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Number 15

## APPLICATION NOTE

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### Use of Stabilant 22 for Stereo Systems

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#### Introducing Stabilant 22

Stabilant 22 is an initially non-conductive block polymer that when used in a thin film within contacts switches to a conductive state under the effect of the electrical field. The field gradient at which this occurs is set such that the material will remain non-conductive between adjacent contacts in a multiple pin connector environment.

*Thus, Stabilant 22 provides the connection reliability of a soldered joint without bonding the contacting surfaces together!*

Contacts are generally the weakest link in any piece of electrical/electronic equipment whether it be in low current devices found in computers or higher current circuits found in automotive and aviation applications, to name only a few. The use of Stabilant 22 or its isopropanol-diluted form, Stabilant 22A, will make contacts from 10 to 100 times more reliable, eliminating costly service call-backs and ensuring customer satisfaction.

#### Benefits in stereo system electronics

In general, Stabilant 22 can be used wherever electrical contacts are used. Stereo systems have a wide assortment of connectors and switches, which carry signals as well as power. Stabilant 22 or 22A can be used to treat these throughout the system, including socketed ICs and multipin connectors inside. This makes contacts resistant to vibration or humidity effects (which would normally lead to corrosion). Low resistance contacts lower signal distortion and can substantially improve signal-to-noise ratio.

Stabilant products are proven through many years of such applications. Some specific uses in stereo systems follow.

## Where and how do I apply Stabilant 22?

**Phono Cartridges:** As the Stabilants reduce distortion caused by thin film rectification effects and as this effect is most pronounced at very low signal levels, the application of Stabilant 22A should start with the phono cartridge pins.

With Stabilant 22A it is not necessary to disconnect the phono cartridge leads as the diluted material will penetrate the connections. Use only a small drop on each cartridge connection.

If the tip of the dropper bottle is too large, use a micro-brush or a toothpick to transfer a smaller drop of the material to the contact. Do not use an excess amount. Don't get the material on any of the rubber shields (if present) that may cover the base of the stylus cantilever as the material will hold dust that might be present on the record surface.

**Phono Arm Contacts:** Audiophiles often forget to treat both the head shell arm connector contacts (if the head shell is detachable) and/or the connector(s) that may connect the cables to the arm. Since Stabilant 22A will not cause leakage or bridging between adjacent contacts there is less restriction on the amount that can be used. If RCA-type connectors are used, be sure that the outer ground shell has a slight bend inward so that it makes a tight contact to the ground section of the chassis-mounted connector half. Stabilant 22A should be applied to both the central pin (signal) and the inside of the outer (ground) connection.

**Preamplifier Switch Treatment:** Audiophiles often overlook the fact that preamplifiers can have electromechanical switches in the signal path (although electronic switching is being used in newer equipment). These switches are also a potential source of distortion and noise. Rotary switches are usually the easiest to treat although it may be necessary to use a micro-brush or a toothpick to transfer a drop of Stabilant 22A from the dropper bottle to the switch contacts. Slide switches may be treated by placing several drops in one end of the switch and cycling the switch.

Push button type switches, especially the IIT-Schadow type, may contain a lubricant that must be removed before Stabilant 22A is used. We have found that if the switch is flushed out with isopropanol (isopropyl alcohol) or one of the proprietary contact cleaners, it does not have to be disassembled. Several drops of Stabilant 22A should be run into the switch body through the slot on the upper side (IIT Schadow type).

We do not recommend the use of Stabilant 22A on volume or balance controls unless they are of the plastic element, wirewound or stepped-metal-contact type. Some controls use a resistive lacquer silk-screened on a phenolic insert for the element and in a few cases, the lacquer can be softened by an excess of isopropanol. These cheap volume controls are rarely found in good quality equipment anymore, although they are more common in old equipment. On plastic-element controls only the concentrate, Stabilant 22, cut 8:1 with hot water, should be used and then only sparingly. Very little is needed! Don't use the (isopropyl alcohol diluted) Stabilant 22A as the plasticizer in the plastic element can be extracted, roughening the control's wiped surface.

All of the input and output jacks (including loudspeaker terminals) can be treated with Stabilant 22A.

*DO NOT TREAT ANY POWER SWITCHES THAT SPARK ON OPENING!*

If an inductive load is present the spark could cause decomposition of the material.

**Tape Recorders:** Stabilant 22A may be used in tape recorders. If spring contacts are used on the playback and recording heads these should be treated in the same way as the connections on a phono cartridge. Anywhere there are card-edge connections, Stabilant 22A can be used. And it should also be used on any microphone connectors.

In critical audio work involving long signal runs, Stabilant 22 on the XLR or cable connectors will not only cut noise, but will, in many cases, improve the sound by stopping high-order harmonic distortion caused by thin film rectification effects.

**CD Players:** Treat electrical type signal output connectors with Stabilant 22A.

**Interconnect Cables:** The RCA-type connectors on the interconnect cables should be treated, making sure that both the inner pin (signal) and outer shell (ground) of each connector are treated. On DIN-type connectors be sure that all the pins are treated.

**Power Amplifiers:** In tube type equipment, the tube pins may be treated individually. Because the voltages encountered in power amplifiers are often well above the switchover-field-strength voltages for Stabilant 22 we specifically caution against the indiscriminate use of the material on an entire tube socket (i.e., treat only the individual tube pins).

In transistor power amplifiers the output transistor pins can be treated as well in the case of socketed types, as the electromechanical contacts to the filter capacitors, any tab-type connectors, as well as any card edge connectors. It is suggested that you have this done by a qualified service technician.

**Loudspeaker Connectors:** The loudspeaker connections may be treated with Stabilant 22A, but we suggest that you make sure that you have treated all the low-level signal contacts first as there will be a much greater effect on these.

**Patch Bays:** Some elaborate stereo systems use patch bays to facilitate equipment interconnection and reconfiguration. In these patch bays, Stabilant 22A is recommended for ring, tip, and sleeve plugs and for the dual tip and sleeve plugs as well as for the jacks. Be sure that the plugs themselves are cleaned of any previous oil-like contact treatment. The older oils can leave a hard to remove "varnish". (They can harden by crosslinking, as many ring-tip-sleeve type connector contacts were made with a high sulfur brass that has promotes that reaction). Unlike most other treatments, Stabilant 22 is chemically stable in the presence of these substances and therefore, does not require periodic cleaning and replacement.

Another potential problem can occur with cleaners and lubricants containing silicones. Under the right circumstances these chemicals can also cross-link producing a thin, glassy polyoxysilane film that can be difficult to remove. For best results, this type of film should be removed before using Stabilant 22A.

**Tuner, TV, Satellite Equipment and General Antenna Use:** Stabilant 22A can be used on cable TV coaxial connectors, on connectors used from a satellite receiver antenna to the low-noise amplifier, and other signal or grounding connections.

Stabilant 22A is not *completely waterproof* (it can mix with water, though not as well as with alcohols), therefore when using it in areas exposed to rain, we suggest that the connector be protected with a section of shrink tubing, and the antenna waveguide flange be sealed at its outer circumference with a sealant or a double layer of stretched black vinyl tape.

**Radio Frequency Interference:** RF interference in stereo systems can be a constant problem. With the passage of time, connectors often build up thin films that act as crude rectifiers. This source of RF interference can often be eliminated by using Stabilant 22.

### **Why should we use Stabilant over less expensive alternatives?**

Properly applied, it only has to be used once. Because of its very low vapor pressure it won't evaporate and therefore it is unique in having a very long useful life once in place. As we noted it is unlike many other contact treatments in that Stabilant 22 will not cross-link (becoming varnish-like) under the action of sulfur based curing agents in elastomers, cutting oil residues, or the sulfur-bearing free-machining metal alloys used in some contacts. In most types of service work, the cost of the time involved in changing the interconnect cables or in removing and replacing a module, plug-in component, or IC will be much greater than the cost of the Stabilant used to treat the connectors.

It is important to note that not only will proper connector treatment cure existing contact problems, but also prevent recurrence of contact problems, eliminating the necessity of repeating the treatment. In other words, why waste the time and expense of doing a job more than once?

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

For home stereo system use, the Stabilant 22A (the isopropyl alcohol diluted form) is preferred, available in a 15mL Service Kit. On special order, a 15 mL bottle of the concentrate, Stabilant 22 is available at a cost of about 5 times as much per mL as the diluted material). For studio, maintenance, and OEM applications, industrial sizes (50mL and up) are available as well.

### **What is the difference in use of the Stabilant 22 vs. 22A?**

The concentrate, Stabilant 22 is most useful where the connections are out in the open such as exposed RF connectors and RCA plugs. 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. The isopropyl alcohol diluent serves only to carry the concentrate into the connector.

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

Not at present. During our early market research we did provide spray cans of the material. Users found that in many cases it did not save time with the application of the material; spraying wasted many times the amount that actually got on the contact areas. Excess material was left (outside of the contact area) that had to be cleaned up.

A further consideration is the fact that we wish to use neither the chlorofluorocarbon propellants, nor the usual alternative, a propellant consisting of a highly flammable mixture of butane and propane. Remember, very little Stabilant 22 is necessary to treat a contact, so why waste it?

## **Is Stabilant just another contact cleaner?**

No, it is important to remember that Stabilant 22 is an electrically active resident treatment which enhances conductivity within a contact without causing leakage between adjacent contacts. Thus, only small quantities are needed.

When using Stabilant 22A, the alcohol can ensure a clean application when contacts are not already badly fouled. However, in that case, we recommend isopropyl alcohol or another suitable contact cleaner to remove bulk contamination before Stabilant treatment .

## **How much should be used?**

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

## **How can I be sure that Stabilant 22 works?**

Stabilant 22 passed a number of stringent field tests before being issued NATO supplier (CAGE) and item part numbers.

We could cite the following established applications of Stabilant 22:

- hospitals use it on biomedical electronics to improve reliability of equipment where lives are in the balance.
- broadcasting networks use it to achieve the last measure of reliability in critical network switching applications.
- Stabilant is TSO'd for avionics and navigational aids.
- computer manufactures and field service personnel use it to increase reliability in their products.
- With years of use in consumer and pro audio, users have found the material easy to use and its results impressive.
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But we still feel that the best way to find out how well it works is to try it out; samples are available on request.

## **Can I use Stabilant 22 in other equipment?**

Stabilant 22 can be used to restore and improve the reliability of computers, test equipment, cameras, and more - everywhere low voltage signal/control connections. Other Application Notes detail the benefits and usage considerations for higher voltage and current circuits, and other types of equipment and their operating environments.

## **Are Stabilant products hazardous?**

Stabilant 22 is quite safe when used as directed. In tests, it has caused no skin reactions (e.g., sensitization). In the undiluted form it is non-flammable, although if heated above 200°C, its decomposition products will burn.

If ingested in small amounts it will cause stomach upset, while ingestion of the concentrate in amounts in the range of 100 mL could cause more serious illness! If it gets into the eyes, it should be flushed out with running water. Stabilant 22 has an LD<sub>50</sub> of about 5 grams per kilogram body weight (considered essentially non-toxic).

Since Stabilant 22A contains isopropyl alcohol, one is more concerned with the safety precautions for the alcohol. Finally, in all cases, skin and respiratory exposure to these materials is insignificant in typical application.

Users should review the Safety Data Sheets for both Stabilant 22 and 22A. These are available on request for all Stabilant products (many are found on our website).

In the United States, Stabilant 22 is not subject to the Toxic Substance Control Act (TSCA), nor reportable under SARA Title III. Some states have restrictions on the type or quantity of solvents used in coatings. The use of even alcohol diluted Stabilant products results in a significant reduction in the equipment solvent burden (per year, often by a factor of 200), which has led Stabilant products to be the contract treatment of choice for many environmentally conscious agencies.

### **Will Stabilant 22 damage any components or plastic parts?**

Both we and others have done extensive tests on the compatibility of the Stabilants with plastics and elastomers. We know of no molded plastic material used in the electronics industry that is adversely affected by Stabilant 22. Some elastomers are "swelled" slightly by the isopropanol diluent. This is not to say that somewhere, at some time a manufacturer, won't come up with a plastic formulation, to cut costs, which might be easily damaged. It is highly unlikely that such materials would be used in good equipment.

### **Does the action of Stabilant 22/22A deteriorate with age?**

Stabilant 22 has been used in some applications for over twelve years now without showing any sign of reduced effectiveness. The material has a high molecular weight and a very low vapor pressure and so is not prone to loss by evaporation.

Once again let us emphasize the point that unlike contact treatments that contain oils, Stabilant 22 will not cross-link when exposed to certain materials such as high sulfur brass. or when used on contacts where cross-link promoting agents are present in the environment. This phenomenon of "varnishing" does not occur with Stabilant 22.

NATO CAGE/Supplier Code 38948

5mL Stabilant 22 (Concentrate), NATO Stock Number 5999-20-002-1112

15mL Stabilant 22 (Concentrate), NATO Stock Number 5999-21-909-9981

15mL Stabilant 22A (Isopropanol Diluted), NATO Stock Number 5999-21-900-6937

15mL Stabilant 22E (Ethanol Diluted), NATO Stock Number 5999-21-909-9984

Stabilant products are patented. Because the patents cover contacts treated with the material a Point-of-Sale license is granted with each sale of the material.

**SAFETY DATA SHEETS ARE AVAILABLE ON REQUEST**

**NOTICE**

This data has been supplied for information purposes only. While to our knowledge it is accurate, users should determine the suitability of the material 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 consequent damages, howsoever caused, based on the use of this information.

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