

INCH-POUND

MIL-PRF-64266/15A
w/Amendment 1
1 December 2014
SUPERSEDING
MIL-PRF-64266/15A
16 October 2013

PERFORMANCE SPECIFICATION SHEET

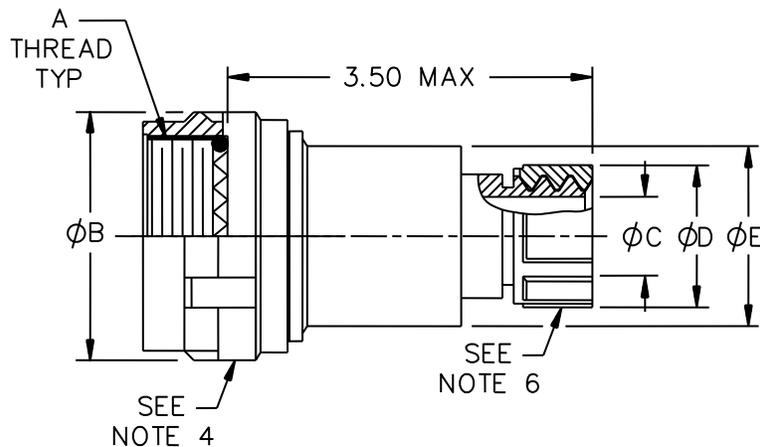
CONNECTORS, FIBER OPTIC, CIRCULAR, PLUG AND RECEPTACLE STYLE,
MULTIPLE REMOVABLE GENDERLESS TERMINI, SCREW THREADS,
BACKSHELL, SOLID, SINGLE FIBER CABLES,
CONVOLUTED TUBING THREADED CABLE INTERFACE,
NONENVIRONMENT RESISTING

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

The requirements for acquiring fiber optic connectors described herein shall consist of this specification sheet and MIL-PRF-64266.

SCOPE. The performance requirements specified herein cover a backshell intended for use with a MIL-PRF-64266 or MIL-DTL-38999 connector plug or receptacle in a fiber optic only application. This backshell is intended for the cable harness configuration in which a bundle of single fiber cables (simplex optical cables) are routed through convoluted tubing to the connector plug or receptacle. This backshell is used for interface with the connector plug or receptacle on one end and with the convoluted tubing on the other end.

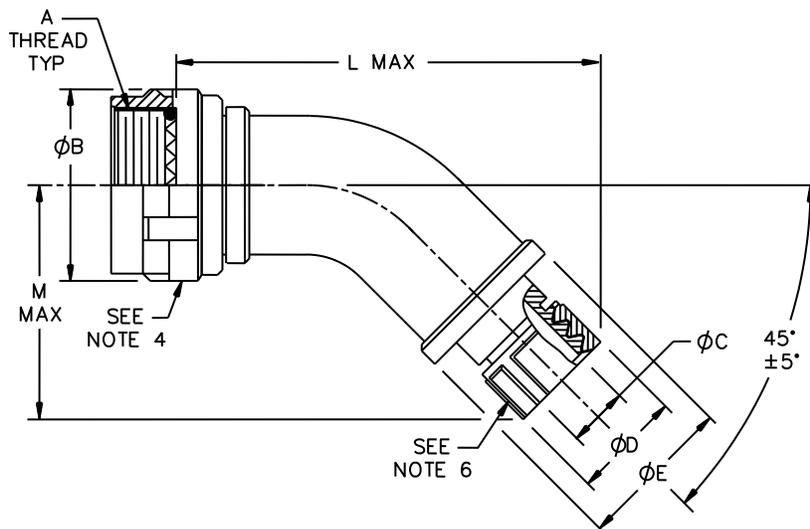
This backshell is one of a solid shell configuration. This configuration consists of a solid shell (or body) with a coupling nut on one end, and convoluted tubing interface components (no gland) on the other end. The coupling nut on the shell mates with the connector.



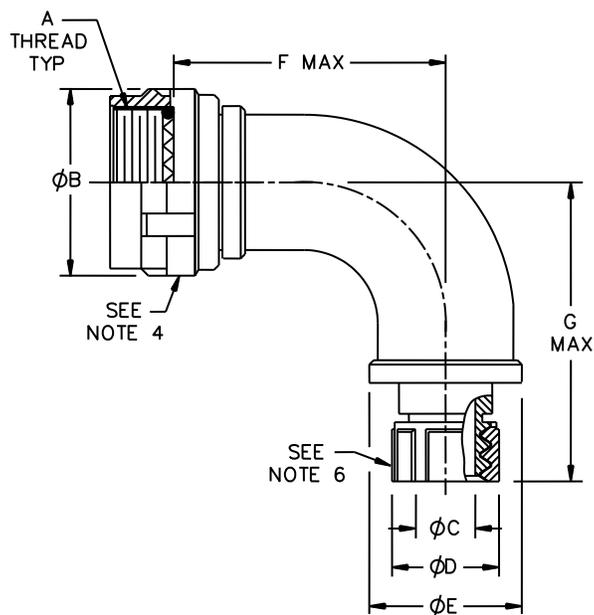
Straight Backshell

FIGURE 1. Straight, 45 and 90 degree backshell orientations.

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45° backshell



90° backshell

FIGURE 1. Straight, 45 and 90 degree backshell orientations – Continued.

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Shell size	A thread ISO metric	B dia Max		C dia min	D dia max		E dia max	
		inches	mm		inches	mm	inches	mm
11	M15x1.0-6H	1.00	25.4	See table I.	1.10	27.9	1.38	35.1
13	M18x1.0-6H	1.13	28.7		1.16	29.5	1.38	35.1
15	M22x1.0-6H	1.25	31.8		1.48	37.6	1.38	35.1
17	M25x1.0-6H	1.38	35.1		1.48	37.6	1.56	39.6
19	M28x1.0-6H	1.50	38.1		1.48	37.6	1.56	39.6
21	M31x1.0-6H	1.63	41.4		1.67	42.4	1.81	46.0
23	M34x1.0-6H	1.75	44.5		2.10	53.3	1.81	46.0
25	M37x1.0-6H	1.88	47.8		2.10	53.3	2.12	53.8

Shell size	F Max		G Max		L Max		M Max	
	inches	mm	inches	mm	inches	mm	inches	mm
11	2.0	50.8	3.7	94.0	4.2	106.7	2.7	68.6
13	2.1	53.3	3.7	94.0	4.4	111.8	2.8	71.1
15	2.1	53.3	3.8	96.5	4.4	111.8	2.8	71.1
17	2.2	55.9	3.9	99.1	4.4	111.8	2.8	71.1
19	2.2	55.9	3.9	99.1	4.4	111.8	2.8	71.1
21	2.3	58.4	4.0	101.6	4.5	114.3	2.9	73.7
23	2.4	61.0	4.0	101.6	4.6	116.8	3.0	76.2
25	2.4	61.0	4.0	101.6	4.8	121.9	3.1	78.7

NOTES.

1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Dimensions apply to plated/finished part.
4. Backshell internal configuration not shown. The backshell interface dimensions shall be in accordance with figure A-6 of MIL-PRF-64266.
5. See table VIII herein for relationship of convoluted tubing size to shell size.
6. Backshell interface dimensions with convoluted tubing shall be in accordance with table II for convoluted tubing made from FEP and table III for convoluted tubing made from PEEK.

FIGURE 1. Straight, 45 and 90 degree backshell orientations - Continued.

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TABLE I. Backshell, cable entry end adapter dimensions, convoluted tubing material dependent.

Convoluted size	Convoluted tube material	C dia Min	
		inches	mm
3/8	FEP	.31	7.9
	PEEK	.32	8.1
7/16	FEP	.38	9.7
	PEEK	.37	9.4
1/2	FEP	.44	11.2
	PEEK	.43	10.9
5/8	FEP	.57	14.5
	PEEK	.55	14.0
3/4	FEP	.70	17.8
	PEEK	.68	17.3
7/8	FEP	.80	20.3
	PEEK	.79	20.1
1	FEP	.92	23.4
	PEEK	.92	23.4
1-1/4	FEP	1.13	28.7
	PEEK	1.17	29.7

TABLE II. Convoluted tubing interface dimensions for FEP material.

Convoluted tubing size	Maximum inside diameter (inch)	Minimum inside diameter (inch)	Maximum outside diameter (inch)	Minimum convolution depth (inch)	Maximum wall thickness (inch)	Convolutions per inch \pm 1 (righthand)
3/8	.375	.359	.510	0.054	0.013	11
7/16	.437	.427	.571	0.054	0.013	11
1/2	.500	.480	.650	0.063	0.018	10
5/8	.625	.603	.770	0.063	0.018	10
3/4	.750	.725	.930	0.079	0.018	9
7/8	.875	.860	1.073	0.079	0.018	8
1	1.00	.970	1.226	0.090	0.018	8
1-1/4	1.25	1.205	1.539	0.115	0.018	7

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TABLE III. Convoluting tubing interface dimensions for PEEK material.

Convoluting tubing size	Maximum inside diameter (inch)	Minimum inside diameter (inch)	Maximum outside diameter (inch)	Minimum convolution depth (inch)	Nominal wall thickness $\pm .002$ (inch)	Convolutions per inch ± 1 (righthand)
3/8	.375	.364	.500	0.054	0.008	8
7/16	.437	.427	.571	0.054	0.008	8
1/2	.500	.485	.630	0.063	0.008	8
5/8	.625	.608	.750	0.063	0.008	8
3/4	.750	.730	.890	0.079	0.009	8
7/8	.875	.855	1.060	0.079	0.009	8
1	1.00	.980	1.195	0.090	0.010	7
1-1/4	1.25	1.220	1.780	0.115	0.010	7

REQUIREMENTS.

Temperature ranges.

Operating: -67°F to 329°F (-55°C to 165°C)
 Non-operating: -40°F to 185°F (-40°C to 85°C)
 Storage: -40°F to 185°F (-40°C to 85°C)

Dimensions and configurations. See figure 1 herein and MIL-PRF-64266, figure A-6.

Weight. Weight shall not exceed the specified value in table IV for the applicable shell size, cable entry angle, and material.

TABLE IV. Backshell weights.

Shell size	Cable entry angle	Composite		Aluminum		Stainless steel	
		ounce	gram	ounce	gram	ounce	gram
11	straight	1.13	32	1.94	55	5.42	154
	45°,90°	1.30	37	2.39	68	7.18	204
13	straight	1.30	37	2.25	64	6.41	182
	45°,90°	1.44	41	2.57	73	7.36	209
15	straight	1.44	41	2.57	73	7.36	209
	45°,90°	1.62	46	2.89	82	8.17	232
17	straight	1.76	50	3.03	86	8.80	250
	45°,90°	1.94	55	3.70	105	10.07	286
19	straight	1.94	55	3.20	91	9.57	272
	45°,90°	2.08	59	3.70	105	10.70	304
21	straight	2.39	68	4.15	118	11.97	340
	45°,90°	2.71	77	4.96	141	14.22	404
23	straight	2.39	68	4.47	127	12.46	354
	45°,90°	2.89	82	5.10	145	13.41	381
25	straight	2.71	77	4.96	141	14.22	404
	45°,90°	3.20	91	5.60	159	16.30	463

Fabrication procedure. Standard fabrication procedure (for both the terminus placement/termination onto the end of fiber optic cabling and the assembly of the connector and backshell onto the fiber optic cabling) shall be used. Standard fabrication procedure shall be in accordance with [NAVAIR 01-1A-505-4/T.O. 1-1A-14-4/TM 1-1500-323-24-4](#). A copy of this document can be obtained at web site. <https://jswag.navair.navy.mil>.

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Backshell capture mechanism for the convoluted tubing. A threaded capture mechanism shall be used to secure the convoluted tubing to the backshell. The threaded capture mechanism is part of the backshell and located at the cable entry end. A retainer or means shall be provided to prevent convoluted tubing movement that may otherwise cause unwinding or separation. The threaded capture mechanism and the retainer shall be designed for use with convoluted tubing made from either fluorocarbon (FEP) or polyether-ether-ketone (PEEK), as specified in the PIN. The retainer and backshell capture mechanism shall be included as part of the PIN.

Requirement for locking mechanism on the backshell coupling nut. The backshell coupling nut shall include a ratchet type locking mechanism (anti-coupling device) to ensure that a backshell mated to a connector maintains full thread engagement (maintains complete coupling). Complete coupling of the mated connector and backshell is achieved by a clockwise rotation of the coupling nut. The anti-coupling mechanism or feature shall be between the backshell coupling nut and the backshell shell only. The locking mechanism shall be sufficient to ensure no backing off of the coupling nut during mechanical shock or vibration.

Wrench flats on composite backshells. Backshell body coupling nuts constructed from composite material shall contain wrench flats or a non-movable hex nut. This wrench flat or hex nut shall be sufficient to permit applying a torque for affixing the backshell to the connector.

Qualification. Qualification shall consist of performing testing specified as listed in table VIII. Backshells qualified to this specification sheet shall include components for interface with convoluted tubing.

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Table VIII. Qualification inspections (except interoperability).

	Straight	Straight	45 Degree	90 Degree
Cable entry angle	15	15	15	15
Shell size 11/ Fiber size (microns)	SM	MM	SM	SM
Temperature range	TR2	TR2	TR2	TR2
Environmental/non-E Specification sheet	Environmental	Environmental	Environmental	Environmental
Test performed <u>2/, 8/, 9/, 12/</u>	/15	/15	/15	/15
Group 1 (4 mated pairs)				
Interoperability <u>6/</u>	X <u>7/</u>	X <u>7/</u>	X <u>7/</u>	X <u>7/</u>
Visual & Mechanical				
Size	X		X	X
Weight	X		X	X
Identification marking	X	X	X	X
Screw threads	X			
Workmanship	X		X	X
Functional				
Banding strap attachment integrity				
Compression fitting engagement integrity				
Backshell mating durability	X			
Optical				
Insertion loss (initial)	X	X	X	X
Return loss (SM only)	X	X		
Group 2 (2 mated pairs)				
Backshell-to-connector mating torque	X			
Cable pull out force (retention)				
External bending moment	X			
Cable seal flexing				
Twist	X			
Impact	X			
Crush	X			
Vibration: Swept sine (TR1)				
Vibration: Random (TR1)				
Vibration: Swept sine (TR2)	X		X	X
Vibration: Random (TR2)	X			
Vibration: Random with temperature (TR2)	X			
Shock: MIL-S-901 10/	X	X		
Shock: Half-sine pulse (TR2)				
Insertion loss verification				
Water pressure				
Modified SO ₂ /salt spray	X			

See notes at end of table.

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TABLE VIII. Qualification inspections (except interoperability) – Continued.

	Straight	Straight	45 Degree	90 Degree
Cable entry angle	15	15	15	15
Shell size 11/	SM	MM	SM	SM
Fiber size (microns)	TR2	TR2	TR2	TR2
Temperature range	Environmental	Environmental	Environmental	Environmental
Environmental/non-E	/14	/14	/14	/14
Specification sheet				
Test performed 2/, 8/, 9/, 12/				
Group 3 (2 mated pairs)				
Thermal shock (TR1)				
Thermal shock (TR2)	X			
Temperature/humidity cycling				
Temperature cycling (TR1)				
Temperature cycling (TR2)	X			
Altitude immersion				
Life aging (Temperature life) (TR1)				
Life aging (Temperature life) (TR2)	X			
Freezing water				
Insertion loss verification	X 7/			
Sand & dust				
Identification marking	X			
Group 4 (2 mated pair + parts) 1/				
Electromagnetic effects (2 mated pair)	X		X	X
Fluid immersion (2 mated pair)	X			
Shell to shell conductivity (initial)	X			
Salt spray (2 mated pair) 4.9.6.10.1 3/	X			
Salt spray (TR2) 4.9.6.10.2				
Shell to shell conductivity	X			
Flammability (1 mated pair) 4/	X			
Fungus resistance (parts) 5/	X			
Ozone exposure (parts) 5/	X			
Insertion loss verification				

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

2/ TR1 = test as specified for temperature range 1. TR2 = test as specified for temperature range 2.

3/ Two options. a. Use same two mated pair from the fluid immersion test. b. Use separate mated pair (If option b, can use one cable of sufficient length to loop around to the cable entrance of each backshell).

4/ One mated pair from the fluid immersion, salt spray, or Group 2/3 samples after that Group's test completion may be used.

5/ Parts only; assembly not required.

6/ Interoperability. This testing is done 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-TEB as interoperability standards.

7/ Interoperability is performed on both single mode and multimode for each shell size.

8/ Specific test practices for physical, mechanical, environmental and material tests, including clarifications and further details, are found in [MIL-STD-1678-3](#).

9/ Specific test practices for the optical performance tests, including clarifications and further details, are found in [MIL-STD-1678-2](#).

10/ Shock test. Standard shock fixture 4A for bulkhead mounting shall be used. Supplement test fixture that shall be used and that the mounting shall be performed are specified in Measurement 3202 of [MIL-STD-1678-3](#).

11/ See qualification by similarity for other shell sizes if shell size 15 is being qualified. Otherwise, use this qualification table for the other shell sizes also.

12/ Full qualification list for the backshell with a straight cable entry angle contains more testing requirements than the 45 or 90°. Only by qualifying the straight backshell first, a further reduced test sequence as listed in the table can be used to qualify the backshell configurations with a 45 and 90° cable entry angle. Otherwise the full qualification listed for the backshell with the straight cable entry angle must be performed for backshell configurations with a 45 and 90° cable entry angle.

Identification marking. Applicable. Both initial and after environmental testing.

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Banding strap attachment integrity. Not applicable.

Backshell and backshell accessory attachment. Not applicable.

Backshell-to-connector mating torque. The backshell threads shall withstand the applied torque to mate (affix) the backshell to the connector that is specified in table VI with no damage. The backshell shall be mated to a connector mounted in a suitable fixture to prevent movement of the connector during the test. The torque shall be applied to the backshell at a rate of approximately 10 in-lb per second until the specified applied torque is obtained. This torque shall be applied for a minimum of 1 minute.

TABLE VI. Backshell-to-connector mating torque.

Shell size	Mating torque ^{1/} ± 5 in-lb (± .55 N-m)			
	Composite		Metal	
	in-lb	N-m	in-lb	N-m
11	50	5.65	100	11.30
13	50	5.65	150	16.95
15	50	5.65	150	16.95
17	50	5.65	150	16.95
19	50	5.65	150	16.95
21	100	11.30	175	19.75
23	100	11.30	175	19.75
25	100	11.30	175	19.75

^{1/} Increments are rounded to nearest 0.05 N-m for compatibility with a torque wrench.

Cable pull-out force. Not applicable.

Cable seal flexing. Applicable.

Twist. Not applicable.

Mating durability. Not applicable.

Backshell mating durability. Backshell shall be assembled and completely disassembled for 25 assembly (mating) cycles. Each cycle shall include connector-to-backshell coupling (mating) as part of the backshell assembly. No optical measurements need to be performed during or after this test. A separate piece of cabling may be used for this test. This test may be performed prior to test sample assembly for Group I optical tests.

External bending moment. Applicable. Applied bending moment shall be as specified in table VII.

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TABLE VII. Backshell applied bending moment.

Shell size	Minimum applied bending moment ^{1/}					
	Composite		Aluminum		Stainless steel	
	in-lb	N-m	in-lb	N-m	in-lb	N-m
11	25	2.85	125	14.15	125	14.15
13	25	2.85	275	31.10	275	31.10
15	50	5.65	300	33.90	300	33.90
17	50	5.65	300	33.90	300	33.90
19	50	5.65	300	33.90	300	33.90
21	75	8.50	300	33.90	300	33.90
23	75	8.50	300	33.90	300	33.90
25	100	11.30	300	33.90	300	33.90

^{1/} Increments are rounded to nearest 0.05 N-m for compatibility with a torque wrench.

Impact. Applicable.

Crush. Applicable.

Water pressure. Not applicable.

Freezing water immersion. Not applicable.

Sand and dust. Applicable.

Electromagnetic effects. Applicable except for classes D and E material designator backshells. When not tested as part of the initial qualification, the backshell shall be assembled to a MIL-PRF-64266/1 or MIL-PRF-64266/3 receptacle. Electromagnetic effects testing shall be conducted both with and without mating the MIL-PRF-64266/1 or MIL-PRF-64266/3 receptacle to a mating plug connector or dust cover.

Salt spray. Applicable.

Shell-to-shell conductivity. Applicable. Perform both initial and after salt spray. For a backshell mated to a connector plug, the voltage drop of the mated connector plug-to-backshell shall be measured from a point on the rear accessory thread of the connector plug to a point on the backshell 1.0 ± .25 inch from the innermost backshell threads that mate with the backshell gland nut. For a backshell mated to a connector receptacle, the voltage drop of the mated connector receptacle-to-backshell shall be measured from a point on the flange of the connector receptacle adjacent to the mounting hole to a point on the backshell 1.0 ± .25 inch from the innermost backshell threads that mate with the backshell gland nut. When tested as part of the initial qualification, the voltage drop between the connector receptacle and connector plug shall be measured also.

Modified SO₂/salt spray. Applicable.

Altitude immersion. Applicable.

Fluid immersion. Applicable.

Cleaning procedures. Each shipment of backshells shall include recommended cleaning procedures. The following wording or equivalent is recommended: "To clean, use lint free wipe dampened with alcohol and blow dry with air."

Qualification by similarity.

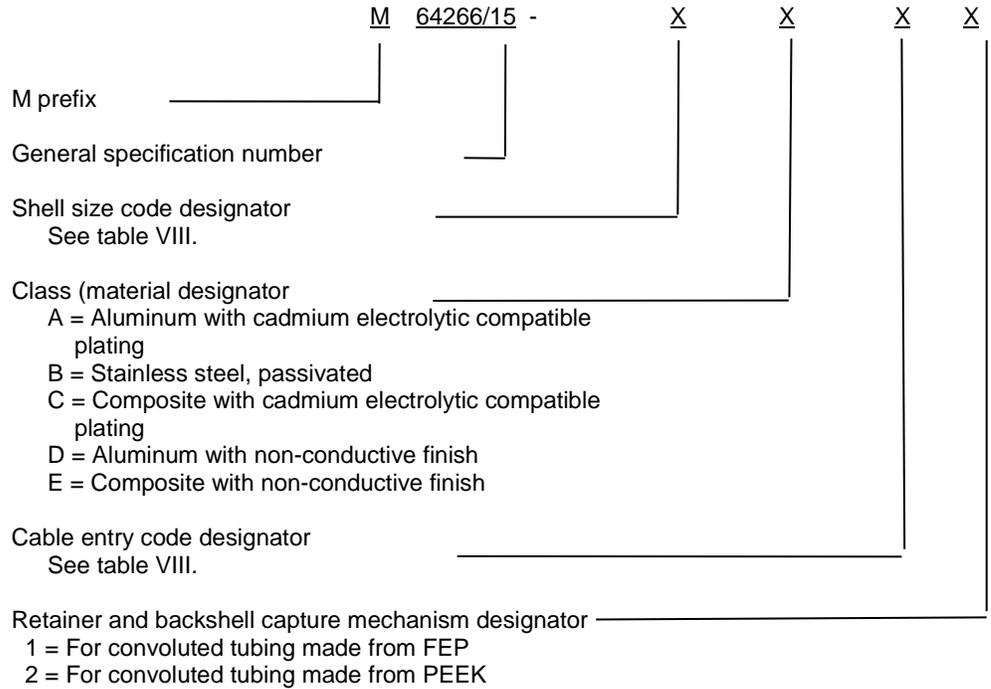
Non-environmental backshells. If a connector backshell that is environmental resisting and of a specified shell size is qualified to MIL-PRF-64266/12 and connector backshells of the same shell size and same cable entry end configuration in this specification sheet that are not environmental resisting meet the visual and mechanical size, weight, identification marking, workmanship, screw thread and backshell mating durability inspections, then the

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connector backshells of the same shell size and same cable entry end configuration that are not environmental resisting are qualified.

Marking.

Part or Identification Number (PIN). Mark on coupling ring of the backshell.



PIN example. M64266/15-CAA1

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TABLE VIII. PIN code designators.

Shell size	Shell size code	Cable entry code	Cable entry angle <u>1/</u>	Connector type	# of entry cables	Convolute tubing size <u>2/</u>
11	B	A	Straight	M64266	2	3/8
	B	B	45°	M64266	2	3/8
	B	C	90°	M64266	2	3/8
11	B	L	Straight	M64266	4	7/16
	B	M	45°	M64266	4	7/16
	B	N	90°	M64266	4	7/16
11	B	D	Straight	M38999	2	3/8
	B	E	45°	M38999	2	3/8
	B	F	90°	M38999	2	3/8
13	C	A	Straight	M64266	6	1/2
	C	B	45°	M64266	6	1/2
	C	C	90°	M64266	6	1/2
13	C	D	Straight	M38999	4	7/16
	C	E	45°	M38999	4	7/16
	C	F	90°	M38999	4	7/16
15	D	A	Straight	M64266	10	3/4
	D	B	45°	M64266	10	3/4
	D	C	90°	M64266	10	3/4
15	D	L	Straight	M64266	8	3/4
	D	M	45°	M64266	8	3/4
	D	N	90°	M64266	8	3/4

See notes at end of table.

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TABLE VIII. PIN code designators - Continued.

Shell size	Shell size code	Cable entry code	Cable entry angle ^{1/}	Connector type	# of entry cables	Convolved tubing size ^{2/}
15	D	D	Straight	M38999	5	½
	D	E	45°	M38999	5	1/2
	D	F	90°	M38999	5	1/2
17	E	D	Straight	M38999	8	5/8
	E	E	45°	M38999	8	5/8
	E	F	90°	M38999	8	5/8
19	F	D	Straight	M38999	11	¾
	F	E	45°	M38999	11	¾
	F	F	90°	M38999	11	¾
21	G	D	Straight	M38999	16	7/8
	G	E	45°	M38999	16	7/8
	G	F	90°	M38999	16	7/8
23	H	A	Straight	M64266	36	1-1/4
	H	B	45°	M64266	36	1-1/4
	H	C	90°	M64266	36	1-1/4
23	H	D	Straight	M38999	21	1
	H	E	45°	M38999	21	1
	H	F	90°	M38999	21	1
	H	L	Straight	M64266	18	7/8
	H	M	45°	M64266	18	7/8
	H	N	90°	M64266	18	7/8
25	J	D	Straight	M38999	37	1-1/4
	J	E	45°	M38999	37	1-1/4
	J	F	90°	M38999	37	1-1/4
25	J	G	Straight	M38999	29	1
	J	J	45°	M38999	29	1
	J	K	90°	M38999	29	1

^{1/} Cable entry code based on cable entry angle, connector type, number of cavities in the connector insert, and convolved tubing size listed for these first three parameters.

^{2/} Convolved tubing size for each shell size and single fiber cable count in table VIII has been selected to ensure adequate cable movement and limit cable bend stress.

Mating counterpart. Backshell mates with MIL-PRF-64266/1 wall mounting receptacle, MIL-PRF-64266/2 plug, and MIL-PRF-64266/3 jamnut mounting receptacle.

Installation and removal tools. Adjustable or 1.25 inches (31.8 mm) open end wrench, strap wrench, and scissors.

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Referenced documents. In addition to MIL-PRF-64266, this specification sheet references the following documents.

MIL-S-901
MIL-PRF-28876
MIL-DTL-38999
MIL-PRF-64266/1
MIL-PRF-64266/2
MIL-PRF-64266/3
MIL-PRF-64266/12
NAVAIR 01-1A-505-4/T.O. 1-1A-14-4/TM 1-1500-323-24-4
MIL-STD-1678-2
MIL-STD-1678-3

Standardization based on lessons learned. For the older, existing fiber optic, multiple termini connectors; each vendor has a different backshell aramid yarn capture mechanism and assembly process. The logistic support is taxing the system. For instance, at several JFOWG (Joint Fiber Optic Working Group) meetings, the Navy school house reported that training on the MIL-PRF-28876 connector assembly took a significant portion of the time and cost for the fiber optic curriculum. This leads to logistic difficulties in adding new training material and obtaining (paying for) parts needed in this connector assembly. The implementation of this lesson learned is that the backshell configuration and assembly process for any new connector and any new backshell configuration introduced must be standardized to the maximum extent feasible.

Amendment notations. The margins of this specification are marked with vertical lines to indicate modifications generated by this amendment. 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.

CONCLUDING MATERIAL

Custodians:
Army - CR
Navy - AS
Air Force - 85
DLA - CC

Preparing activity:
DLA - CC

(Project 6060-2014-054)

Review activities:
Army - TE
Navy - SH
Air Force - 13, 19, 93, 99
MISC - DI
MISC - MDA

Civil agencies:
GSA - FAS
NASA - NA

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