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MILITARY SPECIFICATION

TERMINAL BOARDS, MOLDED, BARRIER

SCREW AND STUD TYPES, AND ASSOCIATED

ACCESSORIES, GENERAL SPECIFICATION FOR

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 one-piece molded, barrier, front-end through-connection, screw-and stud-type terminal boards used for connections in electrical and electronic circuits. The screw-type boards have molded-in or ultrasonically inserted metal terminal plates. This specification also covers the general requirements for bus (jumper) connectors for use with both types of boards and marker strips for use with screw-type boards.

1.2 Classification.

1.2.1 Type designation of terminal boards. The type designation shall be in the following form, and as specified (see 3.1 and 6.1).

| <u>37TB</u> | <u>2</u> | <u>B</u> |
|--------------------|-------------------------------------|--|
| Class (1.2.1.1) | Number of terminals (1.2.1.2) | Terminal board classification (when applicable) (1.2.1.3) |

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, U.S. Army Laboratory Command (LABCOM), ATTN: SLCET-R-S, Fort Monmouth, New Jersey 07703-5000, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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TABLE I. Terminal board types.

| Number of rows of terminals | Type of connection | Type of terminal | Class | Spec sheet | Nominal dimension between barriers (inch) | Rated voltage (volts) | Rated current (amperes) |
|-----------------------------------|-----------------------|--------------------------|-------|---------------|---|-----------------------------|-------------------------------|
| Single | Front | Stud | 25TB | 23 | .250 | 300 | 25 |
| | | | 9TB | 15 | .320 | 300 | 35 |
| | | | 3TB | 9 | .408 | 600 | 45 |
| | | | 18TB | 22 | .408 | 600 | 45 |
| Two Single | Front | Stud | 10TB | 16 | .250 | 600 | 30 |
| | | | 6TB | 12 | .320 | 600 | 30 |
| | | | 15TB | 19 | .320 | 600 | 30 |
| | | | 4TB | 10 | .408 | 600 | 40 |
| Double | Linked front | Stud | 16TB | 20 | .408 | 1000 | 40 |
| | | | 26TB | 24 | .250 | 300 | 20 |
| | | | 8TB | 14 | .295 | 300 | 30 |
| | | | 17TB | 21 | .408 | 600 | 40 |
| Single | Feed- through | Stud | 27TB | 25 | .250 | 300 | 30 |
| | | | 11TB | 17 | .250 | 600 | 40 |
| | | | 7TB | 13 | .320 | 600 | 40 |
| | | | 5TB | 11 | .408 | 600 | 50 |
| Double (no molded barrier) | Front | Stud | 13TB | 18 | ---- | 150 | 15 |
| Double | Linked front | Screw | 37TB | 1 | .290 | 300 | 15 |
| | | | 38TB | 2 | .328 | 600 | 20 |
| | | | 39TB | 3 | .421 | 600 | 30 |
| | | | 43TB | 26 | .187 | 150 | 5 |
| Single | Front | Screw & feed- thru | 40TB | 4 | .290 | 300 | 7.5 |
| | | | 41TB | 5 | .328 | 600 | 10 |
| | | | 42TB | 6 | .421 | 600 | 15 |
| Single | Front | Screw | 44TB | 27 | .187 | 150 | 5 |

1.2.1.1 Class. The class is identified by the two-letter symbol "TB" preceded by a number, as shown in table I, designating a terminal board of given rating and construction.

1.2.1.2 Number of terminals. The number of terminals is identified by a number which indicates the total number of rows of insulated-connection points contained on the terminal board.

1.2.1.3 Terminal board classification. When applicable, a one letter symbol is used to identify the terminal board classification (see 3.1, 3.3.1).

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1.2.2 Type designation of terminal board bus (jumper) connectors. The type designation of terminal board bus (jumper) connectors shall be in the following form, and as specified (see 3.1 and 6.1):

| <u>TBLD</u> | <u>37-4</u> | OR | <u>TBJD</u> | <u>37-8</u> |
|--------------------|--|----|--------------------|--|
| Style (1.2.2.1) | Identi- fication number (1.2.2.2) | | Style (1.2.2.1) | Identi- fication number (1.2.2.2) |
| OR | | | | |
| | <u>TBJA</u> | | | |
| | Style (1.2.2.1) | | | |

1.2.2.1 Style The style is identified by a four-letter symbol identifying bus (jumper) connectors. The first two letters indicate terminal board, the third letter indicates lug type or jumper type connectors (i.e., TBL or TBJ). For the lug type connectors, the fourth letter identifies (D) double or (S) single end configuration. For the jumper type connector, the fourth letter identifies the style jumper (A), (B), (C), (D), (E), (F), or (G).

1.2.2.2 Identification number. The identification number indicates the size of the bus (jumper) connector and is the same as the identifying number of the terminal board on which the bus connector is used.

1.2.3 Type designation of terminal board marker strips. The type designation of terminal board marker strips shall be in the following form, and as specified (see 3.1 and 6.1):

MSA37TB10
Style
(1.2.3.1)

1.2.3.1 Style. The style of the terminal board marker strip only (does not include the terminal board) is identified by a 7 or 8 position part number. The first two letters, MS, identifies the item as a marker strip. The third letter identifies the particular marking style that will be utilized as follows: "A" numerals marked below the contact area with the terminal board only; "B" numerals marked both above and below the contact area with the terminal board; or "C" blank marker strip with the same dimensions as an MSA marker strip. The next 5 or 6 symbols specify the type of terminal board the marker strip is compatible with.

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2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified (see 6.2), the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

| | |
|-----------|--|
| L-P-378 | - Plastic Sheet and Strip, Thin Gauge, Polyolefin |
| NN-P-71 | - Pallet, Material Handling, Wood, Stringer Construction, 2 Way and 4 Way (Partial) |
| QQ-N-290 | - Nickel Plating (Electrodeposited) |
| QQ-W-321 | - Wire, Copper Alloy |
| QQ-C-585 | - Copper-Nickel-Zinc-Alloy Plate, Sheet, Strip and Bar (Copper Alloy Numbers 735, 745, 752, 762, 766, 770). |
| QQ-B-613 | - Brass, Leaded and Nonleaded: Flat Products (Plate, Bar Sheet and Strip) |
| QQ-B-626 | - Brass, Leaded and Nonleaded: Rod, Shape, Forgings, and Flat Products with Finished Edges (Bar and Strip) |
| QQ-B-728 | - Bronze Manganese; Rod, Shapes, Forgings, and Flat Products (Flat Wire, Strip, Sheet, Bar and Plate) |
| QQ-B-750 | - Bronze, Phosphor, Brass, Plate, Rod, Sheet, Strip, Flat Wire, and Structural, and Special Shaped Sections. |
| QQ-S-763 | - Steel Bars, Shapes, and Forgings, Corrosion-Resisting |
| QQ-S-781 | - Strapping, Steel, and Seals |
| PPP-T-97 | - Tape, Packaging Industrial, Filament Reinforced |
| PPP-B-601 | - Boxes, Wood, Cleated-Plywood |
| PPP-B-621 | - Boxes, Wood, Nailed and Lock-corner |
| PPP-B-636 | - Boxes, Shipping, Fiberboard |
| PPP-B-640 | - Boxes, Fiberboard, Corrugated, Triple-wall |
| PPP-S-760 | - Strapping, Nonmetallic (and Connectors) |

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| | |
|-----------------|--|
| MIL-M-14 | - Molding Plastics and Molded Plastic Parts, Thermosetting. |
| MIL-P-116 | - Preservation, Methods of |
| MIL-T-10727 | - Tin Plating; Electrodeposited or Hot-Dipped, for Ferrous and Nonferrous Metals |
| MIL-M-13231(ER) | - Marking of Electronic Items |

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- MIL-P-15037 - Plastic Sheet, Laminated, Thermosetting, Glass-Cloth, Melamine-Resin
- MIL-M-24519 - Molding Plastics, Polyester, and Polyarylether, Thermoplastic

STANDARDS

FEDERAL

- FED-STD-H28 - Screw Thread Standards for Federal Services
- FED-STD-101 - Test Procedures for Packaging Materials
- FED-STD-595 - Colors

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- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
- MIL-STD-129 - Marking for Shipment and Storage
- MIL-STD-147 - Palletized Unit Loads
- MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts
- MIL-STD-454 - Standard General Requirements for Electronic Equipment
- MIL-STD-1285 - Marking of Electrical and Electronic Parts
- MS-17143 - Terminal Lug, Crimp Style, Copper, Insulated, Rectangular Tongue, Type II, Class 1 for 105 Degrees C Total Conductor Temperature
- MIL-STD-45662 - Calibration System Requirements

2.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, (except for associated specification sheets) the text of this specification shall take precedence. Nothing in this specification, however, shall supersede 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 sheets. In the event of any conflict between the requirements of this specification and the specification sheets, the latter shall govern (see 6.1).

3.2 Pre-production sample. When specified in the contract or purchase order, a sample shall be subjected to periodic inspection (see 4.5.2).

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3.3 Material. The material shall be as specified herein. However, when a definite material is not specified, a material shall be used which will enable the terminal boards and accessories to meet the performance requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product.

3.3.1 Plastics. The plastic material for terminal board molding shall conform to type MAI-60, GDI-30F, SDG-F, or MSI-30 of MIL-M-14, or GPT-30F of MIL-M-24519. The materials, temperature, and colors shall be as specified in table II. The colors shall be similar to FED-STD-595 as specified in table II. Designation plates for class 17TB terminal boards shall be made of GME material in accordance with MIL-P-15037. Marker strips when required as specified (see 3.1) shall be made of GME material in accordance with MIL-P-15037.

TABLE II. Requirements for Plastics.

| <u>Terminal Board</u> <u>Class 1/</u> | <u>Maximum</u> <u>Temperature (°C)</u> | <u>Materials</u> | <u>Color</u> |
|--|---|----------------------------|-------------------------------|
| B | 130 | GPT-30F | Semi-gloss gray, No. 26307 |
| F | 155 | GDI-30F SDG-F MAI-60 | Semi-gloss gray, No. 26307 |
| H | 220 | MSI-30 | Lusterless red No. 31136 |

1/ Terminal boards of a higher temperature classification may be substituted for a lower temperature classification terminal board.

3.3.2 Metals.

3.3.2.1 Brass. The brass for specific parts listed in table III shall be as specified.

TABLE III. Requirements for brass

| ITEM | ALLOY | COMPOSITION | SPECIFICATION |
|-----------------------|------------|-------------|---------------|
| Terminal screws | 260 or 270 | --- | QQ-B-626 |
| Nuts | 360 | --- | QQ-B-626 |
| Designation plate | 360 | --- | QQ-B-626 |
| mounting inserts | | | |
| Stud connectors | 260 | --- | QQ-B-626 |
| Metal terminal plates | --- | 11 | QQ-B-613 |
| Terminal board Bus | --- | 11 | QQ-B-613 |
| Connectors | --- | --- | |

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3.3.2.2 Bronze. The material shall have a minimum yield strength of 60,000 pounds per square inch (psi) and a minimum tensile strength of 80,000 psi. For through-connection terminal studs, the material shall have a conductivity of at least 14 percent of the conductivity of copper. For front-connection terminal studs, the material shall have a conductivity of at least 7 percent of the conductivity of copper. Manganese bronze shall conform to Class B of QQ-B-728 and phosphor bronze shall conform to composition A of QQ-B-750.

3.3.2.3 Steel. Material for the high-temperature terminal board studs, stud connectors and nuts shall be corrosion-resistant steel in accordance with class 304 of QQ-S-763.

3.3.2.4 Mercury. Metals such as mercury or other substances which may cause stress corrosion cracking of metal parts shall not be used in the manufacture of terminal boards.

3.3.2.5 Copper alloy. Copper alloy shall be in accordance with alloy 752 of QQ-C-585.

3.4 Design and construction. Terminal boards and associated accessories shall be of the design, construction, and physical dimensions specified (see 3.1).

3.4.1 Finish.

3.4.1.1 Plating. Terminal screws and molded-in or ultrasonically inserted terminal plates shall be plated with nickel or tin-nickel alloy equal to class 1, grade G of QQ-N-290. Plating may be omitted on machined surfaces, drilled holes, and tapped holes. All metal hardware made of corrosion-resistant steel need not be plated.

3.4.1.2 Bus (jumper) connectors. Bus (jumper) connectors shall be nickel plated per QQ-N-290, class 1, grade G (see 3.1).

3.4.2 Threaded Parts. All threaded parts shall be in accordance with FED-STD-H28 and as specified (see 3.1). Studs shall be threaded to within 0.047 inch of the stud shoulder.

3.4.2.1 Terminal screws (when applicable). Terminal screws shall be of the binding head type.

3.4.2.2 Terminal nuts (when applicable). Terminal nuts shall be counterbored or countersunk as specified at each end to clear unthreaded portion of the stud when the nut is fully seated upon the stud shoulder and to clear threads in the slotted end of nut. The number of nuts required shall be as specified. (see 3.1)

3.4.3 Terminal screw holes (when applicable). Terminal screw holes shall not extend completely through the molded board.

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3.4.4 Stud connectors (when applicable). The quantity of stud connectors required shall be as specified (see 3.1).

3.4.5 Mounting plates. Mounting plates shall be permanently affixed to the terminal boards. Mounting plates shall be made of nonmagnetic corrosion-resistant steel in accordance with class 304 of QQ-S-763 or shall be nickel or nickel-tin plated brass in accordance with class 1, grade G of QQ-N-290. Mounting plates shall be optional until 1 January 1988. Mounting plates shall be mandatory for all terminal boards after 1 January 1988.

3.4.6 Integrally molded parts. Prior to molding, metal parts shall be thoroughly cleaned to remove metal chips and dust and studs shall be rounded. Metal parts (studs, threaded inserts, terminal plates, except feed-through type which is an assembled part, and terminal strips) shall be molded integrally with the terminal-board base. Following molding, all molding materials shall be removed from contact surfaces and threaded portions. Stud shoulders shall be spot faced to assure clean, flat contact surfaces.

3.4.7 Warpage. Warpage, measured at point of manufacture, shall not exceed 0.006 inch per inch of terminal board length. (see 4.6.1.1)

3.5 Dielectric-withstanding voltage. When terminal boards are tested as specified in 4.6.2 there shall be no evidence of damage, arcing, breakdown, or hairline cracks when inspected by 3X magnification.

3.6 Torque.

3.6.1 Screw-type terminal boards. When terminal boards are tested as specified in 4.6.3.1, there shall be no evidence of damage to the terminal screws or metal terminal plates, and no loosening of the metal terminal plates.

3.6.2 Stud-type terminal boards. When terminal boards are tested as specified in 4.6.3.2, studs shall not shear off, break, or loosen in the terminal board base, and threads shall not be damaged at the torques specified.

3.7 Current-carrying capacity. When terminal boards are tested as specified in 4.6.4, the temperature rise of the terminal board shall be not greater than 50°C above ambient temperature and there shall be no evidence of damage when inspected by 10X magnification.

3.8 Vibration. When terminal boards are tested as specified in 4.6.5, there shall be no evidence of cracking, breaking, or loosening of parts.

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3.9 Thermal shock. When terminal boards are tested as specified in 4.6.6, there shall be no evidence of cracking, crazing, chipping, stretching, shrinkage, flowing, or other distortion of the plastic material, or loosening, movement or distortion of parts.

3.10 Insulation resistance. When measured as specified in 4.6.7, the insulation resistance shall be not less than 1,000 megohms.

3.11 Moisture resistance. When terminal boards are tested as specified in 4.6.8, the insulation resistance, immediately after conclusion of the test and while the units are still in the humidity chamber, shall be not less than 100 megohms. At the end of the drying period, the insulation resistance shall be as specified in 3.10. At the conclusion of the test, there shall be no evidence of corrosion, cracking, breaking, spalling, or loosening of the terminals. Weight gain of the terminal board shall be measured after testing and shall not exceed 0.5 percent of the original weight.

3.12 High-impact shock. When terminal boards are tested as specified in 4.6.9, there shall be no evidence of cracking, breaking, or loosening of parts.

3.13 Marking. Terminal boards shall be marked in accordance with MIL-STD-1285 with the complete type designation, manufacturer's trademark or code symbol, date code, and other requirements as specified (see 3.1). This information shall be marked on the ends of the terminal boards.

3.13.1 Circuit identification for stud-type terminal boards. For stud-type terminal boards, except through-connection, the mold cavity, circuit identification number shall be molded or stamped as specified (see 3.1). Through-connection terminal boards shall have the mold cavity, circuit identification number molded or stamped as specified (3.1) into the recessed areas between each of the outer sides of the end barriers and adjacent edge of the mounting holes on both sides of the terminal board. No marking in recessed areas shall appear above the surrounding surface of the terminal board.

3.14 Workmanship. Terminal boards and accessories shall be processed in such a manner as to be uniform in quality and shall be free from pits, corrosion, cracks, rough edges, chips, and other defects that will affect life, serviceability, or appearance. Contact surfaces shall be free of molding residue. There shall be no evidence of poor molding, fabricating, damaged or improperly assembled terminal plates, studs, screws or nuts, peeling or chipping of the plating or finish, parting lines of mold which would indicate improper molding techniques, nicks and burrs on the surfaces of metal parts. Terminal boards and accessories shall comply with Requirement 9 of MIL-STD-454.

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3.15 Interchangeability. Terminal lugs, bus (jumper) connectors and marker strips shall be compatible with the terminal boards.

3.16 Dimensional stability. When terminal boards are tested as specified in 4.6.10, the average percent dimensional change shall not exceed 0.2.

3.17 Resistance to solvents (for marker strips only). When terminal board marker strips are tested as specified in 4.6.11, there shall be no evidence of mechanical damage and the marking shall remain legible.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities 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.

4.1.1 Test equipment and inspection facilities. The manufacturer shall insure that tests and inspection facilities of sufficient accuracy, quality and quantity are established and maintained to permit performance of required inspections. The manufacturer shall establish and maintain a calibration system in accordance with MIL-STD-45662.

4.1.2 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.2 Classification of inspections. The inspections specified herein are classified as follows:

- a. Materials inspection (see 4.3),
- b. Quality conformance inspection (see 4.5),
- c. Periodic inspection (see 4.5.2),
- d. Packaging inspection (see 4.7).

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4.3 Materials inspection. Materials inspection shall consist of certification supported by verifying data that the materials listed in table IV, used in fabricating the terminal boards are in accordance with the applicable referenced specifications or requirements prior to such fabrication.

TABLE IV. Materials inspection.

| Material | Requirement paragraph | Applicable specifications and requirements |
|----------------|-----------------------|---|
| Plastics ----- | 3.3.1 | MIL-M-14, MIL-P-15037, MIL-M-24519, FED-STD-595 |
| Brass ----- | 3.3.2.1 | QQ-B-626, QQ-W-321, QQ-B-613 |
| Bronze ----- | 3.3.2.2 | QQ-B-750, QQ-B-728 |
| Steel ----- | 3.3.2.3 | QQ-S-763 |
| Copper Alloy-- | 3.3.2.5 | QQ-C-585 |

4.4 Inspection conditions. Unless otherwise specified herein, all inspections shall be performed in accordance with test conditions specified in the "GENERAL REQUIREMENTS" of MIL-STD-202.

4.4.1 Torque conditions. For all tests, except the torque tests (see 4.6.3), terminal screws and nuts shall be tightened to 80 percent of the applicable value specified in 4.6.3.

4.5 Quality conformance inspection.

4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of group A inspection. Except as specified in 4.5.2.1.3, delivery of products which have passed group A inspection shall not be delayed pending the results of the group B inspection.

4.5.1.1 Inspection lot.

4.5.1.1.1 Stud-type terminal boards and bus (jumper) connectors. An inspection lot shall consist of all stud-type terminal boards or bus (jumper) connectors of the same type designation, produced under essentially the same conditions, and offered for inspection at one time.

4.5.1.1.2 For screw-type terminal boards and bus (jumper) connectors. An inspection lot shall consist of all screw-type terminal boards or bus (jumper) connectors of the same class, produced under essentially the same conditions and offered for inspection at one time.

4.5.1.2 Group A inspection. Group A inspection shall consist of the examinations and tests specified in Table V, in the order shown.

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4.5.1.2.1 Sampling plan. Statistical sampling and inspection shall be in accordance with MIL-STD-105 for general inspection level II. The acceptable quality level (AQL) shall be as specified in Table V. Major and minor defects shall be as defined in MIL-STD-105.

4.5.1.2.2 Rejected lots. If an inspection lot is rejected, the supplier may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. Resubmitted lots shall be inspected using tightened inspection. Such lots shall be separate from new lots, and shall be clearly identified as reinspected lots.

4.5.1.2.3 Disposition of sample units. Sample units which have passed all the group A inspection may be delivered on the contract or purchase order, if the lot is accepted.

TABLE V. Group A inspection

| Examination or test | Requirement Paragraph | Method Para. | AQL (percent defective) | |
|-----------------------------------|--|-----------------|----------------------------|-------|
| | | | Major | Minor |
| Visual and mechanical examination | 3.1, 3.4, 3.13, and 3.14 (as applicable) | 4.6.1 | 1.0 | 4.0 |
| Dielectric withstanding voltage | 3.5 | 4.6.2 | 1.0 | |
| Torque | 3.6 | 4.6.3 | 2.5 | |

4.5.2 Periodic inspection. Periodic inspection shall consist of group B inspection. Periodic inspection shall be performed every 36 months.

4.5.2.1 Group B inspection. Group B inspection shall consist of the examinations and tests specified in table VI, in the order shown. Group B inspection shall be made on sample units selected from inspection lots which have passed group A inspection. A copy of the periodic inspection test data shall be certified by a responsible company official of the manufacturer and forwarded to the preparing activity for this document (Army - ER) within thirty (30) days of test completion.

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TABLE VI. Group B inspection

| Examination or test | Requirement paragraph | Method paragraph |
|---------------------------------------|---------------------------------------|------------------|
| Visual and mechanical examination | 3.1,3.4,3.13 and 3.14 (as applicable) | 4.6.1 |
| Current carrying capacity | 3.7 | 4.6.4 |
| Vibration | 3.8 | 4.6.5 |
| High impact shock | 3.12 | 4.6.9 |
| Thermal shock | 3.9 | 4.6.6 |
| Insulation resistance | 3.10 | 4.6.7 |
| Moisture resistance | 3.11 | 4.6.8 |
| Dielectric withstanding voltage | 3.5 | 4.6.2 |
| Torque | 3.6 | 4.6.3 |
| Dimensional stability | 3.16 | 4.6.10 |
| Resistance to solvents(marker strips) | 3.17 | 4.6.11 |

4.5.2.1.1 Sampling plan. Sample units as shown in 4.5.2.1.1.1. or 4.5.2.1.1.2 shall be selected from the first month's production and from each 35 months' production thereafter.

4.5.2.1.1.1 Screw-type terminal boards and marker strips. For each class, two of the shortest length and two of the longest length terminal boards and marker strips that the manufacturer's molds are capable of producing shall be tested.

4.5.2.1.1.2 Stud-type terminal boards. One terminal board of the shortest length and one of the longest length and one each of two intermediate types in each class shall be tested. If there are no intermediate sizes, two each of the shortest and longest lengths in each class shall be tested. If there is only one intermediate type, two of the longest, one intermediate, and one of the shortest lengths shall be tested. If there is only one terminal board in the class, two of these shall be tested.

4.5.2.1.2 Failures. If one or more sample units fail to pass group B inspection the samples shall be considered to have failed.

4.5.2.1.3 Disposition of sample units. Sample units which have been subjected to group B inspection shall not be delivered on the contract or purchase order.

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4.5.2.1.4 Noncompliance. If a sample fails to pass group B inspection, the manufacturer shall notify the qualifying activity and the cognizant inspection activity of such failure and take corrective action on the material or processes or both, as warranted, and on all units of product which can be corrected and which are manufactured with essentially the same materials and processes, and which are considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the qualifying activity has been taken. After the corrective action has been taken, group B inspection shall be repeated on additional sample units (all tests and examinations, or the test which the original sample failed, at the option of the qualifying activity). Groups A and B inspections may be reinstituted; however, final acceptance and shipment shall be withheld until group B inspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure shall be furnished to the cognizant inspection activity and the qualifying activity.

4.5.3 Inspection of preparation for delivery. Sample packages or packs and the inspection of the preservation, packaging, packing, and marking for shipment and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

4.6 Methods of examination and test.

4.6.1 Visual and mechanical examination. Terminal boards and accessories shall be examined to verify that the design, construction, physical dimensions, warpage, marking, and workmanship are in accordance with the applicable requirements (see 3.1, 3.4, 3.13, and 3.14). For group A, mechanical examination shall consist of measuring the overall length, width, and height of the terminal boards, the diameter of the mounting holes and the distance between the mounting holes. For group B, mechanical examination shall consist of measuring all dimensions specified (see 3.1).

4.6.1.1 Warpage (see 3.4.7). Terminal boards shall be placed on a surface plate or test fixture, mounting surface down, without the use of mounting screws or clamps. Warpage shall then be measured over the entire length of the terminal board. Measurements shall be made with an instrument or device accurate to within 0.001 inch. For this test only, a sample 30 days or older shall be used.

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4.6.2 Dielectric withstanding voltage (see 3.5). Terminal boards shall be tested in accordance with method 301 of MIL-STD-202. The following details and exception shall apply:

- a. Magnitude of test voltage - As specified (see 3.1).
- b. Nature of potential - AC.
- c. Duration of application of test voltage - For group A inspection, the test voltage shall be maintained at the specified value for 5 seconds; for group B inspection, the test voltage shall be maintained at the specified value for 1 minute.
- d. Points of application of test voltage - Between all adjacent terminals. In addition, front-connection terminal boards shall be mounted on a clean metal surface and the test voltage applied between all terminals and the metal surface. (All exposed and grounded non-current carrying metal parts shall be electrically connected to the metal surface.)
- e. Examinations during and after dielectric-withstanding voltage test - Terminal boards shall be examined for evidence of damage, arcing, and breakdown.

4.6.3 Torque.

4.6.3.1 Screw-type terminal boards (see 3.6.1). Terminal board screws shall be subjected to the applicable torque specified in table VII. Torque shall be applied to each terminal screw with a calibrated torque measuring device and maintained for a period of not less than 5 seconds. For group A inspection, two screws per board shall be tested. For group B inspection, one screw per terminal pair or a maximum of 10 screws per board shall be tested.

TABLE VII Torque for screw-type terminal boards

| Screw size | Torque (pound inches) |
|----------------|-----------------------|
| .0860-56(2-56) | 2.0 |
| .1250-40(5-40) | 6.0 |
| .1380-32(6-32) | 12.0 |
| .1640-32(8-32) | 20.0 |

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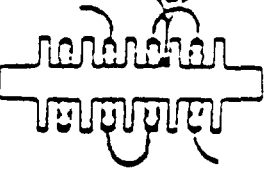


4.6.3.2 Stud-type terminal boards (see 3.6.2). The terminal board stud and nut assemblies shall be subjected to the applicable torque specified in table VIII by means of a calibrated torque measuring device. Studs of through-connection terminal boards shall be torqued on one end only. Stud connectors shall be removed from linked, front-connection terminal boards. For group A inspection, two stud and nut assemblies of each test specimen shall be subjected to the applicable torque. The torque shall be applied for a period of not less than 5 seconds. For group B inspection, all stud and nut assemblies, to a maximum of ten per board, shall be torqued to destruction. The torque range of specified torque to breaking torque shall be traversed in increments of one pound-inch and each increment shall be maintained for a period of not less than 5 seconds. The breaking torques shall be recorded.

TABLE VIII. Torque for stud-type terminal boards.

| Stud size | Torque (pound-inches) |
|----------------|--------------------------|
| .1120-40(4-40) | 5.0 |
| .1250-40(5-40) | 7.5 |
| .1380-32(6-32) | 15.0 |
| .1640-32(8-32) | 25.0 |

4.6.4 Current-carrying capacity (see 3.7). Terminal boards shall be connected as specified in figure 1. For terminal boards having only two terminals, both terminals shall be energized and temperature measurements taken at either terminal. Wire size and wire lug shall be as specified in table IX; wire lengths shall be 18 inches plus or minus one inch. The terminals shall be energized with the applicable test current specified in table IX at any convenient voltage. While test current is being applied, temperature measurements shall be made by means of a thermocouple of small gauge wire (28-32 AWG) placed between the metal terminal plate or terminal stud shoulder and the wire lug. Measurements shall be made at 15-minute intervals until three consecutive readings establish a temperature stabilized to within $\pm 2^{\circ}\text{C}$. Terminal boards shall be visually examined for evidence of damage.

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- A  Single row - front connection
3TB, 9TB, 18TB, 25TB, 44TB
- B  Double row - front connection
4TB, 6TB, 10TB, 13TB, 15TB, 16TB
- C  Single row-through connection
5TB, 7TB, 11TB, 27TB
- D  Double row-front connection
(linked) 8TB, 17TB, 26TB, 37TB,
38TB, 39TB, 43TB
- E  Single row-front connection
Feed through bus (jumper)
connector 40TB, 41TB, 42TB

* Thermocouple

Figure 1. Wiring connections for current-carrying capacity test.

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TABLE IX.

Rated and test currents, wire sizes, and recommended wire lugs

| Terminal board type designation | Rated current (amperes) | Test current (amperes) | AWG wire size | Test wiring diagram symbol <u>1</u> / | Dash number for terminal lugs per MS17143 |
|------------------------------------|-------------------------------|------------------------------|---------------------|--|--|
| 3TB | 45 | 45 | 10 | A | -3 |
| 4TB | 40 | 40 | 12 | B | -3 |
| 5TB | 50 | 50 | 10 | C | -3 |
| 6TB | 30 | 30 | 14 | B | -5 |
| 7TB | 40 | 40 | 12 | C | -6 |
| 8TB | 30 | 30 | 14 | D | -11 |
| 9TB | 35 | 35 | 12 | A | -6 |
| 10TB | 30 | 30 | 14 | B | -14 |
| 11TB | 40 | 40 | 12 | C | -15 |
| 13TB | 15 | 15 | 16 | B | -1 |
| 15TB | 30 | 30 | 14 | B | -8 |
| 16TB | 40 | 40 | 12 | B | -3 |
| 17TB | 40 | 40 | 12 | D | -3 |
| 18TB | 45 | 45 | 10 | A | -3 |
| 25TB | 25 | 25 | 14 | A | -17 |
| 26TB | 20 | 20 | 16 | D | -20 |
| 27TB | 30 | 30 | 14 | C | -17 |
| 37TB | 15 | 22 | 16 | D | -11 |
| 38TB | 20 | 30 | 14 | D | -14 |
| 39TB | 30 | 45 | 10 | D | -9 |
| 40TB | 7.5 | 15 | 18 | E | -10 |
| 41TB | 10 | 20 | 16 | E | -14 |
| 42TB | 15 | 30 | 14 | E | -8 |
| 43TB | 5 | 7.5 | 22 | D | --- |
| 44TB | 5 | 7.5 | 22 | A | --- |

1/ See figure 1.

4.6.5 Vibration (see 3.8). Terminal boards shall be tested in accordance with method 204 of MIL-STD-202. The following details and exception shall apply:

- a. Mounting of specimens - Terminal boards shall be rigidly mounted by their normal mounting means on the vibration platform. Applicable wires and lugs as specified in table IX shall be connected to each terminal. The wires shall be tied down to the vibration plate between 8 to 12 inches from the terminal board. Any slack shall be removed.

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- b. Test-condition letter - A.
- c. Examination after test - Terminal boards shall be visually examined for evidence of cracking, breaking, and loosening of parts.

4.6.6 Thermal shock (see 3.9). Terminal boards shall be tested in accordance with method 107 of MIL-STD-202. The terminal boards shall be mounted by normal mounting means to a steel plate (ground). The following detail and exception shall apply.

- a. Test condition letter - B; except the high temperature for the cycles shall be as follows:

| Terminal Board Class | High Test Temperature (°C) |
|-------------------------|-------------------------------|
| B | 130 |
| F | 155 |
| H | 220 |

- b. Examinations after cycling - Terminal boards shall be visually examined for evidence of cracking, crazing, chipping, stretching, shrinkage, flowing, and other distortion of the plastic material, and loosening, movement, and distortion of parts. Terminal boards shall then be examined for warpage as specified in 4.6.1.1.

4.6.7 Insulation resistance (see 3.10). Terminal boards, with accessories mounted, shall be tested in accordance with method 302 of MIL-STD-202. The following details shall apply:

- a. Operating condition - Applicable wires and lugs as specified in table IX shall be connected to each terminal and the loose ends shall be bundled and clamped to the mounting plate.
- b. Points of measurement - Measurements shall be made between all adjacent terminals and each terminal and ground.

4.6.8 Moisture resistance (see 3.11). Terminal boards shall be tested in accordance with method 106 of MIL-STD-202. The following details and exceptions shall apply:

- a. Initial measurements - Not applicable.

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- b. Mounting - Terminal boards shall be mounted by normal mounting means to a stainless steel plate which shall be positioned in the chamber in such a manner that any condensate will drain from the board. A stainless steel drip shield may be used to shelter the boards from the drip from the top of the chamber.
- c. Steps 7A and 7b - Not applicable.
- d. Loading voltage - Not applicable.
- e. Final measurements - Immediately after conclusion of the test and while the terminal boards are still in the humidity chamber, insulation resistance shall be measured as specified in 4.6.7. At the end of the drying period, insulation resistance shall again be measured as specified in 4.6.7.
- f. Examination after test - Terminal boards shall be examined for evidence of corrosion, breaking, cracking, spalling, and loosening of terminals.

4.6.9 High-impact shock (see 3.12). Terminal boards shall be tested in accordance with method 207 of MIL-STD-202. The following details and exceptions shall apply:

- a. Mounting fixtures - Figures 207-4A or 207-5, except items 4 and 5 shall be omitted.
- b. Operating condition - Applicable wires and lugs as specified in table IX shall be connected to each terminal and the loose ends shall be bundled and clamped to the mounting plate.
- c. Examination after test - Terminal boards including terminal nuts and screws shall be visually examined for evidence of cracking, breaking, and loosening of parts.

4.6.10 Dimensional stability (see 3.16). The terminal boards shall be subjected to the following condition: Humidity condition, 96 hours at $23 \pm 2^{\circ}\text{C}$ and 50 ± 2 percent relative humidity. The initial length of the specimens shall then be measured to the nearest 0.001 inch. The specimens shall then be subjected to 10 cycles, each cycle as follows: 48 hours in a circulating air oven at the temperature specified in Table X plus 24 hours at $23 \pm 2^{\circ}\text{C}$ and 50 ± 2 percent relative humidity. At the

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completion of 10 cycles the final length of the specimens shall be measured to the nearest 0.001 inch. The percentage dimensional change is calculated to the nearest 0.1 percent as follows:

$$\text{Dimensional change (percent)} = \frac{(\text{initial length} - \text{final length})}{\text{initial length}} \times 100$$

The average percent dimensional change of the five specimens shall be recorded.

TABLE X. Dimensional stability test temperatures

| <u>Temperature Classification</u> | <u>Test Temperature (+3°C, -0°C)</u> |
|-----------------------------------|--------------------------------------|
| B | 130°C |
| F | 155°C |
| H | 220°C |

4.6.11 Resistance to solvents (marker strips only) (see 3.17). Marker strips shall be tested in accordance with method 215 of MIL-STD-202. The following details shall apply:

- a. The marked portions on all edges of the marker strips shall be brushed.
- b. Examination - specimens shall be examined for legibility of markings after the completion of the above testing.

4.7 Packaging inspection. Packaging inspection requirements specified herein are classified as follows:

- a. First Article Inspection of Packaging
- b. Quality Conformance Inspection of Packaging

4.7.1 First article inspection of packaging. Unless otherwise specified in the contract, First Article Inspection of Packaging shall be in accordance with the Unit Pack Design Validation Requirements of MIL-P-116.

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4.7.2 Quality conformance inspection of packaging.

4.7.2.1 Materials inspection. All materials to be used in packaging shall be inspected in accordance with the applicable material specification.

4.7.2.2 Preservation inspection. Inspection of preservation and interior markings shall be in accordance with group A and B Quality Conformance Inspection Requirements of MIL-P-116. Lot formation and sampling procedures shall be as specified therein.

4.7.2.3 Packaging inspection. Inspection of packing and the marking for shipment and storage shall consist of the examinations specified in table XI "PACKING INSPECTION PROVISIONS". Lot formation shall consist of all packs made of the same materials during an identifiable period and submitted at one time for acceptance. Sampling procedures shall be in accordance with MIL-STD-105, using a single sampling plan and Acceptable Quality Level of 4.0 percent defective.

TABLE XI. Packing Inspection Provisions

| NO. | CHARACTERISTIC | METHOD OF INSPECTION |
|-----|--|----------------------|
| 101 | Intermediate container not as specified | Visual |
| 102 | Improper closure of intermediate container | Visual |
| 103 | Shipping containers not in accordance with specification | Visual |
| 104 | Excessive cube | Visual |
| 105 | Improper blocking and bracing | Visual |
| 106 | Closure not in accordance with specification | Visual |
| 107 | Weight and size exceed container limitations | Weight & Measure |
| 108 | Strapping not in accordance with specification, incorrectly applied, omitted | Visual |
| 109 | Marking omitted, incorrect, or illegible | Visual |

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5. PACKAGING

5.1 Preservation. Preservation shall be level A or level B, as specified (see 6.1).

5.1.1 Level A.

5.1.1.1 Cleaning. Each terminal board shall be cleaned in accordance with process C-1 of MIL-P-116.

5.1.1.2 Drying. Each terminal board shall be dried in accordance with the applicable procedures of MIL-P-116.

5.1.1.3 Preservation application. No preservation required.

5.1.1.4 Unit packs. Each terminal board shall be unit packed in accordance with submethod IC-1 of MIL-P-116, insuring compliance with the applicable requirements of that specification.

5.1.1.5 Intermediate packs. A multiple quantity of terminal boards (multiples of five and not to exceed 100), unit packed as specified in 5.1.1.4, shall be placed within a close-fitting box conforming to PPP-B-636, class weather-resistant. Containers shall not exceed 1.5 cubic feet with at least two dimensions not exceeding 16 inches; nor exceed a net load of 40 pounds.

5.1.2 Level B. Terminal boards shall be preserved as specified in 5.1.1.

5.2 Packing. Shipping containers for all levels shall be capable of stacking and supporting superimposed loads during shipment and storage without damaging the container(s) or its contents when tested in accordance with Methods 5016 and 5017 of FED-STD-101.

5.2.1 Level A. A multiple quantity of items, intermediate packed as specified and bearing the same stock number, shall be packed within a close-fitting box conforming to PPP-B-601, overseas type; PPP-B-621, class 2, style 4. When the gross weight exceeds 200 pounds, or the container length and width is 48 x 24 inches or more and the weight exceeds 100 pounds, 3 x 4 inch skids, laid flat, shall be applied in accordance with the requirements of the container specification. Closure and strapping shall be in accordance with the applicable container specification or appendix thereto except that metal strapping shall conform to QQ-S-781, type I, finish A. When the quantity of stock numbered item being shipped to a single destination comprises a shipping container volume of less than one cubic foot, packing shall be as specified for level B.

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5.2.1.1 Unitization. Palletization shall be required when: containers specified in 5.2.1 do not require skids; quantities per destination exceed either a total of 250 pounds (excluding the pallet) or a volume of 20 cubic feet; and the container size permits use of one of the pallet patterns of MIL-STD-147. A quantity of containers, packed as specified in 5.2.1 except that load type I conforming to MIL-STD-147. The pallet shall conform to NN-P-71, type IV, group I or II woods. The load shall be "bonded" to the pallet by strapping conforming to QQ-S-781, type I, finish A, or shrink film conforming to L-P-378, type IV. Stretch wrap in accordance with MIL-STD-147 is authorized for shipments within the Continental United States for containerized shipments.

5.2.2 Level B. A multiple quantity of items, intermediate packed as specified and bearing the same stock number, shall be packed within a close-fitting box conforming to PPP-B-640, class 2, style E or PPP-B-636, type CF, class weather-resistant. The gross weight of boxes conforming to PPP-B-640 shall not exceed 250 pounds. Closure shall be in accordance with the appendix of the applicable box specification. Reinforcing shall be by pressure-sensitive filament tape banding or nonmetallic strapping conforming to PPP-T-97 and PPP-S-760, respectively; selection of the material and application shall be in accordance with the appendix of the applicable box specification. When the gross weight exceeds 200 pounds, or the container length and width is 48 x 24 inches or more and the weight exceeds 100 pounds, containers will be pallet-mounted on pallets conforming to NN-P-71, group I or II woods. The load shall be "bonded" to the pallet by strapping conforming to QQ-S-781, type I, finish A or shrink film conforming to L-P-378, type IV. When a single intermediate container is shipped to a single destination, no packing is required; the intermediate container shall serve as the shipping container. Reinforcing shall be as specified above.

5.2.2.1 Unitization. When the palletization requirements specified in 5.2.1.1 are met, a quantity of items, intermediate packed as specified and bearing the same stock number, shall be palletized as specified in 5.2.1.1.

5.3 Marking. In addition to any special marking required by the contract or order, each unit, intermediate and exterior container shall be marked in accordance with MIL-STD-129.

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6. NOTES

6.1 Intended use. This specification is intended for use when one-piece molded, barrier, front-end through-connection, screw and stud-type terminal boards for the connection of electrical and electronic circuits are required. This specification also covers the general requirements for bus connectors for use with both types of boards and marker strips for use with the screw-type and stud-type boards.

6.2 Ordering data. Procurement 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 type designation (see 1.2 and 3.1).
- c. Level A or B preservation and packing (see section 5).
- d. When periodic inspection rough handling tests are not required.
- e. When first article packaging inspection reports require Acquisition Activity approval prior to product unit packing.

6.2.1 Direct government procurement. For direct government procurement, terminal screws, nuts, stud connectors, designation plates and feed-through terminal board bus (jumper) connectors (internal) (see 3.1) shall be assembled on the terminal board.

6.2.2 Indirect shipments. The preservation, packaging, packing and marking requirements specified in section 5 apply only to direct purchases by, or direct shipment to, the Government and are not intended to apply to contracts or orders between the supplier and prime contractor.

6.3 Terminal nut and screw torques. Terminal nut and screw torques indicated in 4.4.1 have been found adequate for installation torques.

6.4 Level B preservation. When level B preservation is specified, this level of protection will only be used under known favorable conditions during transportation, storage and handling.

6.5 Environmental. Environmental pollution prevention measures are contained in the packaging material specifications referenced herein. Refer to material specifications referenced herein. Refer to material specifications or preparing activity for recommended disposability methods.

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6.6 Marking (stud type only). Marking previously required by Bureau of Ships drawing 9000-S6506-73214 for stud type boards may be retained.

6.7 Subject term (key word) listing.

Bus (jumper) connectors
 Marker strips
 Screw type
 Stud type
 Terminal board
 Terminal lugs
 Thermoplastic
 Thermoset

6.8 Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodians:

Army - ER
 Navy - SH
 Air Force - 85

Preparing activity:

Army - ER

Review activities:

Army - MI
 Navy - SH, EC, OS
 Air Force - 17, 99

(Project 5940-0993)

User activities:

Army - AV, AT
 Navy - MC, AS
 Air Force -

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