A-16-01

The Engineering Society For Advancing Mobility Land Sea Air and Space ®

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AEROSPACE INFORMATION REPORT

Submitted for recognition as an American National Standard

AIR1329

Issued 1-75
Revised 11-29-88

REV. A

ELECTRICAL CONNECTORS AND WIRING, COMPATIBILITY OF

1. PURPOSE:

This Aerospace Information Report (AIR) documents the need for a system compatibility analysis between the wire, its termination within the electrical connector, and the associated contact insertion/extraction tool.

2. SCOPE:

This AIR defines the areas where incompatibility may exist between the selected wire and the electrical connector in which it is terminated and how to design for compatibility. Refer to ARP914 for a glossary of connection terms.

3. GENERAL:

Connectors covered by the Military Specifications listed in Table I incorporate crimp rear release contacts and an integral wire sealing grommet. Refer to MIL-STD-1353 and ARP1308 as applicable for connector selection for military and commercial aircraft.

The inserts of these connectors are usually made up of two basic materials (see Fig. 1).

a) A hard dielectric section which incorporates the contact retaining mechanism in each contact cavity and

b) A rear grommet with wire sealing rings in each contact cavity.

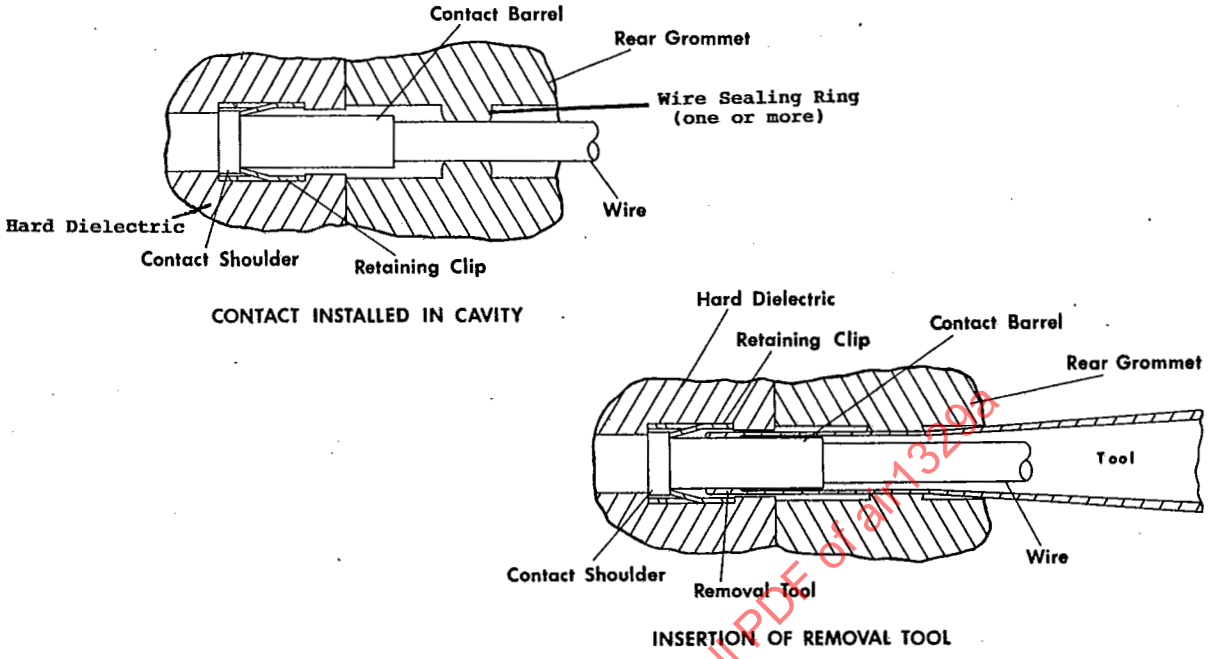

FIGURE 1 - Typical Cross Section of Connector Contact Cavity

3. (Continued):

Contact insertion and removal methods are common for the connectors listed in Table I and employ a tool to release the contact retaining device as shown in Fig. 1. Most tools are made of a plastic material, inexpensive but fragile especially for the small size contacts. Caution must be exercised when using these tools to avoid broken tool chips which could remain in the connector. Correct tool alignment and the avoidance of excessive force will extend tool life as well as protecting the connector from damage to the rear grommet or retaining clip.

3.1 Variations in Connector Types: The following defines the areas where variations may exist between one connector specification and another.

a) Contact Cavity Diameter* Hard Dielectric: This diameter is slightly larger for a given contact than the shoulder of that contact.

*Rear of Cavity

b) Wire Seal Cavity - Sealing Area: The sealing cavity accommodates a given contact size, and range of finished wire diameters.

c) Contact Geometry - Barrel - Shoulder Diameters: The barrel plus the thickness of the tool must be compatible with the shoulder diameter of that contact.

d) Insertion/Extraction Tool - Thickness: The O.D. of the wire plus tool thickness must be compatible with the rear I.D. of the contact cavity.

3.2 Incompatibilities: Variations in the above areas, which do exist from one specification to another, can result in difficulties with the removal of a wired contact or lack of wire seal. This incompatibility will most often occur when the same wire is terminated at one end with one connector and at the other end with a different type or different contact size.

For example: A wire selected to seal with connector B of Fig. 2 may be too small to seal with connector A. On the other hand, a wire selected to seal with connector A may be too large for the contact extraction tool used with connector B. Also, if the wire selected is larger than the I.D. of a given tool, it will increase the O.D. of the tool tip which must enter the contact cavity. The reverse is also true. If the diameter of the wire is significantly smaller than the I.D. of the tool, the I.D. of the tool can be compressed by the wire sealing rings, making it difficult to lead the tool over the rear of the contact crimp barrel.

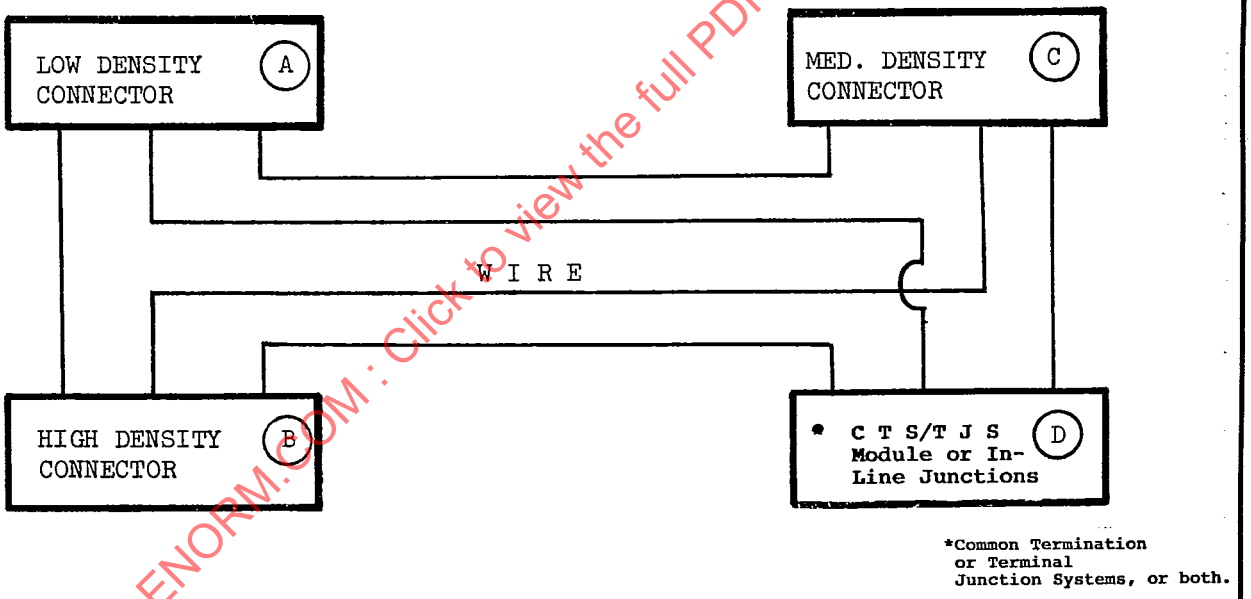

FIGURE 2 - Typical Wiring Harness Concept

In the first case, the small wire can be locally increased in diameter to obtain a seal but if the wire is too large, it will be virtually impossible to remove the wired contact unless special techniques are employed.

Also, oversize wire can cause, with some connectors, undesirable expansion of the sealing grommet. This can result in interference with assembly hardware, prevent insertion/extraction of the contact, or damage the grommet, degrading the connector's environmental characteristics.

The use of supplementary insulation to build up wires to the recommended sealing range can cause maintenance problems and is not recommended. Refer to the applicable revision of MIL-W-5088 for connector/wire compatibility requirements.

3.3 Solutions: To avoid these pitfalls, the designer should establish the allowable minimum-maximum diameter of a finished wire. This can be done through a complete analysis of all the connectors required for the wiring harness system. To accomplish this he must examine the wire sealing ranges of each connector type and where applicable look at the bundle size limits. Table I compares this information for a number of rear release connector types. Table II provides finished diameters for a number of common wire types.

4. It is very unlikely that any one program or project will require all of the connectors listed in Table I. Therefore, the designer should establish his own table based on this project's connector requirements and from this establish the wire range that is compatible with the connectors in the system. This could include connectors other than those listed in Table I.

CAUTION: Elastomer grommets are generally qualified to seal on wires having diameters within the specification grommet sealing range and only one wire per grommet hole. For proper selection and installation of wires, refer to Appendix "A" of MIL-W-5088, Aerospace Vehicle Wiring.

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