



Static Is A Touchy Business

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Introduction-

Today, many people are upgrading their own computers. From installing a memory upgrade to adding a new video card, you can save money by doing it yourself. *There is one problem however....* hiding in the shadows is **static discharge**.

Have you ever walked across the floor and touched a door knob... and felt like you were hit by a lightning bolt? This is static discharge. That same discharge inside a computer can severely degrade or disable a component or your entire computer.

Years ago electronic parts were big and were not susceptible to the effects of static discharge. Today, electronic parts are very small and compact. Surface Mount Technology (SMT) allows us to have on one board, the functionality of what used to take two or three separate boards.

The following information will help you to understand static discharge... and how to safe guard your investment.

Static Is Undoing Some Of Your Best Work-

Many of the components you come in contact with, including all those in the chart below, are susceptible to damage from static discharge. In the case of the most sensitive, it can take as little as 30 volts to degrade or completely destroy the component.

What do you have to do to build up a potentially destructive charge? It can take as little as sitting up straight or lifting one foot off the floor. Walking across a vinyl floor can generate 4,000 volts; a carpeted floor, 8,000 volts.

And you're not the only danger. Plastic coffee cups, cellophane on cigarette packs, synthetic fabrics, paper and visitors to your work area, to mention a few, can also carry a static charge large enough to destroy work in which you have invested a lot of time.

CHART 1.0
SD Susceptibility Of Various Electronic Devices

<u>Device Type</u>	<u>Range of SD Susceptibility (Volts)</u>
VMOS	30 to 1800
MOSFET	100 to 200
GaAsFET	100 to 300
EPROM	100
JFET	140 to 7000
SAW	150 to 500
OPAMP	190 to 2500
CMOS	250 to 3000
Schottky Diodes	300 to 2500
Film Resistors	300 to 3000
Bipolar Transistors	380 to 7000
ECL (PC Board Level)	500 to 1500
SCR	680 to 1000
Schottky TTL	1000 to 2500

How Serious Is The Problem? Perhaps This Will Put It In Perspective

Many people feel that static is no great problem because, with minimal static control procedures, they are able to keep the device failure rate to 0.5%. However, with 20 devices per board, this means 10% defective boards. With five boards per system, that rate translates to a **system failure of 40%**.

Fortunately, the solution is not difficult. It is not necessary to ban plastic cups or visitors from the work areas. In fact, it would be impossible to eliminate all the potential carriers of static charge. Instead, all it takes is for **everyone** to observe two simple static control rules **at all times**.

As you will see in the next few pages, that's not difficult at all.

Rule One-

Handle All Static Sensitive Components At A Static Safe Work Area

A static safe work area can protect against static charge on conductive and nonconductive objects, and personnel. Several elements must be used.

Floor Mat- You become grounded when you step on the conductive floor mat, and your body will not hold a static charge. As you approach your work area, be sure that you have contacted the floor mat before reaching for your wrist strap or turning on the ionizing air blower.

Personnel visiting your work area without wrist straps must also contact the floor mat before approaching the work bench.

Floor mats are usually used at your place of business or in your work shop. Mats range in price from \$75.00 to \$450.00.

Wrist Strap- Your wrist strap is connected directly to ground, and keeps you at zero static potential even when you are not in contact with a floor mat. Always put your wrist strap on before beginning work.

Visually inspect your wrist strap each time you put it on, to be sure that it is connected properly. Be sure it is on snugly. Taking your wrist strap off should be the last thing you do before leaving the work area.

Wrist straps range from \$50.00 to \$100.00. There are also "one-time" use straps available for around \$10.00.

Ground Cord- Your conductive table and floor mats are usually grounded via a grounded cord. Become familiar with where they are located. It is a good idea to visually inspect them each day to be sure they have been inadvertently disconnected.

Conductive Table Mat- When conductive items are placed on the conductive table mat, their static charge is drained to ground. Static shielding bags, conductive tote boxes, conductive foams and conductive shipping tubes all lose their charge when placed on the mat.

Always lay conductive carriers on the mat and attach your wrist strap before removing the components from the carriers.

The table mat is a static safe work surface, and will not hold a static charge. Mats range from \$25.00 to \$100.00. Portable table mats are available in the same price range.

Air Ionizer- Nonconductive materials, such as plastic and synthetic fabrics, cannot be grounded. Only ionized air can neutralize their static charge. It will also help if the presence of these objects in the work area is kept to a minimum.

Turn on the air ionizer immediately after attaching your wrist strap.

If you are applying or removing pressure sensitive tape, do so directly under the blower, using a slow, steady motion. Air Ionizers are costly, but will give you the added protection you need if you work on electronic equipment frequently.

Rule Two-

Transport All Static Sensitive Components In Static Shielding carriers or packages

One particular hazardous time for static sensitive components is during handling and shipping. Static charge on objects and personnel, even static buildup resulting from the movement of the parts themselves, can blow or degrade parts.

Any board or device leaving the protection of a static safe work area must be placed in the appropriate static shielding container. One placed in such a container, it is fully protected from both static discharge and external static fields.

Other Things To Remember-

- Only place components in, or remove them from, static shielding containers at a static safe work place.
- Static shielding bags are designed to contain sensitive devices, not to be used as potholders to pick them up. This does absolutely no good.
- Place components in their containers so that the leads or portions of the component do not protrude from the container.
- When using conductive foam, do not remove or insert IC's, unless at a static safe work area. Make sure that leads do not penetrate to the other side of the foam.
- It's a good idea to put static awareness labels on all components leaving the work area, to prevent removal from static shielding container during transit.

Computer Service Organization-

- When using a CSO, verify that they use anti-static procedures and make sure they wear a wrist strap when working on your equipment.
- For added comfort, make sure the person performing service is an A+ Certified Service Technician.

Static Awareness Quiz-

1) Some static-sensitive components can be destroyed by:

- A. 30 volts
- B. 300 volts
- C. 3,000 volts

2) Walking across a carpeted floor can generate as much as:

- A. 80 volts
- B. 800 volts
- C. 8,000 volts

3) Static charges can be built up on:

- A. Conductive objects
- B. Non-conductive
- C. Personnel
- D. All of the above

4) Once a board is placed in a PC, it is safe from static damage:

- A. True
- B. False

5) Memory upgrade purchase...

If a salesperson hands you memory that's not in a protective bag, should you purchase it?

- A. Yes
- B. No

6) When should you put on the wrist strap?

- A. Before beginning work
- B. Before you sit down
- C. After you sit down

1:A 4:B
2:C 5:B
3:D 6:A