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**Modular Plugs, Thru-Hole and Surface Mount Jacks, Data and Telephone, PCB Mounted**

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**1. SCOPE****1.1. Content**

This specification covers the performance, tests and quality requirements for the TE Connectivity (TE) Modular Telephone Plugs and Jacks designed for Printed Circuit Board (PCB) mounting.

**1.2. Qualification**

When tests are performed on the subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

**1.3. Qualification Test Results**

Successful qualification testing on the subject product line was completed on 19May89. The Qualification Test Report number for this testing is 501-91. This documentation is on file at and available from Engineering Practices and Standards (EPS).

**2. APPLICABLE DOCUMENTS**

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

**2.1. TE Specifications**

- 109 Series: Test Specifications as indicated in Figure 1
- 114-2048: Application Specification (Modular Jacks)
- 114-6016: Application Specification (Modular Plug Connectors (Standard and Small Conductor))
- 114-6040: Application Specification (Modular Jack Surface Mount Printed Circuit (PC) Board Assemblies)
- 114-6053: Application Specification (High Performance Modular Plug Connectors)
- 501-91: Qualification Test Report (Modular Plugs, Thru-Hole and Surface Mount Jacks, Data and Telephone, PCB Mounted)

**2.2. Industry Document**

EIA-364: Electrical Connector/Socket Test Procedures Including Environmental Classifications

**2.3. Reference Documents**

- 108-1163-2 Product Specification (High Performance Modular Plugs & Jacks, PCB Mounted)
- 109-197 Test Specification (AMP Test Specifications vs EIA and IEC Test Methods)
- EIA/TIA 568-A Commercial Building Telecommunications Cabling Standard
- FCC Rules for Registration of Telephone Equipment Part 68, Subpart F, Connectors
- REA Bulletin 345-81, PE-76: Specification for Modular Telephone Set Hardware
- TIA-1096-A Connector Requirements for Connection of Terminal Equipment to the Telephone Network

### 3. REQUIREMENTS

#### 3.1. Design and Construction

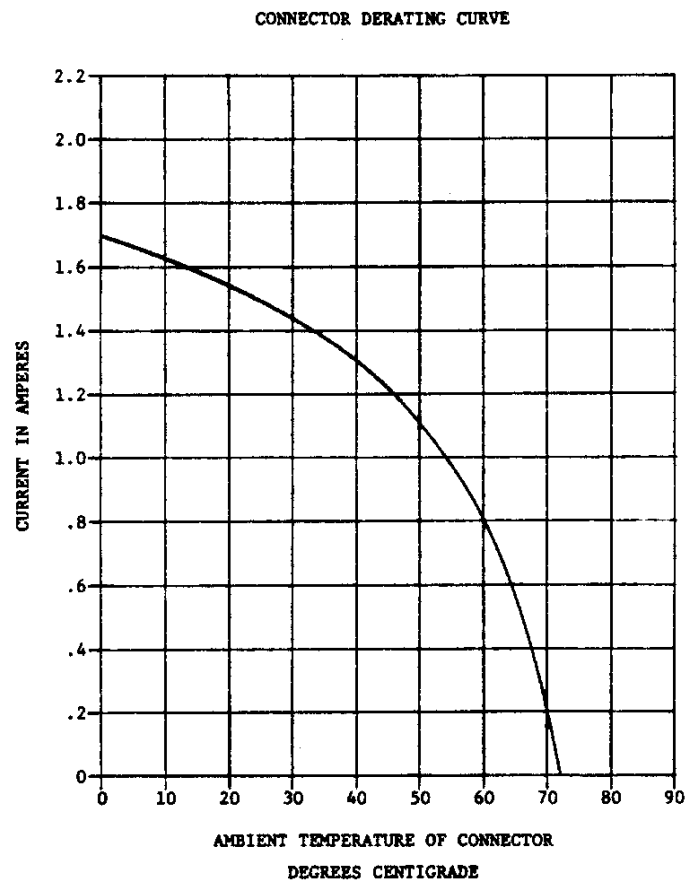
Product shall be of the design, construction and physical dimensions specified on the applicable Product Drawing.

#### 3.2. Materials

Materials used in the construction of this product shall be as specified on the applicable product drawing.

#### 3.3. Ratings

- Current, per pin: 1.5 amperes alternating current maximum at 25°C derated to 0.2 amperes maximum at 70°C ambient
- Derating Curve:



- Voltage: 150 volts AC maximum
- Temperature: -40° to 85°C
- Shielding Effectiveness: 20 dB minimum reduction from 30 to 400 MHz

### 3.4. Performance and Test Description

Product shall be designed to meet the electrical, mechanical and environmental performance requirements specified in Figure 1.

### 3.5. Test Requirements and Procedures Summary

| Test Description                               | Requirement                                                                                                     | Procedure                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Examination of product.                        | Meets requirements of product drawing and Application Specifications 114-2048, 114-6016, 114-6040 and 114-6053. | EIA-364-18.<br>Visual, dimensional and functional per applicable inspection plan.                                                                                                                                                                                                                                                                |
| ELECTRICAL                                     |                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                  |
| Termination resistance, dry circuit.           | $\Delta R$ of 30 milliohms.                                                                                     | EIA-364-23.<br>Subject mated plug and jack to 50 millivolts open circuit at 100 milliamperes maximum.<br>See Figure 3.                                                                                                                                                                                                                           |
| Termination resistance, rated current.         | $\Delta R$ of 30 milliohms.                                                                                     | EIA-364-6.<br>Measure potential drop of mated plug and jack while carrying 1.5 amperes current.<br>See Figure 3.                                                                                                                                                                                                                                 |
| Insulation resistance.                         | 500 megohms minimum.                                                                                            | EIA-364-21.<br>Test between adjacent contacts of mated plug and jack.                                                                                                                                                                                                                                                                            |
| Dielectric withstanding voltage.               | One minute hold.                                                                                                | EIA-364-20, Condition I.<br>1000 volts AC (rms) 60 Hz.<br>Test between adjacent contacts of mated plug and jack.                                                                                                                                                                                                                                 |
| Temperature rise vs current.                   | 30°C maximum temperature rise at 1.5 amperes.                                                                   | EIA-364-70, Method 1.<br>Subject mated plug and jack to temperature rise at rated current.                                                                                                                                                                                                                                                       |
| Current cycling.                               | No evidence of physical damage.                                                                                 | TE Spec 109-51, Condition B, Method 2.<br>Subject mated plug and jack to 500 cycles at 125% of rated current for 15 minutes ON and 15 minutes OFF.                                                                                                                                                                                               |
| Shielding effectiveness, thru-hole jacks only. | Frequency: 30 to 400 MHz.<br>Reduction: 20 dB minimum.                                                          | TE Spec 109-90.<br>Measure radiated response from unshielded mated jack and plug terminated with unshielded cable while conductors are excited between 30 and 400 MHz. Repeat procedure using shielded jack mated with shielded plug terminated with aluminum/MYLAR shielded cable. The difference in response is shielding effectiveness in dB. |

Figure 1 (continued)

| Test Description                   | Requirement                                                                                                               | Procedure                                                                                                                                                     |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Surge.                             | No evidence of physical damage.                                                                                           | Subject mated plug and jack adjacent contacts to 5 surges of each polarity at 1 minute intervals. Pulse to have 10/1000 microsecond shape and 1000 volt peak. |
| MECHANICAL                         |                                                                                                                           |                                                                                                                                                               |
| Vibration.                         | No discontinuities greater than 1 microsecond.<br>Shall remain mated and show no evidence of physical damage.             | EIA-364-28, Test Condition I. Subject mated plug and jack mounted on PCB to sinusoidal vibration for 15 minutes in each of 3 mutually perpendicular axis.     |
| Durability.                        | No evidence of physical damage.                                                                                           | EIA-364-9. Subject plug and jack to 750 mating and unmating cycles at the rate of 500 cycles per hour with latch inoperative.                                 |
| Mating and unmating forces.        | Five pounds maximum for unshielded plug and jack.<br>Eight pounds maximum for shielded plug and jack.                     | EIA-364-13. Measure force required to mate plug and jack. Measure force required to unmate plug and jack with latch depressed.                                |
| Plug retention in jack.            | Plug shall not dislodge from jack.                                                                                        | EIA-364-98. Apply axial load of 20 pounds to plug housing at a rate of .5 inch per minute with plug mated in jack and latch engaged.                          |
| Pull.                              | Plug shall remain mated with no evidence of damage.                                                                       | Load cable in mated plug with a 17 pound pull in axial direction, rotate plug housing 45 degrees from cable axis, remove load.<br>See Figure 4.               |
| Jack retention to PCB.             | Jack shall not dislodge from PCB.<br>One pound minimum before flow soldering.<br>Ten pounds minimum after flow soldering. | Apply perpendicular load at a rate of 2 inches per minute to the jack mounted on a .062 inch thick PCB.<br>See Figure 4.                                      |
| ENVIRONMENTAL                      |                                                                                                                           |                                                                                                                                                               |
| Thermal shock.                     | No evidence of physical damage.                                                                                           | EIA-364-32. Subject mated plug and jack to 25 cycles between -40 and 60°C.                                                                                    |
| High humidity/temperature cycling. | No evidence of physical damage.                                                                                           | TE Spec 109-76-2. Subject mated plug and jack to 10 humidity/temperature cycles between 4 and 60°C at 95% RH.                                                 |

Figure 1 (end)

## 3.6. Connector Tests and Sequences

| Test or Examination                   | Test Group (a)    |     |     |     |   |     |     |     |   |
|---------------------------------------|-------------------|-----|-----|-----|---|-----|-----|-----|---|
|                                       | 1                 | 2   | 3   | 4   | 5 | 6   | 7   | 8   | 9 |
|                                       | Test Sequence (b) |     |     |     |   |     |     |     |   |
| Examination of product                | 1                 | 1   | 1   | 1   | 1 | 1   | 1   | 1   | 1 |
| Termination resistance, dry circuit   |                   | 2,4 | 2,4 | 4,6 |   |     | 2,6 | 2,4 |   |
| Termination resistance, rated current |                   |     |     |     |   | 2,5 |     |     |   |
| Insulation resistance                 | 4                 |     | 5   |     |   |     | 5   |     |   |
| Dielectric withstanding voltage       | 2                 |     |     |     |   |     | 4   |     |   |
| Temperature rise vs current           |                   |     |     |     |   | 3   |     |     |   |
| Current cycling                       |                   |     |     |     |   | 4   |     |     |   |
| Shielding effectiveness               |                   |     |     |     |   |     |     |     | 2 |
| Surge                                 | 3                 |     |     |     |   |     |     |     |   |
| Vibration                             |                   | 3   |     |     |   |     |     |     |   |
| Durability                            |                   |     |     | 5   |   |     |     |     |   |
| Mating force                          |                   |     |     | 2   |   |     |     |     |   |
| Unmating force                        |                   |     |     | 3   |   |     |     |     |   |
| Plug retention in jack                |                   |     |     |     | 2 |     |     |     |   |
| Pull                                  |                   |     |     |     |   |     |     | 3   |   |
| Jack retention to PCB                 |                   |     |     |     | 3 |     |     |     |   |
| Thermal shock                         |                   |     | 3   |     |   |     |     |     |   |
| High humidity/temperature cycling     |                   |     |     |     |   |     | 3   |     |   |

**NOTE**

- (a) See paragraph 4.1.A.  
(b) Numbers indicate sequence in which tests are performed.

Figure 2

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#### 4. QUALITY ASSURANCE PROVISIONS

##### 4.1. Qualification Testing

###### A. Sample Selection

Modular plug and jack test samples shall be selected at random from current production lots. They shall be prepared for testing in accordance with current Application Specifications and Instruction Sheets.

###### B. Test Sequence

Qualification testing shall be conducted as specified in Figure 2.

##### 4.2. Requalification Testing

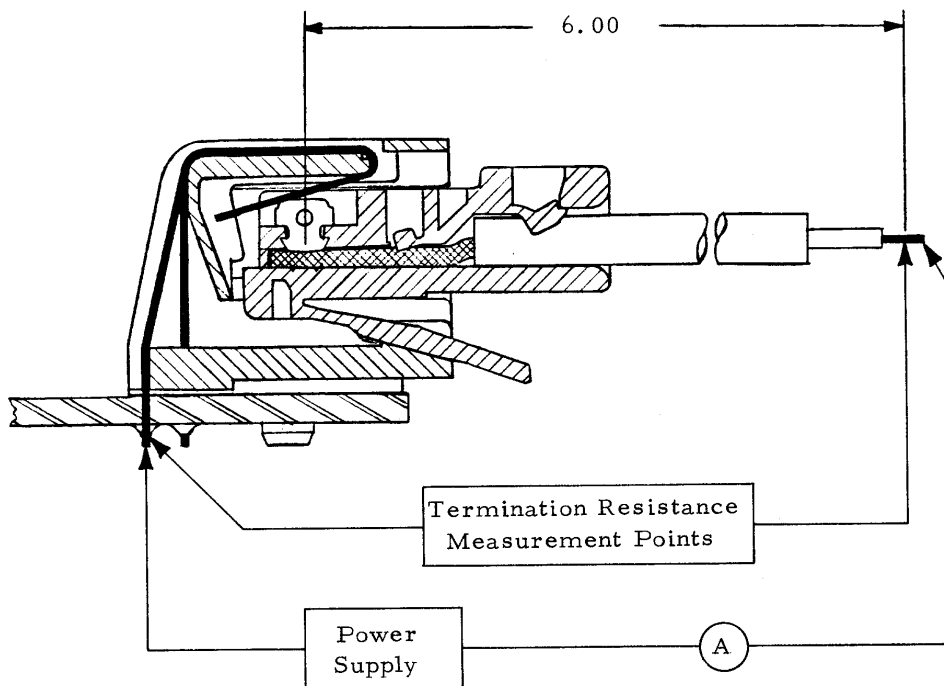
If changes significantly affecting form, fit, or function are made to the product or to the manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality, and reliability engineering.

##### 4.3. Acceptance

Acceptance is based on verification that the product meets the requirements of Figure 1. Failures attributed to equipment, test setup, or operator deficiencies shall not disqualify the product. When product failure occurs, corrective action shall be taken and samples resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

##### 4.4. Quality Conformance Inspection

The applicable quality inspection plan will specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.



**NOTE**

Millivolt drop (resistance) due to the 6 inch wire length shall be subtracted from all readings.

Figure 3  
Termination Resistance Measurement Points

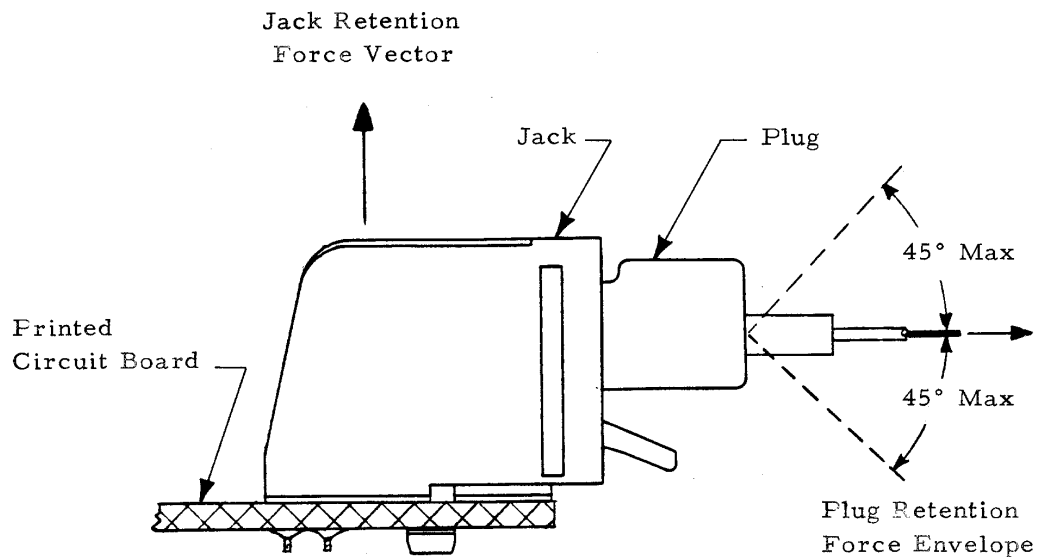


Figure 4  
Plug and Jack Retention Forces