

MIL-C-21617(SHIPS)
23 January 1959

MILITARY SPECIFICATION
CONNECTORS, PLUG AND RECEPTACLE—ELECTRICAL
RECTANGULAR, POLARIZED SHELL,
MINIATURE TYPE

1. SCOPE

1.1 Scope. - This specification covers multi-contact, rectangular polarized shell, miniature type electrical and electronic rack and panel connectors (plug and receptacles).

1.2 Classification. - Connectors shall be of the following types, classes, and styles, as specified (see 6.2).

1.2.1 Type. -

Type P - Plug.
Type J - Receptacle.
Type JS - Receptacle, pressurized type.

1.2.2 Classes. -

Class F - Female, inserts containing socket contacts.
Class M - Male, inserts containing pin contacts.

1.2.3 Styles. -

004A - 4 contact.
008A - 8 contact.
013A - 13 contact.
017A - 17 contact.
023A - 23 contact.
026A - 26 contact.
032A - 32 contact.
040A - 40 contact.
007C - 7 coaxial contacts.
016C { 3 coaxial contacts.
 13 size 20 contacts.

2. APPLICABLE DOCUMENTS

2.1 The following specifications and standards, of the issue in effect on date of invitation for bids, form a part of this specification:

SPECIFICATIONS

FEDERAL

QQ-A-591 - Aluminum Alloy Die Castings.
QQ-P-416 - Plating, Cadmium (Electrodeposited).
PPP-B-586 - Boxes, Folding, Paper-board.
PPP-B-585 - Boxes; Wood, Wirewound.
PPP-B-591 - Boxes, Fiberboard, Wood-Cleated.

FSC 5935

MIL-C-21617(SBIPS)

FEDERAL (cont'd.)

- PPP-B-601 - Boxes, Wood, Cleated-Plywood.
- PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.
- PPP-B-636 - Boxes, Fiber.
- PPP-B-676 - Boxes, Set-Up, Paperboard.
- PPP-T-76 - Tape, Pressure-Sensitive Adhesive, Paper, Water Resistant.

MILITARY

- MIL-M-14 - Molding Plastics and Molded Plastic Parts, Thermosetting.
- MIL-P-116 - Preservation; Methods of.
- MIL-R-3065 - Rubber and Synthetic Rubber Compounds, General Purpose
(Except Tires, Inner Tubes, Sponge Rubber and Hard Rubber).
- MIL-B-4229 - Boxes, Paperboard, Metal-Stayed.
- MIL-D-5028 - Drawings and Data Lists; Preparation of Manufacturer's (for
Production Aeronautical and Associated Equipment).
- MIL-B-10377 - Box, Wood-Cleated, Veneer, Paper-Overlaid.
- MIL-L-10547 - Liners, Case, Waterproof.

NAVY DEPARTMENT

General Specifications for Inspection of Material.

STANDARDS

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes, and
Appendix - Sampling for Expensive Testing by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer.)

2.2 Other publications. - The following document forms a part of this specification. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

OFFICIAL CLASSIFICATION COMMITTEE
Uniform Freight Classification Rules.

(Application for copies should be addressed to the Official Classification Committee, 1 Park Avenue at 33rd St., New York 16, N. Y.)

3. REQUIREMENTS

3.1 Qualification. - Connectors furnished under this specification shall be a product which has been tested and has passed the qualification tests specified herein.

3.2 Definitions. - For purposes of this specification, the following definitions shall apply:

3.2.1 Connector assembly. - A complete connector assembly consists of a mated plug and receptacle.

3.2.2 Receptacle. - A connector receptacle is that portion of the connector assembly which is normally "fixed", that is, rigidly attached to a supporting surface. It shall be provided with pin contacts.

3.2.3 Plug. - A connector plug is that portion of the connector assembly which is normally "removable". The plug shall be provided with socket contacts.

MIL-C-21617(SHIPS)

3.2.4 Shell. - A connector shell is the outside case into which the insert and contacts are assembled.

3.2.5 Insert. - A connector insert is that part which holds the contacts in their proper arrangement and electrically insulates them from each other and from the shell.

3.2.6 Pin. - A connector pin is a male contact. It is normally connected to the "dead" side of a circuit.

3.2.7 Socket. - A connector socket is a female contact. It is normally connected to the "live" side of a circuit.

3.3 Materials. - Materials shall be as specified herein. However, when a definite material is not specified, a material shall be used which will enable the connectors to meet the performance requirements of this specification. Acceptance or approval of a constituent material shall not be construed as an assurance of the acceptance of the finished product.

3.3.1 Nonmagnetic materials. - All parts shall be made from materials considered to be nonmagnetic.

3.3.2 Shells. - Shell material shall be made from a high grade aluminum alloy. Die castings and workmanship shall conform to composition number 1, 2, 5, 5A, 10, or 11 of Specification QQ-A-591.

3.3.3 Insert material. -

3.3.3.1 Rigid insert materials shall be mineral filled type conforming to type MME or MDG of Specification MIL-M-14.

3.3.3.2 Resilient materials. - Resilient materials shall conform to class SC717-A, B and E, of Specification MIL-R-3065, and shall be molded of a high grade resilient dielectric or elastomer having a shore hardness not greater than 85 and shall conform to the additional requirements specified herein.

3.3.4 Dissimilar metals. - Where dissimilar metals are used in intimate contact with each other, protection against electrolysis and corrosion shall be provided. The use of dissimilar metals in contact which tend toward electrolytic corrosion (particularly brass, copper or steel used in contact with aluminum or aluminum alloy) shall not be permitted.

3.3.5 Finish. - All metal exposed parts, other than electric contacts shall be cadmium plated in accordance with type II, class 3 of Specification QQ-P-416, except that a preliminary plating of other metal will be permissible. The resultant finish shall be electrically conductive.

3.4 Electrical characteristics. - Connectors shall have the electrical characteristics shown in table I.

Table I - Nominal current rating.

Contact size	Amperes
20	7.5
16	13.0
12	23.0
8	46.0
4	80.0

MIL-C-21617(SHIPS)

3.5 Design and construction. -

3.5.1 Connectors shall be of the design, construction and physical dimensions specified herein. Bosses and barriers shall be used as necessary to meet leakage requirements.

3.5.1.1 Insert design. - Inserts shall be designed and constructed with proper sections and radii in order that they will not crack, chip, or break in assembly or in normal service. Depressions used to achieve longer creepage paths shall not be used so as to cause structural weakness.

3.5.2 Contacts. - Contact dimensions shall conform to table II and shall be as shown on figure 1.

Table II - Contact dimensions.¹

Contact size	A +0.001	B Minimum	C Maximum	D Minimum	E Minimum
20	0.040	0.043	0.090	0.070	0.093
16	.0625	.065	.127	.078	.125
12	.094	.112	.190	.156	.375
8	.142	.207	.300	.250	.312
4	.225	.262	.441	.312	.312

¹All dimensions are after plating.

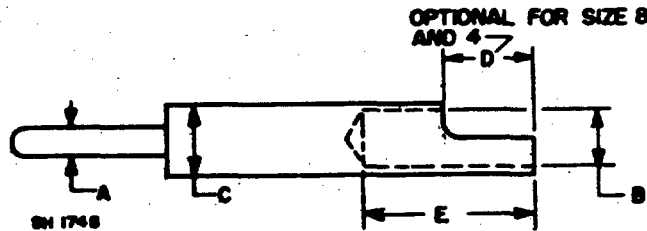


Figure 1 - Contact dimensions.

MIL-C-21617(SHIPS)

3.5.3 Contact material. - Contacts shall be made from copper alloy material and shall be gold plated 0.00025 inch minimum, over silver plating 0.0002 inch minimum or silver plated.

3.5.4 Terminals. - The interior surfaces of the solder cups of the contacts shall be gold plated over silver or silver plated. Unless gold plated, the interior surface of the solder cups shall be tinned with solder having a nominal content of 60 percent tin and 40 percent lead. The interior surface of solder cups of size 20 contacts shall be gold plated over silver. Only rosin, or alcohol and rosin shall be used as a flux, any excess of which shall be removed. Solder cup terminals shall be so constructed that liquid solder cannot leak through to the front of the socket and prevent insertion of the pin.

3.5.5 Contact identification. - Contacts shall be designated as specified herein. Letters or numerals shall be clearly legible, and shall be either raised or depressed. Letters or numerals shall be arranged to avoid confusion between contacts. All letters shall appear on the front of each insert, and as many as practical on the rear face. Lettering of the socket insert shall correspond with that of the mating pin insert.

3.5.6 Contact arrangement. - Contacts shall be arranged in accordance with the individual type requirements.

3.5.7 Contact design. - Contacts shall be so designed that they will not be damaged by mating or unmating the connectors.

3.5.7.1 Pin engaging end. - The entering ends of pins, sizes 16, 12 and 8 shall be formed with a spherical radius approximately $1/2$ the diameter of the pin, allowing for a flat not in excess of 0.015 inch diameter in the center of the spherical development. The entering end of size 20 pin shall be either formed with a spherical or a conical tip. The tip of the spherical end of the size 4 pin shall be cut off to form a blunt end such that the diameter of the blunt end shall be $1/8$ inch less than the pin diameter.

3.5.7.2 Socket engaging end. - The entering end of the socket contact shall be rounded or chamfered to allow for directing and centering of the entering pin. The socket contact shall provide the spring action for maintaining the contact pressure between the pin and socket. Size 16 socket contact shall be of the closed entry design to exclude the entrance of a pin 0.005 inch larger than the allowable maximum diameter of a mating pin. Socket contact size 20 shall be either closed or open entry design. Closed entry socket contacts size 16, shall pass the resistance to test prod damage test specified in 4.8.15.

3.5.8 Polarization. - Polarization of the plug with its receptacle shall be accomplished by the shells. The polarization of the plug, with its receptacle shall be accomplished before engagement of contact pins in their respective sockets.

3.5.9 Mating. - Plugs and receptacles shall be capable of being mated and unmated by hand without the aid of any tools within the temperature range for these connectors (see 3.5.12).

3.5.10 Shell design. - Connector shell design shall be either solid or split shell design.

3.5.11 Junction shells. - Connector shells both plug and receptacle shall be provided with a means of accommodating junction shells for straight and 90 degree angle exit of the cable from the connector assembly. Junction shells both straight and right angle are accessories and are not supplied as a part of the connector assembly (see 3.8.4).

3.5.12 Operating temperature. - Connectors shall have a maximum operating temperature of plus 125°C. and a minimum operating temperature of minus 55°C.

3.5.13 Part number changes. - Changes in manufacturer's part numbers shall be covered by the drawing requirements of Specification MIL-D-5028.

3.6 Performance. -

3.6.1 Insulation resistance. - When tested as specified in 4.8.2, the initial insulation resistance shall be not less than 5000 megohms. After being subjected to the test specified in 4.8.11 the insulation resistance shall be not less than 1 megohm.

MIL-C-21617(SHIPS)

3.6.2 Temperature range. - When tested as specified in 4.8.3 connectors shall not show evidence of physical damage after being subjected to temperature cycling test from plus 125°C. to minus 55°C.

3.6.3 Air leakage, type JS receptacle. - When pressurized connectors are tested as specified in 4.8.4 there shall be no leakage in excess of 1 cubic inch per hour of air at a pressure differential of 30 p. s. i.

3.6.4 High potential. - When tested as specified in 4.8.5, connectors shall be capable of withstanding the applicable high potential voltages shown in table III without flashover.

Table III - Voltage for high potential.

Service rating	Sea level test voltage (r. m. s.) (60 c. p. s.)
A	1500
D	2000
E	2800
Coaxial contacts	1000

3.6.5 Contact retention. - Individual contacts shall withstand the axial loads shown in 4.8.6.

3.6.6 Insert retention. - Connector inserts shall not show evidence of physical damage when tested as specified in 4.8.7.

3.6.7 Vibration. - When the complete connector assembly, wired with the appropriate size wire, is tested as specified in 4.8.8, there shall be no cracking, breaking or loosening of parts. There shall be no loss of electrical continuity of any of the contact circuits.

3.6.8 Insertion and withdrawal force (connector assembly). - When tested as specified in 4.8.9, the force required to either engage or separate any pair of mated connectors (plug and receptacle) shall not exceed a maximum force of 30 pounds.

3.6.9 Mechanical shock. - When tested as specified in 4.8.10 there shall be no evidence of mechanical failure of metallic or dielectric materials.

3.6.10 Moisture resistance. - When tested as specified in 4.8.11 connectors shall meet a potential test of one and one-half times the a. c. voltage specified in table IV for a period of 5 minutes between any pair of contacts or any contact to shell.

Table IV - Basic voltages - moisture resistance and corrosion tests.

Service rating	A. c. volts (r.m.s.) 60 c. p. s.
A	350
D	500
E	800

MIL-C-21617(SHIPS)

3.6.11 Durability. - The connector assembly shall withstand the test specified in 4.8.12 without evidence of mechanical damage.

3.6.12 Salt spray (corrosion). - When tested as specified in 4.8.13 exposure to salt laden atmosphere shall not cause sufficient corrosion to interfere with mating or unmating the connectors or cause exposure of the basis metal on the 25 sets of individual pin and socket contacts subjected. The connectors shall meet a potential test of twice the a. c. voltage specified in table IV.

3.6.13 Resistance of contacts. - When tested as specified in 4.8.14, the resistance of mated pin and socket contacts at $25^{\circ} \pm 3^{\circ}\text{C.}$, assembled as in service shall be such that the potential drop at the current specified in table V shall be not greater than that shown in table V.

Table V - Resistance.

Contact size	Test current (amperes)	Potential drop (millivolts) maximum
20	7.5	35
16	20	40
12	35	35
8	60	30
4	110	25

3.6.14 Resistance to test prod damage (size 16 socket contacts). - When tested as specified in 4.8.15, the socket contacts shall be capable of withstanding the test of 4.8.16.

3.6.15 Contact separation. - When tested as specified in 4.8.16 the force to separate an individual gage pin of minimum size shall not exceed the values shown in table VI.

Table VI - Contact separation forces.

Contact size	Test pin +0.0002 - .0000	Maximum average	Minimum individual
	Inch	Pounds	Pound
20	0.039	0.625	0.0625
16	.0615	1.500	.1875
12	.093	2.750	.375
8	.141	5.000	.625
4	.224	8.000	.750

3.7 Interchangeability. - Receptacles of a given size and design manufactured by one source to the requirements of this specification, shall be capable of mating with associated plugs manufactured to the requirements of this specification by other sources. The connector assemblies having the same part number shall be directly and completely interchangeable with each other with respect to installation and performance as specified herein.

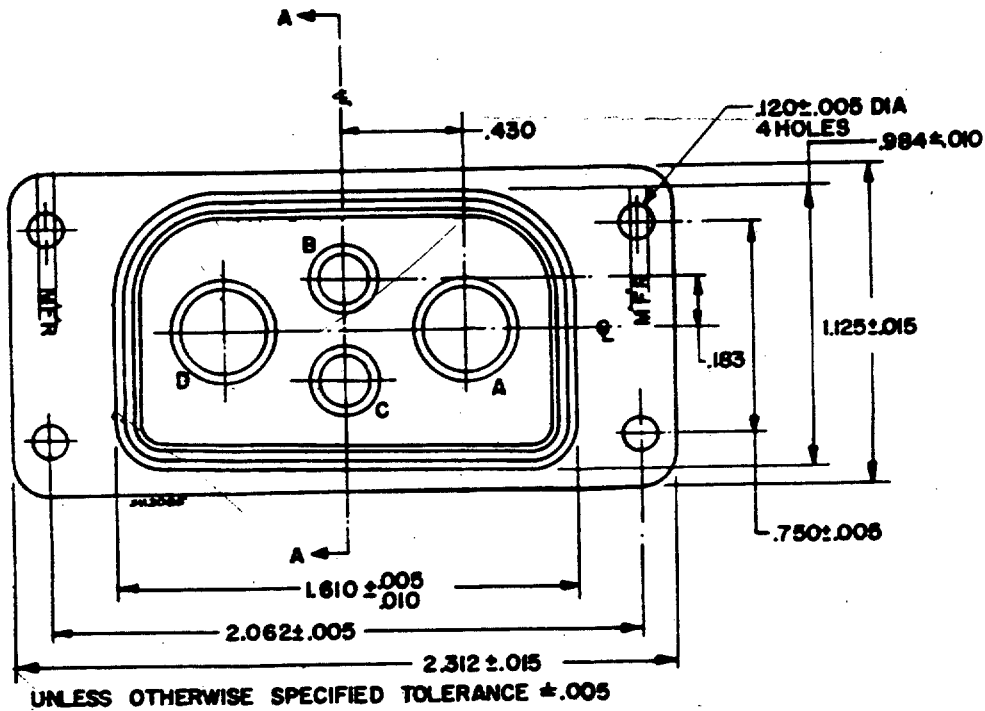
MIL-C-21617(SHIPS)

Table VII - Type P - insert arrangements.

Type designation	PF004A	PF008A	PF013A	PF017A	PF023A	PF026A	PF032A	PF040A
Contact size	2 size 4 2 size 6	2 size 8 6 size 16	16	20	20	16	3 size 16 20 size 20	20
B dimension, inch	0.057 ± 0.025	0.067 ± 0.025 $.161 \pm .025$	0.161 ± 0.025	0.064 ± 0.037	0.064 ± 0.037	0.151 ± 0.026	0.151 ± 0.026 $.064 \pm .037$	0.064 ± 0.037

MIL-C-21617(SHIPS)

3.8.1.1 Style 004A. - The contacts shall be as shown on figure 3.

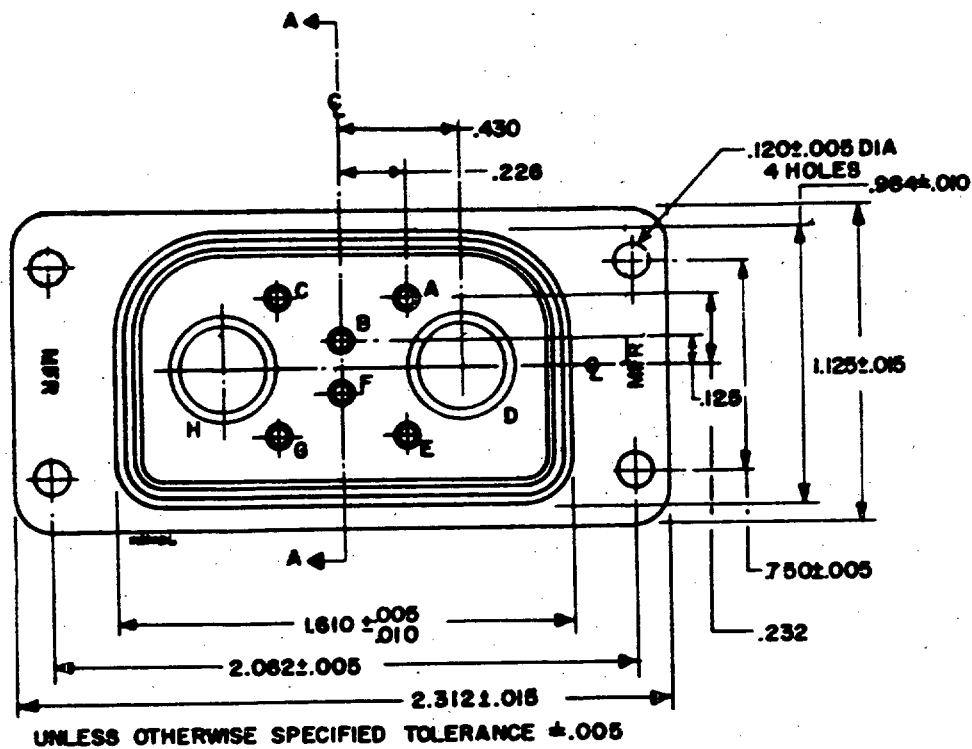


Service rating A
 2 size 4 contacts
 2 size 8 contacts

Figure 3 - Style 004A.

MIL-C-21617(SHIPS)

3.8.1.2 Style 008A. - The contacts shall be as shown on figure 4.

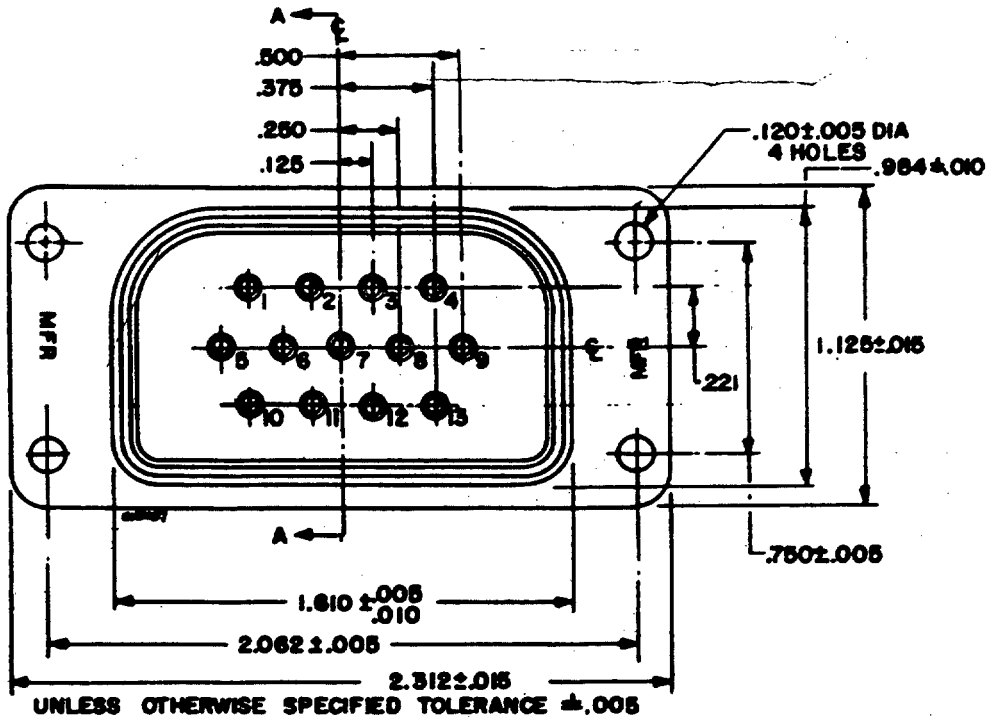


Contacts B and F - service rating D.
 All others - service rating A
 2 size 8 contacts
 6 size 16 contacts

Figure 4 - Style 008A.

MIL-C-21617(SHIPS)

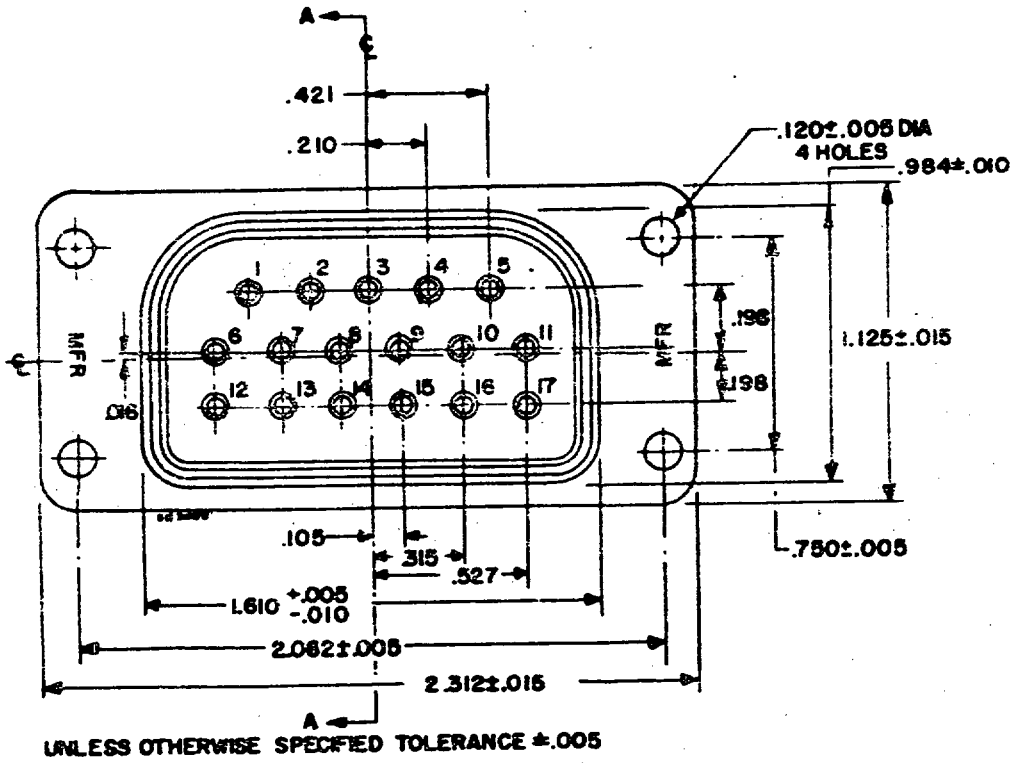
3.8.1.3 Style 013A. - The contacts shall be as shown on figure 5.



Service rating D
13 size 16 contacts

Figure 5 - Style 013A.

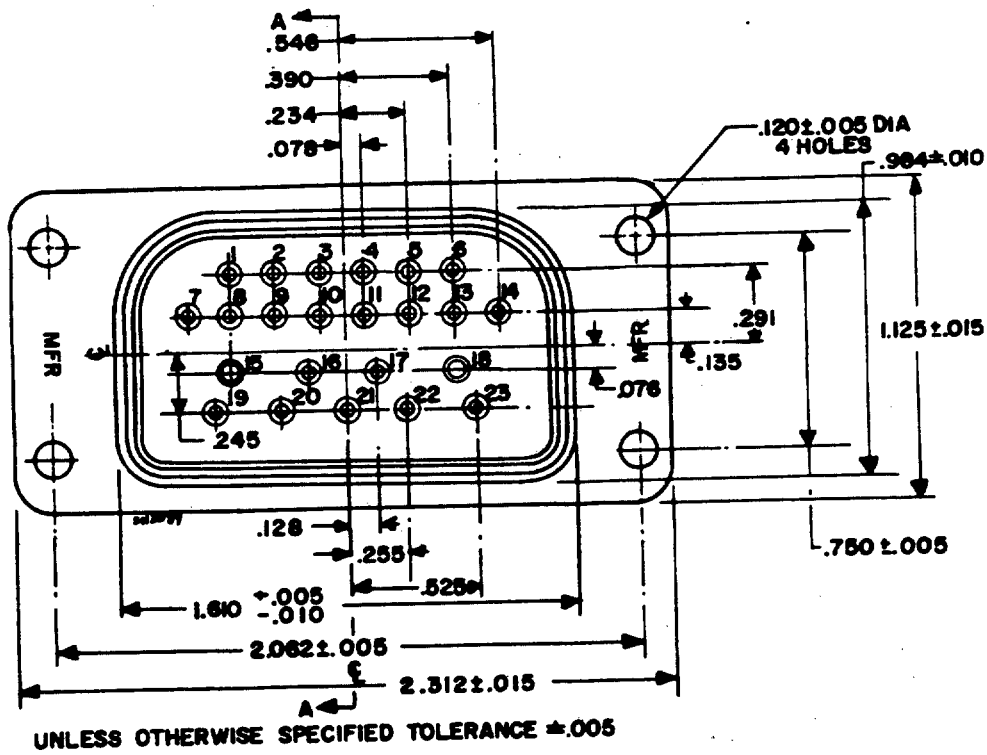
3.8.1.4 Style 017A. - The contacts shall be as shown on figure 6.



Service rating D
17 size 20 contacts

Figure 6 - Style 017A.

MIL-C-21617(SHIPS)

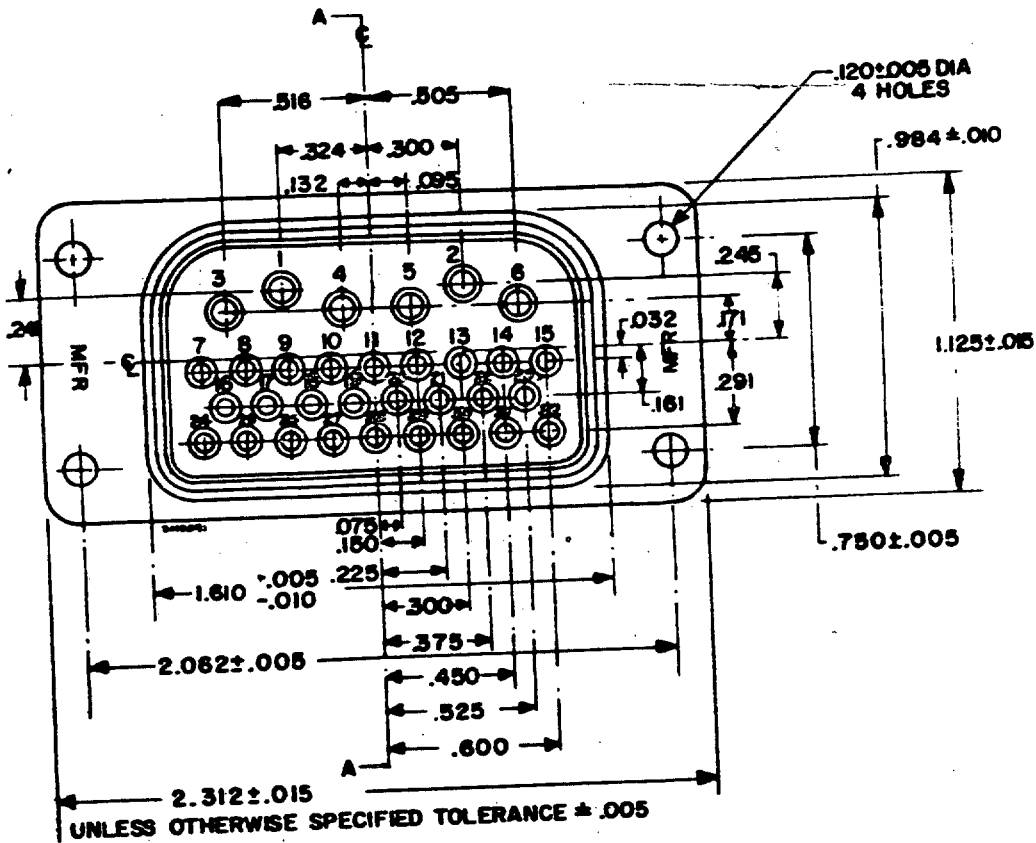
3.8.1.5 Style 023A. - The contacts shall be as shown on figure 7.

Contacts 1 through 14 - service rating A
 Contacts 15 through 23 - service rating D
 23 size 20 contacts

Figure 7 - Style 023A.

MIL-C-21617(SHIPS)

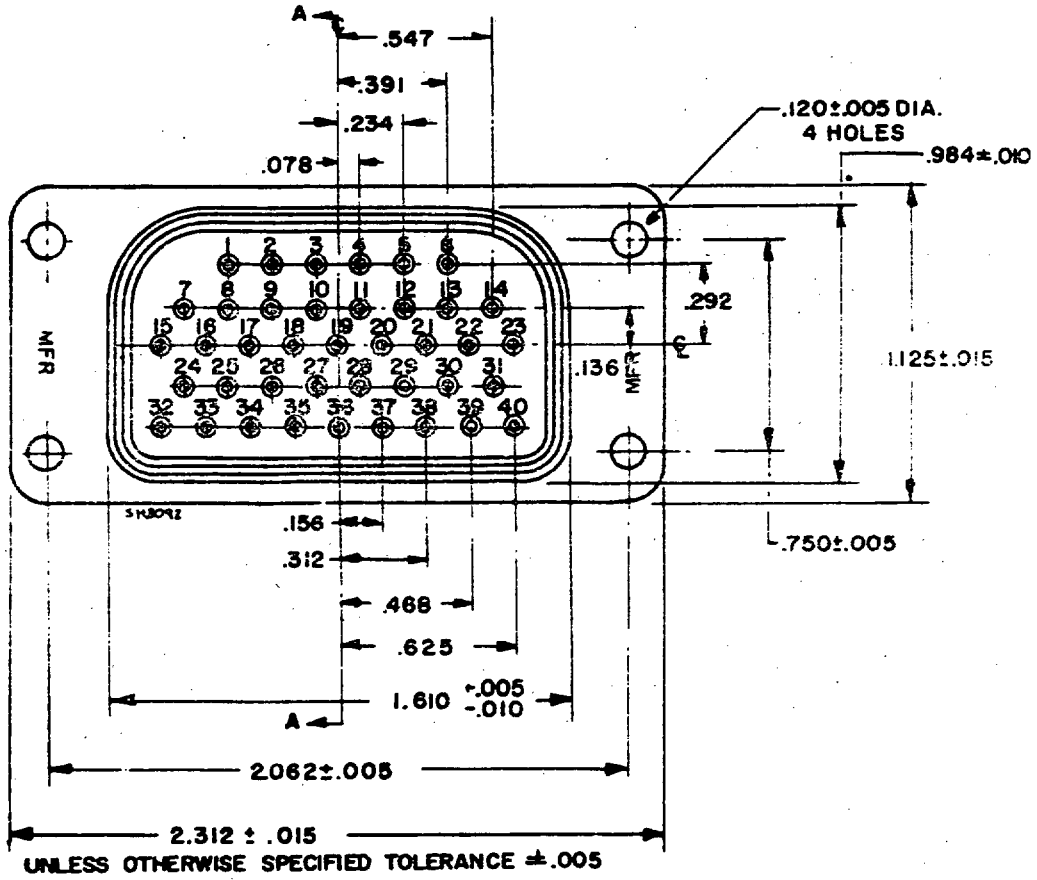
3.8.1.7 Style 032A. - The contacts shall be as shown on figure 9.



Contacts 1 through 6 - service rating D
 All others - service rating A
 Contacts 2, 5, 6 - size 16 contacts
 All others - size 20 contacts

Figure 9 - Style 032A.

3.8.1.8 Style 040A. - The contacts shall be as shown on figure 10.

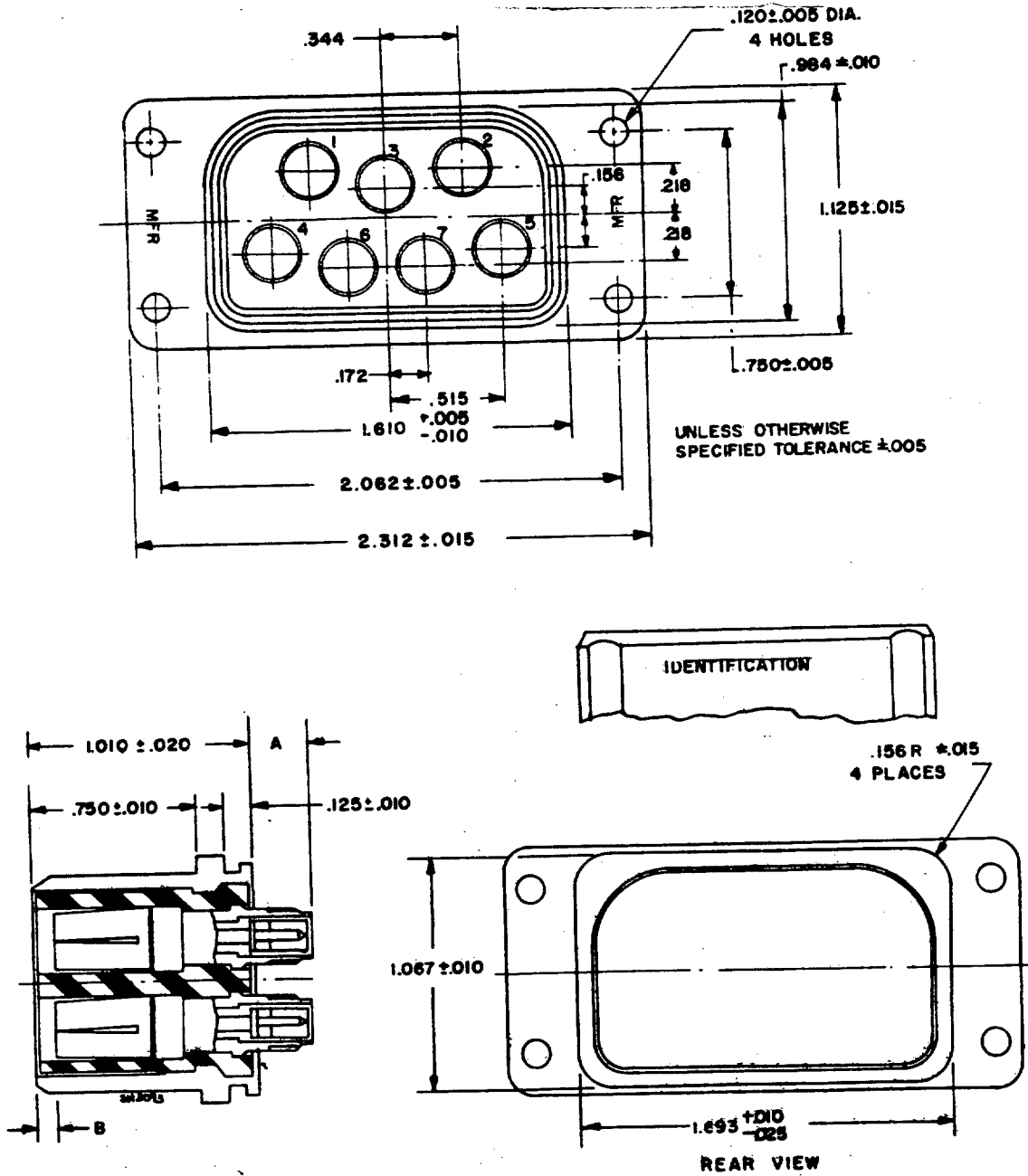


Service rating A
40 size 20 contacts

Figure 10 - Style 040A.

MIL-C-21617(SHIPS)

3.8.1.9 Style 007C. - The coaxial socket contacts shall be as shown on figure 11 and shall have the characteristics shown in table VIII.



Seven size 8 coaxial contacts

Figure 11 - Style 007C.

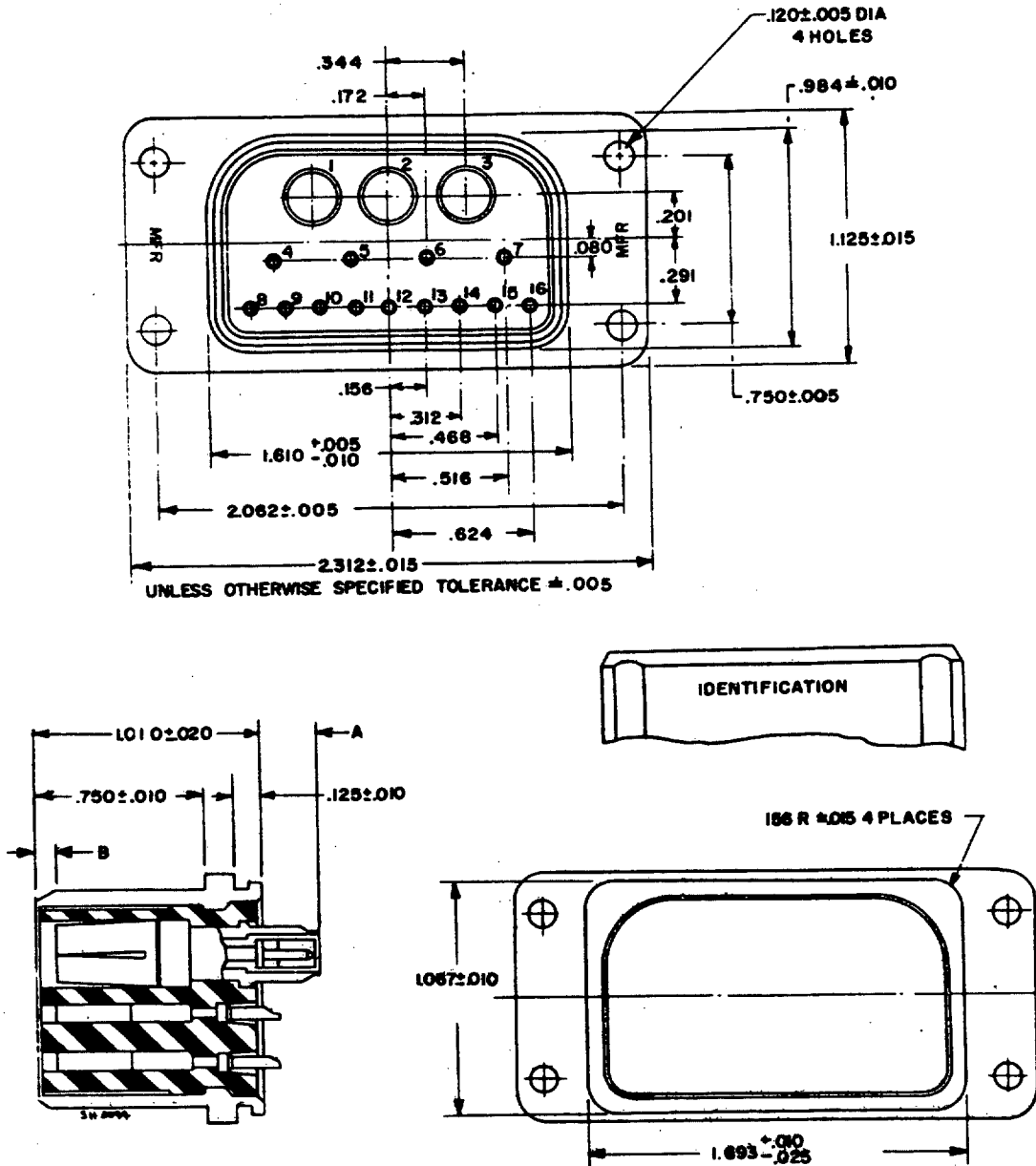
MIL-C-21617(SHIPS)

Table VIII - Coaxial socket contact details.

Style	Size	Location	Quantity	Dimensions	
				A	B
007C	Coax	1, 2, 4, 5	4	0.230 ± 0.045	0.070 ± 0.035
	Coax	3, 6, 7	3	$.480 \pm .045$	$.070 \pm .035$
016C	Coax	1, 3	2	$.230 \pm .045$	$.070 \pm .035$
	Coax	2	1	$.480 \pm .045$	$.070 \pm .035$
	20	20	13	$.052 \pm .045$	$.064 \pm .037$

MIL-C-21617(SHIPS)

3.8.1.10 Style 016C. - The contacts shall be as shown on figure 12 and shall the characteristics shown in table VIII.

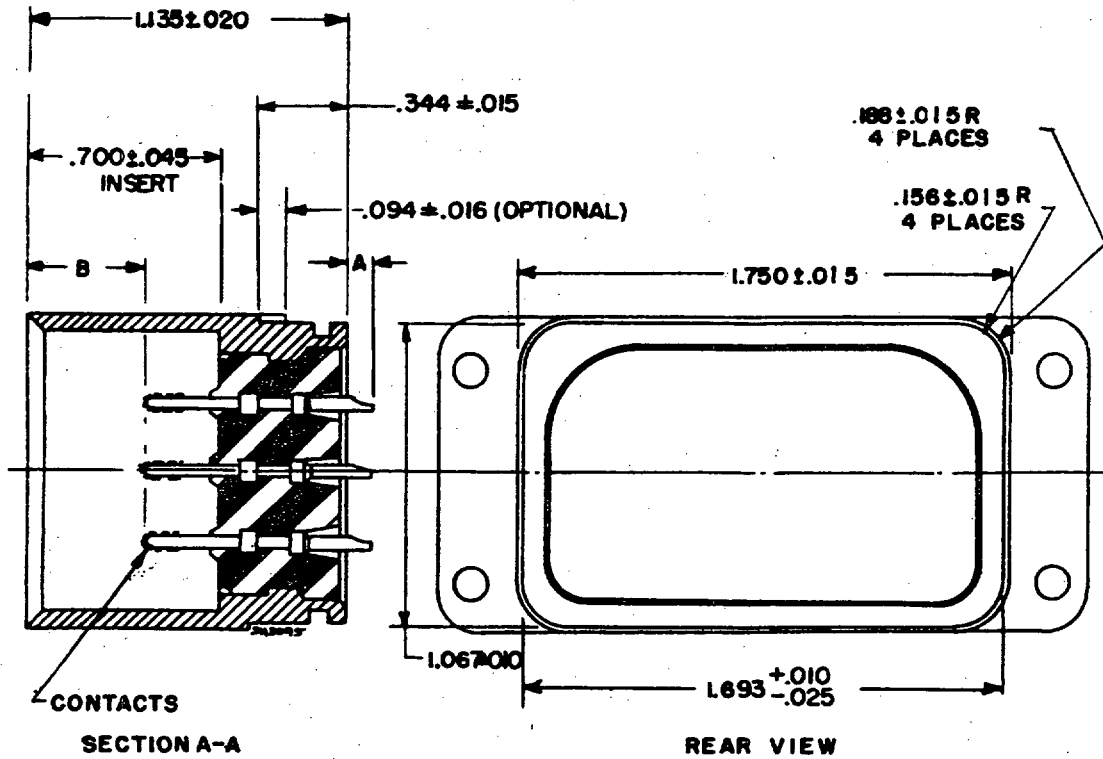


Contacts 4, 5, 6, 7 - service rating D
 All others - service rating A
 3 size 8 coaxial contacts
 13 size 20 contacts

Figure 12 - Style 016C.

MIL-C-21617(SHIPS)

3.8.2 Type J, class M, male receptacle, inserts containing pin contacts. - Receptacles shall have the dimensions shown on figure 13 and shall have the characteristics shown in table IX.



CONTACT SIZE	20	16	8	4
"A" DIMENSION	$0.052 \pm .045$	$0.156 \pm .045$	$0.312 \pm .045$	$0.312 \pm .045$

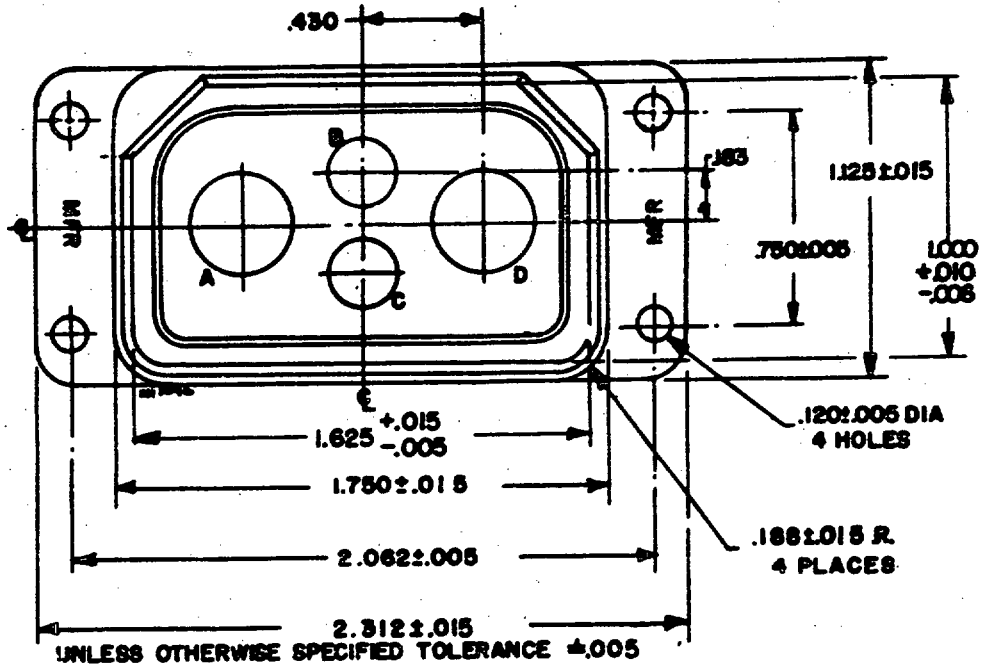
Figure 13 - Type J, class M.

MIL-C-21617(SHIPS)

Table IX - Type J - insert arrangements.

Type designation	JMO04A	JMO08A	JMO13A	JMO17A	JMO23A	JMO26A	JMO32A	JMO40A
Contact size	2 size 4 2 size 6	2 size 8 6 size 16	16	20	20	16	16 20	20
B dimension, inch	0.157 ± 0.025	0.157 ± 0.025	0.157 ± 0.025	0.400 ± 0.025	0.400 ± 0.025	0.157 ± 0.025	0.157 ± 0.025 0.400 ± 0.025	0.400 ± 0.025

3.8.2.1 Style 004A. - The contacts shall be as shown on figure 14.

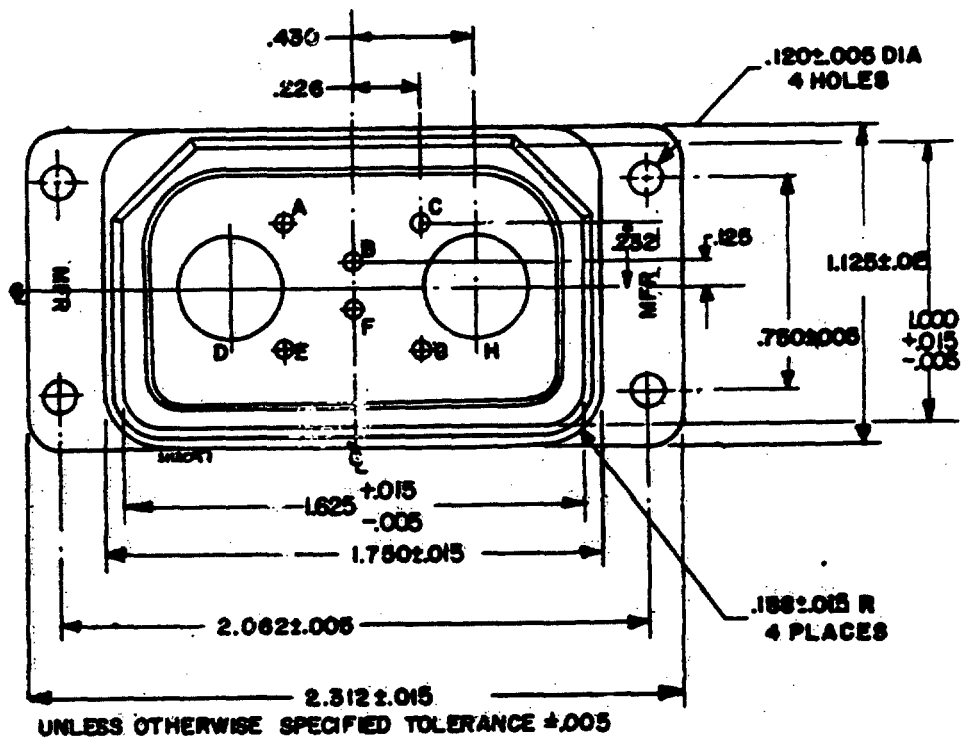


Service rating A
 2 size 4 contacts
 2 size 8 contacts

Figure 14 - Style 004A.

MIL-C-21617(SHIPS)

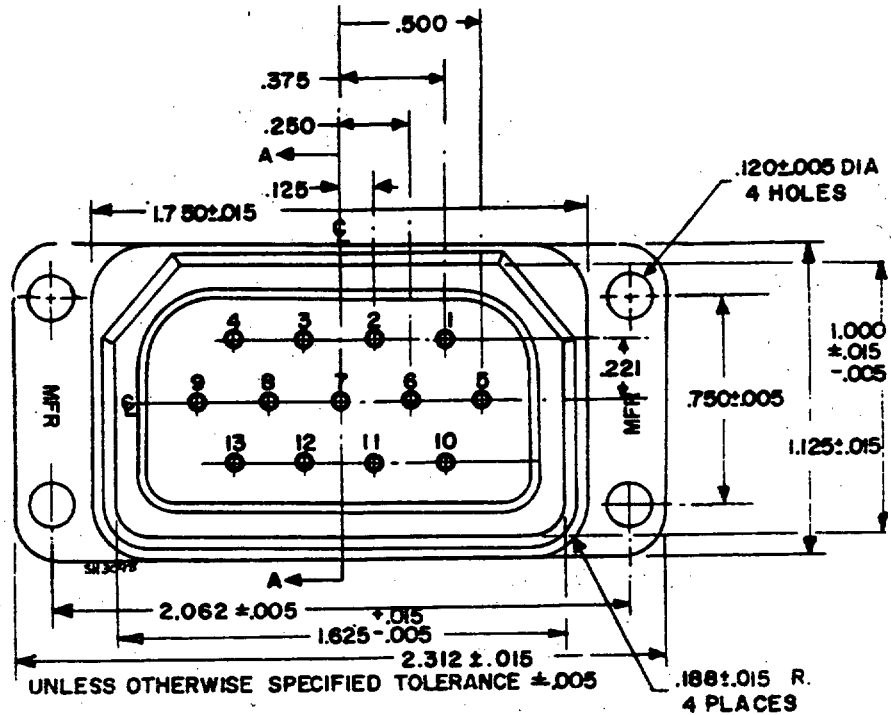
3.8.2.2 Style 008A - The contacts shall be as shown on figure 15.



Contacts B and F - service rating D
 All others - service rating A
 2 size 8 contacts
 6 size 18 contacts

Figure 15 - Style 008A.

3.8.2.3 Style 013A. - The contacts shall be as shown on figure 16.

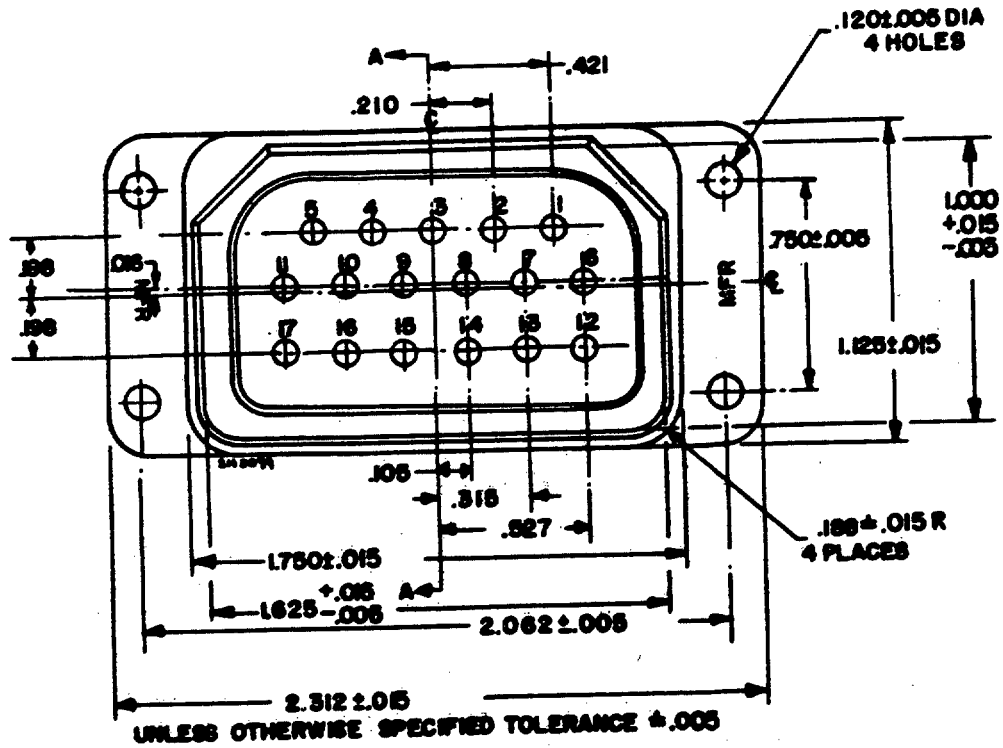


Service rating D
13 size 16 contacts

Figure 16 - Style 013A.

MIL-C-21617(SHIPS)

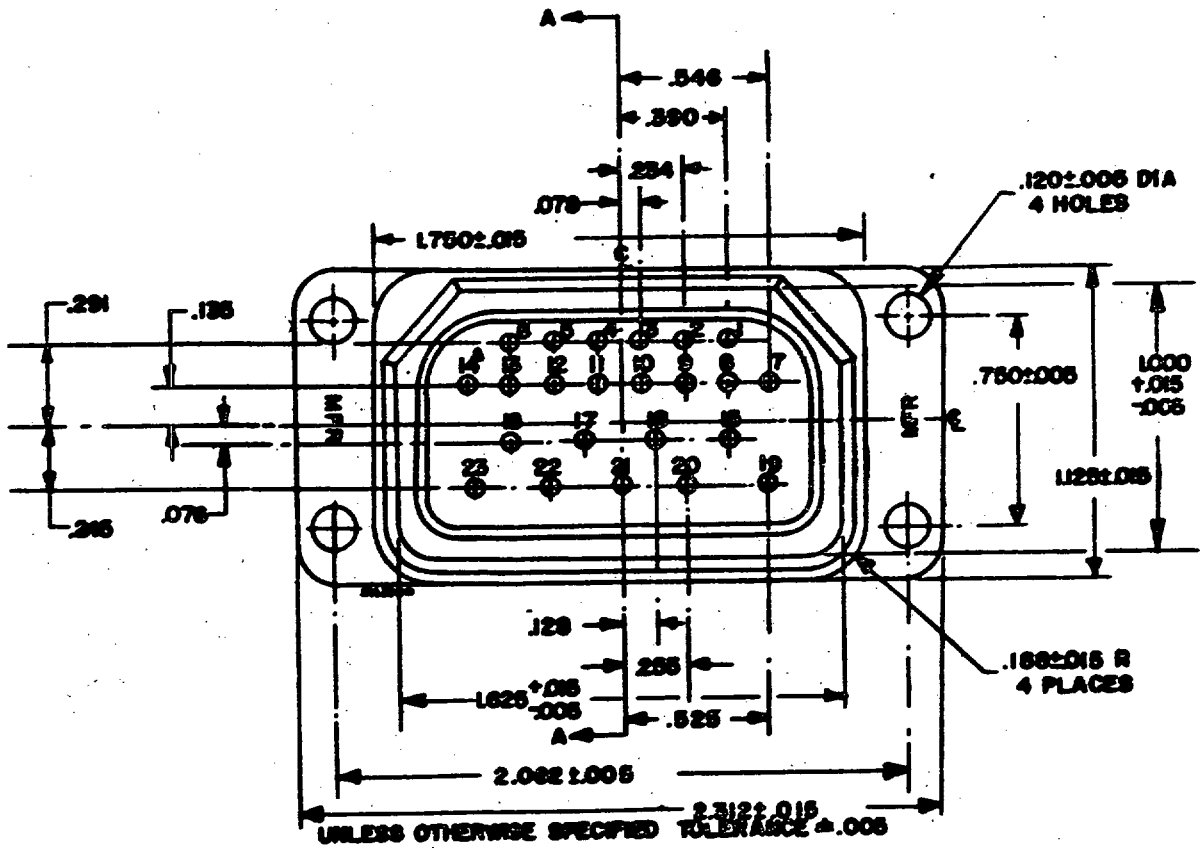
3.8.2.4 Style 017A. - The contacts shall be as shown on figure 17.



Service rating D
17 size 20 contacts

Figure 17 - Style 017A.

3.8.2.5 Style 023A. - The contacts shall be as shown on figure 18.

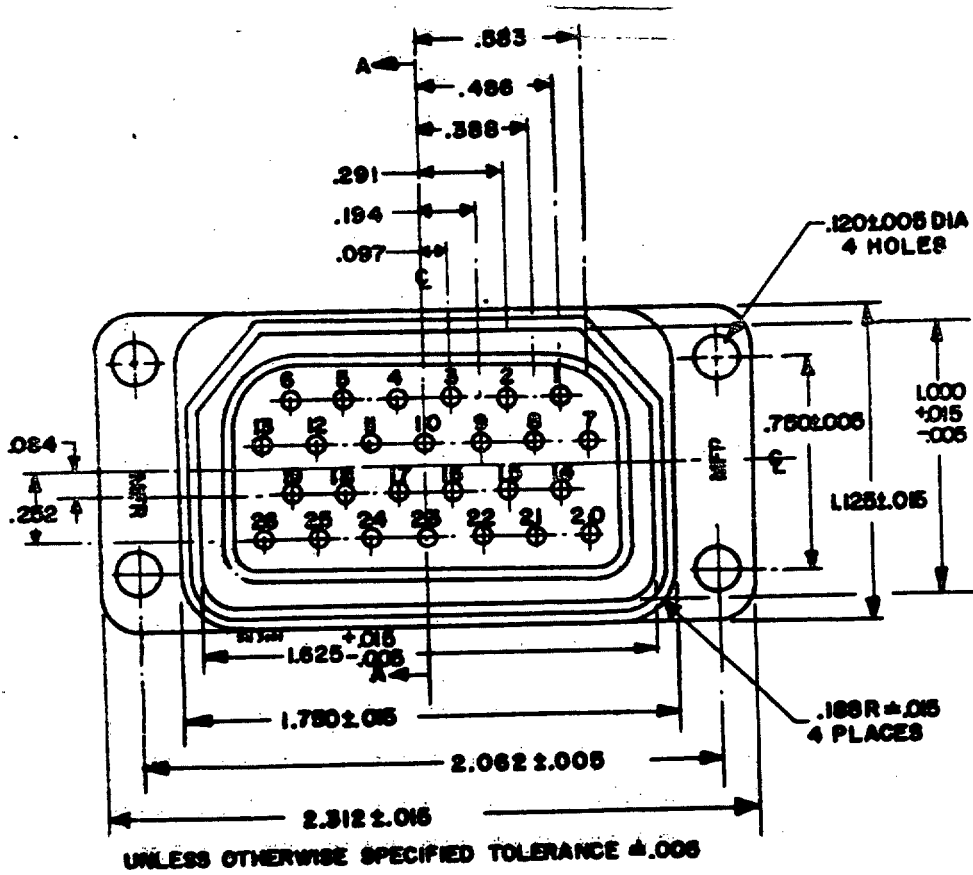


Contacts 1 through 14 - service rating A
 Contacts 15 through 23 - service rating D
 23 size 20 contacts

Figure 18 - Style 023A.

MIL-C-21617(SHIPS)

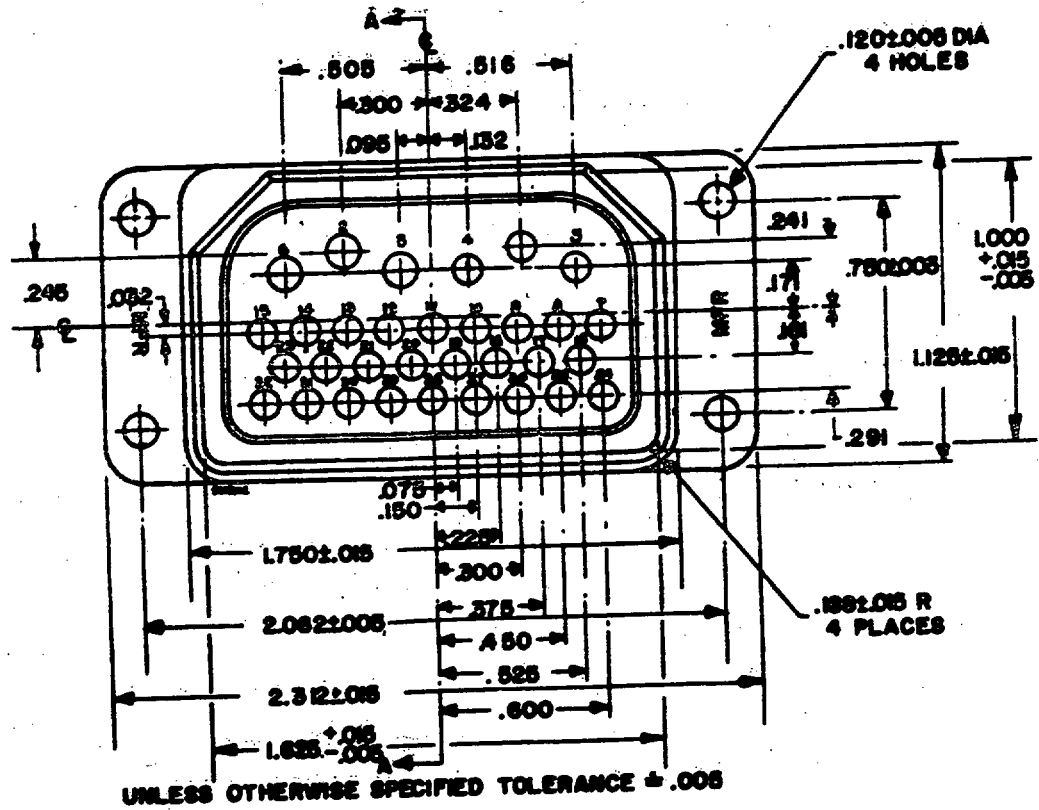
3.8.2.6 Style 026A - The contacts shall be as shown on figure 19.



Service rating A
26 size 18 contacts

Figure 19 - Style 026A.

3.8.2.7 Style 032A - The contacts shall be as shown on figure 20.

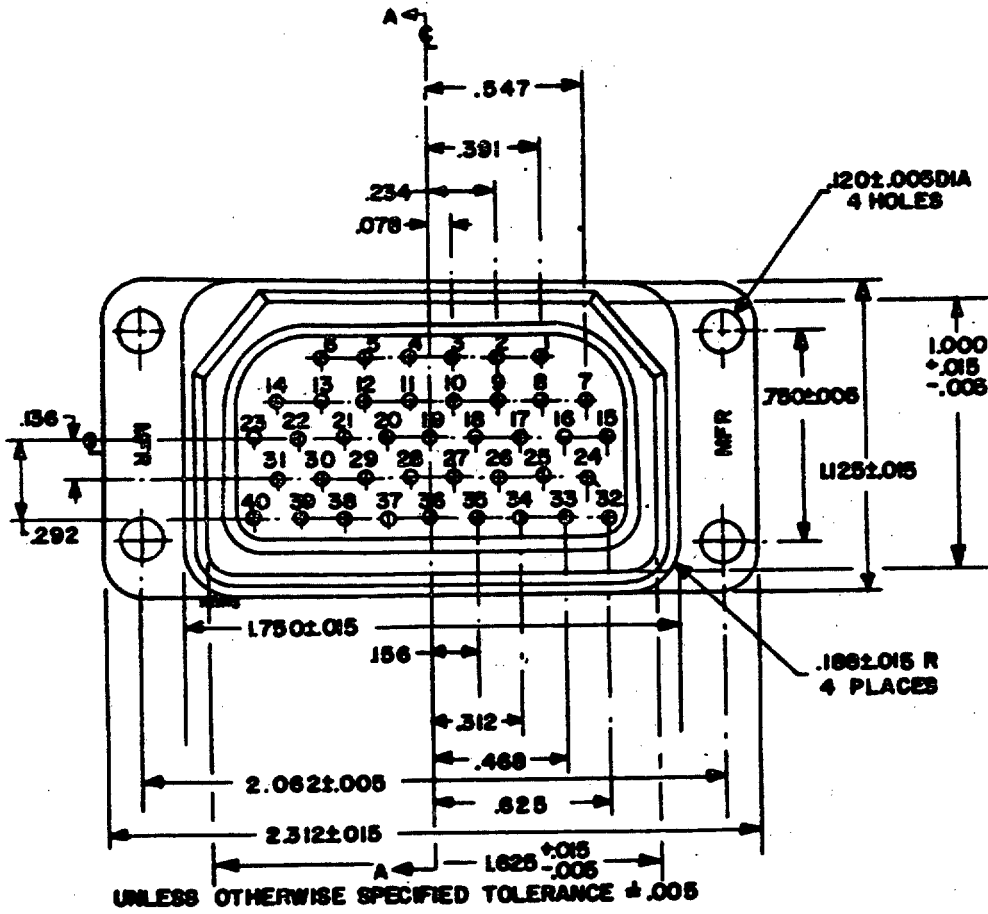


Contacts 1 through 6 - service rating D
 All others - service rating A
 Contacts 2, 5, 6 - size 16 contacts
 All others - size 20 contacts

Figure 20 - Style 032A.

MIL-C-21617(SHIPS)

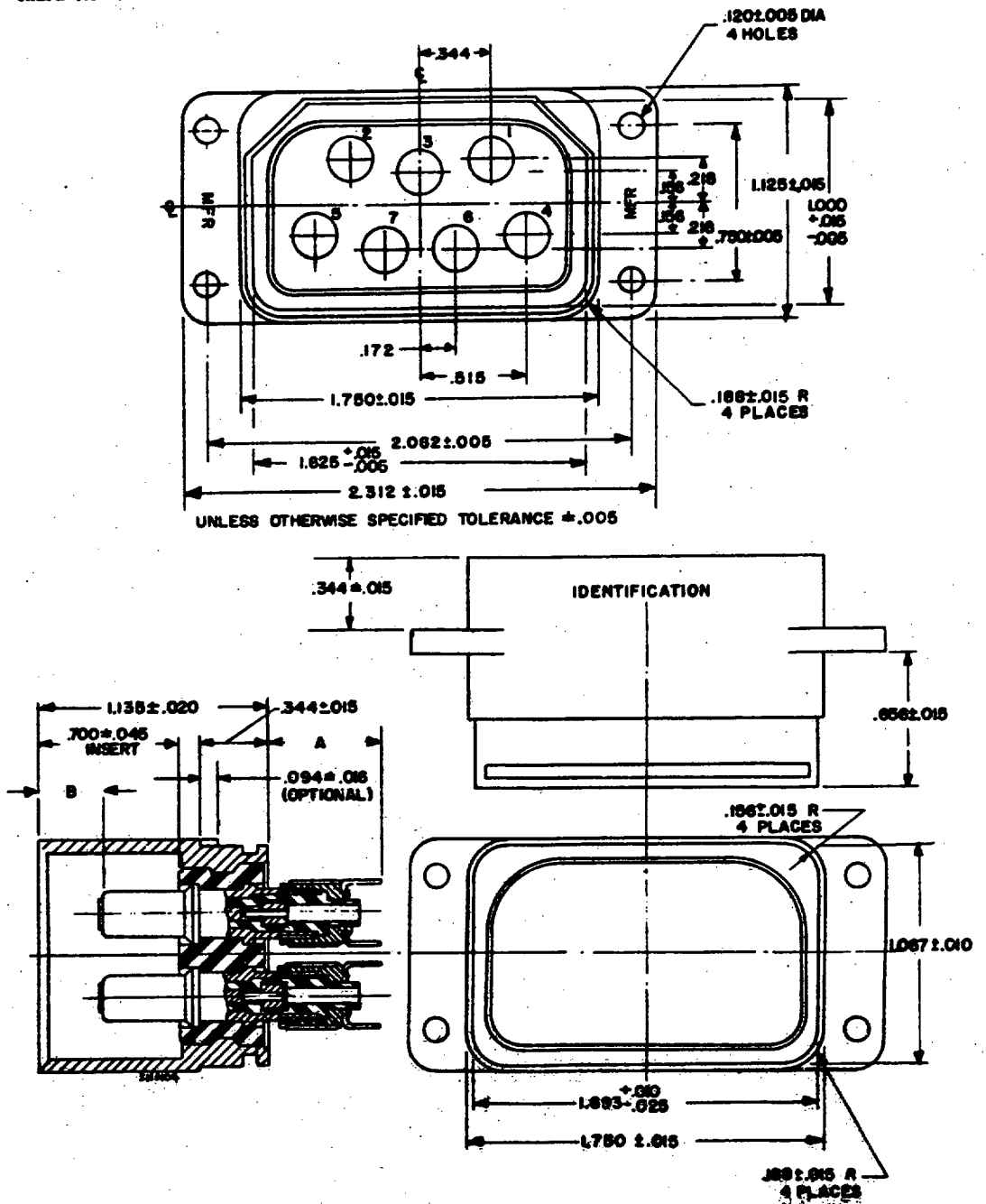
3.8.2.8 Style 040A. - The contacts shall be as shown on figure 21.



Service rating A
40 size 20 contacts

Figure 21 - Style 040A.

3.8.2.9 Style 007C. - The coaxial pin contacts shall be as shown on figure 22 and shall have the characteristics shown in table X.

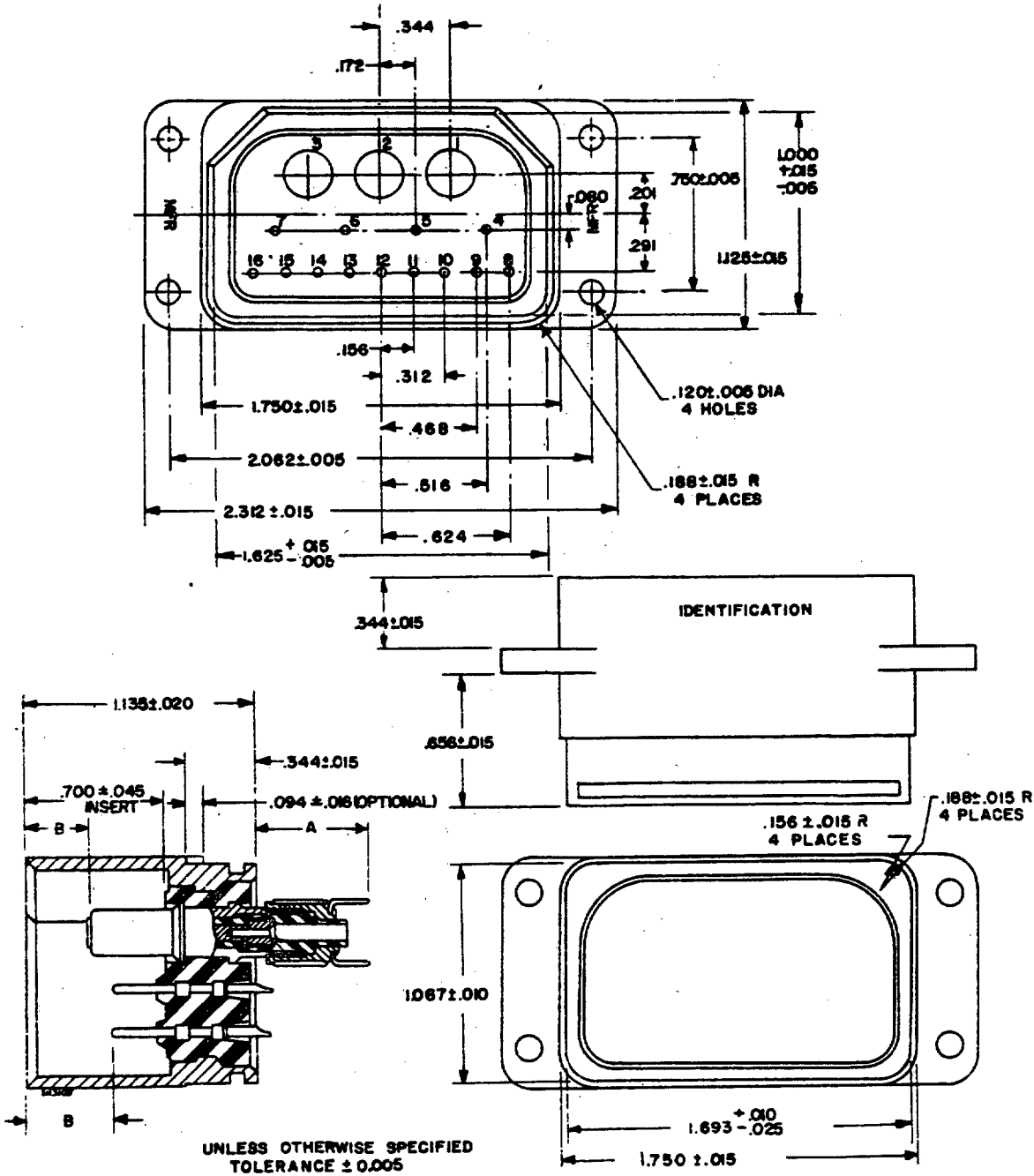


Seven size 8 coaxial contacts

Figure 22 - Style 007C.

ML-C-21617(SHIPS)

3.8.2.10 Style 016C. - The coaxial pin contacts shall be as shown on figure 23 and shall have the characteristics shown in table X.



Contacts 4, 5, 6, 7 - service rating B
 8 through 16 - service rating A
 3 size 8 coaxial contacts
 13 size 20 contacts

Figure 23 - Style 016C.

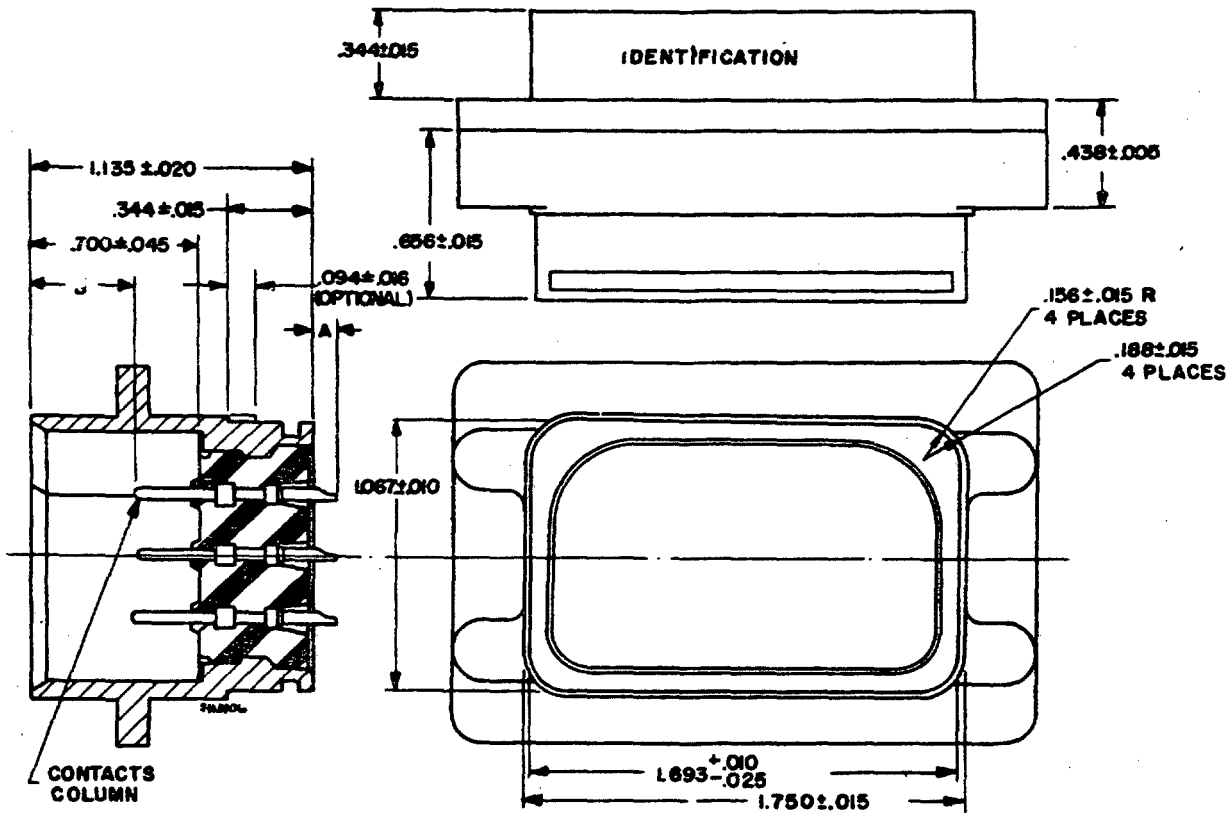
MIL-C-21617(SHIPS)

Table X - Coaxial pin contact details.

Style	Size	Location	Quantity	Solder well		Dimensions	
				Diameter	Depth	A	B
				Inch	Inch	Inch	Inch
007C	Coax size 8	--	7	0.046 ± 0.005	$0.210 \begin{smallmatrix} +0.040 \\ - .025 \end{smallmatrix}$	0.627 max.	0.312 ± 0.025
016C	Coax size 8	1, 2, 3	3	0.046 ± 0.005	$0.210 \begin{smallmatrix} +0.040 \\ - .025 \end{smallmatrix}$	0.627 max.	0.312 ± 0.025
	20	Others	13	----	----	$0.057 \begin{smallmatrix} +0.035 \\ - .045 \end{smallmatrix}$	0.400 ± 0.025

MIL-C-21617(SHIPS)

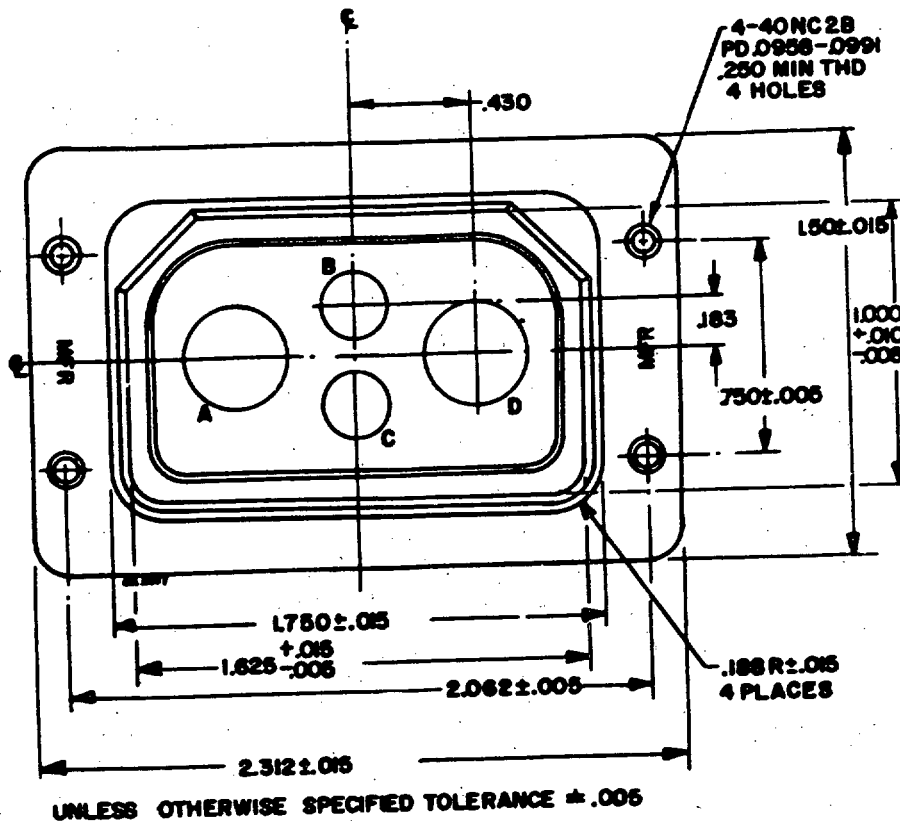
3.8.3 Type JS, class M, large flange male receptacle inserts containing pin contacts.- Receptacles shall have the dimensions shown on figure 24 and shall have the characteristics shown in table IX.



CONTACT SIZE	20	16	8	4
"A" DIMENSION	0.052 ± .045	0.156 ± .045	0.312 ± .045	0.312 ± .045

Figure 24 - Type JS, class M.

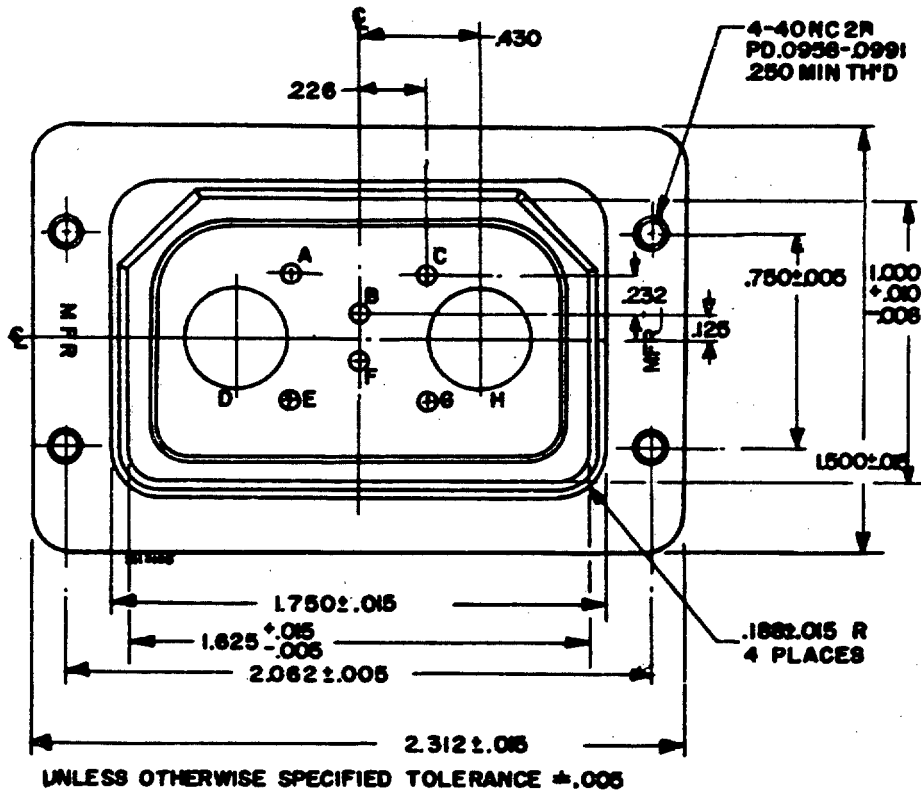
3.8.3.1 Style 004A. - The contacts shall be as shown on figure 25.



Service rating A
2 size 4 contacts
2 size 8 contacts

Figure 25 - Style 004A.

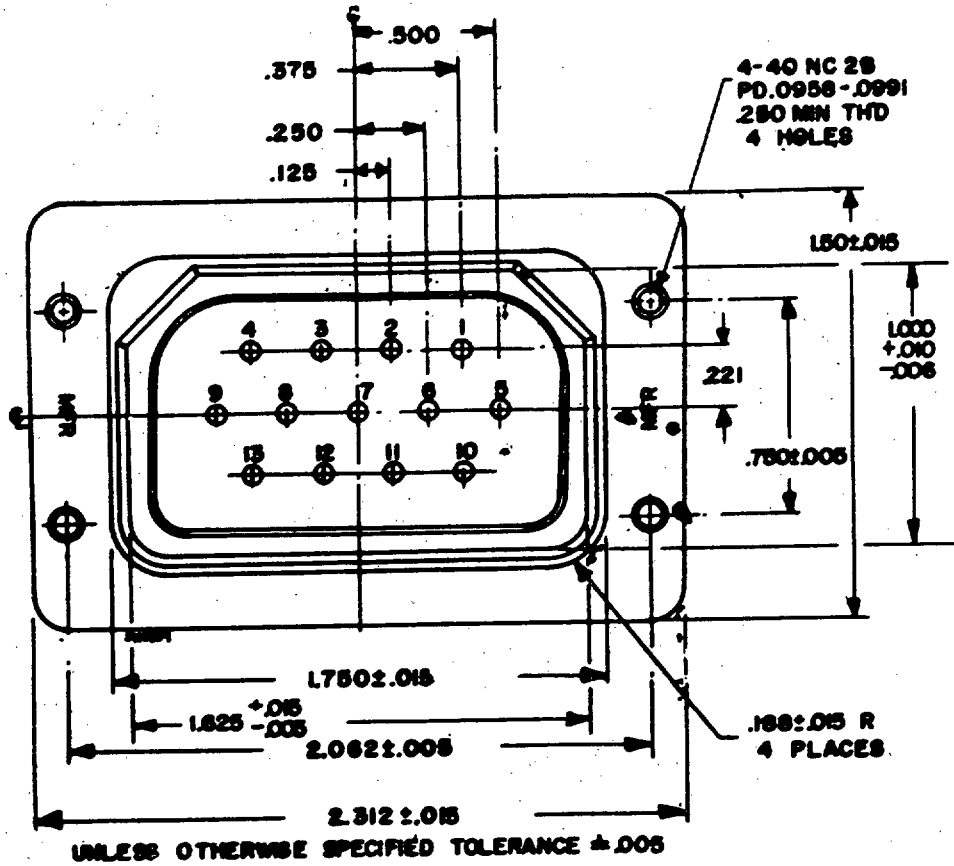
MIL-C-21617(SHIPS)

3.8.3.2 Style 008A. - The contacts shall be as shown on figure 26.

Contacts B and F - service rating D
 All others - service rating A
 2 size 8 contacts
 6 size 16 contacts

Figure 26 - Style 008A.

3.8.3.3 Style 013A. - The contacts shall be as shown on figure 27.

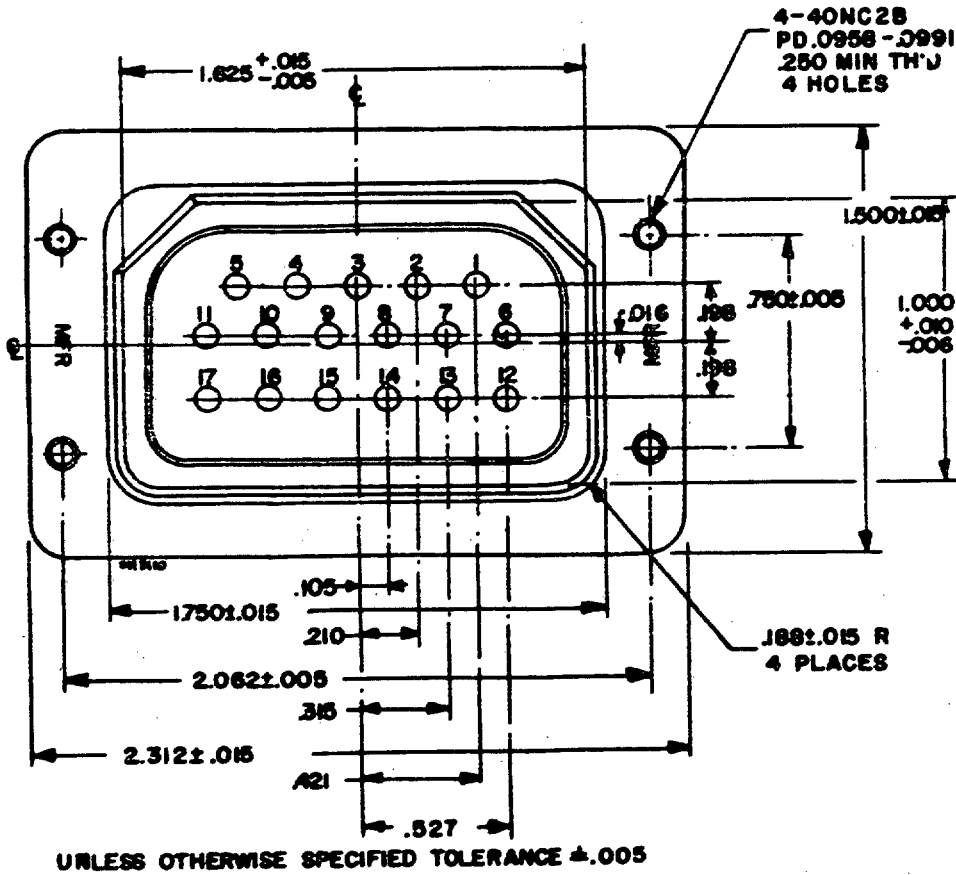


Service rating D
13 size 16 contacts

Figure 27 - Style 013A.

MIL-C-21617(SHIPS)

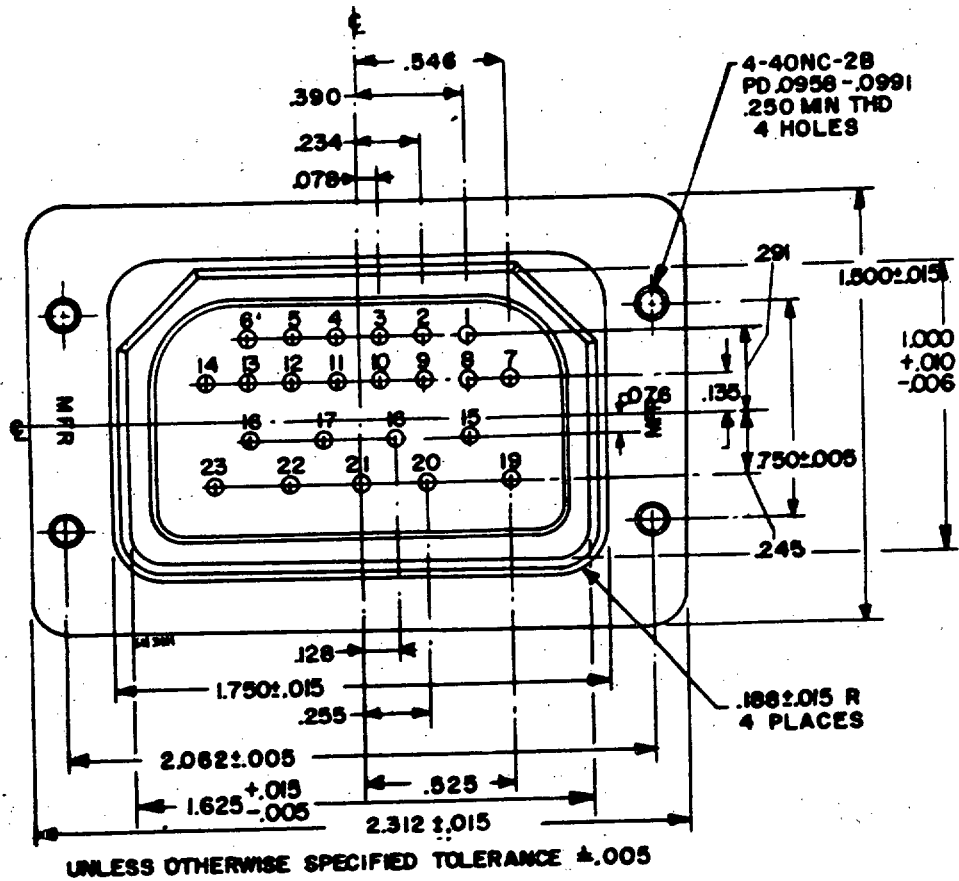
3.8.3.4 Style 017A. - The contacts shall be as shown on figure 28.



Service rating D
17 size 20 contacts

Figure 28 - Style 017A.

3.8.3.5 Style 023A. - The contacts shall be as shown on figure 29.

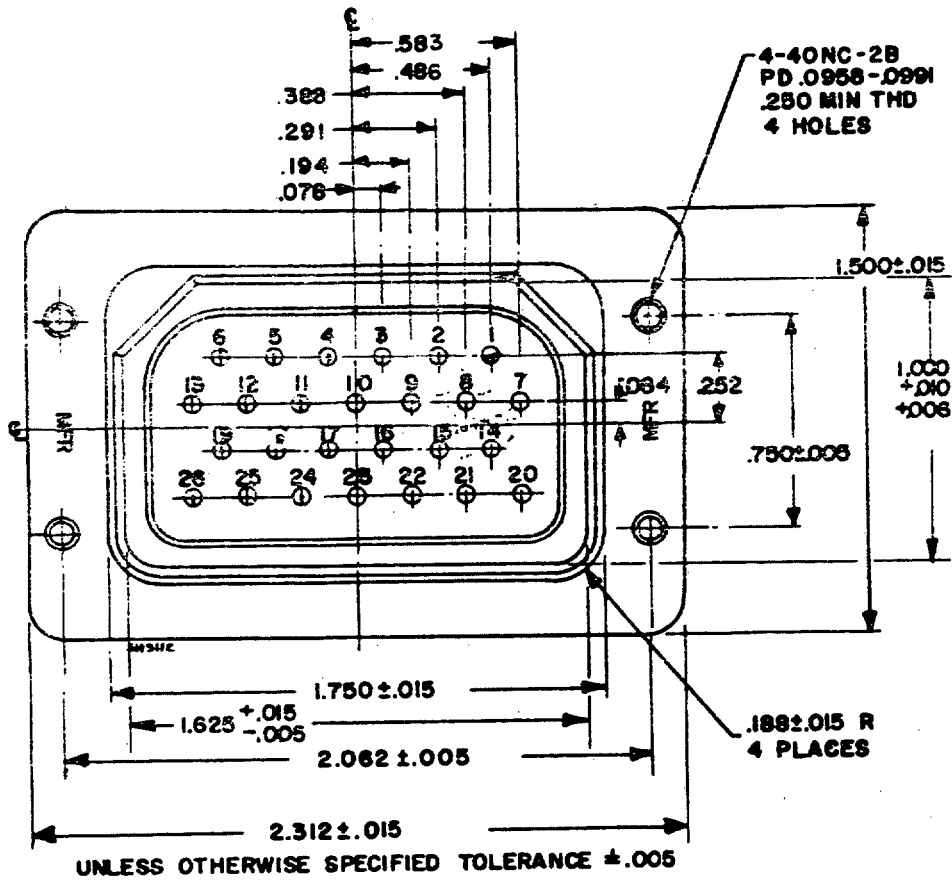


Contacts 1 through 14 - service rating A
 Contacts 15 through 23 - service rating D
 23 size 20 contacts

Figure 29 - Style 023A.

MIL-C-21617(SHIPS)

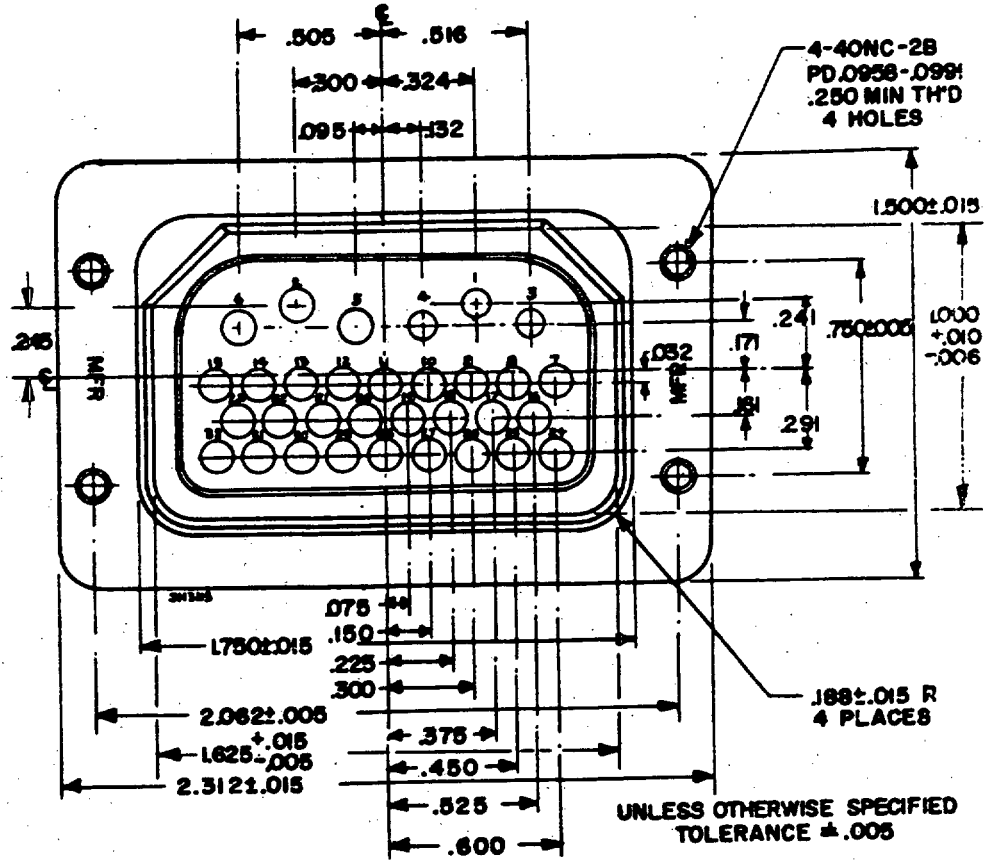
3.8.3.6 Style 026A. - The contacts shall be as shown on figure 30.



Service rating A
26 size 16 contacts

Figure 30 - Style 026A.

3.8.3.7 Style 032A. - The contacts shall be as shown on figure 31.

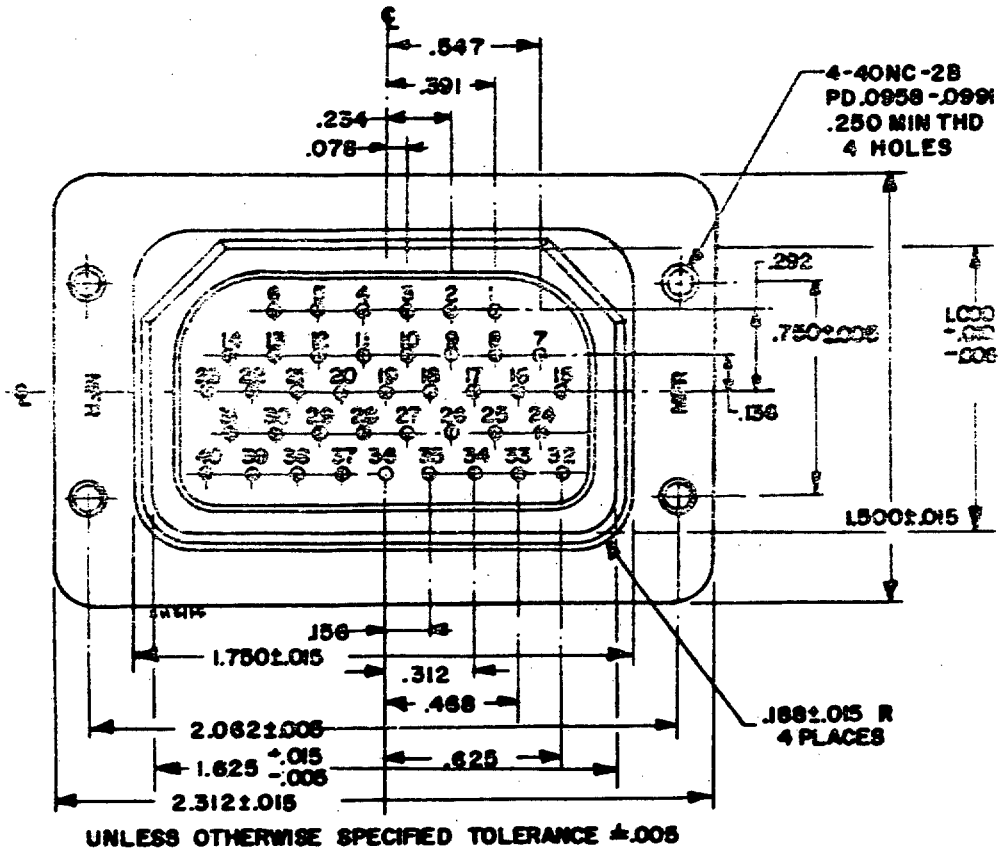


Contacts 1 through 6 - service rating D
Balance - service rating A
Contacts 2, 5, 6 - size 16 contacts
All others - size 20 contacts

Figure 31 - Style 032A.

MIL-C-21617(SHIPS)

3.8.3.8 Style 040A. - The contacts shall be as shown on figure 32.



Service rating A
40 size 20 contacts

Figure 32 - Style 040A.

3.8.4 Junction shells.- Junction shells for straight and 90 degree angle exit of the cable from the connector assembly shall be as shown on figures 33 and 34.

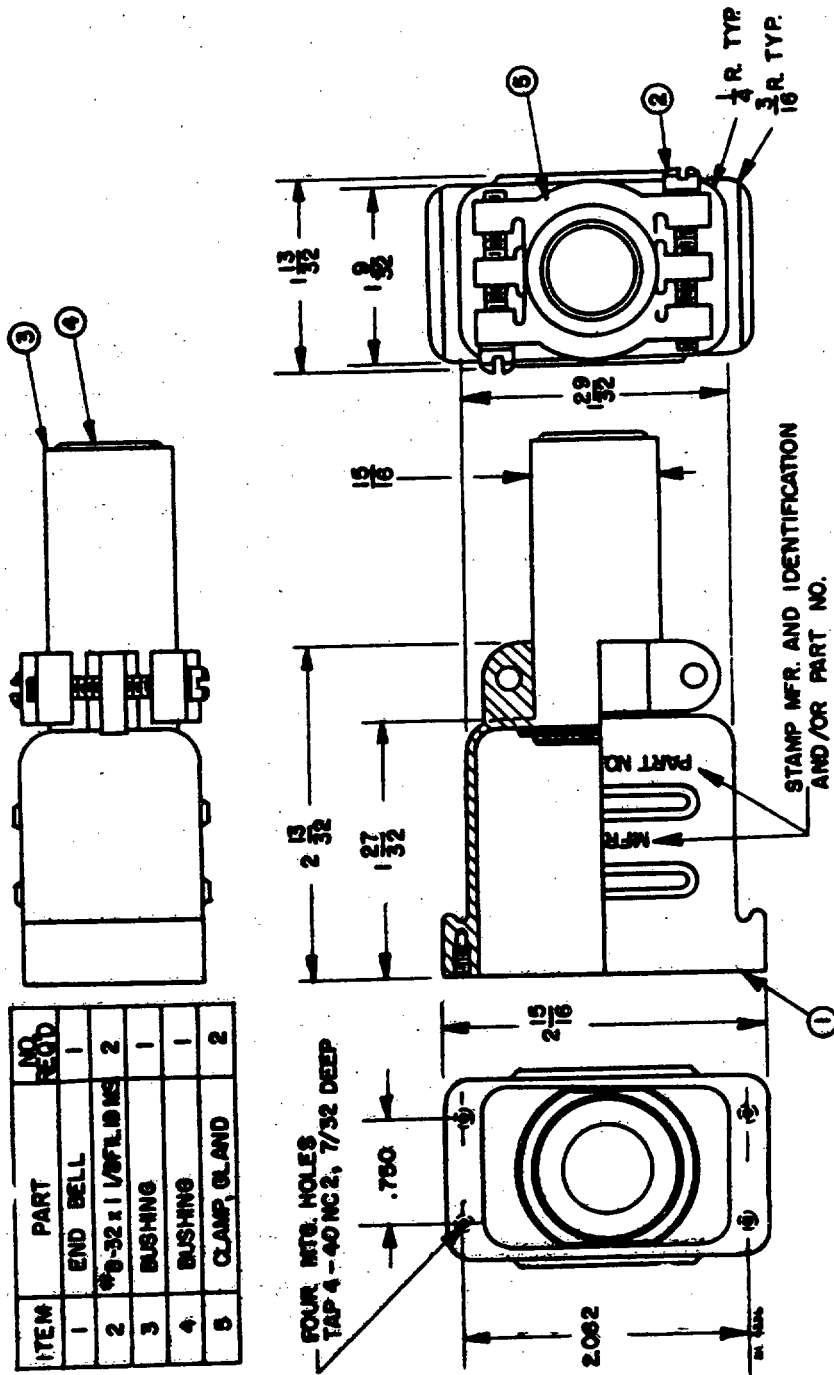


Figure 33 - Junction shell, straight.

MIL-C-21617(SHIPS)

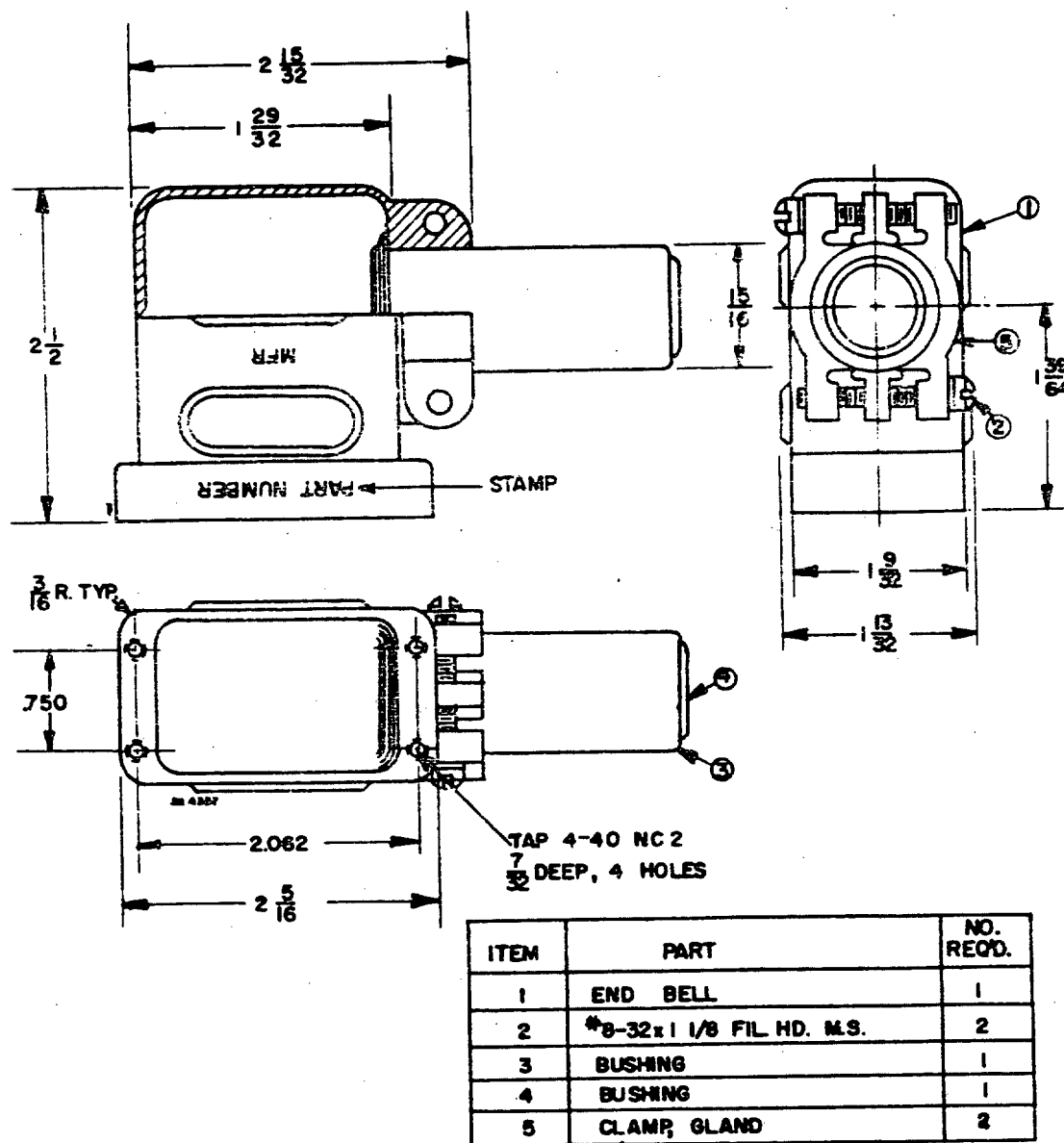


Figure 34 - Junction shell, 90 degree angle.

MIL-C-21617(SHIPS)

3.9 Workmanship. - Connectors shall meet the design and dimensional requirements of this specification. There shall be no evidence of loose contacts, poor molding or fabricating, damaged or improperly assembled contacts, peeling or chipping of the plating and finish, parting lines of mold which would indicate flash and improper molding techniques, improper tinning of solder cups, nicks and burrs of metal parts surfaces and no post molding warpage of connectors (see 4.8.1).

4. QUALITY ASSURANCE PROVISIONS

4.1 Classification of tests. - The inspection of connectors shall be classified as follows:

- (a) Qualification tests.
- (b) Comparison inspection.
- (c) Acceptance inspection.

4.2 Unless otherwise specified herein the supplier is responsible for the performance of all inspection requirements prior to submission for Government inspection and acceptance. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. Inspection records of the examinations and tests shall be kept complete and available to the Government as specified in the contract or order.

4.3 Test conditions. - Test conditions shall be as outlined in Standard MIL-STD-202.

4.4 Qualification tests. - Qualification tests shall be conducted at a laboratory designated by the Bureau of Ships. These tests shall consist of the tests specified in 4.4.2.

4.4.1 Qualification samples. - Qualification test samples shall consist of the following:

- (a) Five each completely assembled plugs or receptacles complete with insert arrangement of the greatest complement of contacts on which approval is desired shall be submitted. Mating plugs or receptacle assemblies shall be furnished.
- (b) Three each connector insert assembly, except for the arrangement with the greatest complement of contacts on which approval is desired shall be submitted. Insulators shall have their contacts installed. Inserts shall be furnished in their plug or receptacle shells complete with holding plates or bands, if applicable.
- (c) Fifty pin contacts and fifty socket contacts, of each size on which approval is desired, shall be submitted.

4.4.2 Tests. - Qualification tests of connectors shall consist of all the tests of this specification as described under test methods of 4.8. The five complete connectors of each type shall be subjected to and in the order given all the tests of column I of table XI, excluding the resistance of contacts test of 4.8.14, the resistance to test prod damage test of 4.8.15, and the contact separation test of 4.8.16. Twenty-five sets of pin and socket contacts shall be subjected to the salt spray (corrosion) test of 4.8.13, followed by the resistance of contacts test of 4.8.14. Twenty-five socket contacts shall be subjected to the contact separation force test of 4.8.16. Twenty-five size 16 socket contacts shall be subjected to the resistance to test prod damage test of 4.8.15.

4.4.2.1 The three each connector insert assemblies shall be subjected to the thermal shock test of 4.8.6 followed by the contact retention test of 4.8.6, the insert retention test of 4.8.7 and the insertion and withdrawal force test of 4.8.9.

MIL-C-21617(SHIPS)

4.4.3 **Defectives.** - No defects shall be allowed in the qualification tests of table XI; any defect shall be cause for refusal to grant qualification approval.

Table XI - Qualification tests.

Test	Requirement paragraph	Test paragraph
Examination of product	3.9	4.8.1
Insulation resistance	3.6.1	4.8.2
Thermal shock	3.6.2	4.8.3
Air leakage (type JS)	3.6.3	4.8.4
High potential	3.6.4	4.8.5
Contact retention	3.6.5	4.8.6
Insert retention	3.6.6	4.8.7
Vibration	3.6.7	4.8.8
Insertion and withdrawal force	3.6.8	4.8.9
Mechanical shock	3.6.9	4.8.10
Moisture resistance	3.6.10	4.8.11
High potential	3.6.4	4.8.5
Insulation resistance	3.6.1	4.8.2
Durability	3.6.11	4.8.12
Salt spray (corrosion)	3.6.12	4.8.13
High potential	3.6.4	4.8.5
Resistance of contacts	3.6.13	4.8.14
Resistance to test prod damage	3.6.14	4.8.15
Contact separation	3.6.15	4.8.16
Thermal shock ¹	3.6.2	4.8.3
Contact retention ¹	3.6.5	4.8.6
Insert retention ¹	3.6.6	4.8.7
Insertion and withdrawal force ¹	3.6.8	4.8.9

¹Applies to connector insert assembly only (see 4.4.2.1).

4.5 **Comparison inspection.** - The number of samples specified in 4.4.1 (a), (b) and (c) shall be selected by the inspector and shall be subjected to the examination and tests specified in 4.8, except that after initial approval, additional contacts and material specimens will not be required unless changes are made in design, material, or molding methods. The comparison inspection shall be performed after each 200,000 connectors of each type have been produced except that the tests shall be performed at least once every six months and need not be performed more often than once every three months.

4.6 **Acceptance.** - Connectors shall be selected in accordance with Standard MIL-STD-105, and subjected to examination of product (see 4.8.1) as described under "Test Method". The acceptable quality level (AQL) shall be 1 percent for major defects and 4 percent for minor defects as defined in Standard MIL-STD-105.

4.6.1 **Frequency.** - Sampling for examination of product as specified in 4.8.1 shall be performed on each connector lot. A lot shall consist of connectors which are produced under essentially the same conditions of manufacture and are presented for acceptance at one time and shall include connectors of one type, arrangement, and style. A lot shall contain as large a number of connectors as is practical.

4.6.2 When Standard MIL-STD-105 specifies an action by the Government, it shall, at the option of the Government, be performed either by the Government, or by the contractor under the supervision of the Government inspector.

MIL-C-21617(SHIPS)

4.7 Noncompliance. - If a sample fails the comparison inspection specified in 4.5, the manufacturer shall take corrective action on the processes and all units of product which were manufactured with the same conditions, materials and processes, and are considered subject to the same test failures. Government inspection may be discontinued at the option of the bureau or agency concerned, until a sample produced by the corrected process has been subjected to and has passed the comparison inspection failed by the preceding sample. Units of production subsequently submitted for Government inspection shall incorporate the corrective action.

4.8 Test methods. -

4.8.1 Examination of product. - Connectors shall be examined for compliance with the dimensions and workmanship requirements of this specification (see 3.9).

4.8.2 Insulation resistance. - The insulation resistance shall be measured separately between any pair of contacts and between the shell and any contact. Measurements shall be made by an approved method using a potential of 500 volts \pm 10 percent. Electrification time shall not exceed 2 minutes (see 3.6.1).

4.8.3 Thermal shock. - The mated connectors shall be subjected to temperature cycling in accordance with method 107, test condition B of Standard MIL-STD-202, except that the lower temperature shall be minus 55°C. (see 3.6.2).

4.8.4 Air leakage - type JS receptacle. - While subject to a pressure differential of 30 p. s. i. at a stabilized temperature of minus 55°C., type JS pressurized receptacles shall not exceed the requirement as indicated in 3.6.3 measured at atmospheric pressure under conditions specified in 4.3.

4.8.5 High potential. - The unmated connectors shall be tested in accordance with method 301 of Standard MIL-STD-202. The connectors shall show no evidence of flashover when the applicable voltage of table III is applied between any contact and any other contact or shell and held for a period of 1 minute. For coaxial contacts, the test voltage of table III shall be applied between the center conductor and the outer conductor (see 3.6.4).

4.8.6 Contact retention. - Individual contacts in connectors shall withstand axial loads in either direction as shown in table XII. Measurements shall be made on individual contacts with all other contacts in place and the insert assembled in its shell. The loads shall be applied uniformly at approximately 1 pound per second (see 3.6.5).

Table XII - Contact axial loads.

Contact size	Axial load (min.)
20	7
16	10
12	15
8	20
4	20

4.8.7 Insert retention. - Connector inserts shall withstand a uniformly distributed axial load of 80 pounds in either direction without being dislocated from their normal position in the connector shell. The load shall be increased gradually at a rate of approximately 1 pound per second until the specified load is reached. The insert assembly shall retain its normal position in the connector shell for the specified load (see 3.6.6).

MIL-C-21617(SHIPS)

4.8.8 Vibration. - Complete mated connectors shall be vibrated in accordance with test condition A, method 204 of Standard MIL-STD-202 to determine conformance with 3.6.7. All contacts shall be wired with the appropriate size wire. At least one pair of contacts shall be connected to a suitable testing circuit with at least 0.1 ampere flowing through the contacts. Plugs and receptacles shall be held together only by the normal locking device. Strain relief shall be provided by the use of junction shells. Wires shall be supported on a stationary frame not closer than 12 inches from the connectors. There shall be no interruption of continuity of the contact circuits (see 3.6.7).

4.8.9 Insertion and withdrawal force (connector assembly). - The connector assembly (plug and receptacle) shall meet the requirements of 3.6.8. A test fixture constructed in accordance with figures 35 and 36 is a satisfactory device for this test.

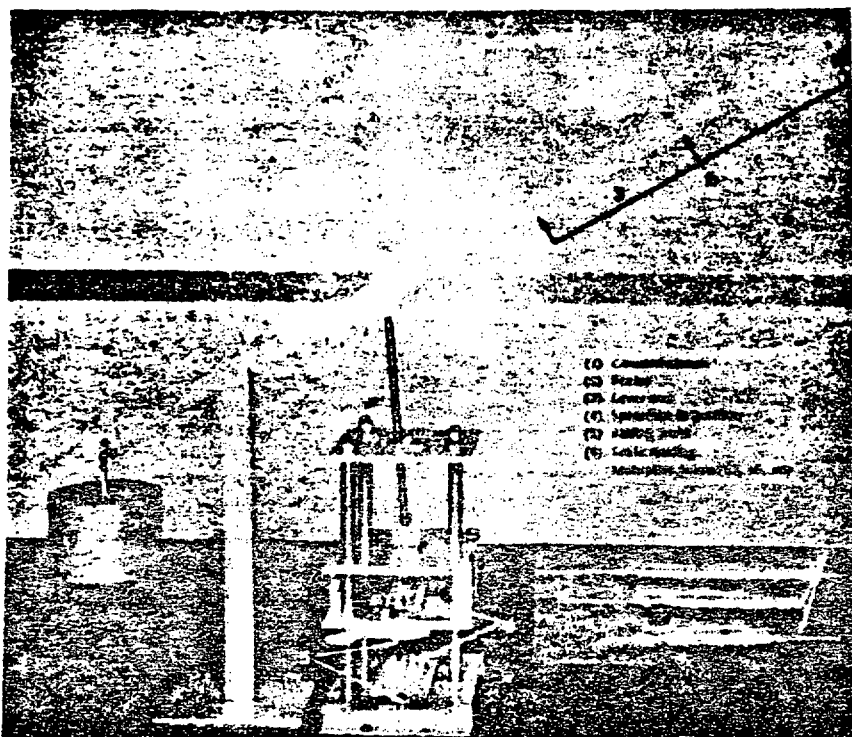


Figure 35 - Apparatus used to measure insertion and withdrawal forces of rack-and-panel connectors.

MIL-C-21617(SHIPS)

- (a) The connector plug and receptacle shall be mounted on specimen plates, by means of the 0.120 inch diameter mounting holes. The plates shall be of such size and material as to permit adaption to test apparatus without damage to the specimen. The plates shall simulate actual rack and panel mountings and shall be fabricated from solid sheets in accordance with mounting data of table XIII.

Table XIII - Mounting data.

Type	A +0.015		B +0.015		R +0.015	C +0.005	D +0.005	E +0.005	Gap ¹ +0.015
	Front	Rear	Front	Rear					
	Inches	Inches	Inches	Inches	Inch	Inches	Inch	Inch	Inch
P	1.641	1.703	1.031	1.094	0.125	2.062	0.750	0.120	0.375
J	1.781	1.781	1.141	1.141	.187	2.062	.750	.120	.375
JS	1.781	1.781	1.141	1.141	.187	2.062	.750	4-40NC2 tapped holes (4)	.375

¹Opening between flanges after mating.

- (b) The mounted specimen plate shall be placed in the apparatus shown on figures 35 and 36 at point 4.
- (c) The guide pins are used to line up the specimen plates which are held in place by sliding locks (5).
- (d) The system is then balanced by adjusting the counterbalance (1).
- (e) The connector is mated by placing the scale in one of the holes in the ratio (lever) arm, (6) and pulling down until the connector is fully mated.
- (f) By use of slip rings on the scale the maximum force required to mate the connector can be observed and recorded.
- (g) The withdrawal force can be measured by pulling up on the scale and recording the maximum force required to unmate the connector.

4.8.10 Mechanical shock. - A mated plug and receptacle shall be subjected to a transient decelerating force produced by securing them to sufficient mass, and dropping the assembly through such a height that, when decelerated by resilient impact, a deceleration of 50 gravity units shall be obtained. The parts of the connector shall show no damage and the contacts shall meet the resistance of contacts test as specified in 4.8.14. The shock test shall be repeated in each of the referenced 90-degree axis positions. A shock testing device in accordance with method 202A of Standard MIL-STD-202, revised for connector mounting, is a satisfactory device for this test.

4.8.11 Moisture resistance. - Unmated plugs and receptacles shall be tested in accordance with Standard MIL-STD-202, method 106A except that steps 7A and 7B are not required. Connectors shall be mounted in a horizontal position. No measurements are required after initial conditioning nor voltages applied to connectors during exposure. After final conditioning and completion of step 6 of the final cycle, the connectors shall be removed from the cabinet and the unmated connectors shall meet the requirement as specified in 3.6.10 and table IV.

4.8.12 Durability. - The complete connector assemblies shall be subjected to 500 cycles of insertion and withdrawal at a rate not exceeding 600 cycles per hour. The insertions and withdrawals shall be accomplished in a manner similar to that which the connectors shall be subjected to in service. After 500 cycles, the plug and receptacle assemblies shall conform to 3.6.11.

4.8.13 Salt spray (corrosion). - The mated plugs and receptacles and 25 sets of individual pin and socket contacts shall be subjected to a salt spray (corrosion) test in accordance with Standard MIL-STD-202, method 101, condition B. Immediately after exposure the connectors shall be unmated and the exterior surfaces of the connectors and of the individual sets of pin and socket contacts shall be

ML-C-21617(SHIPS)

washed with tap water and the connectors and the individual sets of pin and socket contacts shall be dried for 12 hours maximum in a circulating air oven at a temperature of $38^{\circ} + 3^{\circ}\text{C}$. ($100^{\circ} + 5^{\circ}\text{F}$). Upon removal, the connectors shall be mated and shall meet the requirement as specified in 3.6.12 and table IV.

4.8.14 Resistance of contacts. - The electrical resistance of each pair of the 25 sets of mated pin and socket contacts shall be determined by measuring the potential drop across the assembled contacts when carrying the specified current. The potential drop shall be measured at the extreme terminal end of the contacts as shown on figure 37 (see 3.6.13).

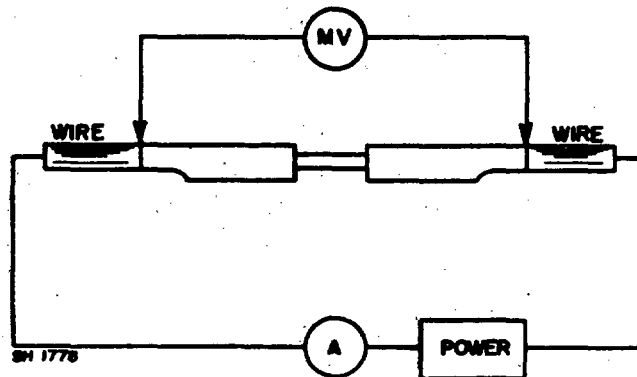


Figure 37 - Measurement of potential.

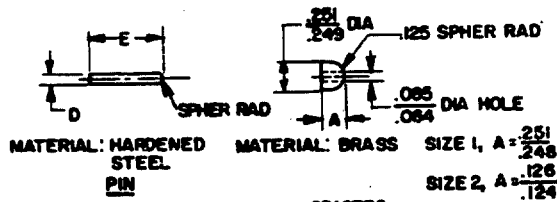
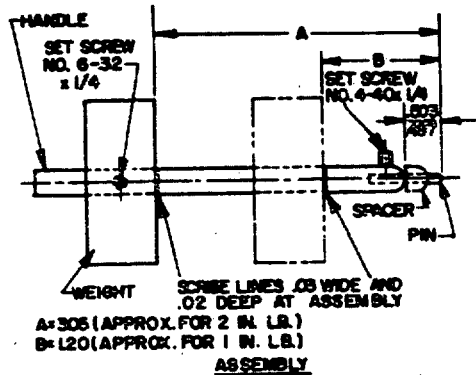
4.8.15 Resistance to test prod damage. -

4.8.15.1 Size 16 socket contacts shall meet the requirements of 3.6.15 after having been subjected to the following test: A test prod of hardened steel having a diameter equal to a nominal mating pin shall be inserted into each socket to (a) 1/2 inch, (b) 3/8 inch, and (c) 1/4 inch depth. At each of these depths, measured from the face of the insert, a bending moment of 2 inch-pounds plus or minus 10 percent shall be applied to the prod, about the inserted end of the prod, and the connector shall be rotated in one direction through 360 degrees, in order that a uniform force is applied to the inside surface of the socket. This test shall be performed with the socket contacts in their inserts, and the sockets locked, if necessary, to prevent rotation in the inserts during the test.

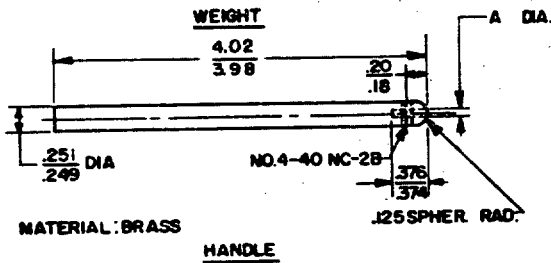
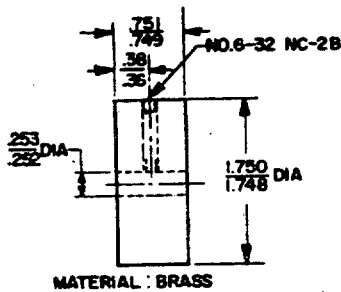
4.8.15.2 Test procedure for resistance to test prod damage. - In order to insure uniform test results, the test fixture shown on figure 38 shall be used to perform the tests required by 3.6.14. Procedures shall be as follows:

- (a) With the weight in position for the 2 inch-pound moment and no spacers on the pin, insert the pin in a socket of an assembled receptacle or plug while the axis of the socket is in a horizontal position.
- (b) With the fixture free and unsupported, rotate the receptacle or plug 360 degrees about a horizontal axis, maintaining the socket in a horizontal position.
- (c) Repeat with size 1 spacer.
- (d) Repeat with size 2 spacer.
- (e) After withdrawal of the fixture, the socket shall pass the contact separation force requirement of 3.6.15.

MIL-C-21617(SHIPS)



CONTACT SIZE	D	E
16	.0633 ± .0002	.075 ± .002



CONTACT SIZE	A
16	.064 ± .001

Figure 38 - Test fixture.

MIL-C-21617(SHIPS)

4.8.16 Contact separation. - Provisions shall be made for mounting socket contacts in a suitable position for applying gradually increasing loads during withdrawal of the minimum diameter hardened steel test pins. The finish on the steel pins shall not exceed 10 microinches, and the gaging end of the pin shall be rounded or chamfered. The average force required to separate the test pin from socket contact shall not exceed the maximum average values shown in table VI, and none of the values shall be less than the minimum individual force indicated in table VI. The values shall be obtained from a sample lot of 25 socket contacts. The separation force may be determined with socket contacts either in or out of their insulators. Gradually increasing loads shall be applied until the test pin properly separates from the socket. Depth of engagement shall conform to that encountered in service (see 3.6.15).

4.9 Inspection procedures. - For Naval purchases, the general inspection procedures shall be in accordance with General Specifications for Inspection of Material.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. -

5.1.1 Level A. - Connectors shall be individually preserved and packaged in accordance with method IA of Specification MIL-P-116. Contact preservative is not required.

5.1.1.1 When more than 10 identical items are being shipped at the same time to one destination, the items shall be intermediate packaged in quantities of not more than 10 in an intermediate package. Intermediate containers shall conform to Specification PPP-B-566, PPP-B-676, MIL-B-4229, or PPP-B-636, at the option of the contractor. Box closures shall conform to the applicable box specification and the appendix thereto. The gross weight of paperboard boxes shall not exceed 10 pounds and fiberboard boxes shall not exceed 20 pounds.

5.1.1.2 When 10, or less, identical items are being shipped at the same time to one destination, intermediate packaging will not be required and the item shall be packaged as specified herein and packed directly into shipping containers as specified for level A, B or C, as applicable.

5.1.2 Level C. - Connectors shall be preserved and packaged in accordance with the manufacturer's commercial practice.

5.2 Packing. -

5.2.1 Level A. - Connectors, preserved and packaged in accordance with level A or C as specified (see 6.2), shall be packed in overseas type wood cleated fiberboard, nailed wood, wirebound wood, corrugated or solid fiberboard, wood cleated paper overlaid, or wood cleated plywood boxes conforming to Specification PPP-B-591, PPP-B-621, PPP-B-585, PPP-B-636, class 3, MIL-B-10377 or PPP-B-601, respectively, at the option of the contractor. Shipping containers shall have case liners conforming to Specification MIL-L-10547 and shall be closed and sealed in accordance with the appendix thereto. Case liners for boxes conforming to Specification PPP-B-636 may be omitted provided all joints of the boxes are sealed with tape conforming to Specification PPP-T-76. Box closures shall be as specified in the applicable box specification or appendix thereto. The gross weight of wood boxes shall not exceed 200 pounds; fiberboard boxes shall not exceed the weight limitations of the applicable box specification.

5.2.2 Level B. - Connectors, preserved and packaged in accordance with level A or C as specified (see 6.2), shall be packed in domestic type wood cleated fiberboard, nailed wood, wirebound wood, corrugated or solid fiberboard, wood cleated plywood or wood cleated paper overlaid boxes conforming to Specification PPP-B-591, PPP-B-621, PPP-B-585, PPP-B-636, class 2, PPP-B-601, or MIL-B-10377, respectively, at the option of the contractor. Box closures shall be as specified in applicable box specification or appendix thereto. The gross weight of wood boxes shall not exceed 200 pounds; fiberboard boxes shall not exceed the weight limitation of the applicable box specification.

5.2.3 Level C. - Connectors, preserved and packaged for level A or C as specified (see 6.2) shall be packed in containers of the type, size and kind commonly used for the purpose in a manner which will insure acceptance and safe delivery at destination. Shipping containers shall comply with the Uniform Freight Classification Rules or other regulations as applicable to the mode of transportation.

MIL-C-21617(SHIPS)

5.3 Marking. - In addition to any special marking required by the contract, or order, or herein, interior and exterior shipping containers shall be marked in accordance with Standard MIL-STD-129, except that cure date and expiration date for resilient materials are not required.

6. NOTES

6.1 Intended use. -

6.1.1 Type P, plug. - Plugs are intended for use at the end of a cable mounted on panel of a unit plug-in to be mated with a panel mounted receptacle.

6.1.2 Type J, receptacle. - Receptacles are intended for fixed panel mounting of unit, and for use with conduit to eliminate the necessity of a conduit box.

6.1.3 Type JS, pressurized receptacle. - Pressurized receptacles are intended for use on pressurized devices, and their performance requirements are determined by the particular application. They should maintain the degree of pressurization required by the equipment specification and be suitable for mating with plugs conforming to the requirements of this specification.

6.1.4 Wire sizes to be used with contact. - It is intended that the wire soldered to each connector contact should be of the AWG size (or smaller diameter) corresponding to the contact size number. For example, it is intended that an AWG size 20 wire be soldered to at least a size 20 contact.

6.2 Ordering data. - Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Complete type designation (see 1. 2).
- (c) Selection of applicable levels of preservation and packaging, and packing required (see section 5).

6.3 Qualification. - With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in Qualified Products List QPL-21617, whether or not such products have actually been so listed by that date.

6.3.1 The attention of suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government, tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products covered by this specification may be obtained from the Chief of the Bureau of Ships, Department of the Navy, Washington 25, D. C.

Notice. - When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Preparing activity:
Navy - Bureau of Ships
(Project 5935-0005Sh)

E 34315

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 119-R004
INSTRUCTIONS		
This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof).		
SPECIFICATION		
ORGANIZATION (of submitter)		CITY AND STATE
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT \$
MATERIAL PROCURED UNDER A		
<input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?		
A. GIVE PARAGRAPH NUMBER AND WORDING.		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE?		
<input type="checkbox"/> YES <input type="checkbox"/> NO IF "YES", IN WHAT WAY?		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED BY (Printed or typed name and activity)		DATE