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**Number 15**

## **APPLICATION NOTE**

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### **Use of Stabilant 22 for Stereo Systems**

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#### **What is Stabilant 22?**

Stabilant 22 is an initially non-conductive block polymer that under the effect of an electrical field in a very narrow gap between metal contacts, becomes conductive. The electric field gradient at which this occurs is such that the material will remain nonconductive between adjacent contacts in a multiple pin environment.

Thus, when applied to electromechanical contacts, Stabilant 22 provides the connection reliability of a soldered joint without bonding the contact surfaces together.

While Stabilant 22 exhibits surfactant action it is not promoted as a contact cleaner. Equally, it exhibits quite good lubricating properties but is not promoted as a contact lubricant. Its strength is in its active property when used in a connection and the other properties are a bonus.

Remember, Stabilant 22 is a resident treatment, it only has to be applied once and is left in place.

#### **What are its benefits in a stereo system?**

In general, Stabilant 22 can be used wherever electrical contacts are used, whether this is in connectors, or in switches. In home stereo, Stabilant 22 or 22A have numerous. When the signal-path connectors and switches in an entire stereo system are treated (including socketed ICs and card-edge connectors) the distortion and signal-to-noise performance are usually improved substantially.

#### **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 ITT-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. Treat only the individual tube pins!

In transistor power amplifiers the output transistor pins can be treated as well 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 use. In these patch bays, Stabilant 22A is recommended for both 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 material that might have been used. The reason for this is that it is not uncommon to find that the ring-tip-sleeve type connector contacts have been made from a "free-machining" brass that has a high sulfur content. The presence of sulfur can cause unsaturated oils to "varnish" producing a thin film that is difficult to remove. Unlike most of these protective oils, Stabilant 22A is chemically stable in the presence of these cross-linking chemicals and therefore, need not be periodically cleaned off and replaced.

There is also a potential problem 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. Nevertheless, for best improvement this film should be removed before using Stabilant 22A.

TUNER, TV, SATELLITE EQUIPMENT AND GENERAL ANTENNA USE: Stabilant 22A can be used on cable TV connections, on the co-axial connectors used between satellite receivers and the low-noise amplifier, and on the flange between the low-noise amplifier and the satellite antenna.

Stabilant 22A is not waterproof (it can mix with water as it does 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. Here, what is important is that not only will proper connector treatment cure existing contact problems, it will prevent contact problems from re-occurring, thus eliminating the necessity of repeating the treatment at a future date.

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 the initial stages of our market research we did provide spray cans of the material, but the users found that in many cases it did not ease the application of the material; spraying wasted many times the amount that actually got on the contact areas, and generally left a film of excess material that had to be cleaned up (for appearance and practical reasons).

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, large quantities of the material do not have to be "hosed" on as is the case with cleaners.

## **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 the material works?**

Quite apart from the fact that Stabilant 22 has passed a number of stringent field tests before being issued a NATO supply code number, we could cite the fact that Stabilant 22 is used by many hospitals on their bio-medical electronics to improve reliability of the equipment where lives are at stake. We could cite the use of Stabilant 22/22A by many broadcasting networks to achieve the last measure of reliability in critical network switching applications. We could point out that many computer manufactures and field service personnel use the material to increase reliability in their products. We could note that it has been TSO'd for use in avionics & navigational aids, or we could refer the years of its use in the audio field where consumers have found the material easy to use and its results impressive. But we still feel that the best way to find out just how well it works is to try it out!

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

It can be used in test equipment, cameras, just about everywhere there's a low voltage signal or control connection. For example, the effect of Stabilant 22 in Computers is to reduce the number of times the system locks-up or crashes, often it completely eliminates non-software crashes in older systems.

When used on socketed ICs, connectors for photo-couplers/isolators, rotary, push button, or slide switches, or BNC connectors, the net effect is usually to make the proper operation of the equipment less erratic, and in the case of IEEE-488 bus-controlled equipment, to cut down on the potential for system lock-ups.

## **Is the material hazardous?**

Stabilant 22 has caused no skin reactions in tests. 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). In the form of Stabilant 22A, one is more concerned with the safety precautions for isopropyl alcohol. Safety Data Sheets are available on request.

In the United States, neither Stabilant 22 or Stabilant 22A are subject to the Toxic Substance Control Act (TSCA), nor are either of them reportable under SARA Title III. Some states have restrictions on the type or quantity of solvents used in coatings; the fact that the use of even isopropyl-alcohol diluted Stabilant 22A results in a factorial reduction in the equipment solvent burden (per year) by about 200, has led Stabilants 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?**

Stabilants have 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

15ml Stabilant 22 (Concentrate), NATO Part # 5999-21-909-9981

15ml Stabilant 22A (Isopropanol Diluted), NATO Part # 5999-21-900-6937

15ml Stabilant 22E (Ethanol Diluted), NATO Part # 5999-21-909-9984

The Stabilants 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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