STABILANT 22

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APPLICATION NOTE

Problems with Tin-plated Electromechanical Contacts

- *What problems are sometimes encountered in tin-plated contacts?*

On occasion, our customers have encountered problems with tin-plated contacts. These are usually of the "header" type where one or more square male contacts, spaced either on 0.10 or 0.156 inch centers are used to connect either stacked PC boards, or mate with wiring harnesses. Quite often the problem occurs only whenever several conditions exist. A typical example would be that encountered where design engineers were encouraged to use a connector from a "standard-parts" list as part of a inventory-limiting cost-effectiveness program. Often, an engineer will employ a connector with a current rating grossly in excess of the actual currents involved in the circuit, reasoning, that while it may be over-design, the selection of a very-low current connector is not warranted.

Many engineers fail to realize that it is often more difficult to design a connector to function properly when carrying signals in the range of from 5 picoamps through 10 microamps than it is to design a connector to carry an amp. of signal current. While the connector may function properly in both the evaluation stages and the initial months of field use, they often encounter problems within the second six months in the field. Contaminant films which would be of little problem for a higher current flow will cause conditions ranging from zero-crossing distortion in AC signals through thin-film rectification and/or intermittence.

Sometimes the design of the connector is such that manufacturing processes can, when combined with storage and/or transportation conditions, produce a synergistic effect that will result in field failure. Some tin-plated connectors have a small dimple formed on the inside of the female contact in order to increase the pressure at the actual point of contact with the male pin. If the forming process involves stretching of the tin plating rather than the use of a coining technique (wherein the tin flows under pressure), micro-cracking may take place in the tin coating. At the lattice structure of tin changes with temperature-induced-phase changes, stresses can be set-up that will induce the plating to "spall" or flake off the substrate.

This might not occur in any significant amount under normal conditions, but we have encountered cases where so simple a thing as the storage or shipping of completed wiring harnesses in craft-paper based corrugated cardboard containers (which contain sulfides) can induce sufficient corrosion in the substrate exposed by the cracks such that the rate of spalling is increased to the point of causing connector failure within a year of being placed in service.

- ***Can the use of Stabilants solve the problem?***

Under most circumstances, the use of **Stabilants** can increase the MTBF in the field to the point where the equipment's erratic connector may only have to be serviced once in its lifetime, but this could be changed by exposure to especially corrosive environments. Increases in MTBF of 10x are routine in these cases.

The service group can confirm the existence of this tin-spalling condition by having a connector's contact pair examined by electron microscope. Not only are the flakes of plating usually quite readily apparent, but the pattern of corrosion on the exposed substrate will sometimes show where the original cracking of the tin-plating occurred, revealing the stress placed on the plating by the manufacturing process.

Effective use of **Stabilants** require that the female connector be treated with sufficient material that the residue of this "metallic- dandruff" be purged from the contact area. Even though the substrate material is exposed, the connectors will generally be serviceable upon treatment.

One caveat. As many of these connectors use insulation-piercing designs as part of the female contact, the service engineer should make sure that the connector problem is not caused by migration of plasticizers from the wire's insulation into the contact between the bared wire and the insulation-piercing part of the contact. Under some circumstances this junction, rather than the actual male-female contact pair, can be the source of trouble, and should be treated with **Stabilant 22a**.

NATO Supplier Code 38948 - 15 mL S22a size has NATO Part # 5999-21-900-6937

The **Stabilants** are patented in Canada - 1987; US Patent number 4696832. Worldwide patents applied for. Because the patents cover contacts treated with the material, a Point-of-sale License is granted with each sale of the material.

MATERIAL SAFETY DATA SHEETS ARE AVAILABLE ON REQUEST

NOTICE