



**D.W. ELECTROCHEMICALS LTD.**  
97 Newkirk Road North, Unit 3  
Richmond Hill, Ontario L4C 3G4  
Canada Phone: (905) 508-7500  
Fax: (905) 508-7502

Number 44

# APPLICATION NOTE

---

## The use of Stabilants on SCSI systems

### Background

SCSI drives are used both in multi-channel sound recording (where they replace tape drives) and in digital recording as used in animation. In either case, they allow the digital recording to be removed. At a later time, it can be edited or copies made, edited and assembled. One possible problem occurs as the SCSI drives themselves are in removable caddies. At one time, SCSI 2 was most frequently employed (50 pin connectors) but with speed and resolution increases, the need for SCSI 3 (with 68 on connectors) is now almost standard.

Now, even SCSI 2 and SCSI 3, may have die cast bodies. The need for larger hard disk storage mandated the use of SCSI 3, as twelve SCSI drives can be employed. As these connectors are smaller than the SCSI 1, their pin spacing is smaller.

But where larger arrays are involved, these are usually plugged into a back plane by using a single unified 80 pin connector.

This technique is termed SCA connection. With a pin density this extreme, cable and pin connection become very dependent on anything that can cause a conductivity error. Rectification of RF signals where the signal voltages are low and the circuit impedance is high can result in the proliferation of errors.

- **Connector problems**

It is rare that connector faults show up immediately. But when the 68 pin caddies or removable SCA 80 pin drives are used, errors can accumulate until "best two out of three" becomes one "out of three" This situation is rare; which drive is correct?

Note that the use of the RAID technique allows for "hot swapping". In essence this means that defective SCA drive can be replaced without powering down the system.

As the larger storage systems use error correction (best two out of three) in a RAID configuration (Redundant Arrays of Inexpensive Drives), it isn't until two of the records are faulty that a major problem becomes apparent.

But in some cases they may often be of an intermittent nature and thus difficult to trace. Stabilants can be used to prevent or solve these problems. We'll explain the use of this material in some detail.

- **SCSI 1, SCSI 2 and SCSI 3**



On some connectors, the metal may be tin plated; with several sets of gold flashings applied after the tin plated connector is formed. However, when a connector's stock is tin plated before it is formed one must remember that some tin alloys resist high-speed forming and can have areas of latent stress. Whenever this type of connector is subject to thermal stress and/or cycling of humidity, the pre-stressed tin may "flake" away. These "flakes" are so small that micro-techniques have to be used even to see them. We have encountered instances where connectors passed quality control testing and were approved for shipping. Often these connectors were bulk shipped in cartons made from sulfide stock. In other words these cartons were not manufactured from acid-free stock. In time, the tin plating started to "micro-flake", and these connectors became erratic.

We recommend the use of **Stabilants** on these connectors. As it is available as the concentrate (**Stabilant 22**) or in a partially filled bottle (**Stabilant 22S** - for Short fill) - where the diluant is added to the concentrate and mixed on site, there are less problems when it has to be shipped by air and the diluant added in the field.

- **Removal and cleaning of back plane boards**

Disassembly can be somewhat tricky because of the potential for damage of components by static electricity.

Obviously any hard drives will have to be removed from the plug-in SCA carriers. It is advisable to make a note of the name (part # or serial #) for each hard drives or SCA's as they are disassembled.

What might seem obvious at the time may not be so easy to remember later, especially when several faults occur when time is critical. While this may seem pedantic the use of any Quality Assurance Program (such as one of the ISO's) requires methodology

This caution also applies to any wiring harness connectors in the system. Wires can be tagged using surgical tape until such time as a listing can be made. A rough sketch of each connector location can often save hours of work later on.

- **Cooling fans.**

Most caddies that are used with large storage capacity have hard disk drives are fan cooled. If the power supply is deficient in its voltage output and/or regulation, the needed cooling fans won't work. This can lead to premature failure of the hard disk. The problem might be related to the switching-mode power supply. These contain aluminum electrolytic capacitors. As the efficiency and regulation of the supply can be dependent on the operating frequency, if the capacitor develops resistance, it will both lower the Q of the circuit but also cause a build up of heat. This, in turn, can cause the supply to fail and so on!

Where fan-cooled SCA's are employed, regulation is generally less of a concern. The investment is so large that the type of regulation problems encountered in less expensive (\$3,500 and lower) computing systems should not be a problem.

- **Other types of equipment.**

The **Stabilants** can also be used on connectors, the switches in mixers, and in computing equipment. It can even be used in the consolidation of cables. This applies to connectors in general, irrespective of whether they are microphone connectors, patch bays, screw terminals, tab connectors or other types.

- **What is Stabilant 22?**

**Stabilant 22** is an initially non-conductive block polymer which when used in a thin film between metal contacts becomes conductive under the effect of an electric field. This occurs at an electric field gradient such that the material will remain non-conductive between adjacent contacts in a multiple pin environment. In addition Stabilant 22 exhibits surfactant action as well as lubrication ability providing a simple component resident solution to virtually all contact problems.

*When applied to electromechanical contacts, Stabilant 22 can provide the connection reliability of a soldered joint without bonding the contact surfaces.*

- **Where can Stabilant 22 be used?**

Stabilant 22 can be used in all types of connectors, at frequencies from to DC to several Gigahertz, on faders or potentiometers, or in non-inductive (non-arcing power-interrupt switches. The number of uses are almost limitless.

- **Is Stabilant 22 just another contact cleaner?**

No, Stabilant 22 is a resident potentially electrically active material which through synergistic combination of effects enhances conductivity within a contact without causing leakage between adjacent contacts. Thus large quantities of the material does not have to be "hosed" on as is the case with cleaners.

- ***Is Stabilant 22 cost effective?***

As **Stabilant 22** can be quickly applied to all contacts and connectors in a system the often difficult diagnostic determination as to which one of many contacts are erratic, can often be eliminated. This can significantly reduce service time in the field and in many cases eliminates the need to return boards for shop service or re-manufacturing. As any service manager knows, the diagnosis of electronic problems especially where intermittent failures are concerned, is often much more difficult than the actual part replacement; as well as requiring service personnel of exception caliber. In many cases the use of **Stabilants** can thus increase the efficiency of existing staff as well as allowing many connector harness related problems to be handled at a much lower cost.

- ***How can Stabilants correct electrical contact problems?***

In many electronic applications demodulation (detection) of RF signals in connectors exhibiting thin-film rectification effects can either reduce the signal-to-noise ratio or introduce artifacts, which can disrupt data flow. **Stabilants** can cure these.

While **Stabilants** have demonstrated that they can cut the cost of both shop and field maintenance; their use in the manufacturing of electronic systems can speed up production as well as reducing rejections.

- ***How does Stabilant 22 work?***

Contact failure is rarely caused by a single factor. Thus, treatments that solve only one problem don't necessarily offer a reliable long term solution. For example, cleaners do not prevent the re-entry of contaminants or the reformation of contaminant films; nor do they offer any lubrication. They must be used each time a connector gets dirty. Lubricants in themselves are rarely cleaners. Corrosion inhibitors are neither cleaners nor lubricants and are often specific to one type of metal or plating. Unsaturated oils used as contact treatments can cross-link under the influence of elastomer or thermoset plastic curing agents and accelerants.

While resident in the connector, **Stabilant 22** performs several concurrent functions. Its very presence in the contact gap will prevent the entry of outside contaminants. It has sufficient surfactant action to lift surface contaminants and hold them in suspension. In cases where corrosion products are present **Stabilant 22** will penetrate them and prevent rectification effects. Due to its high dielectric constant it will act to form a capacitive layer which is in parallel with whatever residual resistance exists in the contact increasing the passage of AC signals. Given sufficient DC bias within the gaps of the contact the thin film of **Stabilant** will "switch", conducting by quantum tunneling and thus limit the resistance of the contact to a serviceable level.

- ***In what forms is Stabilant available?***

The **Stabilants** are available in several forms; as a concentrate (**Stabilant 22**) and as an isopropyl alcohol-diluted form (**Stabilant 22A**). In a similar fashion, we produce **Stabilant 22E** Because of the 4:1 dilution, a given size container of **Stabilant 22A** will cost about less

than the same size bottle of **Stabilant 22** as it contains only one-fifth the amount of the concentrate.

- ***What is the difference in use of these materials?***

**Stabilant 22** is most useful where the connections are out in the open - such as card-edge connectors or where the lubricating properties of the material are useful such as an aid to installing microprocessor IC's or on switches. Where the connections are not too easy to get at or where the user wishes to apply the material to something such as a socketed IC (without removing the IC from its socket) it is easier to use the alcohol diluted form (**Stabilant 22A** or **Stabilant 22E**). The isopropyl alcohol diluant serves **ONLY** to carry the concentrate into the connector.

The **Stabilants** have proven to be very effective in improving the reliability of connectors in general and are developing a reputation for ease and speed of use under field conditions. Not only are many OEM's pre-treating sensor connectors during manufacture, many are providing the **Stabilants** to their service technicians either as Standard-Store items, or recommending them for field procurement.

The **Stabilants** are presently used in applications ranging from Avionics through Process control, including such critical fields as Bio-medical electronics, Air Traffic Control, Police & Emergencies (such as communications and the like).

- ***How are the Stabilants applied?***

The application of the **Stabilants** is exceptionally easy. Just use a drop of two of **Stabilant 22A** on one of the electrical or electronic sensor connectors, including an other in-signal-path connector in the wiring harness, and reconnect the system.

- ***What packaging is available?***

We can supply the concentrate (**Stabilant 22**) in 5 mL, 15mL, 50mL, 100mL, 250m 500mL and 1 Liter bottles. The dilute (**Stabilant 22A**) is available in 50mL, 100m 250mL and 500mL containers. We do not have a 1 liter container of the dilute as 500 mL is the largest size bottle that can be shipped by air (in single or multiple packages) without additional restrictions. We maintain our stock in depth, and ship most orders the same day they are received. The 15 mL and 50 mL sizes are in dropper bottles and these are available on request for the 0.5 mL sizes as well.

- ***Is it available in a spray can?***

No. Why waste the material? We would like to think we are environmentally responsible and safety conscious. We use no CFCs, HCFC's or any other ODC (Ozone Depleting Chemical) either in or in the manufacture of **Stabilants**.

In addition even **Stabilant 22A** has only about 1/200th the solvent impact as conventional contact cleaning solvents over a three year time span.

As **Stabilant 22** contains no solvent it has absolutely minimal environmental impact and is, therefor becoming the treatment of choice for many service organizations!

***Just how much should be used?***

Normally, a final film thickness of from 0.5 mils to 1 mils of the concentrate is all that is necessary. In other words, you want just enough to fill up the interstices between the contact's faces. When using Stabilant 22A, use enough so that once the alcohol evaporates the desired 1/2 to 1 mil film of Stabilant 22 remains.

In applications to moving surfaces, such as in slip-rings or potentiometers, film thickness should be minimized to the point where "hydroplaning" won't occur.

- ***What is the 15mL service kit?***

This was made up at the request of several manufacturers who wanted a standard kit that they could issue to their service personnel. It consists of a 15mL dropper bottle of Stabilant 22A and some applicators, all in a small capped cardboard tube that can be tossed into a tool box without damage.

In response to some manufacturers and their field service people, we decided to provide a 5mL service kit. Because of the cost of packaging these kits, the cost per drop is greater than the 15mL service kit

- ***Does the action of Stabilant deteriorate with age?***

In some field trial applications lasting over ten years Stabilant 22 has shown no sign of reduced effectiveness. With a high molecular weight and a very low vapor pressure, almost none of the material will be lost by evaporation. Unlike some other contact protection oils, Stabilant 22 will not cross-link when exposed to free-machining materials such as high sulfur brass, or when used on contacts where agents used to promote cross-linking of thermosets or elastomers are present in the environment or in the actual connector components. Thus Stabilant 22 does not form a scum or "varnish".

***Revision 5***

Stabilants are a product of Dayton Wright research & development and are made in Canada

---

**NSCM/Cage Code - NATO Supply Code 38948**

**15 mL of S22A has NATO Part # 5999-21-900-6937**

---

The Stabilants are patented in Canada - 1987; US Patent number 4696832. World-wide patents pending. 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.**

**Stabilant, Stabilant 22, and product type variations thereof are Trade Marks of D.W. Electrochemicals Ltd.**

© Copyright 2003 - D.W. Electrochemicals Ltd. This note may be reproduced or copied, provided its content is not altered. The term "contact enhancer", © 1983 Wright Electroacoustics.

**NOTICE:**

This Application Note is based on customer-supplied information, and D.W. Electrochemicals is publishing it for information purposes only. In the event of a conflict between the instructions supplied by the manufacturer of the equipment on which the Stabilant material was used, and the service procedure employed by our customer, we recommend that the manufacturer be contacted to make sure that warranties will not be voided by the procedures. While to our knowledge the information is accurate, prospective users of the material should determine the suitability of the Stabilant materials for their application by running their own tests.

Neither D.W. Electrochemicals Ltd., their distributors, or their dealers assume any responsibility or liability for damages to equipment and/or any consequent damages, howsoever caused, based on the use of this information.

**Stabilant, Stabilant 22, and product type variations thereof are Trade Marks of D.W. Electrochemicals Ltd.**