

INCH-POUND

MIL-DTL-22438C
w/AMENDMENT 1
11 April 2022

SUPERSEDING
MIL-DTL-22438C
2 May 2012

DETAIL SPECIFICATION

PANELS, RECEPTACLE, FOR ELECTRICAL AND ELECTRONICS TEST AND MAINTENANCE TABLE, GENERAL SPECIFICATION FOR

INACTIVE FOR NEW DESIGN
AFTER 18 July 1997

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 electrical and electronic test and maintenance table receptacle panels.

1.2 Part or Identifying Number (PIN). The PIN will consist of the letter "M", the basic number of the specification sheet, and an assigned dash number (see 3.1), as shown in the following example:

<u>M</u> 	<u>22438/1</u> 	-	<u>001</u>
Designator	Specification Sheet number		Dash number (See 3.1 for details)

1.3 Classification. Panels will be of the types specified in the individual specification sheets (see 3.1).

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 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 and 4 of this specification, whether or not they are listed.

Comments, suggestions, or questions on this document should be addressed to: DLA Land and Maritime, ATTN: DLA Land and Maritime-VAT, Post Office Box 3990, Columbus, Ohio 43218-3990 or by emailed to CircuitProtect@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil/>.



MIL-DTL-22438C
w/AMENDMENT 1

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 (see 6.2).

FEDERAL SPECIFICATIONS

- W-C-596 - Connector, Electrical, Power, General Specification for.
- W-C-596/12 - Connector, Receptacle, Electrical, General Purpose, Duplex, General Grade and Hospital Grade, Grounding, 2 Pole, 3 Wire, Three 15 Amperes, 125 Volts. 50/60 Hertz.

FEDERAL STANDARDS

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

DEPARTMENT OF DEFENSE SPECIFICATIONS

- MIL-DTL-901 - Shock Test, H.I. (High-Impact); Shipboard Machinery, Equipment and Systems Requirements for.
- MIL-DTL-917 - Electric Power Equipment, Basic Requirements For (Navy Shipboard Use).
- MIL-DTL-2726 - Receptacles, Receptacle Plugs, Switch and Receptacles, and Outlets(Electrical), General Specification for.
- MIL-DTL-15024 - Plates, Tags and Bands for Identification of Equipment.
- MIL-P-15024/5 - Plates, Identification.
- MIL-DTL-15090 - Enamel, Equipment, Light Gray (Formula No. 111).
- T-T-C-490 - Chemical Conversion Coatings and Pretreatments for Metallic Substrates (Base for Organic Coatings).
- MIL-DTL-16377 - Fixtures, Lighting; and Associated Parts Shipboard Use, General Specification for.
- MIL-DTL-22438/1 - Panel, Receptacle, Electrical and Electronic (Symbol no. 754.2.
- MIL-DTL-22438/2 - Panel, Receptacle, Enclosed, Electrical and Electronic (Symbol no. 755.3).

DEPARTMENT OF DEFENSE STANDARDS

- MIL-STD-167-1 - Mechanical Vibrations of Shipboard Equipment (Type I Environmental and Type II Internally Excited).
- MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.

(Copies of these documents are available online at <https://quicksearch.dla.mil/> or <https://assist.dla.mil/>.)

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 (see 6.2).

MIL-DTL-22438C
w/AMENDMENT 1

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA PB1 - Panelboards.

(A Copy of this document is available from <https://www.nema.org/> or from 1300 North 17th Street, Suite 1752, Rosslyn, VA 22209).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

SAE AS50151 - Connectors, Electrical, Circular Threaded, AN Type, General Specification For.

(Copies of this document are available at <https://www.sae.org/> or from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001).

2.4 Order of precedence. Unless otherwise noted herein or in the contract, or 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.

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), the contractor shall furnish one receptacle panel for first article inspection and approval (see 4.4 and 6.3).

3.3 Material. The material for each part shall be as specified herein. However, when a definite material is not specified, a material shall be used which will enable the receptacle panels to meet the performance requirements of this specification.

3.3.1 Restricted material. Flammable or explosive material, or material which can produce toxic or suffocating fumes shall not be used. Mercury in any form shall not be used in shipboard equipment, including materials and parts.

3.3.2 Finishes and plating. The use of pure tin as an underplate or final finish is prohibited both internally and externally. Tin content shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum of 3 percent lead, by mass (see 6.4).

3.3.2 Metals. Current-carrying parts and terminal posts shall be copper alloy. Other metal posts shall be either noncorrosive or shall be treated, coated, or plated in accordance with MIL-DTL-917.

3.3.2.1 Dissimilar metals. Dissimilar metals in contact with each other shall be in accordance with the requirements of MIL-DTL-917.

MIL-DTL-22438C
w/AMENDMENT 1

3.3.3. Terminal board insulating materials.

3.3.3.1 Plastics, laminated. Laminated plastic material shall be glass base laminated plastic in accordance with [MIL-DTL-917](#).

3.3.3.2 Plastics, molded. Molded terminal boards shall be made of glass fiber reinforced thermosetting molding compounds in accordance with [MIL-DTL-917](#).

3.3.3.3 Flashing. Flash shall be removed from molded parts and the width of the flash edges made thereby shall be not greater than 1/32 inch. Flash edges shall be buffed smooth.

3.4 Design and construction. Receptacle panels shall conform to the design, construction, and physical dimensions specified on the specification sheets.

3.4.1 Hardware. Screws, nuts, washers, and miscellaneous hardware shall be of a good commercial grade material compatible with that of the basic panel, and protected against corrosion. Self-tapping screws or other self-tapping devices shall not be used.

3.4.1.1 Locking devices. Locking devices shall be used, where required, to secure components to insure continuous satisfactory operation under test conditions specified.

3.4.2 Threads. Threads shall be right hand, class 2, complying with Unified and American National screw threads as specified in [FED-STD-H28](#).

3.4.2.1 Engagement of threaded parts. Thread engagement shall be a minimum of 2/3 of the diameter of the bolt or screw.

3.4.3 Drilling, countersinking, or tapping. All drilling, countersinking, and tapping shall be done before plating or finish is applied, except when necessary to insure conformance with [3.4.5.4](#).

3.4.4 Sharp edges. All sharp edges that are accessible shall be given a slight radius.

3.4.5 Receptacle and plug assemblies.

3.4.5.1 Receptacles, direct current (dc) and 400 hertz (Hz) alternating current (ac). Receptacles furnished for dc and 400Hz power outlets shall be in accordance with [SAE AS50151](#) or [MIL-DTL-2726](#), as applicable. The type receptacle designated by part number or specification sheet number, and the quantity to be furnished shall be as specified on the applicable specification sheet.

3.4.5.2 Receptacles, 60Hz ac. Receptacles for 60HZ power outlets shall be duplex receptacle assemblies in accordance with [W-C-596](#) and [W-C-596/12](#) and furnished in the quantity specified on the applicable specification sheet.

3.4.5.3 Plug assemblies, dc and 400Hz ac. Plug assemblies for use with dc and 400HZ outlets shall be furnished only when specified on the individual specification sheet. The plugs, when specified, shall be in accordance with [SAE AS50151](#) or [MIL-DTL-2726](#) and furnished in the quantity specified on the applicable specification sheet.

MIL-DTL-22438C
w/AMENDMENT 1

3.4.5.4 Ground continuity. Any receptacle with a ground contact electrically connected to the receptacle shell or mounting strap shall maintain this electrical continuity with the panel through the mounting screws (an additional connection to a ground post may be required by the specification sheet).

3.4.6 Terminal boards. Terminal post assemblies (see 3.4.6.1) shall be securely fastened to or molded integrally with the terminal board base by a method that will prevent any loosening or change in position under the test conditions of 4.7.5 and 4.7.6. Any live part of the terminal board exposed on the underside of the base (such as screws, rivets, and so forth used for attaching terminal post assemblies to the base) shall be recessed in a counterbored hole, and covered with a good quality insulating resin. The sealing of the counterbored holes with resin is not required when the fasteners involved are prevented from loosening under vibration shock, and an insulating subbase is employed, or the creepage and clearance distances specified in MIL-DTL-917 are adequate without the use of a subbase. To facilitate interpanel bus connections, the orientation of bus connection terminal posts shall be as shown on the applicable specification sheet. Phase and frequency, or polarity markings, as shown on the specification sheet, shall be molded or engraved on the terminal boards. The height of the terminal boards, after installation of the panel, shall be sufficient to permit interpanel bus wiring to clear receptacles, if the terminal board location and terminal post orientation requires this wiring to pass over the receptacles (see 3.1).

3.4.6.1 Terminal posts. Separate terminal connections or posts, silver brazed (except in the case of screw terminal connections) to a common terminal bus bar, shall be provided for interpanel bus connections and local interior wiring. The terminal posts used for interpanel wiring shall be as specified on the applicable specification sheet. The type of terminal connector used for interior wiring shall be at the option of the manufacturer.

3.4.6.1.1 Ground connection. A separate ground connection terminal post shall be brazed to the panel or panel enclosure in the location and orientation shown on the specification sheet.

3.4.7 Interior wiring. All interior wiring shall be furnished and installed by the manufacturer using stranded copper wire of the type required by the individual specification sheet. Connections at screw terminals shall be made with pressure type connections. Connectors shall be prevented from turning, unless such turning does not decrease the creepage and clearance distances below those specified in MIL-DTL-917. Interior wiring shall be connected as shown in the wiring diagram on the applicable specification sheet.

3.4.8 Wiring diagram. A wiring diagram shall be furnished with all panels, and attached to the rear of the panel or to the inside of the cover for a totally enclosed panel. A type III label, as specified in MIL-DTL-16377, shall be used.

3.4.9 Enclosed receptacle panels. Receptacle panels designated as enclosed shall have all their components housed in a type I general purpose steel enclosure in accordance with NEMA PB1, and finished in accordance with 3.7. Enclosure cover or door shall be sized to permit easy access to all interior components. A locking device shall be provided if the method of attachment of the cover or door to the enclosure is by hinges or means other than screw type fasteners. The manufacturer is cautioned that the thickness of the sheet metal and the supporting channels or strips used in the enclosure must be sufficient to permit the enclosure, complete with all interior components, to comply with the test conditions of 4.7.5 and 4.7.6.

MIL-DTL-22438C
w/AMENDMENT 1

3.5 Performance.

3.5.1 Operation. Receptacle panels shall perform in a satisfactory manner when tested as specified in 4.7.1.

3.5.2 Dielectric strength. When receptacle panels are tested as specified in 4.7.2 there shall be no arcing, breakdown, or other evidence of damage or malfunction.

3.5.3 Insulation resistance. When receptacle panels are tested as specified in 4.7.3 the insulation resistance between electrical conductors and between electrical conductors and ground shall be not less than 100 megohms.

3.5.4 Temperature rise. When enclosed receptacle panels are tested as specified in 4.7.4 the temperature rise of any current carrying component shall not exceed 30°C.

3.5.5 Vibration. When receptacle panels are tested as specified 4.7.5 there shall be no evidence of cracking, breaking, loosening of parts, interruption of circuit continuity, or other damage.

3.5.6 Shock. When receptacle panels are tested as specified in 4.7.6 there shall be no loosening of parts or other damage and the panels shall be capable of performing their intended function.

3.6 Identification plates and labels. All open receptacle panels shall have an identification label, type I as specified in MIL-DTL-16377, attached to the interior of the panel. Enclosed receptacle panels shall be provided with either two of these identification labels, attached to the interior and exterior of the enclosure cover, or one identification plate, in accordance with MIL-DTL-15024 and MIL-P-15024/5, types A, B, C, and F only, mounted externally on the enclosure cover. The identification plate or label shall contain the following information:

- a. Name of the item.
- b. Complete electrical rating.
- c. Specification sheet number and complete Military part number as indicated on the appropriate specification sheet.
- d. National stock number.
- e. Contract number.
- f. Manufacturer's (prime contractor) name or monogram.

3.7 Finish. The main panel or enclosure shall be given one coat of wash primer in accordance with TT-C-490, followed by two coats of gray equipment enamel conforming to MIL-DTL-15090, type II or type III, class 2.

3.8 Panel marking. White lettering shall be applied by engraving, stenciling or screening (see 3.1 for location and text) directly on the panel, or separate information plates, in accordance with MIL-DTL-15024 and MIL-P-15024/5 types A, B, C, F, or H, and may be secured to the panel or enclosure. Letters shall not be less than 3/32 inch high.

3.9 Recycled, recovered, or environmentally preferable, or biobased materials. Recycled, recovered, or environmentally preferable, or biobased 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.

MIL-DTL-22438C
w/AMENDMENT 1

3.10 Workmanship. The control-panel assembly shall be free from dirt, scale, flux, and other extraneous material. All electrical connections shall be secure, metal joints and seams shall be tight, and all edges shall be rounded or beveled.

4. VERIFICATION

4.1 Classification of inspections. Inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.4).
- b. Conformance inspection (see 4.5).

4.2 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.3 Inspection conditions. Unless otherwise specified (see 3.1), inspection shall be performed in accordance with the test conditions of MIL-STD-202.

4.4 First article inspection. First article inspection shall subject one receptacle panel to the examination and tests specified in table I in the order shown. The manufacturer shall provide verification to the procuring activity that the first article inspection and tests have been performed on the receptacle panel supplied to the requirements of this specification. One or more failures of first article examination or tests shall be cause for rejection.

TABLE I. First article inspection.

Inspection	Requirement paragraph	Test method paragraph
Visual and mechanical examination	3.1, 3.3	4.6
Operation	3.5.1	4.7.1
Dielectric strength	3.5.2	4.7.2
Insulation resistance	3.5.3	4.7.3
Temperature rise	3.5.4	4.7.4
Vibration	3.5.5	4.7.5
Shock	3.5.6	4.7.6

4.5 Conformance inspection. This is inspection of product for delivery and shall consist of the examination and tests specified in table II, in the order shown. One or more failures of conformance inspection shall be cause for rejection.

MIL-DTL-22438C
w/AMENDMENT 1

TABLE II. Conformance inspection.

Inspection	Requirement paragraph	Test method paragraph
Visual and mechanical examination	3.1, 3.3	4.6
Operation	3.5.1	4.7.1
Dielectric strength	3.5.2	4.7.2
Insulation resistance	3.5.3	4.7.3

4.5.1 Inspection lot. An inspection lot shall consist of all panels covered by a single specification sheet produced under essentially the same conditions, and offered for inspection at one time.

4.5.2 Sample size. The number of receptacle panels to be subjected to conformance inspection shall be as shown in table III.

TABLE III. Conformance inspection, zero defect sampling plan.

Lot size	Sample size
1 - 8	100 percent
9 - 90	8
91 - 150	12
151 - 280	19
281 - 500	21
501 - 1200	27
1201 - 3200	35
3201 - 10,000	38
10001 - 35000	46

4.6 Examination. The receptacle panel shall be subjected to a visual and mechanical surface examination to ascertain that the requirements of this specification and the applicable specification sheets concerning materials, design, construction, dimensions, and marking, have been met.

4.7 Tests.

4.7.1 Operation. Each receptacle panel shall be coupled with its appropriate plugs and inspected for proper electrical and mechanical operation.

4.7.2 Dielectric strength. An ac root mean square (rms) test voltage of 60Hz frequency, equal to 1000 volts plus twice the rated voltage shall be applied between points of opposite polarity and also between live parts and ground. The test voltage shall be increased from zero at a rate not exceeding 500 volts per second until the specified potential is reached and shall be maintained at that value for one minute. The source of test potential shall have a rating of at least one kilowatt.

4.7.3 Insulation resistance. Insulation resistance of receptacle panels shall be measured with a 500 volt dc megometer, between electrical conductors and between electrical conductors and ground, at an approximate room temperature of 25°C and at relative humidity of approximately 50 percent.

4.7.4 Temperature rise. Each current carrying component shall carry its maximum rated current, with no parts showing a temperature rise in excess of that specified in 3.5.4. The test current shall be applied until a stable temperature is obtained; temperature is considered stable when three successive readings, taken at 5-minute intervals, show no change. The temperature rise is the difference between the stable temperature and the average ambient temperature during the last quarter of the test. Temperature readings may be obtained by thermocouples or by other standard methods. Specified (see 3.1) components and wiring shall be excluded from this test.

4.7.5 Vibration. Receptacle panels shall be tested in accordance with MIL-STD-167-1, type I.

4.7.6 Shock. Receptacle panels shall be tested in accordance with MIL-DTL-901, class I type A.

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 material 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. Receptacle panels covered by this specification are for use on electrical and electronic test and maintenance tables.

6.2. Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, date of this specification, it's specification sheets and the complete military or contractor's type or part number, as applicable (including the CAGE).
- b. When first article is required for inspection and approval (see 3.2, 4.3 and 6.3).
- c. Under what conditions inspections shall be performed (see 4.3).
- d. ASSIST Online database should be cited in the solicitation, and if required, the specific issue of individual documents referenced. If not otherwise specified, the versions of the individual documents referenced will be those in effect on the date of release of the solicitation (see 2.1).
- e. Packaging requirements (see 5.1).

MIL-DTL-22438C
w/AMENDMENT 1

6.3 First article inspection. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection as to those bidders offering a product which has been previously procured or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending procurement. Further, the first article should be the first production item. The first article should consist of one receptacle panel. The contracting officer should include specific instructions in all procurement instruments regarding arrangements for examinations, test, and approval of the first article.

6.4 Tin whisker growth. The use of alloys with tin content greater than 97 percent, by mass, may exhibit tin whisker growth problems after manufacture. Tin whiskers may occur anytime from a day to years after manufacture and can develop under typical operating conditions, on products that use such materials. Conformal coatings applied over top of a whisker-prone surface will not prevent the formation of tin whiskers. Alloys of 3 percent lead, by mass, have shown to inhibit the growth of tin whiskers. For additional information on this matter, refer to [ASTM B545](#) (Standard Specification for Electrodeposited Coatings of Tin).

6.5 Subject (key word) listing.

Connector
Duplex
Enclosure
Plug
Terminal boards

6.6 Amendment notations. The margins of this specification are marked with vertical lines to indicate modifications generated by this amendment. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations.

Custodians:
Navy - SH
DLA - CC

Preparing activity:
DLA - CC

(Project 6110-2022-002)

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 <https://assist.dla.mil>.