

INCH-POUND

MIL-DTL-12520D
31 March 2005
SUPERSEDING
MIL-C-12520C (EL)
5 November 1965

DETAIL SPECIFICATION

CONNECTORS, PLUG AND RECEPTACLE
(ELECTRICAL, WATERPROOF), AND ACCESSORIES;
GENERAL SPECIFICATION FOR

Inactive for new design after 24 June 1999.

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

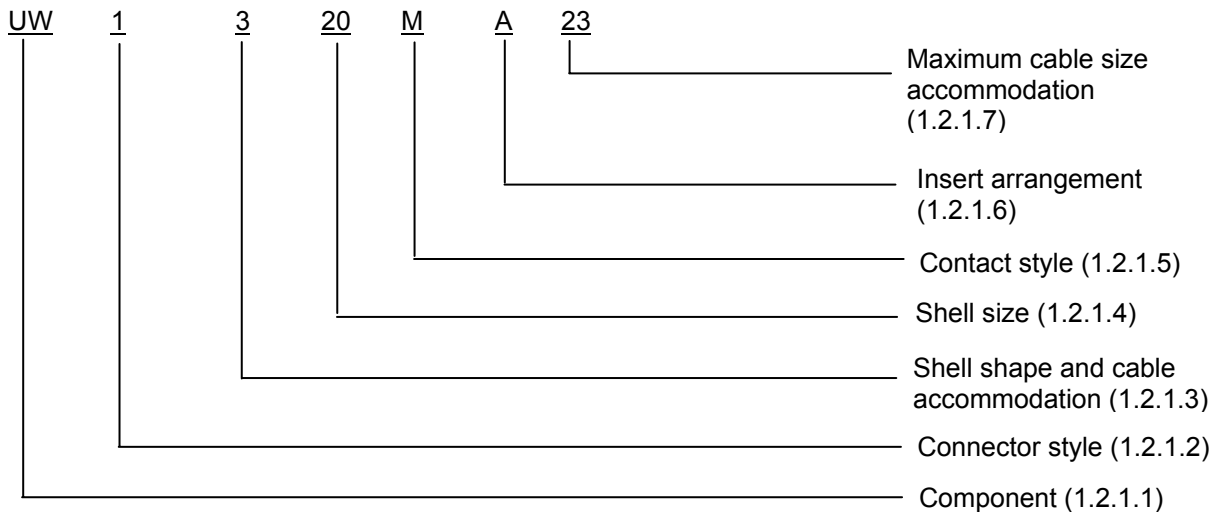
1. SCOPE

1.1 Scope. This specification covers the general requirements for a series of centerlock screw coupling, waterproof, polarized, multicontact connectors and accessories for inter-connection of power and control circuits on electronic equipment (see 6.1).

1.2 Classification.

1.2.1 Part or Identifying Number (PIN). The type designation is in the following form and as specified (see 3.1 and 6.2).

Example:



Comments, suggestions, or questions on this document should be addressed to: Defense Supply Center Columbus, ATTN: DSCC-VAI, 3990 East Broad Street, Columbus, OH 43218-3990 or e mail: CircularConnector@dsccl.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>.

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1.2.1.1 Component. Connectors are identified by the two-letter symbol "UW" (see 6.2).

1.2.1.2 Connector Style. The style is identified by a one-digit number; plugs by the number "1", receptacles by the number "2" (see 6.2).

1.2.1.3 Shell shape and cable accommodation. The shell shape and cable accommodation are identified by one-digit number in accordance with table I.

TABLE I. Shell shape and cable accommodation.

Symbol	Shell shape and cable accommodation
0	Not applicable
1	Round; bellows clamp
2	Round; cable clamp
3	Cathedral; cable clamp

1.2.1.4 Shell size. The shell size is identified by a two-digit number. The two-digit number indicates the major diameter of the thread size on the receptacle measured in .062 inch increments.

1.2.1.5 Contact style. The contact style is identified by a single-letter; male contacts by the letter "M", female contacts by the letter "F".

1.2.1.6 Insert arrangement. The insert arrangement is identified by a single letter in accordance with table III (see 3.5.3).

1.2.1.7 Maximum cable-size accommodation. The maximum cable-size accommodation is identified by a two-digit number in accordance with table II. The two-digit number indicates the maximum outer diameter of the cable in .031 inch increments.

TABLE II. Cable outside diameter ranges.

Symbol	Minimum	Maximum
00	Cable not applicable	Cable not applicable
11	.292	.343
13	.323	.406
15	.386	.468
17	.448	.531
19	.511	.593
21	.573	.656
23	.636	.718
25	.698	.781
27	.761	.843
29	.823	.906
31	.886	.968
33	.948	1.031

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TABLE III. Insert arrangements.

Insert arrangement	Shell size	Number of contact	Contacts size
A	20	4	12
B	20	9	16
C	26	14	16
D	26	19	16
E	26	30	20
F	26	30	20
G	26	4	8

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 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 of documents cited in sections 3, 4, or 5 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 SPECIFICATION

MIL-F-14072 - Finishes for Ground Based Electronic Equipment

(See supplement 1 for list of specification sheets.)

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-130 - Identification Marking of U. S. Military Property
MIL-STD-13231 - Marking of Electronic Items
MIL-STD-202 - Electronic and Electrical Component Parts
MIL-STD-810 - Environmental Engineering Considerations and Laboratory Test

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

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DEPARTMENT OF DEFENSE HANDBOOKS

FED-STD- H28 - Screw-Thread Standards for Federal Services

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch> or <http://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins 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 these documents are those cited in the solicitation or contract.

ASTM INTERNATIONAL

ASTM B16	-	Rod, Brass, Free-Cutting, Bar and Shapes for Use in Screw Machines
ASTM B26	-	Aluminum-Alloy Sand Castings
ASTM B36	-	Plate, Brass, Sheet, Strip, and Rolled Bar
ASTM B85	-	Aluminum-Alloy Die Castings
ASTM B121	-	Plate, Leaded Brass, Sheet, Strip, and Rolled Bar
ASTM B124	-	Copper and Copper Alloy Forging Rod, Bar, and Shapes
ASTM B194	-	Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar
ASTM B196	-	Rod and Bar, Copper-Beryllium Alloy
ASTM B197	-	Wire, Alloy Copper-Beryllium
ASTM B488	-	Gold Plating (Electrodeposited)
ASTM D2000	-	Rubber Products in Automotive Applications
ASTM D5948	-	Compounds, Molding, Thermosetting

(Copies of these documents are available from <http://www.astm.org> or from the ASTM International, P.O. Box C700, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

NATIONAL CONFERENCE OF STANDARDS LABORATORIES (NCSL)

NCSL Z540.1 - Laboratories Calibration and Measuring and Test Equipment

(Copies of these documents are available from <http://www.ncsli.org> or from the National Conference of Standards Laboratories (NCSL), 2995 Wilderness Place Suite 107, Boulder, CO 80301-5404.)

SOCIETY OF AUTOMOTIVE ENGINEERS. INC (SAE)

SAE-AMS-QQ-P-416	-	Plating, Cadmium (Electrodeposited)
SAE-AMS-QQ-S-763	-	Steel Bars, Wire, Shapes, and Forgings; Corrosion Resistant

(Copies of these documents are available from <http://www.sae.org> or from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

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.

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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 (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.1.

3.2.1 Preproduction samples. The contractors shall furnish preproduction samples for approval if required by the invitation for bids and contract (see 4.2.1).

3.3 Materials. Materials shall be as identified herein or as approved by the qualifying activity. However, when a definite material is not specified, a material shall be used which will enable the connectors and accessories to meet the performance requirement. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product.

3.3.1 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.

3.3.2 Marking. Shall be in accordance with MIL-STD-13231. (see 4.3)

3.4 Materials. The material for each part shall be as specified herein. When a definite material is not specified, a material shall be used which will enable the connector and accessories to meet the performance requirements of this document. Acceptance as approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product.

3.4.1 Plastics. Insert material shall be type GDI-30 in accordance with [ASTM D5948](#).

3.4.2 Rubber. Rubber shall be in accordance with [ASTM D2000](#), grade RS612ABFZZ, except that compression set, suffix B, for 70 hours at 212°F, shall be 25 percent maximum. Suffix Z requirements are as follows:

- a. Change in shore A durometer hardness after oven aging 70 hours at 212°F shall, be 10 points maximum.
- b. After conditioning 14 days at -67°F, the shore D durometer hardness at -67°F shall be 60 maximum (instantaneous reading). The measuring instrument shall be desiccated and cold conditioned as follows:
 - (1) The durometer and the specimen shall be conditioned at the prescribed temperature for at least 30 minutes before test.
 - (2) Whenever, for any reason, it becomes necessary to remove the durometer from a chamber at a temperature below room temperature, the durometer shall be placed in a suitable desiccators immediately upon such removal and allowed to remain there until, its temperature is above the dew point of the air in the room.

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3.4.3 Metals. Metals used for non-current carrying parts shall be of a corrosion-resistant type, or shall be plated or treated to resist corrosion.

3.4.3.1 Brass. Brass shall be in accordance with composition 22, half-hard, in accordance with, [ASTM B16](#), [ASTM B36](#), [ASTM B121](#) and [ASTM B124](#).

3.4.3.2 Copper beryllium. Copper beryllium shall be in accordance with [ASTM B196](#), [ASTM B197](#) and [ASTM B194](#). Parts fabricated of copper beryllium shall be heat-treated.

3.4.3.3 Corrosion-resistant steel. Corrosion-resistant steel shall be in accordance with [SAE-AMS-QQ-S-763](#), class 303.

3.4.3.4 Aluminum-alloy die castings. Aluminum-alloy die castings shall be in accordance with [ASTM B85](#).

3.5 Design and construction. Connectors and accessories shall be of the design, construction, and physical dimensions specified ([see 3.1](#)).

3.5.1 Threaded parts. Unless otherwise specified ([see 3.1](#)), all threaded parts shall be class 2 fit in accordance with [FED-STD- H28](#). Where practical, all threads shall be in conformity with the coarse-thread series. The fine-thread series shall be used only for applications that might show a definite advantage through their use. Where a special diameter-pitch combination is required, the thread shall be of American National Form and of any pitch between 16 and 36, which is used in the fine-thread, series.

3.5.2 Inserts. Hollow-type inserts shall not be used. When the resultant reduction in cross-sectional area would cause structural weakness, depressions on front and rear male-insert disks and rear female-insert disks used to achieve creep age distance shall not be located directly opposite on front and rear surfaces of individual disks.

3.5.2.1 Male inserts. Male contacts shall be rigidly fixed in position relative to the insert.

3.5.2.2 Female inserts. Female contacts shall be so mounted in the insert as to provide for contact alignment.

3.5.3 Insert arrangements. The connector insert arrangements and corresponding shell and contact sizes shall be in accordance with [table III](#) and figure 1, as specified ([see 3.1](#) and [3.5.8](#)). The dimensions shown on figure 1, are for the front face of male inserts, female inserts shall have corresponding dimensions and an arrangement opposite to that of the male inserts to provide for correct male-to-female connection.

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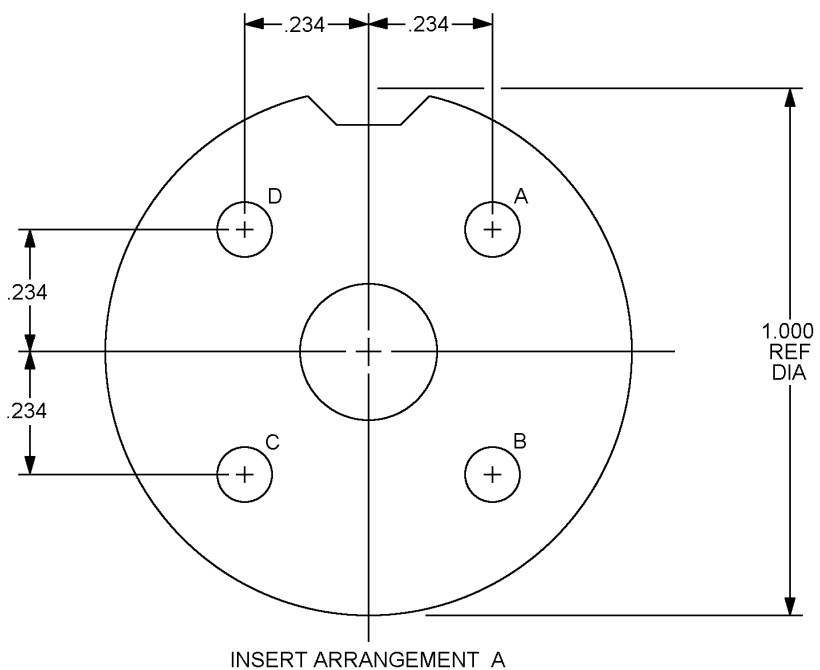


FIGURE 1. Insert arrangements.

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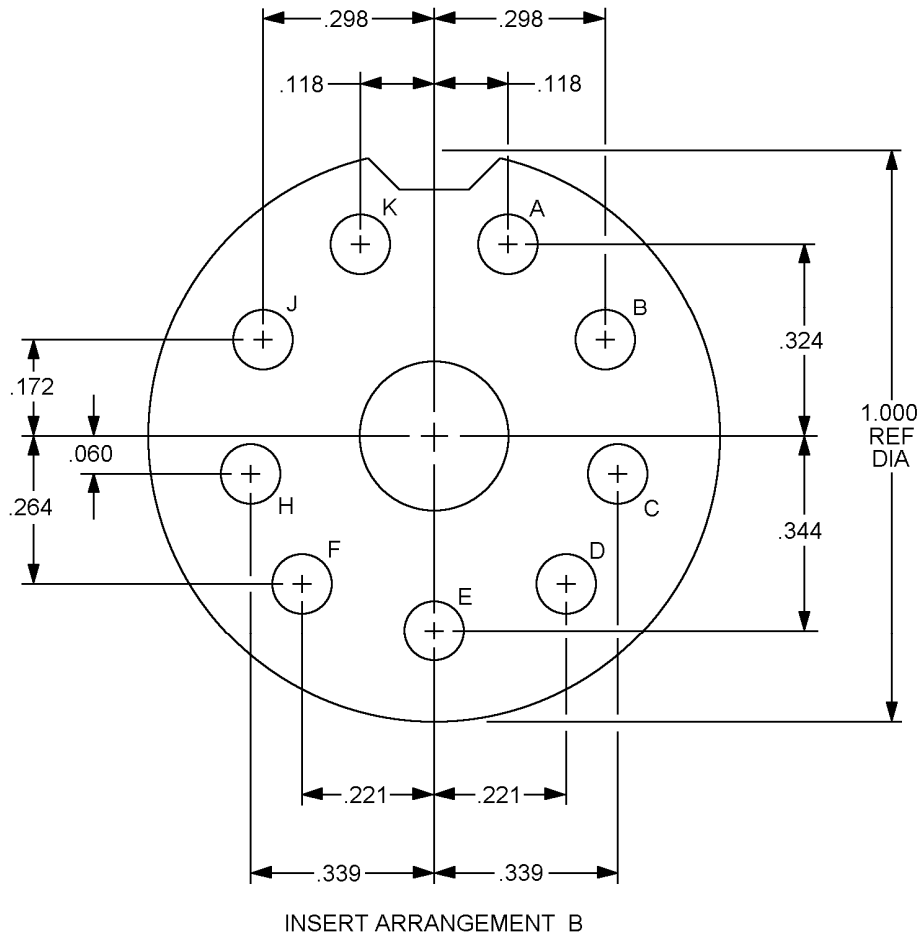
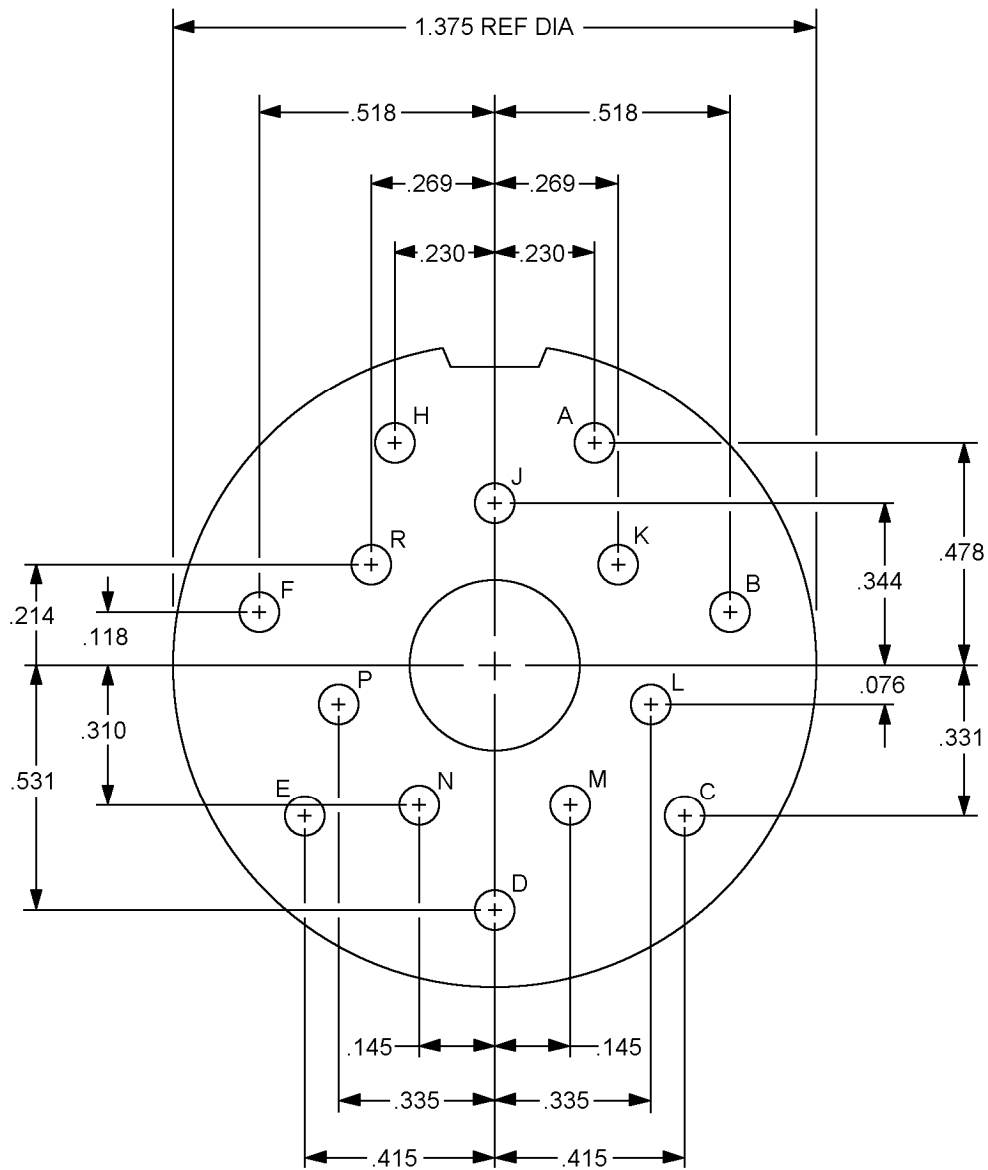


FIGURE 1. Insert arrangements - Continued.

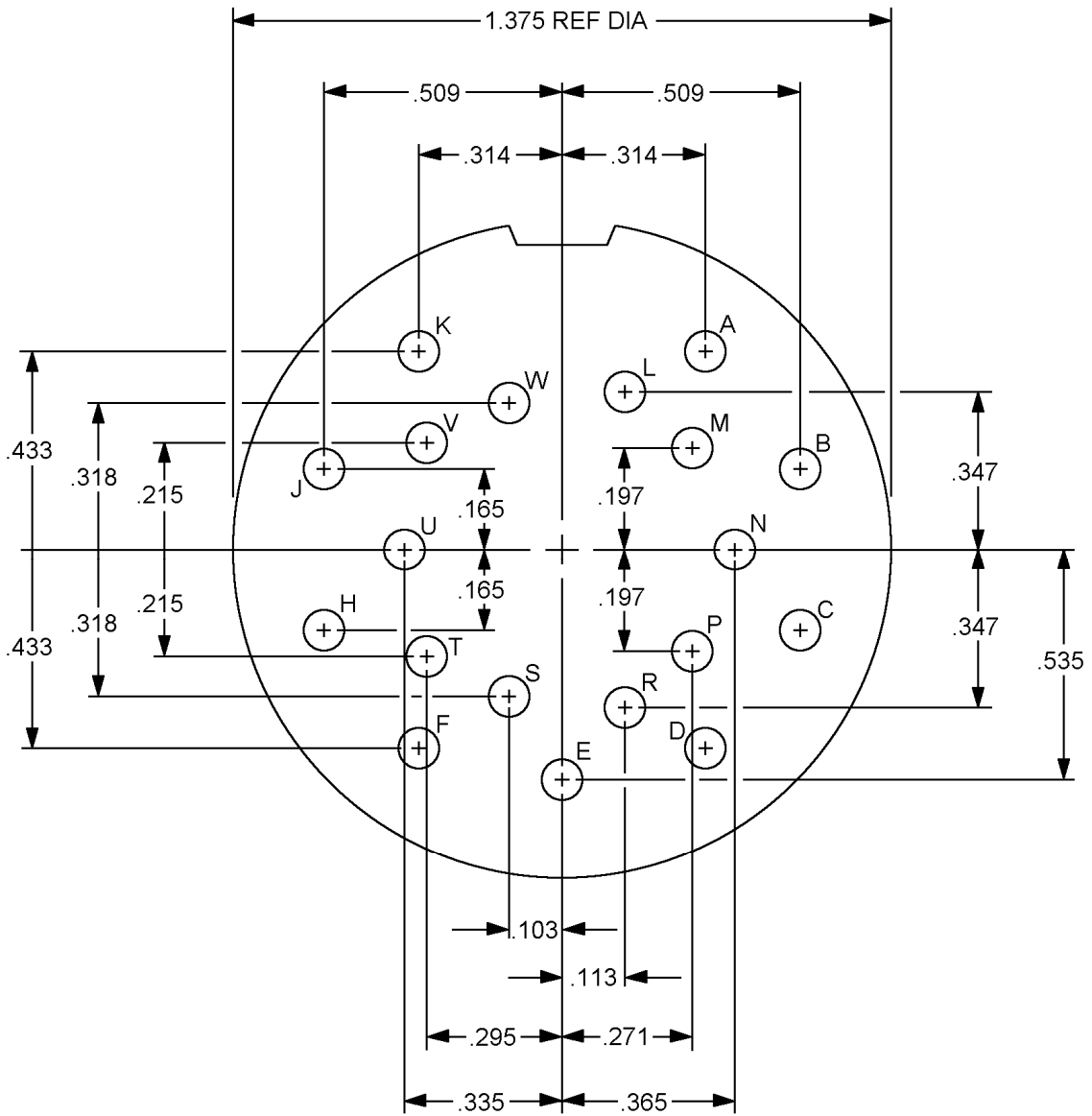
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INSERT ARRANGEMENT C

FIGURE 1. Insert arrangements - Continued.

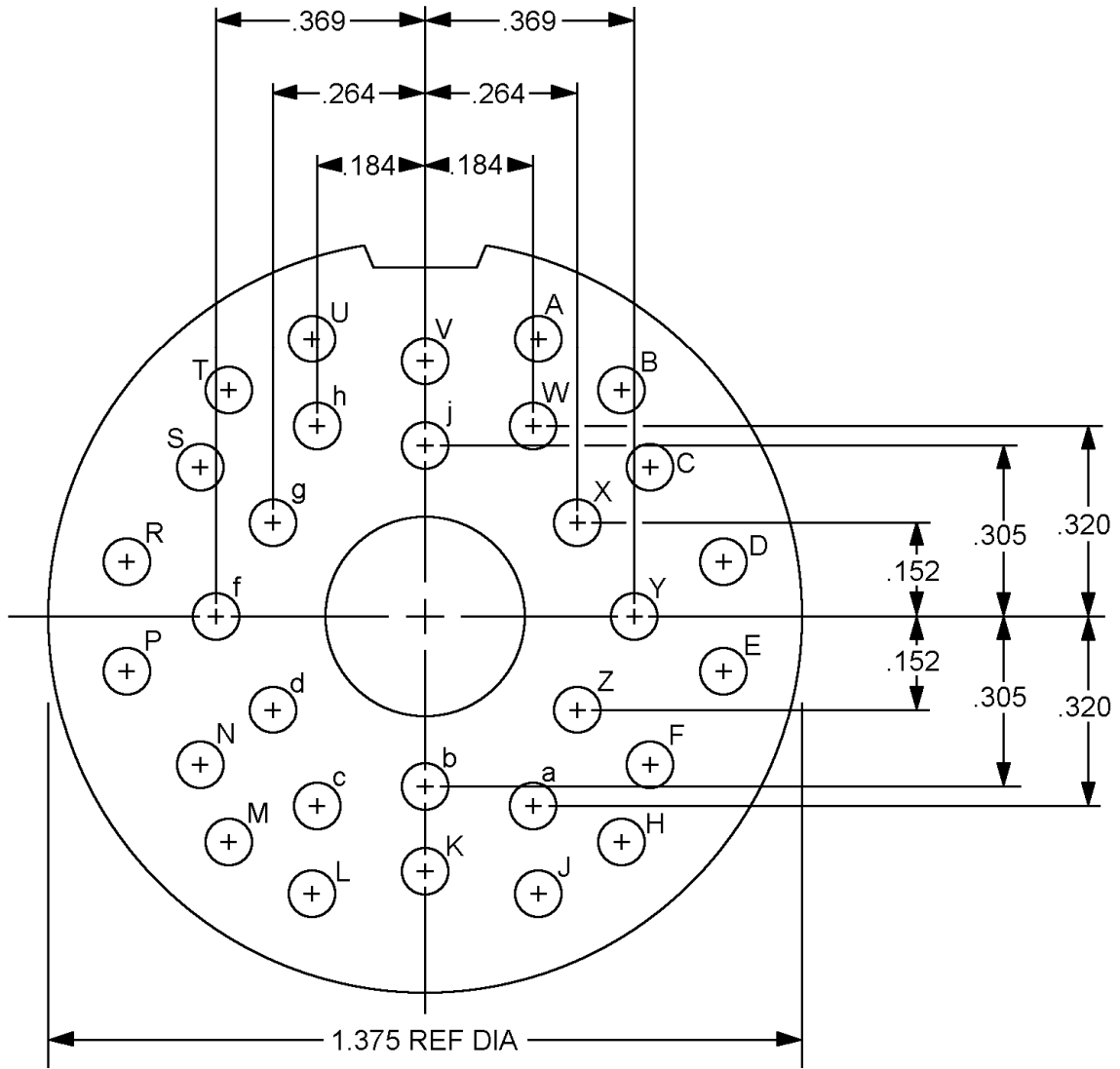
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INSERT ARRANGEMENT D

FIGURE 1. Insert arrangements - Continued.

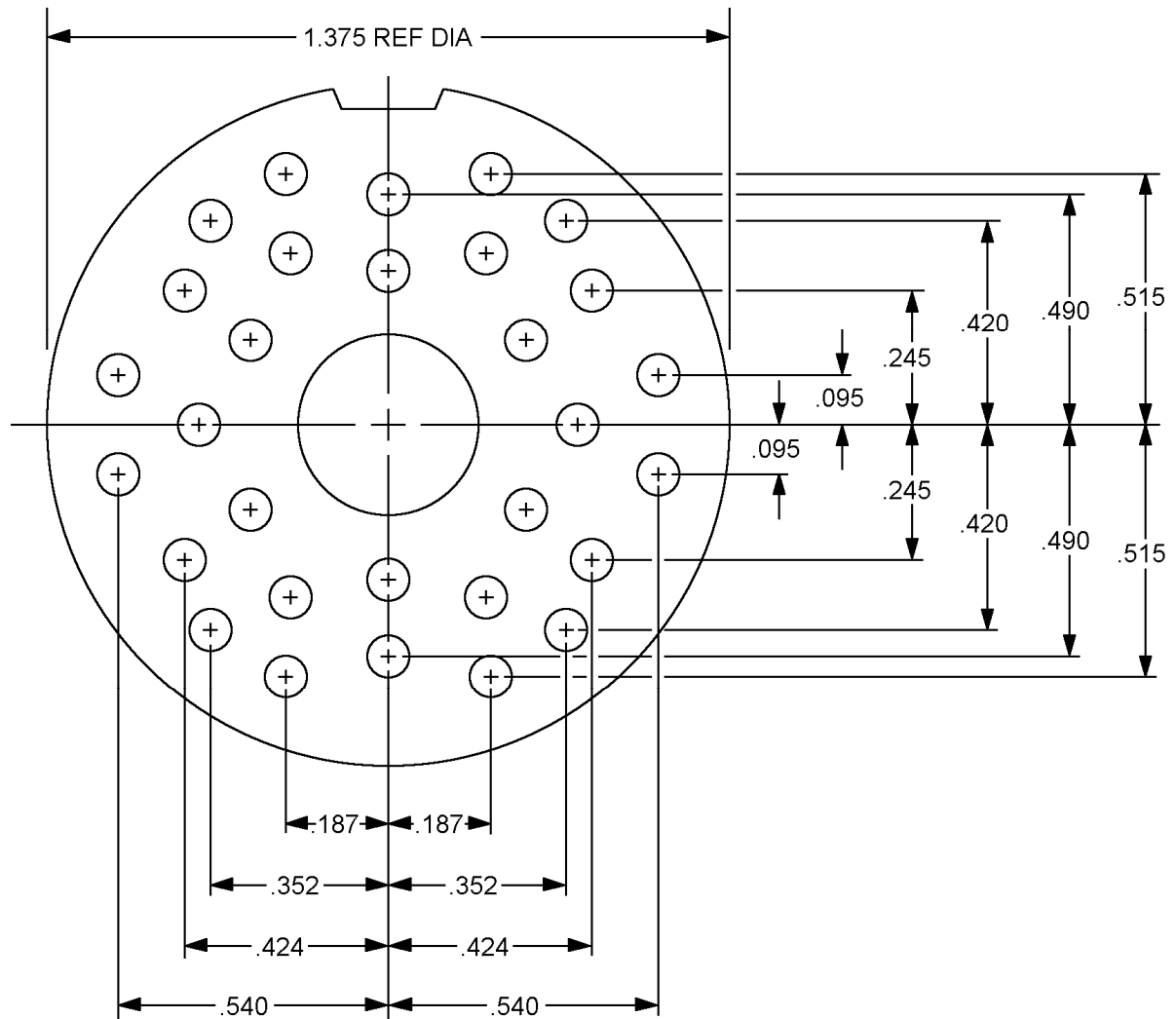
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INSERT ARRANGEMENT E
(Inner circle of contacts dimension shown)

FIGURE 1. Insert arrangements - Continued.

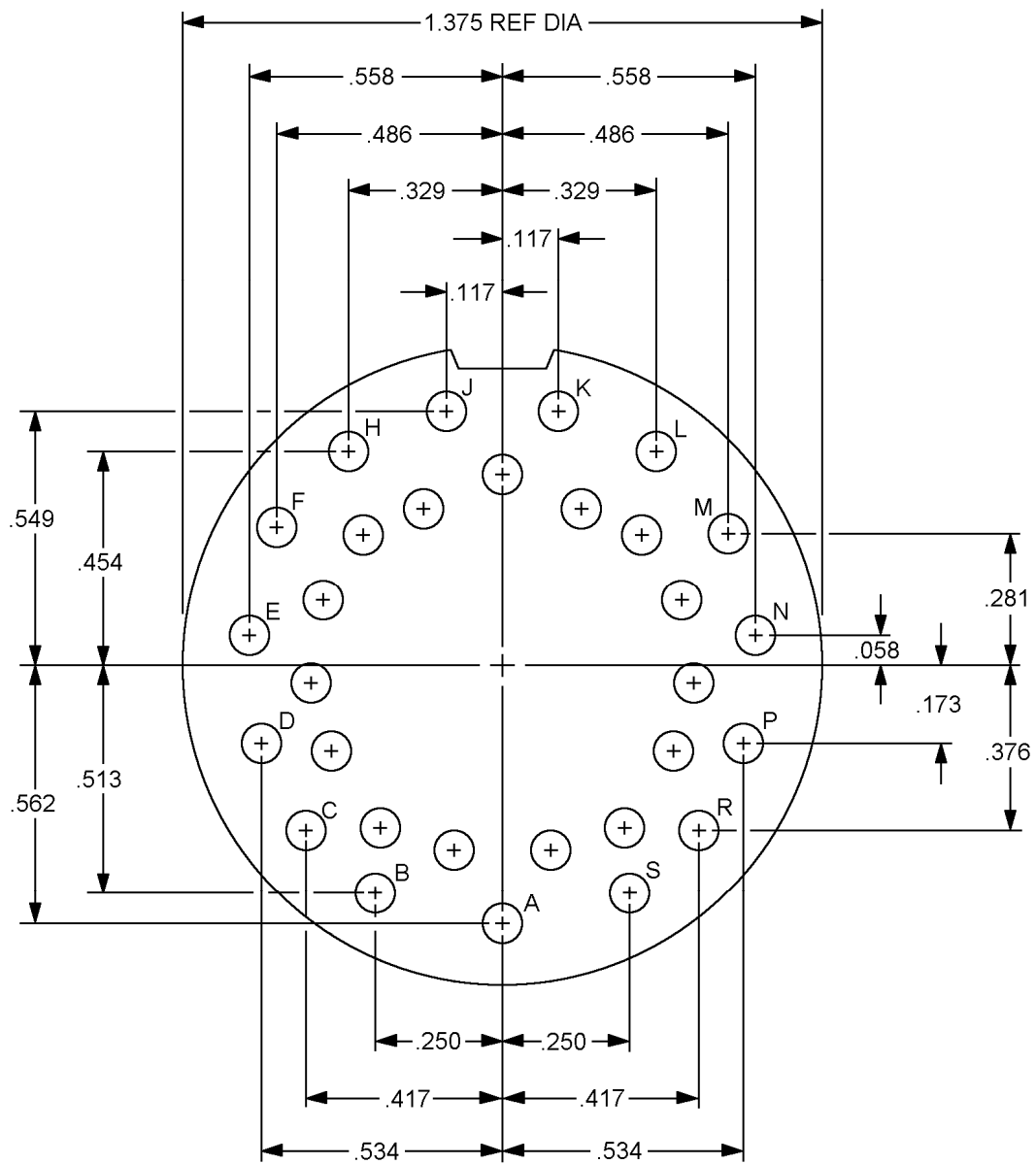
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INSERT ARRANGEMENT E
(Outer circle of contacts dimension shown)

FIGURE 1. Insert arrangements - Continued.

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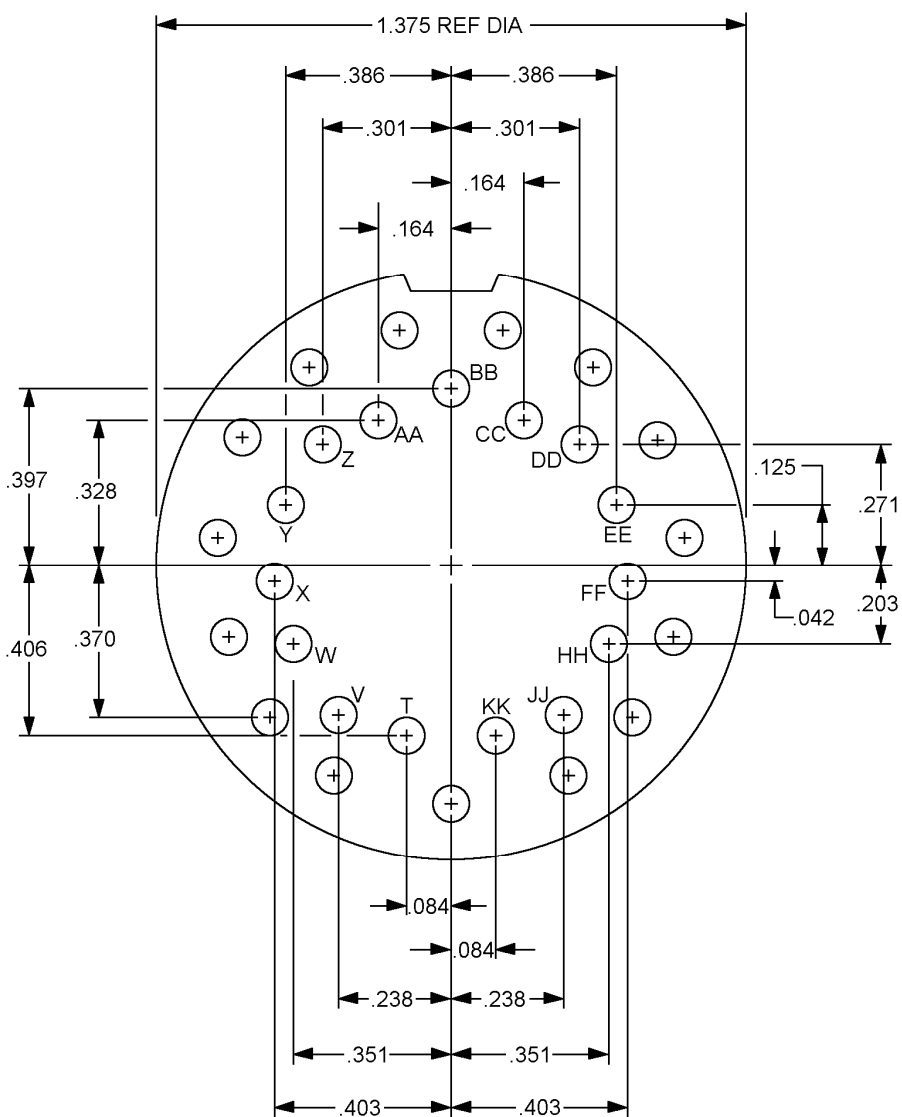


(NOT TO BE USED FOR NEW DESIGN)

INSERT ARRANGEMENT F
(Outer circle of contacts dimension shown)

FIGURE 1. Insert arrangements - Continued.

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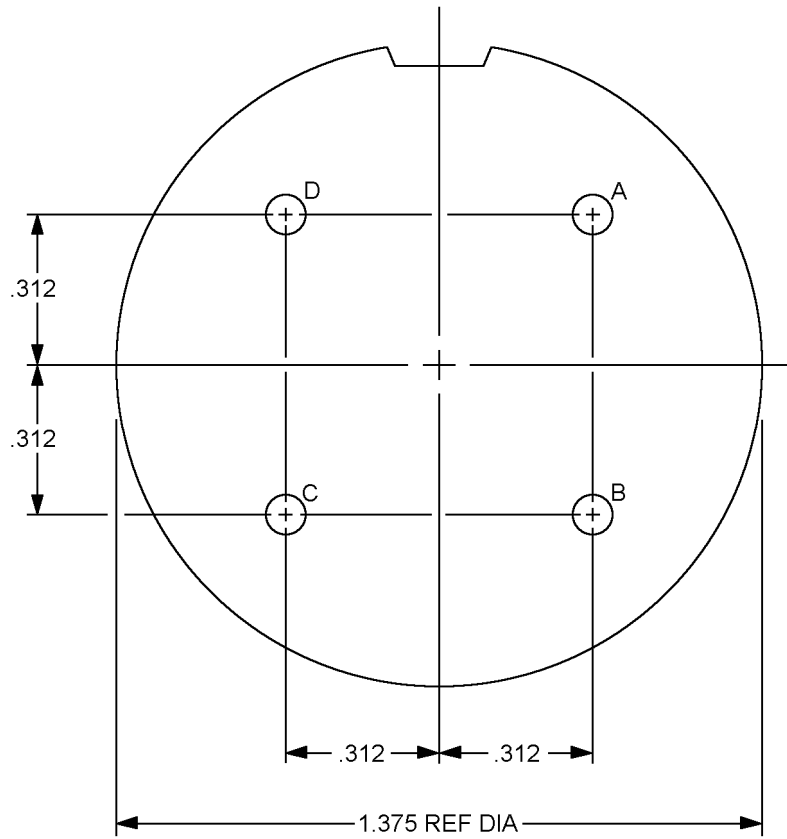


(NOT TO BE USED FOR NEW DESIGN)

INSERT ARRANGEMENT F
(Inner circle of contacts dimension shown)

FIGURE 1. Insert arrangements - Continued.

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INSERT ARRANGEMENT G

FIGURE 1. Insert arrangements - Continued.

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Inches	mm	Inches	mm	Inches	mm
.002	0.05	.245	6.22	.370	9.40
.042	1.07	.246	6.25	.376	9.55
.058	1.47	.250	6.35	.386	9.80
.060	1.52	.264	6.70	.397	10.08
.076	1.93	.269	6.83	.403	10.24
.084	2.13	.271	6.88	.406	10.31
.095	2.41	.281	7.14	.415	10.54
.103	2.62	.295	7.49	.417	10.59
.113	2.87	.298	7.57	.420	10.67
.117	2.97	.301	7.64	.424	10.77
.118	3.00	.305	7.75	.433	11.00
.125	3.17	.310	7.87	.454	11.53
.145	3.68	.312	7.92	.478	12.14
.152	3.86	.314	7.97	.486	12.34
.164	4.16	.318	8.08	.490	.490
.165	4.19	.320	8.13	.509	.509
.172	4.37	.324	8.23	.513	.513
.173	4.39	.328	8.33	.515	.515
.184	4.67	.329	8.36	.518	.518
.187	4.75	.331	8.41	.531	.531
.197	5.00	.335	8.51	.534	.534
.203	5.16	.339	8.61	.535	.535
.214	5.43	.344	8.74	.540	.540
.215	5.46	.347	8.81	.549	.549
.221	5.61	.351	8.91	.558	.558
.230	5.84	.352	8.94	.562	.562
.234	5.94	.365	9.27	1.000	1.000
.238	6.04	.369	9.37	1.375	1.375

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for information only.
3. Unless otherwise specified, tolerances are $\pm .002$ (0.05 mm).

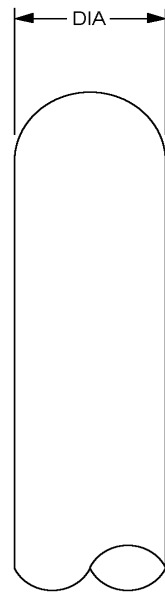
FIGURE 1. Insert arrangements - Continued.

3.5.4 Contacts. Contacts shall be fabricated of a copper-alloy material. All contact surfaces shall be smooth and shall be gold plated, 0.000030 thick in accordance with [ASTM B488](#) over silver plate finish number M310 in accordance with [MIL-F-14072](#).

3.5.4.1 Female contacts. All contacts and spring elements of contacts shall be beryllium copper [ASTM B194](#). The contacts shall be of the closed entry type, rounded and chamfered to follow for directing and centering of the entering male contact.

3.5.4.2 Male contacts. Contacts shall be of the dimensions specified on figure 2.

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Diameter	Contact size
.050	20
.0625	16
.094	12
.142	8

MALE CONTACT

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for information only.
3. Unless otherwise specified, tolerances are $\pm .001$ (0.02 mm).
4. Dimension is measured over plating:

FIGURE 2. Male contact dimension.

3.5.5 Connector shell. The connector shell shall be fabricated of brass or aluminum; the nosepiece which consists of the mating portion of the shell shall be fabricated of steel of type capable of meeting the impact requirement of 4.7.11.

3.5.5.1 Castings. Castings shall be of uniform quality and condition, and free from cracks, harmful shrinkage, porosity, gas holes, foreign matter, and other injurious defects. The surface of the castings shall be free from pits, burns, sharp edges, parting lines, porous area, fins, ridges, nodules, raised metal, and scale. All the castings shall be completely cleaned prior to presentation for inspection. Castings shall not be plugged, or welded nor shall imperfections be filled in.

3.5.6 Center-coupling thread (plugs). All parts of the center-coupling thread subassembly of the plug shall be fabricated of corrosion-resistant steel. The center-coupling thread shall be capable of being turned freely in either direction, without the use of tools.

3.5.6.1 Wing blade. The wing blade shall fold back by a snap action or be held in place against the metal body by slight friction at the hinge.

3.5.7 Center-coupling thread (receptacles). The center-coupling thread of receptacles shall be fabricated of corrosion-resistant steel.

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3.5.8 Finish. External corrosion-resistant steel parts shall be of a fine sandblast finish. All other metal parts except electrical contacts shall be cadmium-plated conforming to class 1, type II in accordance with [SAE-AMS-QQ-P-416](#). Aluminum parts shall be zincated and copper-plated (0.0001 inch thick) prior to being finished. The resulting finish shall be dull olive drab in color.

3.6 Cleaning.

3.6.1 Parts. After fabrication, parts shall be cleaned in accordance with good commercial practice, or as specified in an applicable document. Cleaning processes shall have no deleterious effect. Corrosive material shall be removed completely before the parts are assembled.

3.6.2 Units. After assembly, units shall be cleaned, thoroughly and shall be free from particles of solder, flux, and other foreign materials. In addition, when necessary, such cleaning shall also be performed before final assembly of the units.

3.7 Markings. Connectors and accessories shall be marked with letters approximately .062 inch high in accordance with [MIL-STD-130](#), with the type designation and the manufacturer's name or code. Co-designating numbers shall be in accordance with Commercial and Government Entity (CAGE) Cage Codes ([see 3.1](#)).

3.7.1 Identification of contacts. All contacts shall be identified as specified on FIGURE 1, ([see 3.5.3](#)), by letters either raised or depressed on the front and on the rear surface of each male and female insert. Lettering on the female insert shall correspond with the lettering on the male insert.

3.8 Soldering.

3.8.1 Acid or acid salts. Acid or acid salts may be used for soldering of mechanical joints not used to complete electrical circuits, but in no case shall acid or acid salts be used where they can come in contact with insulation material. Where acid or acid salts are used, they shall be completely neutralized and removed immediately after use.

3.8.2 Process. There shall be no sharp points or rough surfaces resulting from insufficient heating. The solder shall feather out to a thin edge, indicating proper flowing and wetting actions, and shall not be crystallized, overheated, or under heated. Any means employed to remove an unavoidable excess of flux shall not incur the risk of loose particles of flux, brush bristles, or other foreign material remaining in the equipment; flux being spread over a larger area; or damage to the equipment. Insulation material has been subjected to heating during the soldering operation shall be undamaged and parts fastened thereto shall not have become loosened.

3.9 Dielectric withstanding voltage. When mated or unmated connectors are tested as specified in [4.7.2](#), there shall be no arcing or dielectric breakdown.

3.10 Insulation resistance. When mated or unmated connectors are tested as specified in [4.7.3](#), the insulation resistance shall be not less than 1000 megohms.

3.11 Air pressure. When connectors are tested as specified in [4.7.4](#), there shall be no evidence of leakage through the body.

3.12 Voltage drop. When female connectors are tested as specified in [4.7.5](#), the voltage drop across the mating contact terminals shall not exceed the value specified ([see 3.1](#)).

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3.13 Moisture resistance. When unmated connectors are tested as specified in [4.7.6](#), the insulation resistance shall be not less than 1 megohm after step 6 of the final cycle and a minimum of 100 megohms after the 24 hour drying period. After the test, there shall be no evidence of breaking, cracking, spalling, or loosening of terminals (see [4.7.6](#)).

3.14 Insert strength. When connectors are tested as specified in, [4.7.7](#), there shall be no cracking or breaking of inserts and the center-locking nut shall not rotate or become disassociated from the insert.

3.15 Temperature cycling. When connectors are tested as specified in, [4.7.8](#), there shall be no physical damage, arcing, or dielectric breakdown. During the fifth cycle of test, connectors shall be capable of mating and unmating, and female connectors shall maintain electrical continuity.

3.16 Water pressure. When connectors are tested as specified in, [4.7.9](#), there shall be no evidence of leakage through the body, and the insulation resistance shall be not less than 100 megohms.

3.17 Endurance. When connectors are tested as specified in, [4.7.10](#), there shall be no evidence of mechanical damage and the wing blade shall not loosen, change in shape, or be otherwise damaged. After test, the voltage drop across the female contacts shall not exceed the value specified (see [3.1](#)).

3.18 Impact resistance. When connectors are tested as specified in, [4.7.11](#), there shall be no physical damage to the shell or nosepiece, and connector shall be capable of being mated. The nosepiece is defined as the mating portion of the shell.

3.19 Vibration. When mated connectors are tested as specified in, [4.7.12](#), there shall be no evidence of cracking, breaking, or loosening of parts, and the plug shall not become disengaged from the receptacle. The voltage drop across the female contacts shall not exceed the value specified (see [3.1](#)).

3.20 Salt spray (corrosion). After unmated connectors are tested as specified in, [4.7.13](#), there shall be no evidence of base metal corrosion.

3.21 Interchangeability. Like units and replaceable parts shall be physically and functionally interchangeable, without modification of such items or of the equipment (see [4.7.14](#)). Individual items shall not be handpicked for fit or performance; however, matched pairs or sets, when permitted, may be interchangeable as such. Reliance shall not be placed on any unspecified dimensions, rating, characteristic.

3.22 Workmanship. The connectors shall be manufactured and assembled in accordance with the applicable portions of the following:

[3.5](#) Design and construction.

[3.6](#) Cleaning.

[3.8](#) Soldering.

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4. VERIFICATION

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

- a. First Article inspection ([see 4.2](#))
- b. Conformance inspection ([see 4.4](#)).

4.2 First Article inspection. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in this specification.

4.2.1 Preproduction inspection. This inspection will be performed by the Government unless otherwise specified in the contract. It shall consist of the inspection specified in the subsidiary documents covering the items listed in [4.3](#), and the inspection specified for group A, group B, and group C (see tables [IV](#), [V](#), and [VI](#) respectively). The preproduction inspection will normally be performed in this order: (1) vibration, (2) impact resistance and (3) water pressure; other preproduction inspection may precede follow or be interspersed between the foregoing.

4.3 Acceptance inspection covered by subsidiary document. The following shall be inspected under the applicable subsidiary documents as part of the acceptance inspection before preparation for delivery:

<u>Item</u>	<u>Requirement paragraph</u>
Finish	3.5.8
Markings	3.7

4.4 Conformance inspection. The contractor, to demonstrate compliance with specified requirements, shall perform the inspection specified in [4.3](#) and [4.4.1](#) through [4.4.4](#). This does not relieve the contractor of his responsibility for performing any additional inspection, which is necessary to control the quality of the product and to assure compliance with all specification requirements. The Government will review and evaluate the contractor's inspection procedures and examine the contractor's inspection procedures and examine the contractor's inspection records. In addition the Government at its discretion may perform all or any part of the specified inspection, to verify the contractor's compliance with specified requirements ([see 6.5](#)). The contractor shall make test equipment for Government verification inspection available.

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4.4.1 Group A inspection. Group A inspections shall consist of all the tests specified in [table IV](#), in the order shown.

TABLE IV. Group A inspection. 1/

<u>Inspection</u>	<u>Requirements paragraph</u>	<u>Inspection paragraph</u>
Visual and mechanical	3.1, 3.4, thru 3.8	4.7.1
Interchangeability	3.21	4.7.14
Dielectric withstanding voltage 2/	3.9	4.7.2
Insulation resistance	3.10	4.7.3
Air pressure	3.11	4.7.4

1/ 100 percent inspection.

2/ Test between adjacent contacts and between two peripheral contacts and the shell.

4.4.2 Group B inspection. Group B inspections shall consist of all the tests specified in [table V](#), in the order shown. Group B inspection shall be performed on samples, which have been subjected to and have passed the group A inspection.

TABLE V. Group B inspection.

<u>Inspection</u>	<u>Requirements paragraph</u>	<u>Inspection paragraph</u>
Voltage drop	4.7.5	4.7.5
Insert strength	3.14	4.7.7

4.4.2.1 Sampling plan (group B inspection). A sample size shall be randomly selected in accordance with TABLE VI. If one or more defects are found the lot shall be rescreened and defects removed. A new sample in accordance with table VI shall be randomly selected. If one or more defects are found in the second sample the lot shall be rejected and shall not be supplied to this specification.

TABLE VI. Sampling plans.

<u>Lot size</u>	<u>Sample size</u>
1 to 13	100 percent
14 to 150	13 units
151 to 280	20 units
281 to 500	29 units
501 to 1,200	34 units
1,201 to 3,200	42 units

4.4.2.2 Disposition of sample units. Sample units which have passed all of group B inspections may be delivered on the contract or purchase order if the lot is accepted and the sample units are still within specified tolerances.

4.4.3 Group C inspection. Group C inspections shall consist of all the tests specified in [table VII](#), in the order shown. Group C inspection shall be performed on sample units that have been subjected to and have passed group A and group B inspections. Sample units subjected to group C inspection shall not be furnished on contract.

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TABLE VII. Group C inspection.

<u>Inspection</u>	<u>Requirements paragraph</u>	<u>Inspection paragraph</u>
Temperature cycling	3.15	4.7.8
Water pressure	3.16	4.7.9
Endurance	3.17	4.7.10
Impact resistance	3.18	4.7.11
Vibration	3.19	4.7.12
Moisture resistance	3.13	4.7.6
Salt spray (corrosion)	3.20	4.7.13

4.4.3.1 Sampling for inspection of connectors. For each group C inspection, 2 connectors each type produced shall be selected from each month's production without regard to quality. The units inspected at the start of the contract shall be selected from the first units produced.

4.4.3.2 Noncompliance. If a sample unit fails group C inspection the contractor shall immediately investigate the cause of failure and shall report to the Government inspector the results thereof and details of the corrective action taken on the process and all units of product which were manufactured with the same conditions, materials, processes, etc. If the Government inspector does not consider that the corrective action will enable the product to meet specified requirements, or if the contractor cannot determine the cause of failure, the matter shall be referred to the contracting officer ([see 6.4](#)).

4.4.4 Reinspection of conforming group B and group C sample units. Unless otherwise specified, sample units which have been subjected to and passed group B or group C inspection, or both, may be accepted on contract, provided that they are resubjected to and pass group A inspection after repair of all visible damage.

4.5 Inspection conditions. Unless otherwise specified herein, all inspections shall be made at room temperature, pressure, and humidity.

4.6 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality, and quantity to permit performance of the required inspection shall be established and maintained by the contractor. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with [NCSL Z540.1](#).

4.6.1 Test and mating connectors. The test and mating connectors shall have passed all applicable tests in [table IV](#).

4.6.1.1 Test plug. The test plug for insert-strength tests shall be identical with the mating plug except that it shall be fabricated of high strength steel and to the minimum dimensions specified ([see 3.1](#)). Both the insert and shell shall be so constructed as to permit their use separately or as a complete unit.

4.6.1.2 Test receptacle. The test receptacle for insert-strength tests shall be identical with the mating receptacle except that it shall be fabricated of high strength steel and to the minimum dimensions specified ([see 3.1](#)). Both the insert and shell shall be so constructed as to permit their use separately or as a complete unit.

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4.7 Methods of examinations and tests.

4.7.1 Visual and mechanical inspection. Connectors shall be examined to verify that the materials, design and construction, marking and workmanship are in accordance with the applicable requirements (see 3.1, 3.4, 3.5 and 3.7).

4.7.2 Dielectric withstanding voltage. The test voltage specified (see 3.1) shall be applied between each contact of the connector and the remaining contacts connected together and to the shell. The voltage shall be increased gradually from zero until the specified voltage is reached and shall be maintained at that value for approximately, but not less than 1 minute. The voltage shall be reached within 5 seconds.

4.7.3 Insulation resistance (see 3.10). The insulation resistance shall be measured between each contact of the connector and the remaining contacts connected together and to the shell.

4.7.4 Air pressure (see 3.11). An air pressure of 2.5 pounds per square inch shall be applied to the contact face and then to the rear of the plug or receptacle using the differential leakage tester shown on figure 3 as follow:

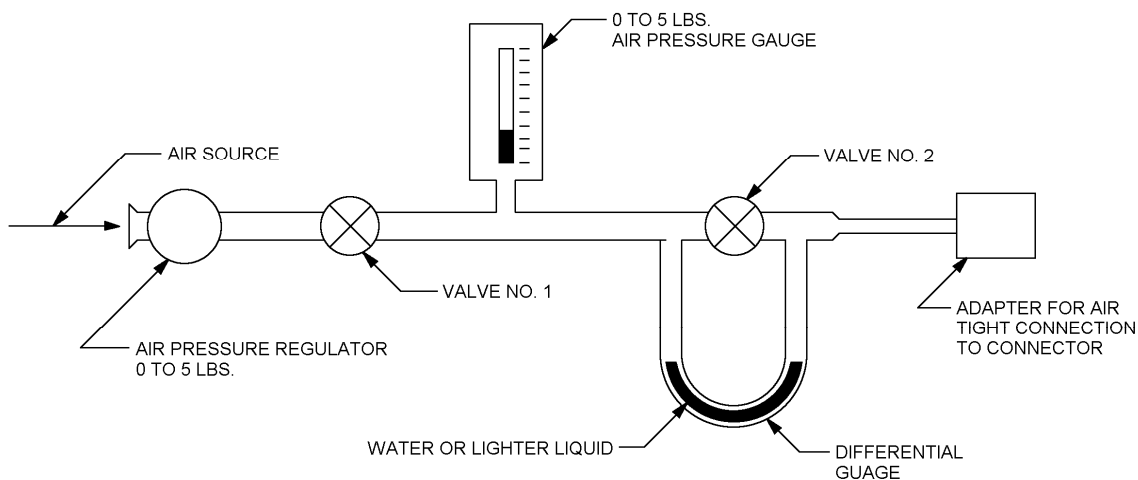


FIGURE 3. Diagram of air pressure test setup.

- a. The connector shall be attached to the leakage tester with its face against the appropriate jig of the leakage tester. With the differential gage bypass valve open, the line valve and regulator shall be adjusted to apply 2.5 pounds pressure to the connector face. After at least 15 seconds the line valve shall be closed. Then the differential gage bypass valve shall be closed and the differential gage observed for not less than 30 seconds for a continuous change in the level of the two columns (a small momentary change when the bypass valve is closed is not evidence of leakage). The bypass valve shall be opened before removal of the connector.
- b. After completion of the above, the rear of the connector shall be attached to the proper jig of the tester and the test repeated.
- c. After completion of the above, the face of the connector shall be attached to the appropriate jig of the tester and the mating seal shall be tested by applying a differential pressure of 2.5 pounds to the seal lip around the contact face and repeating the test.

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4.7.5 Voltage drop (see 4.7.5). The female connector shall be mated with the specified male connector, and the specified direct current shall be applied between corresponding terminals (see 3.1). The voltage drop across the mating contact terminals shall be measured using the voltmeter-ammeter method or equivalent. The combined error of the measurements shall not exceed 5%.

4.7.6 Moisture resistance (see 3.13). Connectors, mated and unmated, shall be subjected to continuous cycling for five 48-hour cycles. Temperature, relative humidity, and period of time shall, be in accordance with MIL-STD-810. The connectors is to be removed from the humidity chamber and allowed to dry for a period of approximately 24 hours at $25^{\circ} \pm 5^{\circ}\text{C}$, with relative humidity controlled at $50 \pm 5\%$. The connectors shall be then subjected to the test specified for insulation resistance in 4.7.3. (see 3.13)

4.7.7 Insert strength (see 3.14). The connector shall be securely mounted and shall be tested with the applicable test connector (see 4.6.1) as specified in 4.7.7.1, 4.7.7.2, and 4.7.7.3.

4.7.7.1 Axial force. A force parallel to the axis of the receptacle, increasing from 0 to 400 pounds in not less than 10 or more than 20 seconds shall be applied for a period of 60 seconds. The force shall be applied first against the front and then the rear face of the insert. A pull of 400 pounds shall be applied to the center coupling threaded part.

4.7.7.2 Radial torque.

4.7.7.2.1 Plugs. The steel insert portion of the test receptacle (see 4.6.1.2) shall be mated with the plug under test. A gradually increasing radial torque shall be applied until a torque of 150 inch-pounds is reached, and shall be maintained for a period of 60 seconds.

4.7.7.2.2 Receptacles. The test shall be performed as specified in 4.7.7.2.1, except that the steel insert portion of the test plug (see 4.6.1.1) shall be mated with the receptacle under test.

4.7.7.3 Torque. The complete test plug shall be mated with the receptacle under test. A gradually increasing torque shall be applied to the test plug by means of a lever attached to the cable entry, until a torque of 150 inch-pounds is reached. The torque shall be maintained, for a period of 1 minute, and shall be applied both axially and radially.

4.7.8 Temperature cycling (see 3.15). Fifty percent of the connectors shall be mated and 50% unmated, and all shall be tested in accordance with method 102 of MIL-STD-202. The following details and exceptions shall apply:

- a. Test condition, D.
- b. Measurements after cycling. During the last 5 minutes of each exposure in the fifth cycle, unmated connectors shall be mated and checked for electrical continuity, and then unmated. Mated connectors shall be checked for electrical continuity. Forty-five minutes after the end of the fifth cycle, all connectors shall be subjected to the mating and unmating operation at least once, and then be subjected to the dielectric withstanding voltage test (see 4.7.2) while unmated.

4.7.9 Water pressure (see 3.16). Connectors shall be immersed in tap water to a depth of 6 feet for a period of 48 hours. Fifty percent of the connectors tested shall be mated and 50% shall be unmated.

4.7.9.1 Plugs. A rubber test jig shall be inserted into the cable accommodation of the plugs to prevent entrance of water. The test jig shall be approximately 6 inches long and shall have the minimum diameter specified for the cable accommodation with a tolerance of (+ 0.010, - 0.000). Plugs shall be disassembled and reassembled twice before being tested. After test, the plugs shall be examined for

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leakage. All excess moisture shall be removed and the connector dried at room temperature by compressed air for a period of 5 minutes. The insulation resistance shall be measured (see 3.16).

4.7.9.2 Receptacles. Receptacles shall be mounted using the normal mounting method so that only the front face is exposed to water. After test, the receptacles shall be examined for leakage. All excess moisture is to be removed and the connector dried at room temperature by compressed air for a period of 5 minutes. The insulation resistance shall be measured (see 3.16).

4.7.10 Endurance (see 3.17). Connectors shall be coupled and uncoupled with their mating plugs or receptacles 500 times. For each coupling, a torque of 25 ± 1 inch-pounds shall be applied to the wing blade in the direction to tighten. During the final coupling, the torque shall be maintained for at least 1 minute. After test, the connectors shall be examined for mechanical defects and the voltage drop across the female contacts is to be measured (see 4.7.5).

4.7.11 Impact resistance.

4.7.11.1 Connector nosepiece (see 3.18). The plug connector under test shall be securely mounted to a hardwood base. The nosepiece shall be supported along its axial length by a hardwood block and subjected to a transverse blow of 40 inch-pounds (a weight of 2 pounds falling freely through a height of 20 inches). The blows shall be delivered by a flat, blunt object, approximately .125 inch wide one to the polarizing groove and the other at a point 180° from the polarizing groove in the vicinity of the mating edge (see figure 4).

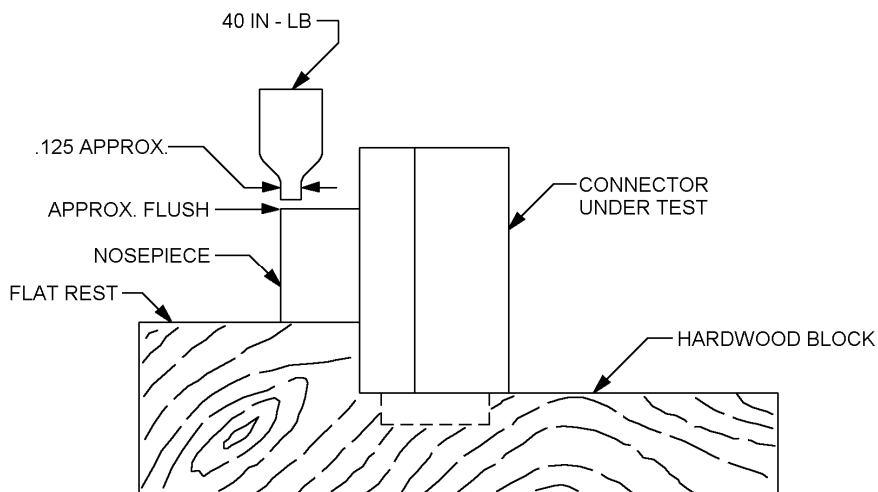


FIGURE 4. Impact resistance test setup.

4.7.11.2 Connector shell.

4.7.11.2.1 Impact resistance of shell body (see 3.18). The shell body of the connector plug, if fabricated by means of die-casting, shall be subjected to a force of 115 inch pounds applied as shown on figure 5.

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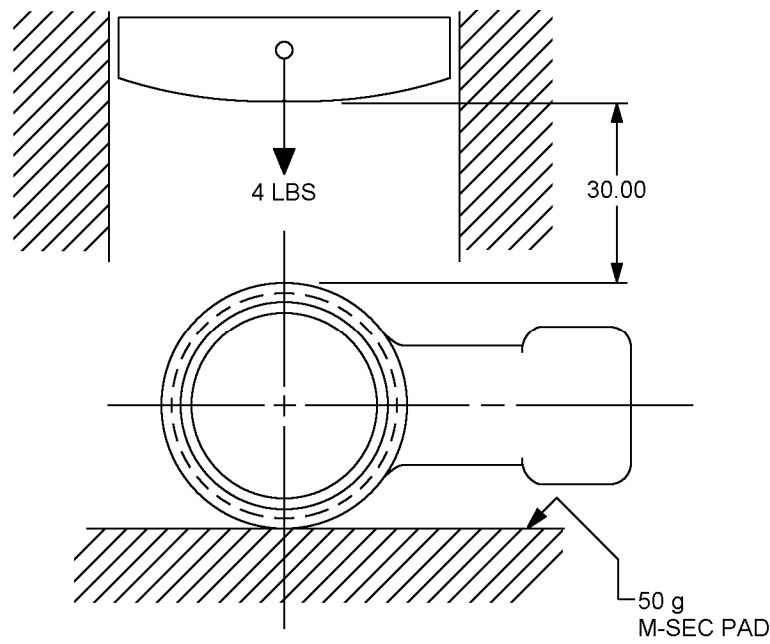


FIGURE 5. Impact resistance of shell body.

4.7.11.2.2 Compression of shell body (see 3.18). The shell body of the connector plug, if fabricated by means of die-casting, shall be subjected to a force of 300 pounds applied as shown on figure 6.

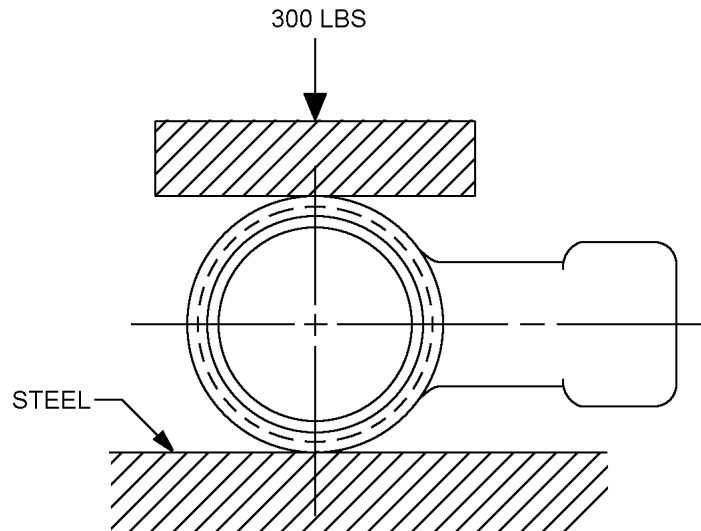


FIGURE 6. Compression of shell body.

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4.7.12 Vibration (see 3.19). Mated connectors shall be tested in accordance method 201 of MIL-STD-202. The following details and exceptions shall apply:

- a. Method of mounting: Connectors shall be rigidly mounted by receptacle mounting.
- b. Tests and measurements after vibration. The connector shall be subjected to the dielectric withstanding voltage test (see 4.7.2) and the voltage drop test (see 4.7.5).
- c. Duration and direction of motion: Two hours in each of three mutually perpendicular directions. One direction shall be with the contact axis in a horizontal plane.

4.7.13 Salt spray (corrosion) (see 3.20). Unmated connectors shall be tested in accordance with method 101, test condition B, of MIL-STD-202. After test, the connector shall be visually examined for evidence of base metal corrosion.

4.7.14 Inspection for dimensional interchangeability (see 3.21).

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 activities within the Military Service or Defense Agency, or within the Military Service's system commands. 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 electrical connectors covered by this specification are intended primarily for ground or shore use.

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 3.1).
- c. Level of preservation, packaging, and marking required (see section 5).

6.3 Group C inspection. Approval to ship may be withheld, at the discretion of the Government, pending the decision from the contracting officer on the adequacy of corrective action (see 4.4.3.2).

6.4 Definitions.

6.4.1 Connector. Connector is a term used to denote an electrical plug or receptacle.

6.4.2 Plug. A plug is an electrical fitting with male, female, or male and female contacts, constructed to be affixed to the end of cable, conduit, coaxial line, cord, or wire for convenience in joining with another electrical connector (s), and not designed to be mounted on a bulkhead, chassis, or panel.

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6.4.3 Receptacle. A receptacle is an electrical fitting with male, female, or male and female contacts, constructed to be electrically connected to a cable coaxial line, cord, or wires to join with another electrical connector(s), and is designed to be mounted on a bulkhead, wall, chassis, or panel.

6.4.4 Contacts. Contacts are current-carrying parts of a connector, which connect and disconnect a circuit.

6.4.5 Inserts. Inserts are the insulated parts of a connector in which the contacts are arranged.

6.4.6 Shell. The shell is that part of a connector which houses the threaded mating parts and the insert and contact assembly.

6.4.7 Polarization. Polarization is the physical means of properly aligning the contacts of both the plug and the receptacle for correct engagement. A connector may be polarized by the use of a key on the receptacle shell with a corresponding slot in the plug shell.

6.5 Verification inspection. Verification by the Government will be limited to the amount deemed necessary to determine compliance with the contract and is to be limited in severity to the definitive quality assurance provisions established in this specification and the contract. The amount of verification inspection by the Government will be adjusted to make maximum utilization of the contractor's quality control system and the quality history of the product.

6.6 Cross index of type designation. [Table VIII](#) is a cross index of type designations covered by this specification corresponding to the type designations of superseded MIL-C-12520A Signal Corps (SigC).

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TABLE VIII. Cross index of type designations.

Specifications MIL-C-12520A(SigC)				Specifications MIL-C-12520B		
CS-1220	(1)	(S)	(.450)	UW-1220	FA	15
CS1220	(1)	(P)	(.450)	UW-1220	MA	15
CS-1220	(2)	(S)	(.500)	UW-1220	FB	17
CS-1220	(2)	(P)	(.500)	UW-1220	MB	17
U-113						
CS-1220	(1)	(P)	(.525)	UW-1220	MA	17
U-115						
CS-1220	(2)	(P)	(.550)	UW-1220	MB	19
CS-1226	(1)	(S)	(.550)	US-1226	FC	19
CS-1226	(1)	(P)	(.550)	US-1226	MC	19
CS-1226	(2)	(S)	(.700)	US-1226	FD	25
CS-1226	(2)	(P)	(.700)	US-1226	MD	25
CS-1320	(1)	(S)	(.450)	US-1226	FA	15
CS-1320	(1)	(P)	(.450)	US-1320	MA	15
CS-1320	(2)	(S)	(.500)	US-1320	FB	17
CS-1320	(1)	(P)	(.540)	US-1320	MA	17
CS-1320	(2)	(P)	(.500)	US-1320	MB	17
CS-1320	(2)	(P)	(.550)	US-1320	MB	19
CS-1326	(1)	(S)	(.550)	UW-1326	FC	19
CS-1326	(1)	(P)	(.550)	UW-1326	MC	19
CS-1326	(1)	(P)	(.550)	UW-1326	MC	19
CS-1326	(2)	(S)	(.700)	UW-1326	FD	25
CS-1326	(2)	(P)	(.700)	UW-1326	MD	25
CS-2020	(1)	(S)		UW-2020	FA	00
CS-2020	(2)	(S)		UW-2020	FB	00
CS-2026	(1)	(S)		UW-2026	FC	00

6.7 Military unique statement. This connector is military unique because it is a centerlock screw coupling connector, that is waterproof, used primarily for power and control circuits.

6.7 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. Table IX 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 IX. 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	

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6.9 Guidance on use of alternative parts with less hazardous or nonhazardous materials. This specification provides for a number of alternative plating materials via the PIN. Users should select the PIN with the least hazardous material that meets the form, fit and function requirements of their application.

6.10 Subject term (keyword) listing.

Brass
Castings
Control circuits
Copper beryllium
Ground shore use
Polarized

6.11 Changes from the previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

CONCLUDING MATERIAL

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

Preparing activity:
DLA - CC

(Project 5935-4726-000)

Review activities:
Army - MI
Air Force - 99

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 the ASSIST Online database at <http://assist.daps.dla.mil>.