

INCH-POUND

MIL-C-29600
AMENDMENT 3
6 August 1999
SUPERSEDING
AMENDMENT 2
4 May 1990

MILITARY SPECIFICATION

CONNECTORS, ELECTRICAL, CIRCULAR, MINIATURE, COMPOSITE,
HIGH DENSITY, QUICK COUPLING, ENVIRONMENT RESISTANT, REMOVABLE
CRIMP CONTACTS ASSOCIATED HARDWARE, GENERAL SPECIFICATION FOR

This amendment forms a part of MIL-C-29600, dated 20 December 1989, and is approved for use by all Departments and Agencies of the Department of Defense.

PAGE 2

* 1.3.1c: Delete and substitute:

“1.3.1c Class: R - Environment resisting - conductive shell, EMI shielded.
E - Environment resisting - conductive or nonconductive shell, non-EMI shielded.
G - Environment resisting - conductive shell, EMI shielded, space grade.”

PAGES 4, 5, AND 6

* 2.1 Military Specifications: Add “MIL-PRF-8516 Sealing Compound, Synthetic Rubber, Electric Connectors and Electric Systems, Chemically Cured,” “MIL-I-16923 Insulating Compound, Electrical, Embedding, Epoxy,” “MIL-PRF-23586 Sealing Compound (With Accelerator), Silicone Rubber, Electrical,” “MIL-M-24041 Molding and Potting Compound, Chemically Cured, Polyurethane,” “MIL-I-81550 Insulating Compound, Electrical, Embedding, Reversion Resistant Silicone,” “MIL-C-85049 Connector Accessories, Electrical General Specification For.” Delete “MIL-G-45204 Gold Plating, Electrodeposited.” Federal Standards: Delete “QQ-S-571 Solder, Electronic (96 to 485 °C),” Military Standards: Delete “MIL-STD-105 Sampling Procedures and Tables For Inspection By Attributes,” “MIL-STD-454 Standard General Requirements For Electronic Equipment,” “MIL-STD-1373 Screw-Thread, Modified 60° Stub, Double,” “MIL-STD-45662 Calibration Systems Requirements,” and “MS9068 Packing, Preformed - AMS 3304, O Ring (ASG).”

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PAGE 6

* 2.2: Before listing of American Society for Testing and Materials documents add the following:

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI - Z540.1 - Laboratories, Calibration and Measuring and Test Equipment.
(DoD adopted)

(Application for copies should be addressed to the American National Standards Institute,
11 West 42nd Street, New York, NY 10036.)

AMERICAN SOCIETY FOR QUALITY CONTROL (ASQC)

ASQC-Z1.4 - Procedures, Sampling, and Tables for Inspection by
Attributes (DoD adopted).

(Application for copies should be addressed to the American Society for Quality Control,
P.O. Box 3005, 611 East Wisconsin Avenue, Milwaukee, WI 53201-4606.)

* 2.2: American Society for Testing and Materials document list, add the following:
“ASTM-B488 Gold for Engineering Uses, Electrodeposited Coatings of (DoD adopted). “Also,
change the paragraph after the ASTM list to read: “(Application for copies should be addressed to
the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA
19428-2959.)”

* 2.2: Before listing of Society of Automotive Engineers documents add the following:

THE INSTITUTE FOR INTERCONNECTING AND PACKAGING
ELECTRONIC CIRCUITS (IPC, INC.)

J-STD-006 - Requirements for Electronic Grade Soldering Alloys and
Fluxed and Non-Fluxed Solders for Electrical Soldering
Applications.

(Application for copies should be addressed to the Institute for Interconnecting and
Packaging Electronic Circuits (IPC, Inc), 7380 North Lincoln Avenue, Lincolnwood,
IL 60646-1776.)

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- * 2.2: At the beginning of the beginning of the Society of Automotive Engineers document list, add: "SAE-AS3582 Packing Preformed O-ring Seal AMS 3304."

PAGE 8

- * 3.3.1.2: Delete first sentence and substitute: "Encapsulation and embedment materials shall be selected from the following specifications: MIL-PRF-8516, MIL-I-16923, MIL-PRF-23586, MIL-M-24041, and MIL-I-81550. The materials selected shall be capable of filling all voids and spaces around the items enclosed. For Air Force applications use of materials other than transparent silicone in accordance with MIL-I-81550 requires procurement activity approval."

- * 3.3.2a: Delete last sentence and substitute: "Use of regrind material requires the connector manufacturer to demonstrate to the qualifying activity that the regrind process does not jeopardize the intended use of the connector and the material meets the characteristics, properties, and capabilities of virgin material."

- * 3.3.4: Delete first sentence and substitute: "Materials used in the construction of these connectors shall be fungus inert (see 4.1.3)."

PAGE 9

- * 3.4.1, First sentence, delete and substitute: "Contacts shall be designed for crimp termination and shall be as specified in MIL-C-29600/24, MIL-C-39029/106 or /107. Third sentence, delete and substitute: "However, when the latter group of MIL-C-39029 contacts are used, the durability level of the connector system shall be 500 cycles."

PAGE 10

3.4.3.2, line 3, After "MS27488" add "and MIL-C-85049/80."

PAGE 11

- * 3.4.4.2. Line 3: Delete "MS9068" and substitute "SAE-AS3582."

- * 3.4.4.3, Delete and substitute:

"3.4.4.3. Screw threads. Design of screw threads shall use FED-STD-H28 as a reference. Composite threads shall be checked with ring gages made to the worst case dimensions. Slight out-of-roundness beyond the specified tolerances is acceptable if threads can accept the go gages without forcing, and meet the minimum torque values of paragraph 3.39 for accessory thread strength."

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PAGE 12

- * 3.4.6, line 2: Delete “any” and substitute “the”. At the end of the paragraph add: “After filling, the grommet shall be in accordance with figure 5 or 10.”

PAGE 14

3.16, second paragraph: Delete.

PAGE 15

- * 3.24, title: Delete “Conductivity” and substitute “Conductivity (classes R and G only).”

- * 3.24.1: Delete and substitute:

“3.24.1 Shell-to-shell conductivity. When tested as specified in 4.6.19.1 the maximum measured resistance between the two connectors shall be 6.0 milliohms for shell sizes 17 and larger and 10 milliohms for sizes 15 and smaller. The test probes shall not puncture or damage the connector finish.”

- * 3.24.2: Delete.

3.24.3: Renumber as 3.24.2.

- * 3.27: Delete and substitute the following:

“3.27 EMI shielding (classes R and G only). When tested as specified in 4.6.22.1 and 4.6.22.2 the EMI shielding capabilities of mated shells shall be not less than that specified in table V at the specified frequencies.”

PAGE 16

- * Table V: Delete “class R” and substitute “classes G and R.”

PAGE 18

- * 4.1.1, line 6: Delete “MIL-STD-45662” and substitute “ANSI-Z540.1.”

PAGE 19

- * 4.4.1.1a: Delete the last four sentences and substitute the following: “One small, one medium, and one large shell size connector shall be exposed to all of the table VIII, group 1 tests

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except for plating adhesion (thermal shock). The other small, medium, and large size connectors shall be exposed to all table VIII, group 1 tests except for plating adhesion (solder pull).”

PAGE 20

4.4.1.1e: Delete and substitute:

4.4.1.1e: Connectors supplied for the tests of table VIII, group 9, shall consist of twelve mating pairs, straight plugs, and wall mounting receptacles, of a medium shell size, in any representative insert and shell size arrangement. In addition, 12 elastomeric o-rings, separate from the connectors, shall be tested. One o-ring per test fluid.

* 4.4.1.1f: Delete and substitute:

4.4.1.1f: Connectors supplied for the tests of table VIII, group 10, shall consist of a sufficient quantity to subject 20 contact cavities of each size to each immersion fluid specified.

4.4.1.1: Add the following new subparagraph:

4.4.1.1g: Unplated connectors supplied for the tests of table VIII, group 11, shall consist of one small, one medium, and one large mated pair. No insert is required.

PAGE 21

* Table VIII, group 1: Delete “Durability (first 50 cycles) (see 4.6.10),” and requirement paragraph “3.10” and test paragraph “4.6.5.” Delete “* Salt spray (2000 hours)” and test paragraph “4.6.10.1” and substitute “Salt spray” and test paragraph “4.6.10.” Delete “Salt spray (acetic acid) (500 hours)” and requirement paragraph “3.15” and test paragraph “4.6.10.2.” Delete “Durability (remaining 1450 cycles) (see 4.6.10)” and requirement paragraph “3.10” and test paragraph “4.6.5”. In two places, delete “Contact retention” and requirement paragraph “3.20” and test paragraph “4.6.15.” Delete “*” before “Altitude immersion.”

PAGES 21 AND 22

* Table VIII, group 2: After “High temperature exposure,” delete “Insulation resistance (elevated temperature)” and requirement paragraph “3.12.2” and test paragraph “4.6.7.2.” After Humidity, delete “Insulation resistance (ambient temperature)” and requirement paragraph “3.12.1” and test paragraph “4.6.7.2.”

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PAGE 23

* Table VIII, group 5: Delete “Durability,” and requirement paragraph 3.10 and test paragraph “4.6.5.” Delete “Salt spray (acetic acid) (500 hours),” and test paragraph “4.6.10.2,” and substitute “Salt spray,” and test paragraph “4.6.10.” Add “(classes G and R only)” to “EMI shielding effectiveness” inspection.

PAGE 24

* Table VIII, groups 8 and 9: Delete “Elastomeric o-ring conductivity,” and requirement paragraph “3.24.2” and test paragraph “4.6.19.2,” and substitute, “Shell to shell conductivity” and requirement paragraph “3.24.1” and test paragraph “4.6.19.1.”

PAGE 25

* Table IX, minimum diameter column: Delete “-22” and substitute “-24.”

PAGE 26

* 4.4.2.1: Delete and substitute

“4.4.2.1 Group C inspection (periodic tests). Periodic tests shall be performed on a 12-month and 24-month basis, beginning with the 12-month periodic test. These tests shall be accomplished within this period after notification of qualification and alternating thereafter with the 24-month periodic test. Samples submitted to either of these periodic tests shall have passed groups A and B inspections.”

* Add as new paragraphs:

“4.4.2.1.1 Twelve month periodic test. The following tests shall be performed:

a. Two mated connectors, one series A in a -35 arrangement and one series B in an arrangement with size 23 contacts, of the largest shell size in regular production shall be subjected to the humidity test in accordance with 4.6.20.

b. One mated pair of any representative shell size for each contact size qualified shall be subjected to the high temperature exposure with contact loading test in accordance with 4.6.28 for 250 hours.

c. Two mated connectors of any representative size and arrangement, one pair being subjected to each of the specified fluids conduct the fluid immersion test in accordance with 4.6.24, except that the fluids shall be:

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- (1) MIL-PRF-5624, JP-5
Test fluid c, Method 1016, MIL-STD-1344.
- (2) Test fluid b, Method 1016, MIL-STD-1344.

d. One receptacle shell and one plug shell with coupling ring, of any small and large shell size of each finish style qualified, conduct the salt spray test in accordance with 4.6.10.

4.4.2.1.2 Twenty-four month periodic tests. Every 24 months, mating connector sample units shall be selected and tested in accordance with the following:

a. For each series qualified, two mated plugs and receptacles from each shell size range and having each service rating represented shall be provided. Three mated plugs and receptacles shall be provided if a manufacturer has qualified only one series. The three shell size ranges are small (size 8 through 13), medium (size 14 through 19), and large (size 20 through 25). One mated pair from each shell size range shall be fully wired with the maximum wire listed in table IX and subjected to the applicable tests of table VIII, group I. The remaining samples shall be fully wired with the minimum wire listed in table IX and subjected to the applicable tests of table VIII, group 2.

b. One mating pair from each shell size range shall be subjected to the impact test in accordance with 4.6.33.

* Change the following paragraph numbers:

Delete "4.4.2.1.1" substitute "4.4.2.1.3"
Delete "4.4.2.1.2" substitute "4.4.2.1.4"
Delete "4.4.2.1.3" substitute "4.4.2.1.5"

PAGE 27

* 4.5.2.1, lines 2 and 3: Delete "MIL-STD-105" and substitute "ASQC-Z1.4."

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* 4.6.3, line 2: Add "test condition A of" before "Method 1003."

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- * 4.6.10, 4.6.10.1 and 4.6.10.2: Delete and substitute:

“4.6.10 Salt Spray (corrosion). The wired, assembled plugs and receptacles shall be mated and unmated 50 cycles at a rate that shall be not greater than 300 cycles per hour. The mating and unmating shall be accomplished so that the plug and receptacle are completely separated during each cycle. The connectors shall then be subjected to the salt spray test in accordance with Method 1001 of MIL-STD-1344. The following details and exceptions shall apply (see 3.15):

a. For initial qualification, the connectors shall be tested for 1952 hours mated followed by 48 hours unmated. For the periodic tests, the connectors shall be tested for 452 hours mated followed by 48 hours unmated.

b. The connectors shall not be mounted but shall be suspended from the top of the chamber using waxed twine or string, glass rods or glass cord.

c. Wire ends shall be protected to prevent salt migration.

d. After the salt spray exposure, the remaining 1450 durability cycles as specified in 4.6.5 shall be completed.”

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- * 4.6.17: Add the following to the end of the paragraph, “Connectors shall not be torqued beyond the maximum coupling in table III.”

- * 4.6.17.1, 4.6.17.2 and 4.6.17.3: Add “(series A only)” to the end of the paragraph titles.

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- * Add as new paragraph:

“4.6.17.4 Vibration (series B only). Connectors shall be vibrated in accordance with Method 2005, test condition IV of MIL-STD-1344. In addition, the vibration shall be conducted at the low temperature extreme of $-65 \pm 0/-3$ °C, and the high temperature extreme of $175 \pm 3/0$ °C. The duration of vibration at the extreme temperatures shall be 25 percent of the duration specified for the standard temperature condition.”

- * 4.6.19: Delete title “Conductivity” and substitute “Conductivity (classes R and G only).”

- * 4.6.19.2: Delete.

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- * 4.6.19.3: Renumber as 4.6.19.2. In title delete “3.24.3” and substitute “3.24.2.”

PAGE 36

- * 4.6.22: Add “(class R and G only).” to the end of the paragraph title. Add to the following to the end of the paragraph: “Connectors shall not be torqued beyond the maximum coupling torque specified in table III.”

- * 4.6.22.2: Delete and substitute:

4.6.22.2 EMI Shielding effectiveness (from 1 to 10 GHZ). Preparation of samples, and measurements of the EMI shielding effectiveness of mated connectors shall be in accordance with the mode stirred technique specified in Method 3008 of MIL-STD-1344 (see 3.27).

PAGE 38

4.6.24.1, line 4: Delete “(this includes time from fluid immersion, 4.6.24).”

PAGE 39

- * 4.6.32.1, line 2: Delete “QQ-S-571” and substitute “J-STD-006.”

PAGE 41

- * 4.6.36.2: Add the word “Unplated” at the beginning of the paragraph.

- * 5.1: Delete and substitute:

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department'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.

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- * 6.3 and 6.3a: Delete 6.3a and add the following to the end of paragraph 6.3: “Information pertaining to the qualification of products may be obtained from the Naval Air Warfare Center

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Aircraft Division Patuxent River, Code 4.4.4, Building 1461, 48256 Shaw Road, Unit 4,
Patuxent River, MD 20670.”

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* Figure 1: Delete “.035/.025” and substitute “0.045/0.025.” Delete “.564/.556” and substitute “0.564/0.549.” Delete “.465 min” and substitute “.450 min.” Delete “.188/.175” and substitute “0.188/0.167.” Delete “.0145/.0045” and substitute “0.023/0.005.” Delete “.125/.105” and substitute “0.135/0.105.” Delete “.035/.025R” and substitute “0.035R max.” Delete “31°/29°” and angled construction line from side view of the connector. Detail N: Insert “1” after detail N and add the following footnote: “1 Front configuration I.D. and O.D. optional chamfer and radius to facilitate mating.”

PAGE 45

* Figure 1, dimension table: JØ tolerance, delete “± .0025” and substitute “± 0.003.” KØ tolerance, delete “± .0045” and substitute “± 0.0050.” Note 7, Line 3: Delete “MS9068” and substitute “SAE-AS3582.”

PAGE 46

* Figure 2: Delete “.160/.130” and substitute “0.160/0.125.” Delete “.100 max” and substitute “0.102 max” Delete “.390/.375” and substitute “0.392/0.375.” Detail H: Delete “36°/34°” and substitute “37°/33°.” Delete “.029/.023” and substitute “0.030/0.015.” Delete “.006/.003R” and substitute “0.003R min.” Delete “.035/.025R” and substitute “0.02R min.”

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* Figure 5: Delete Figure 5 and substitute attached Figure 5.

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PAGE 52

* Figure 5, dimension table: Delete and substitute:

Shell size	A° Bsc	B	C	D Thread	EØ	F Min	GØ Max	H	J Min	K Min
9	20	0.051 0.046	0.430 0.424	.500-28UNEF-2A	0.462 0.454	0.257	0.439	0.157 0.127	0.107	0.237
11	15	0.049 0.044	0.555 0.549	.625-28UN-2A	0.587 0.579		0.564			
13	12	0.048 0.043	0.676 0.670	.750-28UN-2A	0.708 0.700		0.685			
15	12	0.054 0.049	0.805 0.799	.875-28UN-2A	0.837 0.829		0.814			
17	10	0.053 0.048	0.930 0.924	1.000-28UN-2A	0.962 0.954		0.939			
19	9	0.053 0.048	1.055 1.049	1.125-28UN-2A	1.087 1.079		1.064			
21	9	0.059 0.054	1.180 1.174	1.250-28UN-2A	1.212 1.204	0.276	1.189	0.158 0.128	0.108	0.263
23	9	0.062 0.057	1.305 1.299	1.375-28UN-2A	1.337 1.329		1.314			
25	9	0.069 0.064	1.430 1.424	1.500-28UN-2A	1.462 1.454		1.439			

Notes:

1. Dimensions are in inches unless otherwise specified.
2. Dimensions apply after plating.

PAGE 53

* Figure 6: Delete “.547/.537” and substitute “0.547/0.532.” Delete “.035/.025” and substitute “0.045/0.025.” Delete “.210/.196” and substitute “0.219/0.196.” “Delete “.028/.018” and substitute “0.028/0.011.” Delete “31°/29°” and angled and construction line. Delete “.125/.105” and substitute “0.135/0.105.” Detail N delete “.035/.025” and substitute “0.035R max.” Insert “1” after detail N and add the following footnote: “1/ Front configuration I.D. and O.D. optional chamfer and radius to facilitate mating.”

PAGE 54

* Figure 6, dimension table: JØ tolerance, delete “±.0025” and substitute “± 0.003.” KØ tolerance, delete “± .0045” and substitute “± 0.0050.” Note 7, third line: Delete “MS9068” and substitute “SAE-AS3582.”

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* Figure 7: Delete “.150/.120” and substitute “0.150/0.115.” Delete “.530/.519” and substitute “0.531/0.519.” Detail H: Delete “36°/34°” and substitute “37°/33°.” Delete “.029/.023” and substitute “0.030/0.015.” Delete “.006/.003R” and substitute “0.003R min.” Delete “.035/.025R” and substitute “0.02R min.”

PAGE 60

Figure 10: Delete and substitute attached Figure 10.

PAGE 61

* FIGURE 10, dimension table: Delete and substitute:

Shell size	A° Bsc	B	C	D Thread	EØ	F Min	GØ Max	H	J Min	K Min
8	20	0.051 0.046	0.430 0.424	.500-28UNEF-2A	0.462 0.454	0.300	0.439	0.190 0.160	0.140	0.270
10	15	0.049 0.044	0.555 0.549	.625-28UN-2A	0.587 0.579		0.564			
14	12	0.054 0.049	0.805 0.799	.875-28UN-2A	0.837 0.829		0.814			
16	10	0.053 0.048	0.930 0.924	1.000-28UN-2A	0.962 0.954		0.939			
18	9	0.053 0.048	1.055 1.049	1.125-28UN-2A	1.087 1.079		1.064			
20	9	0.059 0.054	1.180 1.174	1.250-28UN-2A	1.212 1.204	0.338	1.189	0.220 0.190	0.170	0.325
22	9	0.062 0.057	1.305 1.299	1.375-28UN-2A	1.337 1.329		1.314			
24	9	0.069 0.064	1.430 1.424	1.500-28UN-2A	1.462 1.454		1.439			

Notes:

1. Dimensions are in inches unless otherwise specified.
2. Dimensions apply after plating.

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* FIGURE 18: Delete.

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PAGE 70

- * FIGURE 19: Delete and substitute attached Figure 19.

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- * FIGURE 22: Delete and substitute attached Figure 22.

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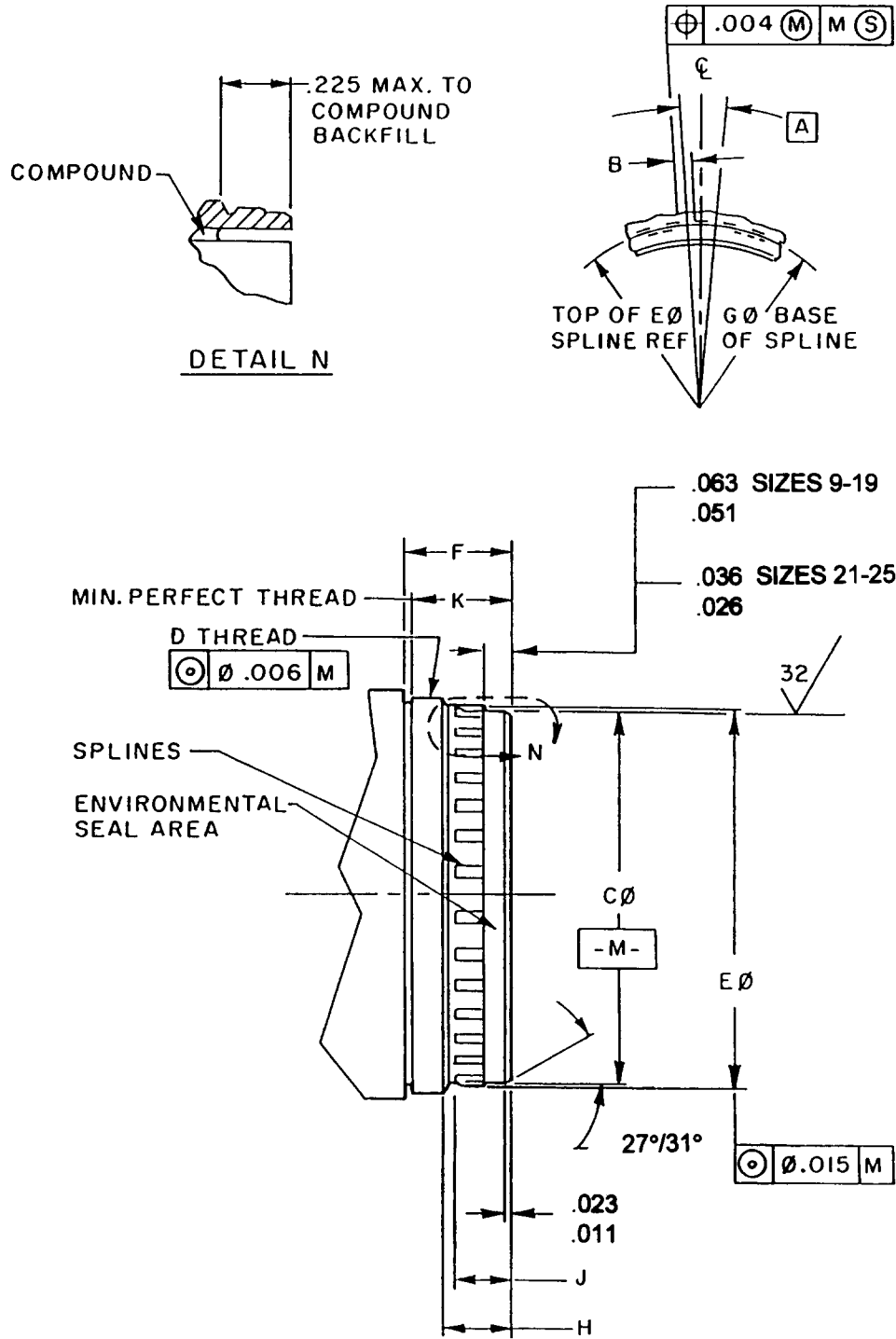


FIGURE 5. Connector accessory interface dimensions (series A) - continued.

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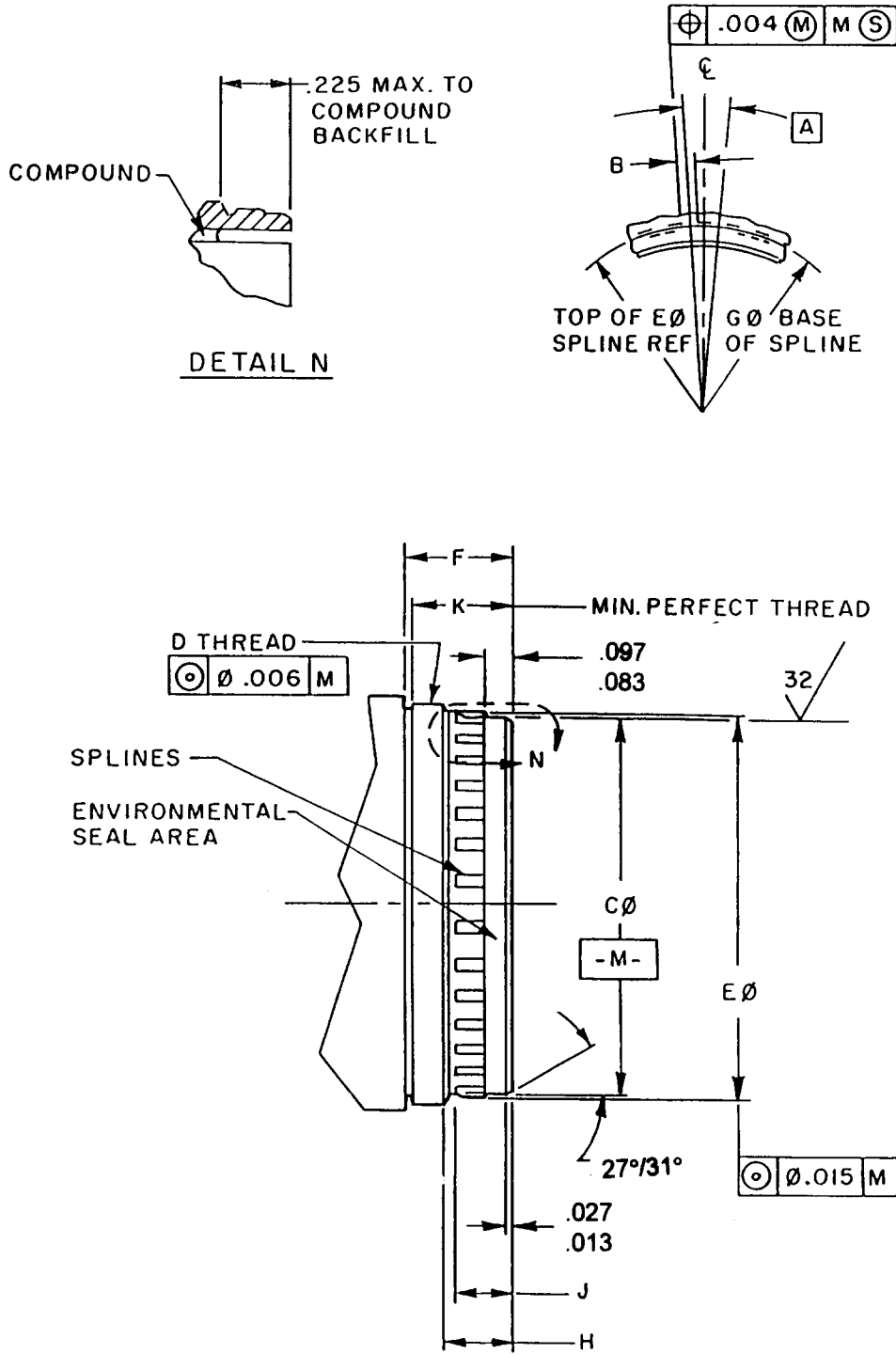


FIGURE 10. Connector accessory interface dimensions (series B).

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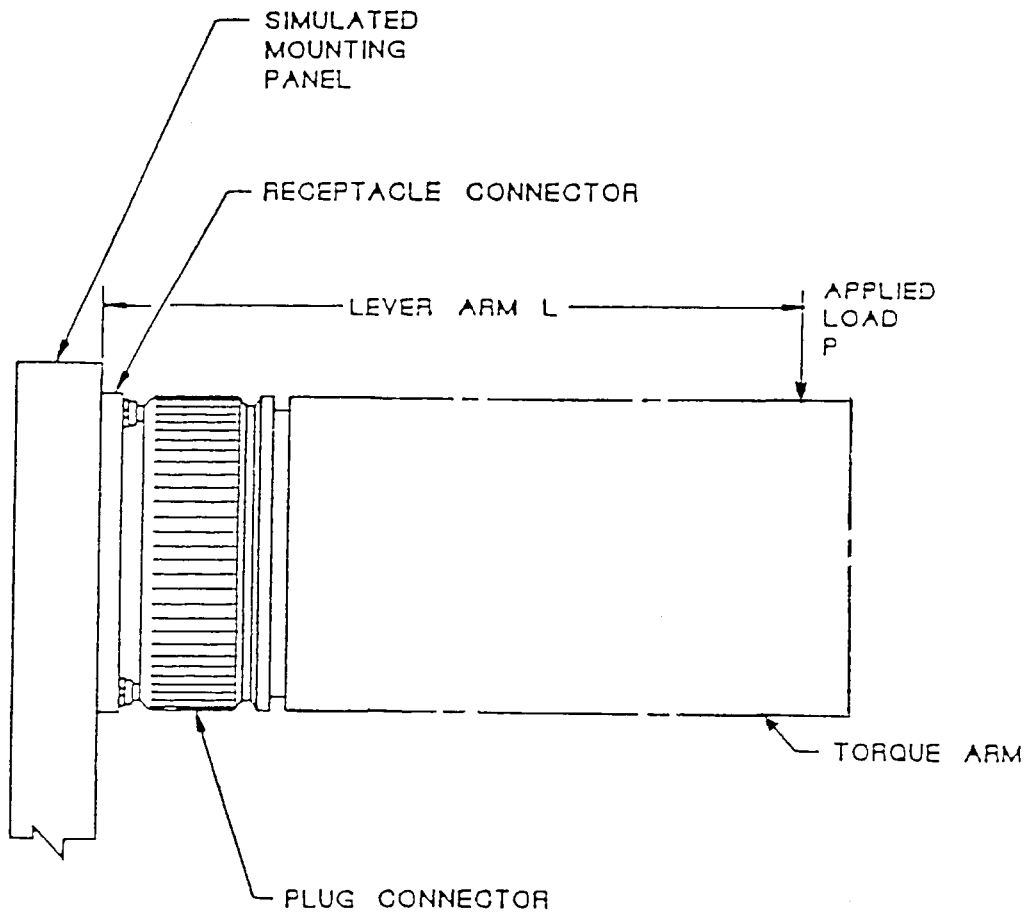
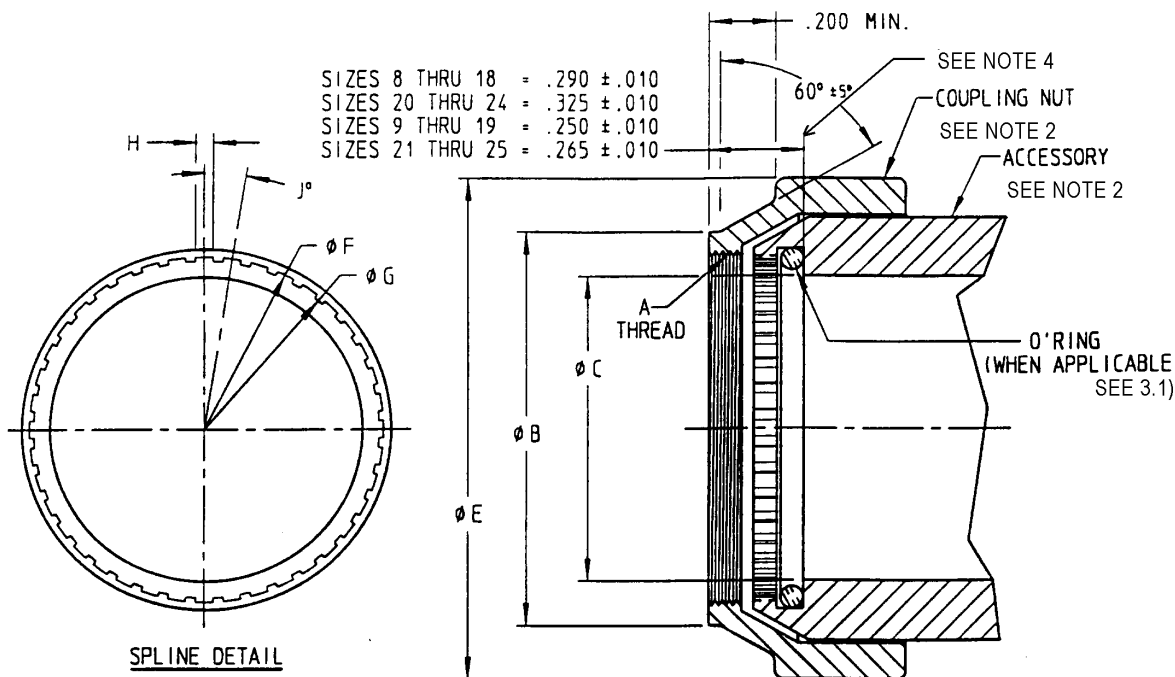


FIGURE 19. External bending moment test set-up.

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Shell Size	A Thread	ØMinor Mod.	ØB Max	ØC Min	ØE Max	ØF Min	ØG	ØH	ØJ
8/9	.500-28UNEF-2B	0.470 0.464	0.630	0.310	1.000	0.468	0.447 0.441	0.048 0.040	20°
10/11	.625-28UN-2B	0.595 0.589	0.755	0.435	1.125	0.593	0.572 0.566	0.047 0.039	15°
13	.750-28UN-2B	0.720 0.714	0.880	0.565	1.250	0.714	0.693 0.687	0.041 0.033	12°
14/15	.875-28UN-2B	0.845 0.839	1.005	0.685	1.375	0.843	0.822 0.816	0.053 0.045	12°
16/17	1.000-28UN-2B	0.970 0.964	1.130	0.810	1.500	0.968	0.947 0.941	0.051 0.043	10°
18/19	1.125-28UN-2B	1.095 1.089	1.255	0.935	1.625	1.093	1.072 1.066	0.053 0.045	9°
20/21	1.250-28UN-2B	1.220 1.214	1.380	1.060	1.750	1.218	1.197 1.191	0.063 0.055	9°
22/23	1.375-28UN-2B	1.345 1.339	1.505	1.185	1.875	1.343	1.322 1.316	0.063 0.055	9°
24/25	1.500-28UN-2B	1.470 1.464	1.630	1.295	2.000	1.468	1.447 1.441	0.067 0.059	9°

NOTES:

1. Dimensions are in inches unless otherwise specified.
2. Coupling nut shall be captivated to and free to rotate on accessory.
3. Dimensions apply after plating.
4. Non-rotateable hardware shall bottom on rear surface of connector.

FIGURE 22. Connector accessory front end data (series A and B).

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NOTE: The margins of this amendment are marked with an asterisks to indicate where changes from the previous amendment were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous amendment.

CONCLUDING MATERIAL

Custodians:

Army - CR
Navy - AS
Air Force - 85

Preparing activity:

Navy - AS

(Project 5935 - 4097)

Review activities:

Army - AV, MI
Navy - EC, MC, SH
Air Force - 19
DLA - CC
NASA - NA