

| REVISIONS | | | |
|-----------|---------------------|--------|--------------------|
| SYMBOL | DESCRIPTION | DATE | APPROVAL |
| D | Revised and redrawn | 9/5/91 | <i>[Signature]</i> |

| SHEET REVISION STATUS | | | | | | | | | | | | | | | | | | | | |
|-----------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| SH | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| REV | D | D | D | D | D | D | D | D | D | D | D | | | | | | | | | |
| SH | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
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| ORIGINATOR <i>[Signature]</i> / GSFC | DATE 8/30/91 | FSC: 5935 |
| APPROVED <i>[Signature]</i> | 9-4-91 | CONNECTORS, ELECTRICAL, SUBMINIATURE, RACK AND PANEL, GENERAL SPECIFICATION FOR |
| CODE 311 APPROVAL <i>[Signature]</i> / GSFC | 8/30/91 | |
| CODE 311 SUPERVISORY APVL <i>[Signature]</i> | 9/4/91 | |
| ADDITIONAL APPROVAL | | S-311-P-4 |

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
 GODDARD SPACE FLIGHT CENTER
 GREENBELT, MARYLAND 20771

CAGE CODE: 25306 PAGE 1 OF 11

1. SCOPE.

- 1.1 Purpose. This specification delineates the general provisions for multi-contact electrical connectors utilizing crimp-type removable contacts intended for space flight use at Goddard Space Flight Center (GSFC).

2. APPLICABLE DOCUMENTS.

- 2.1 Documents. The following documents, of the issue in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein. A later revision of a specification may be used as long as the later revision does not degrade the specification requirements.

Specifications

| | |
|-------------|--|
| MIL-M-14 | Molding Compounds, Thermosetting |
| MIL-C-14550 | Copper Plating (Electrodeposited) |
| MIL-W-16878 | Wire, Electrical, Insulated, General Specification for |
| MIL-M-24519 | Molding Compounds, Thermoplastic |
| MIL-C-24308 | Connectors, Electrical, Rectangular, Miniature, Polarized Shell, Rack and Panel, General Specification for |
| MIL-C-39029 | Contacts, Electrical Connector, General Specification for |
| MIL-G-45205 | Gold Plating, Electrodeposited |
| MIL-I-45208 | Inspection System Requirements |
| MIL-C-55330 | Connectors, Electrical and Fiber Optics, Packaging of |
| MIL-I-81969 | Installing and Removal Tools, Connectors Electrical Contact General Specification for |
| SD-6 | Provisions Governing Qualifications |

Standards

| | |
|-------------|--|
| MIL-STD-105 | Sampling Procedure and Tables for Inspection by Attributes |
|-------------|--|

| | |
|--------------|---|
| MIL-STD-1344 | Test Methods for Electrical Connectors |
| MIL-STD-1353 | Connectors, Electrical, Selection and Use of |
| MS14004 | Insert Arrangement, Electrical Connector, Shell Size 6 |
| MS18270 | Connectors, Electrical, Rectangular, Miniature, Polarized Shell, Rack and Panel, Shell, Receptacle Socket Contacts, Crimp Style |
| MS18271 | Connectors, Electrical, Rectangular, Miniature, Polarized Shell, Rack and Panel, Shell, Receptacle Socket Contacts, Crimp Style |
| MS18273 | Insert Arrangement, Electrical Connector, Shell Size 1 |
| MS18274 | Insert Arrangement, Electrical Connector, Shell Size 2 |
| MS18275 | Insert Arrangement, Electrical Connector, Shell Size 3 |
| MS18276 | Insert Arrangement, Electrical Connector, Shell Size 4 |
| MS18277 | Insert Arrangement, Electrical Connector, Shell Size 5 |

Other Publications

| | |
|-----------|--|
| ASTM E595 | Material from Outgassing in a Vacuum Environment, Standard Test Method for |
| ASTM B-19 | Brass Sheet, Strip, Plate and Disk |
| ASTM B-36 | Brass Plate, Sheet, Strip and Rolled Bar |

2.2 Order of precedence. In the event of conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specified exemption has been granted.

2.3 Copies of documents. Copies of federal and military documents may be obtained from the Standardization Document Order Desk, 700 Robbins Avenue, Building #4-Section D, Philadelphia, PA 19111-5094. Copies of ASTM publications are available from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

3. REQUIREMENTS

3.1 General. The general requirements of MIL-C-24308 shall be met. In addition, individual connector and contact requirements shall meet the requirements of this specification and the applicable detailed specification sheet.

3.2 Qualification. The individual connectors and contacts furnished under this specification shall be product which have been granted qualification approval by NASA/GSFC. Qualification approval shall be based on the following.

3.2.1 Application for qualification. Each application shall be made in accordance with SD-6, Provisions Governing Qualifications. All applications shall be submitted to the activity listed below:

NASA/GSFC
Greenbelt, MD 20771

Attn: QPLD Administrator
Code 311.2

3.2.2 Design and source approval. Prior to qualification, the manufacturer's facilities shall be subjected to survey (at the option of GSFC) by the Office of Flight Assurance, GSFC. Compliance with MIL-I-45208 is required. In addition the history and detailed engineering of the specific connector design will be reviewed, as will the documented manufacturing and quality control procedures. Only those sources approved in the design and source approval phase shall be eligible for qualification or award of contract under this specification. Source approval and design approval do not constitute part qualification or an equivalent thereof.

- 3.2.3 Part qualification. The individual connectors and contacts shall be product which have passed the qualification inspection requirements of MIL-C-24308. Additionally, the connectors and contacts shall have passed the requirements cited herein.
- 3.3 Materials. Materials shall be in accordance with MIL-C-24308, except as specified herein.
- 3.3.1 Nonmagnetic material. All parts used in the connectors and contacts shall be made from materials which are classed as nonmagnetic (see 3.4).
- 3.3.2 Sublimate materials. Cadmium and other materials that sublimate in a hard vacuum shall not be used.
- 3.3.3 Shell material and finish. The shell shall be made of brass in accordance with ASTM B-19 or ASTM B-36. They shall be gold plated in accordance with MIL-G-45204, Type II, Grade C, Class 1 over copper flash in accordance with MIL-C-14550.
- 3.3.4 Insert. The insert shall be made of diallyl phthalate in accordance with MIL-M-14, Type SDG-F or polyester in accordance with MIL-M-24519, Type GPT-30F or GET-30F.
- 3.3.5 Contacts. The contacts shall be made of Copper Alloy. The contacts shall be gold plated in accordance with MIL-G-45204, Type II, Grade C, with a thickness of .000050 to .000100 inches over copper in accordance with MIL-C-14550, .000100 to .000150 inch thick.
- 3.3.6 Retention clip. The retention clip shall be made of Beryllium Copper.
- 3.4 Residual magnetism. When tested in accordance with 4.5.1, the residual magnetism of fully assembled connectors shall not exceed the limits for residual magnetism as specified below:.

| <u>Level</u> | <u>Residual Magnetism (gamma)</u> |
|--------------|-----------------------------------|
| A | 2000 |
| B | 200 |

- 3.5 Outgassing. When tested in accordance with 4.5.2 the material shall meet the requirements of MIL-C-24308.
- 3.6 Contact engagement and separation forces. When tested in accordance with 4.5.3, the contact engagement and separation forces shall meet the requirements of MIL-C-39029.

3.7 Part marking. Connectors shall be marked in accordance with MIL-C-24308 except the GSFC type designation as identified on the detailed specification sheet shall replace the Military Part Number.

4. QUALITY ASSURANCE PROVISIONS

4.1 General. The Quality Assurance Provision of MIL-C-24308 shall be met, except where modified herein. NASA/GSFC 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 the prescribed requirements.

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

- a. Materials inspection per MIL-C-24308.
- b. Qualification inspection (see 4.3).
- c. Quality Conformance inspection (see 4.4).

4.3 Qualification inspection. Qualification inspection shall be performed in accordance with MIL-C-24308, except as modified herein.

4.3.1 Residual magnetism. Residual magnetism (see 3.4) shall replace the Magnetic permeability test in Group I of the qualification inspection table of MIL-C-24308. The residual magnetism test shall be performed during periodic testing.

4.3.2 Outgassing. The thermal vacuum outgassing (see 3.5) shall be performed per 4.5.2.

4.3.3 Contact engagement and separation forces. The contact engagement and separation force (see 3.6) tests shall be conducted for all connectors procured to this specification.

4.3.4 Failure analysis. A failure analysis shall be performed on each connector having failed during qualification inspection. The failure analysis shall be designated to isolate the cause(s) of failure and yield adequate conclusions to initiate a corrective action plan to eliminate the cause(s) to prevent recurrence of the type of failure mode reported (see 4.3.5).

- 4.3.5 Failure analysis. Two copies of the failure analysis report (see 4.3.4) shall be submitted to GSFC, one copy to the address listed in 6.5 and one copy to the procuring activity. The report shall include, as a minimum, the following information:
- a. Date defect occurred.
 - b. Lot number, lot size, and serial numbers (where applicable).
 - c. Connector type designation.
 - d. Test and/or examination at which defect was first noted.
 - e. Failure mode.
 - f. Cause of failure.
 - g. Corrective action taken or to be taken.
 - h. Effect of failure on other connectors in the inspection lot.
 - i. Purchase orders or contracts affected.
- 4.3.6 Retention of qualification. To retain qualification, the retention of qualification requirements in accordance with MIL-C-24308 shall be met.
- 4.4 Quality conformance inspection. The QCI requirements of MIL-C-24308 shall be met, except as modified herein.
- 4.4.1 Group A. The Group A inspection shall be performed in accordance with MIL-C-24308. In addition, each connector shall be subjected to the tests in Table I.
- 4.4.1.1 Sampling plan. Statistical sampling and inspection shall be in accordance with MIL-STD-105 for general inspection level II. Major and minor defects shall be defined in MIL-STD-105. The AQL shall be 1.0 percent for major defects and 4.0 percent for minor defects.

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

Table I - Acceptance Testing

| Test or Examination | Requirement | Test Method | Quantity |
|--|-------------|-------------|----------|
| Residual Magnetism | 3.4 | 4.5.1 | AQL 1.0% |
| Contact engagement and separation forces | 3.6 | 4.5.3 | AQL 1.0% |

- 4.4.2 Group B - Periodic Inspection. The periodic inspection shall be performed in accordance with MIL-C-24308 except as modified herein.
- 4.4.2.1 Residual magnetism. Residual magnetism (see 3.4) shall replace the Magnetic Permeability test in Group I of the qualification inspection table of MIL-C-24308. The residual magnetism test shall be performed during periodic testing.
- 4.4.2.2 Outgassing. The thermal vacuum outgassing (see 3.5) shall be performed in accordance with 4.5.2.
- 4.5 Test methods
- 4.5.1 Residual magnetism.
- 4.5.1.1 Acceptable test method. Connector shall be fully assembled before testing. The residual magnetism test shall be performed in a magnetically quiet area, i.e., where machines, electronic equipment, vehicles, and personnel traffic are restricted. Refer to the test arrangement of Figure 1 and proceed as follows:
- a. Warm up the milliammeter for a minimum of fifteen minutes.
 - b. Mount the magnetometer probe in a nonmagnetic stand in a horizontal position at full cable length from the milliammeter.

- c. With the meter preset to the appropriate scale, align the probe in a magnetic E-W direction or orient to obtain a zero reading on the meter.
 - d. Pass the connector specimen three times between the poles of a magnet with a field strength of approximately 5000 gauss. The connector shall not contact the pole pieces.
 - e. Immediately, place the connector to within one-eighth (1/8) inch of the probe tip and orient the specimen for a maximum magnetism reading. The measurement unit shall be in gamma, where one gamma is equivalent to 1×10^{-5} gauss.
- 4.5.1.2 Alternative test method. An alternative residual magnetism test method may be used with approval from GSFC.
- 4.5.2 Outgassing. The outgassing test shall be conducted in accordance with ASTM E595.
- 4.5.3 Contact engagement and separation forces. The contact engagement and separation forces tests shall be conducted in accordance with Method 2014 of MIL-STD-1344.

5. PREPARATION FOR DELIVERY

- 5.1 Preservation and packaging. Preservation and packaging shall be in accordance with MIL-C-55330. The manufacturer shall be responsible for any damage to or deterioration of connectors and contacts resulting from faulty or improper packing, preservation, or packaging, and shall replace connectors and/or contacts without cost to GSFC or to the procuring activity.

6. NOTES

6.1 Application guidance.

- 6.1.1 MIL-C-24308 covers the use of contact sizes 20 or 22D only. For connectors using multiple sized contacts in a single arrangement, consult NASA/GSFC Parts Branch.
- 6.1.2 Application restrictions concerning the use of these connectors are those specified in MIL-STD-1353.
- 6.1.3 Demagnetization. All connectors shall be demagnetized in a field strength of 1500 gauss (minimum) for a period not less than 2 seconds at peak level of demagnetization prior to installation.

- 6.2 Ordering data. Procurement documents should specify the following:
- a. Title, number and date of this specification.
 - b. Nomenclature by class, type, finish, style, size and part number.
- 6.3 Definitions. Definitions shall be those listed in MIL-STD-1353.
- 6.4 Qualification provisions. With respect to product requiring qualification, awards will be made only for product which have been tested and approved by GSFC before the time for opening of bids. The attention of the suppliers is called to this requirement: manufacturers should arrange to have qualification tests made on product which they purpose to offer to GSFC to become eligible for awards of contracts or orders for product covered by this specification. The manufacturer shall bear the cost of qualification inspection to this specification. Information pertaining to qualification of product may be obtained from the activity whose address is listed in 6.5.
- 6.5 NOTICE. When GSFC drawings, specifications, or other data are sent for any purpose other than in connection with a definitely related GSFC procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever: the fact that GSFC might 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 person or corporations, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Custodian:
Code 311
Goddard Space Flight Center
Greenbelt, Maryland 20771.

EQUIPMENT

- 1 -- Hewlett-Packard model 428B milliammeter
- 1 -- Hewlett-Packard model 3529A magnetometer probe
- 1 -- Nonmagnetic stand and probe holder

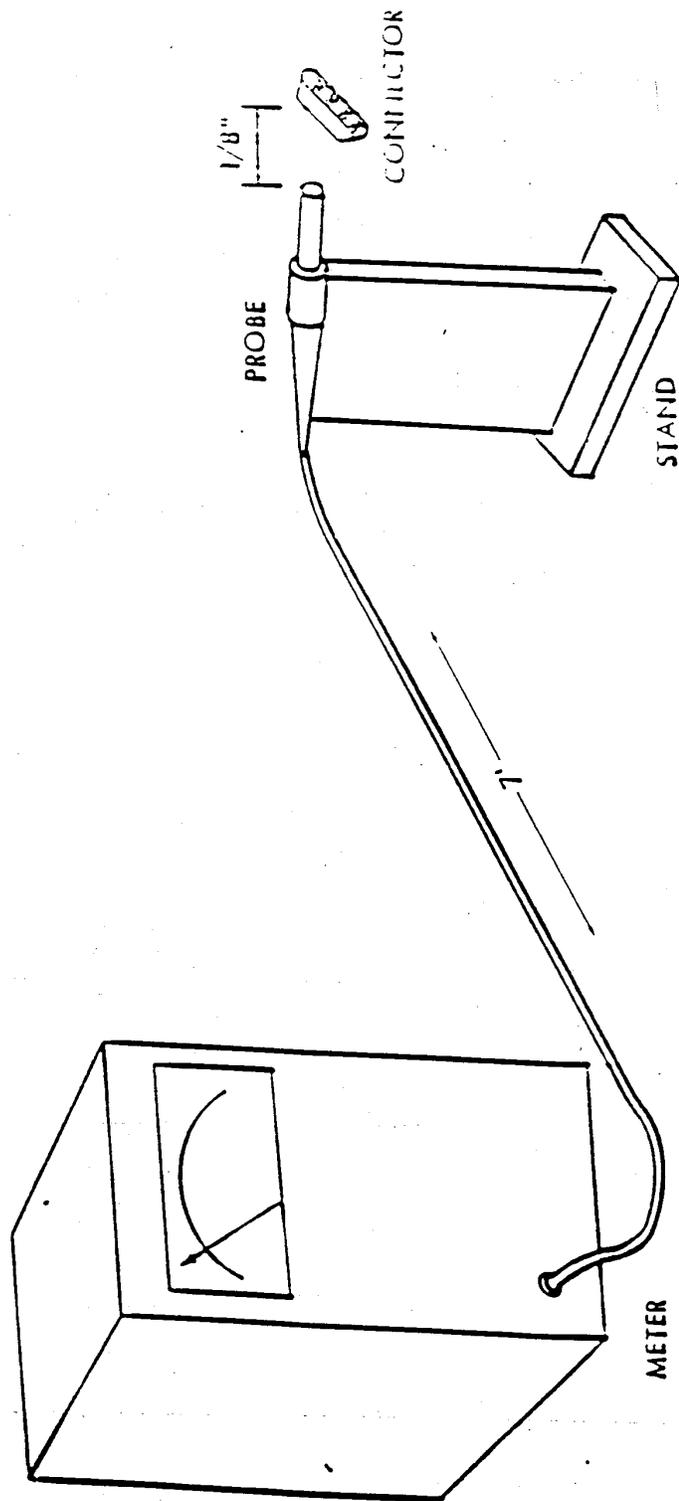


Figure 1 - Residual-Magnetism Test Arrangement

