hardware not shown. The backshell shall prevent the connector insert from moving rearward during connector mating. See Figure 9 for proper rear position of connector insert.
7. K dimension is the width of the spline key."

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Figure 11, table: Delete "U thread class 2B" and substitute "M thread class 2B".

Figure 11, add the following note:

"5. Insert retention nut insert retention hardware not shown. The insert retention nut shall prevent the connector insert from moving rearward during connector mating. See Figure 9 for proper rear position of connector insert."

Figure 11, title: Delete "strain relief assembly" and substitute "Insert retention nut".

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Delete "CONCLUDING MATERIAL" and substitute as printed herein.

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CONCLUDING MATERIAL

Custodians:
Army - CR
Navy - SH
Air Force - 85
NASA - NA

Review activities:
Army - MI
Navy - AS, MC, OS, YD
Air Force - 13, 14, 17, 19, 80, 90, 99
DLA - ES

Preparing activity:
Navy - SH

Agent:
DLA - ES

(Project 6060-0115)

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