

Product Data Sheet

Amphenol[®] Electrostatic Discharge (ESD) Protected Connectors

No. 171-1

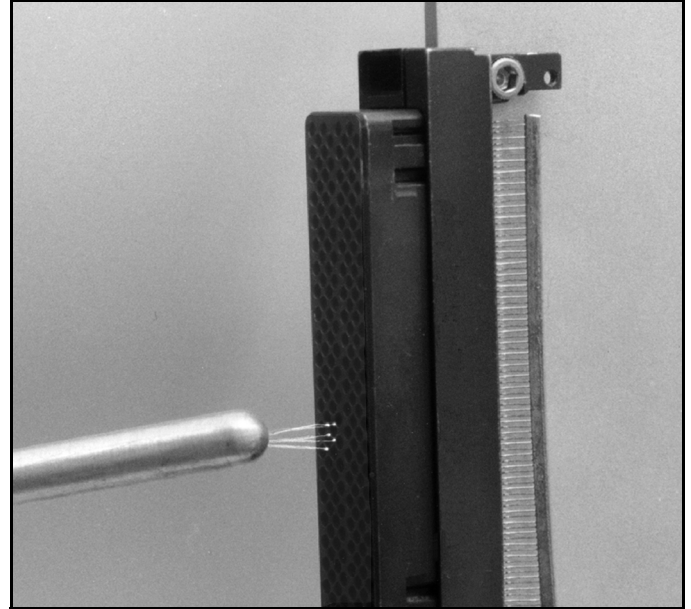
Amphenol has developed cylindrical and rectangular connectors which protect sensitive components from Electrostatic Discharge (ESD) without diodes, varistors, gas tubes, or “experimental” semiconductive materials.

These connectors utilize the Faraday Cage principal to shunt electrostatic discharge events to the conductive enclosure on which the connector is mounted, thus never allowing the high voltage, high current discharge event to reside on any contacts.

The ESD protected connectors have the same physical envelope as their standard counterparts, and do not require special mounting or terminating techniques. All of the contacts remain fully functional, and electrical characteristics such as capacitance are not effected.

Product Features:

- Connector Envelope Identical to Unprotected Design for Most Applications
- Exceeds Protection Requirements of IEC 801-2 and MIL-STD-1686:
 - Ensures that All Components within a Conductive Enclosure will be Subjected to a Maximum of 10V during Electrostatic Discharges between -26 KV and +26 KV
- Voltage Observed on Contacts during ESD Events – <10V (at 1 megohm)
- Current Observed on Contacts during ESD Events – <100 milliamperes (at 2 ohms)
- Response Time – Instantaneous (Voltage and Current are Maximum Values)
- Maximum ESD Voltage – Tested to ±26KV
- No Capacitive Loading
- Eliminates the Need for Discrete Components (such as diodes) and Maximizes Printed Circuit Board Real Estate for Equipment Housed in Conductive Enclosures which require ESD Protection as Free-standing Units
- Operating Voltage of Connectors not Effected for Most Designs
- Pulse Life – Infinite



ESD Testing on LRM Rectangular Connectors
(Actual Photo)

What is Electrostatic Discharge (ESD)?

Electrostatic Discharge (ESD) is the rapid transfer of a static electric charge from one body to another. A static electric charge consists of either a surplus or depletion of electrons on a body, which gives that body a potential or voltage relative to ground (or another body). The discharge is extremely fast (less than 1 nanosecond risetime) and the current flow may exceed 100 amps!

Static electricity is normally the result of two materials transferring charges when rubbed or separated, such as shoes scuffing across a dry carpet, or sheets of untreated plastic being separated. This phenomena is commonly referred to as the **triboelectric effect**.

The voltage developed due to the **triboelectric effect** depends on the materials involved, the quantity and type of contact, and relative humidity. In a dry environment a person can accumulate a charge of up to 25 KV! In a moist environment a person's potential is reduced due to the effect of moisture on the insulating properties of materials.

What is a Faraday Cage?

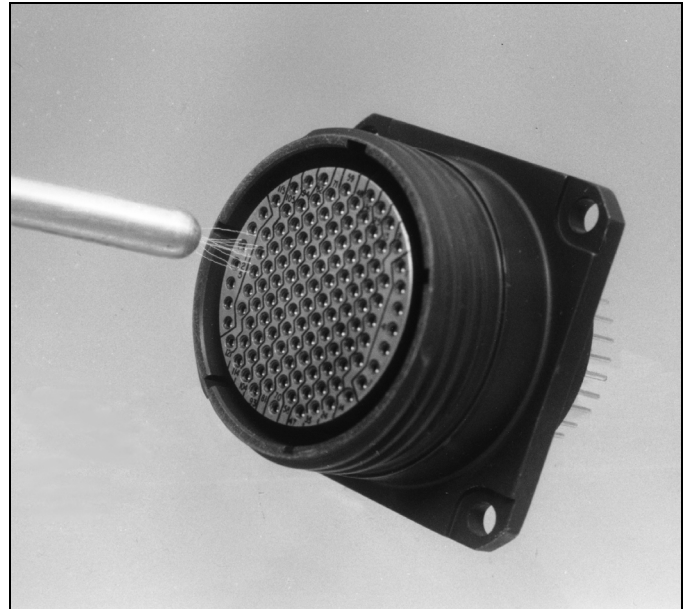
A **Faraday cage** is a conductive enclosure. It may be solid in form such as a sheet-metal enclosure, or it may be full of apertures, such as a wire cloth box. When a charge is placed on a faraday cage the electrons which make up the charge, having like polarity, try to position themselves as far as possible from each other. This places the electrons on the outer surface of the enclosure, leaving the inner surface uncharged. The charge on the outer surface does not induce a charge on any neutral object inside of the faraday cage, and therefore does not try to transfer itself onto the internal object. Neutral objects (such as IC's) inside of a faraday cage are thereby protected from ESD activity external to the faraday cage.

The voltage and current observed on neutral objects within a faraday cage during ESD events are due to the secondary effects of ESD. These include Electromagnetic Interference (EMI), magnetic and electrical field coupling. The faraday cage of the Amphenol ESD Protected Connectors has been designed to minimize these effects.

The Amphenol® ESD Protected Connectors

The Amphenol® ESD Protected Connectors have a faraday cage at the mating interface. The faraday cage has been specifically designed to intercept electrostatic discharges from the contacts in the unmated state, while maintaining each contact's isolation when the connector is mated. When the ESD Protected Connectors have been mounted to a conductive enclosure, a faraday cage is created which will protect components located within the enclosure from electrostatic discharges. This eliminates the need for discrete components such as diodes and gas discharge tubes, and saves printed circuit board real estate.

The Amphenol ESD Protected Connectors have been applied to Line Replaceable avionics Modules (LRM) and nuclear missiles, and can be applied to any equipment or system with minimal impact. There are many drop-in replacement ESD Protected connectors for retrofitting existing programs which have conductive enclosures and require ESD protection as free-standing equipment.



ESD Testing on MIL-C-38999, Series III
Filter Cylindrical Connectors (Actual Photo)

Publication L-2075, "ESD Attenuation Test Procedure for Connectors with Faraday Cage Protective Structures" is available as a reference document to this product data sheet. For technical publication L-2075 or for any further information on ESD Protected Connectors or any of the other products in the broad family of Amphenol Interconnection Products, contact:

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