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**Number 30**

## **APPLICATION NOTE**

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### **Preventing Computer System Crashes with Stabilant 22**

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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 sold as a contact cleaner. Equally, it exhibits quite good lubricating properties but is not sold as a contact lubricant. Its strength is in its active properties when used in a connection and the other properties are a bonus.

#### **Why do computer and computer systems lock up or crash?**

Assuming the software is not at fault, or that you don't have conflicts caused either by the improper installation of programs, misbehaving TSR programs, or even port address, interrupt, or DMA conflicts between expansion boards, the most common problem is poor contacts either in the computer (including the expansion boards) or the keyboard, or in the connectors which attach the computer to its keyboard, printer, scanner, LAN's, or other peripherals.

#### **Can these crashes be prevented?**

Yes, most of them can be prevented. As good as connectors are, they are still the weakest link in your computer's operation. There are hundreds of these connections in a typical computer system. Outside of the obvious ones such as the connector that connects the computer to the printer, or LAN connections, the computer itself is full of electromechanical contacts. These range from the card-edge connectors that are used on the various plug-in cards, to the numerous types of sockets into which IC's are plugged. The interdependence of the components within the computer is such that the erratic operation of virtually any one of the contacts in any of these connectors can

crash or lock-up the computer. What is even more frightening, if the computer doesn't hang up, vital data or the execution of a program sequence may be altered such that key data is overwritten on a disk and thus lost.

### **What do these crashes cost?**

Many users are not aware of the cumulative costs of computer crashes. But consider: if you're a programmer and have been working on a program for an hour when the computer crashes, and you didn't save anything during that time; the crash just cost you an hour's work not to mention the additional time required to re-adjust your overview of the program on which you were working. If you're developing a program you'll have to call up the previous version, put your brain in reverse, and try to remember just what it was you did during that hour. If you've ever had to do this, then you know just how frustrating it can be. Thus the loss of that hour's work can cost you a lot more than that hour.

Consider a person processing a batch run of invoices. What was the last invoice that was processed? Did the computer program rewrite the FAT file every time an invoice was processed or was it waiting until the completion of the run to update the directory in the computer? Did your program handle all the interdependent files in an identical manner? Do you even know? Well, if it happened to one of your staff and you have to sort out the mess, you're going to find out the hard way!

Consider someone working on a spreadsheet who didn't save it before the computer crashed, not only would it be frustrating to have to go back and figure out just where they were in its development at the previous save, if any, can you be sure that they will be able to match their previous performance?

As you probably know, when a deadline is hanging over your head, it's human nature to try and speed things up by ignoring some of the details which prevent problems, you get "on a roll" and that's when accidents happen. Gee..forgot to save it did you? Now what will the additional delay and a missed deadline cost you?

What about the hidden costs of client dissatisfaction? Could you have lost a number of jobs because you missed a deadline. Sure, you know why it couldn't be met but does your client understand? Then again, perhaps you couldn't really do your best work because of the pressure or because of the lack of time?

What about an engineer involved in a complex CAD-CAM problem? Can you imagine how he feels when part way through a day of intensive work, his input device freezes leaving several hours work in a non- recoverable state?

Or consider newspaper reporters, working against a deadline. How often have we heard of stories which have gone off into limbo because of a terminal crash?

And then, consider the problems imposed by computer crashes in process control or experimental data acquisition. The disruption in even a fail-safe process control could cost more than the computer; and in data acquisition, the whole experiment might have to be restarted from scratch.

If you're responsible for servicing a system wouldn't you like to increase the reliability of the equipment in your charge? And if your part of a team marketing complex systems think of how an increased reputation for reliability could aid you in the sale of replacement or even new systems!

Too often, people tolerate problems on the basis that so long as their system is just as reliable as the other parties. then that's all they have to achieve. In fact we often run across managers who tell us that on the basis of the proceeding philosophy, "They don't have any connector reliability problems at all!" But when we talk to their service personnel we find out otherwise.

Connector unreliability is like a time-bomb, waiting to go off in the most unexpected places and at the most unexpected times. Very expensive preventative maintenance programs attempt to stop these unexpected events. But connector problems seem to elude even the most thorough maintenance; perhaps because of the sheer quantity and diversity of the connections in even a simple system.

### **What can be done to reduce the number of these crashes?**

Mainframe computers are usually operated in humidity and temperature controlled rooms using specially filtered and regulated power lines just to obtain reliability. Military computers are designed with special shock-proofed and electrically isolated cases; "Hardened" for use in the field. You probably can't afford the costs of these types of solutions. And you may not realise how vulnerable you are as the complexity of your installation grows; until, one day, it comes to a halt! Often it is at this point that the person responsible for the system is faced with a major re-planning of the system to be sure that the problem does not occur again. At the same time, the system has to be made operational once more as soon as possible! The amount of planning and the re-organization of the system at this point can be very expensive and the words fail-safe often seem very ironical. Usually the planner finds out that some of the older and often key elements in the system may have to be replaced due to diminishing reliability. Are the equivalent new units compatible? After all, there are probably more non-standard standards in the computer industry than anywhere else!

If you need reliability shouldn't you start dealing with the least reliable component in the system? Of course! And that's where our product comes into use; a connector reliability upgrade based on a simple one-time treatment of all the connectors in the computer.

### **What is this treatment?**

It involves treatment of all the connectors with a "contact enhancer" called Stabilant 22. The use of Stabilant 22 or its isopropyl alcohol-diluted form. Stabilant 22a will make contacts from 10 to 100 times more reliable in operation, eliminating almost all "lock-ups" or crashes caused by connector malfunction. The Stabilants are not used repeatedly like a cleaner, instead they are applied to all the contacts and left in place!

### **What specific types of failures can it prevent?**

When applied to socketed DRAM, RAM or SIMM's it will usually prevent the annoying PARITY ERROR message indicating a bad memory error. When used on the connectors of a hard disk drive it will usually stop intermittent malfunctions in drives that often occur once they warm up. We're sure that you've had error messages indicating that a peripheral device wasn't responding when you know that it was plugged in and turned

on! And have you ever considered the slow-down in a LAN or data transfer operation because of the need to re-transmit data that was received incorrectly the first time?

### **Is it reliable?**

Both Stabilant 22 and Stabilant 22a are used in electronics where equipment failure can cost lives! These applications typically include biomedical electronics in hospitals, as well as aircraft navigation and instrument landing systems. Does that answer your question?

### **What is its effective life?**

If Stabilant material is not lost during the repeated plugging and unplugging of a connector, the coating should last in excess of 5 to 10 years. Where a number of different connectors are being interchanged in a single socket there will be an obvious need to treat all the units to obtain this life. This is because the vapor pressure of the material is so low that the material is used in space applications.

### **Is it expensive to use?**

Not when you consider how much time can be saved by the use of Stabilants! And when you actually have to service the computer how long does it take you to remove the computer's case just to get to the circuit boards inside? How long does it take to maneuver the computer around to the point where you can even remove the case or undo the port connectors? Have you timed yourself on the removal and replacement of a BIOS chip lately? There are about 900 drops in a 1.5 mL Stabilant 22a service kit, and each drop could save you many minutes of service time! Some of our customers report savings of as much as \$3000 per 1.5mL bottle of Stabilant 22a!

### **Why should we use Stabi/ant over less expensive alternatives?**

We grant that the material itself is expensive. However it is unique in having a very long useful life once in place. Unlike other so-called contact treatments Stabilant 22 will not cross-link (becoming varnish-like) under the action of sulphur based curing agents in elastomers, cutting oil residues, or the sulphur-bearing freemachining metal alloys used in some contacts. In most types of service work, the cost of the time involved in removing and replacing an expansion board will be much greater than the cost of the Stabilant used to treat all the connectors on that board. Here, what is important is that not only will proper connector treatment cure existing contact problems, it will prevent others from occurring, thus eliminating the necessity of repeating the treatment at a later date!

In other words, why should you have the expense of doing a job more than once?

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

Stabilant 22 and 22a are packaged in 15mL, 50mL, 100mL, 250mL, 500mL and 1 Liter containers. (Stabi/ant 22a is also available in a 7/2 mL vial for inclusion with expansion boards) The Stabilants are available in two forms; as a concentrate Stabilant

22, and as an isopropyl alcohol-diluted form called Stabilant 22a. Because of the 4:1 dilution, a given size container of Stabilant 22a will cost about one-fifth the amount of a container of Stabilant 22 for it has only one-fifth the amount of the concentrate in it. A third packaging is available for industrial-bulk users. Stabilant 22s packages the concentrate such that it occupies one-fifth the volume of an otherwise empty container. This saves the added costs of shipping isopropyl alcohol, as well as allowing the end-user to use an alternate diluant of their own choice.

### **What is the difference in use of the Stabilants?**

The concentrate, Stabilant 22 is most useful where the connections are out in the open such as card-edge connectors or where the material is also being used for its lubricating qualities, such as an insertion aid for IC's. 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 diluant 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 most cases they did not speed the application of the material enough to justify the cost of the material that was wasted. In addition the spray application generally left a film of excess material that had to be cleaned up if only for appearances sake.

We do not want to use either a chlorofluorocarbon propellants or one of the highly flammable mixtures of butane and propane that are often being substituted. Remember, very little Stabilant 22 is necessary to treat a contact, so why waste it?

And on the topic of environmental impact, have you considered the fact that the use of a small amount of Stabilant can replace the use of up to 200 times as much cleaning solvent?

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

No, it is important to remember that Stabilant 22 is an electrically active material 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's 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.

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

This was made up at the request of several manufacturers and electronics equipment service organizations who wanted a standard kit of reasonable dimensions that they could purchase and stock in quantity, issuing it to their field service personnel as required. The service kit consists of a 15mL container of Stabilant 22a and some soft-tipped swabs as applicators, all in a small capped tube. The applicators are reusable.

## **Why would anyone want to buy quantities of the concentrate?**

Many manufacturers and larger cable companies prefer to make large volume purchases, diluting the material and issuing it, as required, for specific field service requirements.

Many end users have found that the material cuts their service costs so much that it is more economical to purchase Stabilant 22 in the larger container sizes rather than run any risk of being without the material. The number of different applications tends to increase as users discover the large number of problems that can be solved by the material.

## **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 we were issued a NATO Supplier 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 in the balance, we could cite the use of Stabilant 22 by many broadcasting networks to achieve the last measure of reliability in critical network switching applications. We could refer to its use in navigational aids, or we could number the years of its use in the audio field where consumers found the material easy to use and its results impressive. We still feel that the best way to find out just how well it works is to try it out! That's why we have samples available. Almost every service shop or manufacturer has equipment available where the switches or connectors have become erratic over the years. Use Stabilant 22a on them for a quick turnaround test, or use the material in field service and satisfy yourself.

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

It can be used in test equipment, laser-printers, scanners, radios, audio systems, intercom systems, satellite systems, telephones...in fact just about everywhere there's a low voltage signal or control connection.

## **Is the material hazardous?**

Stabilant 22 has caused no skin reactions in tests. In the undiluted form it is non-flammable although if its temperature is raised above 2000 C the decomposition products will burn. If swallowed in small quantities it will cause some nausea and stomach upset. Both Stabilant 22 and Stabilant 22a have an LD50 of about 5 grams per kilogram body weight which is virtually non-toxic. Neither are subject to the Toxic Substances Control Act and neither are reportable under SARA Title III.

Service and Production Managers faced with the need to eliminate solvents from the workplace are finding that the use of Stabilants not only allows them to meet the new regulations, but substantially improves the reliability of their equipment in the process!

Safety Data Sheets are available on both products.

### **What is the best way to apply it to a contact?**

The 15ml container has a "dropper" type cap that allows Stabilant 22a to be applied directly to such components as socketed IC's, switches, connectors, etc. Some end users prefer to buy larger quantities and use industrial syrettes to apply the material onto connections. Camel's hair or sable brushes can be used to brush it on card-edge connectors. Cards can also have their edge connectors dipped into the dilute material. The material can be silk-screened on key-switch-pad areas on circuit boards or "offset printed" onto the same areas when protruding components or component pins prevent silk-screening.

And the material can be readily handled by the numerous types of automatic dispensers available in the marketplace!

### **Does the action of Stabilant 22 deteriorate with age or cause deterioration?**

Our first concern has always been that Stabilants should not cause any problems when used in a system. Not only did we do lab-modeling and accelerated life tests. we delayed the introduction of the material for several years until we satisfied ourselves through field trials that real-life conditions did not show up any unexpected problems for the use of Stabilants.

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, thus it is not prone to evaporation.

The Stabilants do not affect elastomers save for some slight swelling of some materials. The diluant employed (isopropyl alcohol) usually is responsible for this problem. although the potential for this is gone as soon as the isopropanol evaporates. Nor are plastics generally affected. There are a few restrictions, but they are very minor. For example we don't recommend the use of Stabilants on very low-cost resistive-paint-film type potentiometers. And we don't recommend that Stabilants be used on switches breaking inductive loads where sparking is present; the decomposition temperature of Stabilant 22 is about 220 0 Celcius.

Once again let us emphasize the point that unlike some other contact treatments containing oils, Stabilant 22 will not cross-link when exposed to certain materials such as high sulphur brass, in connectors having rubber or thermoset plastics containing accelerants or curing agents, 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.

Thus, besides their efficiency, the Stabilants are the safest long-term connection treatment available anywhere in the world!

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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