ANTISTAT™
ESD & PRODUCTION CONSUMABLES

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CLEANROOM PRODUCTION SOLUTIONS

Learning about Electrostatic Discharge - Part 1:

ESD Protected Work Area

Contents

The Basics of ESD

What is static electricity or electrostatic discharge?

When two surfaces come into contact and separate, electrons move or can be given up to the other surface, causing an imbalance.

The amount of static electricity generated depends upon the materials subjected to contact or separation, friction, the area of contact or separation, and the relative humidity of the environment.

At lower relative humidity, as the environment is drier, charge generation will increase significantly.

If two items are at differing electrostatic charge levels, as they approach one another, a spark or Electrostatic Discharge (ESD) can occur. This rapid transfer of electrostatic charge can generate heat and melt circuitry in electronic components.

There are two types of materials to be aware of:

1. Conductors

Conductors have the ability to remove electrostatic charges to ground. Electrical current flows easily through conductive materials so therefore can be grounded easily.
Examples: Metals, carbon and people.

2. Insulators

Insulators hold charge, these materials cannot be grounded and cannot “conduct” the charge away. Electrical current does not flow through insulative materials so they cannot be grounded.
Examples: Plastics, glass, and dry air.

Why worry about ESD?

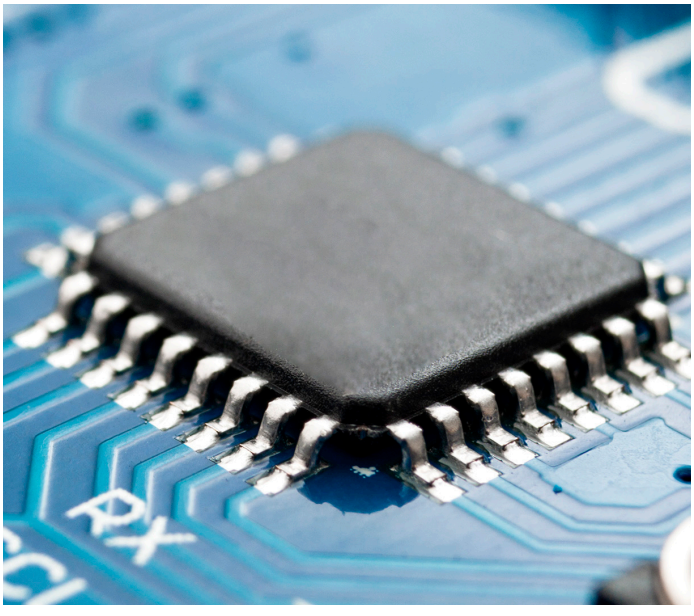
Electrostatic Discharge (ESD) can damage sensitive electronic components, resulting in:

- Failures
- Reduced reliability
- Increased rework costs
- Latent component failures in equipment in the field

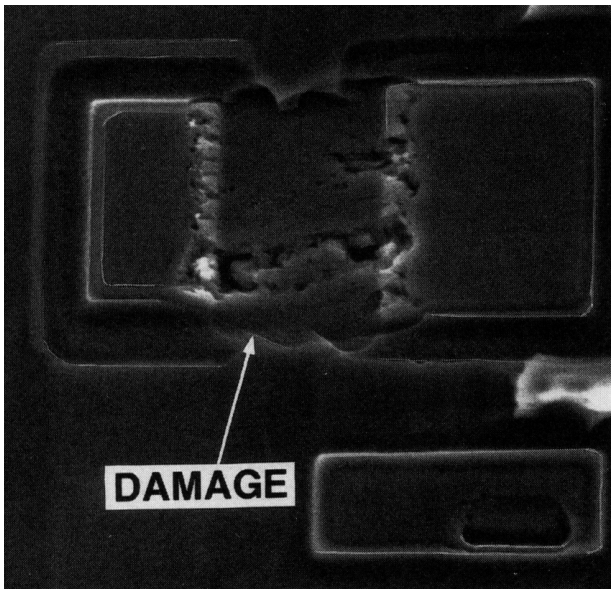
The cost of a single ESD failure in the field can be astounding. The cost of in-house failures can also be significant, and wastes time and resources. Whilst it is difficult to attribute specific failures to ESD damage, most companies prefer to prevent possible damage and reliability problems by storing, assembling and handling equipment under electrostatic safe conditions.

ESD damaged the device below. The static spark that damages devices may be too small for you to see or feel.

An electronic device or 'chip'



Magnified view of the device interior



Typical electrostatic voltages

Walking across a carpet
1,500 - 35,000 volts

Walking over untreated vinyl floor
250 - 12,000 volts

Using a work bench
100 - 6,000 volts

Unwinding regular tape
9,000 - 15,000 volts

"People generate charge frequently but for a person to feel a discharge it must be around 3,000 volts. However, as little as 10 volts might damage a component."

(Source: ESD Association)

Basic ESD events – what causes devices to fail?

Damage is usually caused by one of three events:

- **Direct ESD to the device** – can occur when any charged conductor (including the human body) discharges to an item.
- **ESD from the device** – the transfer of charge from an ESD susceptible item to a conductor. For example, through handling or contact and separation from packaging materials, worksurfaces or machine surfaces.
- **Field-induced discharges** – when an object becomes electrostatically charged it creates an electrostatic field.

Whether or not damage occurs to an ESD susceptible item by an ESD event is determined by the device's ability to dissipate the energy of the discharge or withstand the voltage levels involved. The level at which a device fails is known as the device's ESD sensitivity or ESD susceptibility.

What Can We Do About It?

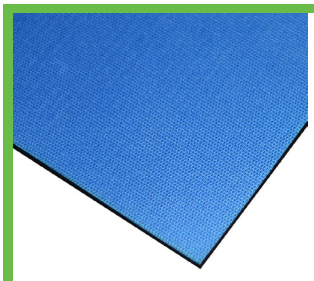
Devices are protected from ESD when a work area is equipped with proper static control items:

Common Grounding Points
A common ground point allows all connected items to be at the same potential. Usually utility ground (mains ground) is used.
Find out more in Part 2: Working Within A Typical EPA

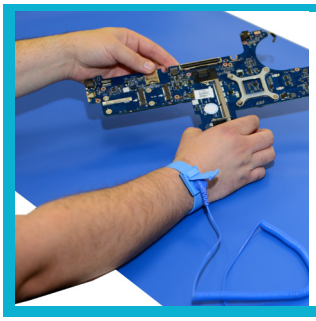
Ground Cords
Ground cords connect static control devices to the ground point. These are available in a variety of terminations, and designs.
Find out more in Part 2: Working Within A Typical EPA

Foot Grounders
Foot Grounders allow people that stand or move on the job, to equalize static potential with ground. Always wear two grounders. *(Image displays a heel grounder. Sole and toe grounders are also suitable)*
Find out more in Part 2: Working Within A Typical EPA

Wrist Straps
A wrist strap allows static potential on a person to equalize with ground. People that sit at a bench should always wear a wrist strap, even if they wear foot grounders.
Find out more in Part 2: Working Within A Typical EPA



ESD Flooring / Matting
Both floor and bench ESD matting is required to be connected to ground. This enables this dissipation of electrical charges whilst using foot and wrist straps.
Find out more in Part 5: Choosing the Right Matting

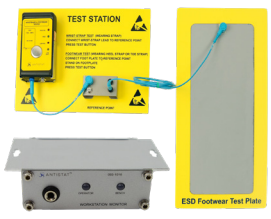


Work Surface
You should be aware of the type of work surfaces used by your company. Be sure to keep your work surface clean, and follow the maintenance procedures recommended by the manufacturer. Be aware that some regular cleaners contain silicone, an insulator.
Find out more in Part 5: Choosing the Right Matting

Protective Packaging
Components and devices must be placed in ESD protective packaging before being moved away from the ESD Protected Area.
Find out more in Part 3: Choosing the Right ESD Bag

ESD Clothing
ESD Clothing prevents static charges and is an important element of any ESD protected area.
Find out more in Part 2: Working Within A Typical EPA

ESD Warning Signs
ESD warning signs keep everyone mindful of correct handling requirements, and define an ESD protected area.
Find out more in Part 2: Working Within A Typical EPA



Wrist Strap, Foot and Equipment Testers
ESD Wrist Strap, Foot and Equipment Testers are used to check the continuity of the grounding equipment and to ensure contact is made with the user ensuring they function correctly before stepping into an ESD area. Constant monitors within an EPA are used to provide a constant check that the user is correctly grounded.
Find out more in Part 2: Working Within A Typical EPA

Standards

Industry standards

When setting up an Electrostatic Discharge Protected Area (EPA), it's important to adhere to various industry standards and guidelines to ensure effective electrostatic discharge (ESD) control and prevent damage to sensitive electronic components. Here are some key standards and guidelines to consider:

ESD Association

ANSI/ESD S20.20: This is a widely recognised standard that provides guidelines for the development of ESD control programs in various industries, including electronics manufacturing, assembly, and repair. It covers the requirements for EPA design, ESD control procedures, grounding, personnel grounding, testing, and auditing.

International Electrotechnical Commission

IEC 61340-5-1: This international standard specifies requirements for the implementation of an ESD control program within a facility, including EPA design, grounding, protective measures, and test methods. It provides comprehensive guidance for controlling static electricity in electronic manufacturing and handling processes.

Jedec: Global Standards for the Microelectronics Industry

JESD625-A: Published by the Joint Electron Device Engineering Council (JEDEC), this standard outlines ESD control procedures for handling electronic devices. It covers various aspects of ESD control, including workstation setup, personnel grounding, packaging, and testing.

Association Connecting Electronics Industries (IPC)

IPC-610: The IPC-A-610 standard addresses acceptable criteria for the assembly of electronic components. It includes guidelines for ESD control, handling, and testing during electronics assembly processes.

ISO Standards

ISO 9001: 2015 is a standard which sets out the criteria for quality management and is based on a number of principles including a strong customer focus, the motivation and implication of top management, the process approach and continual improvement.

ESD Association standards

The ESD Association (ESDA) produces a range of standards and documents related to ESD control. These include standards for grounding, wrist strap requirements, packaging materials, and more. Some examples include **ANSI/ESD S1.1** for wrist straps, **ANSI/ESD STM11.11** for testing ESD packaging materials, and **ANSI/ESD STM97.1** for floor materials.

Industry-specific guidelines

Depending on your specific industry, there may be additional guidelines or standards that are relevant to your EPA setup. For example, the automotive industry might reference the **IATF 16949** standard, while the aerospace industry may refer to **AS9100**.

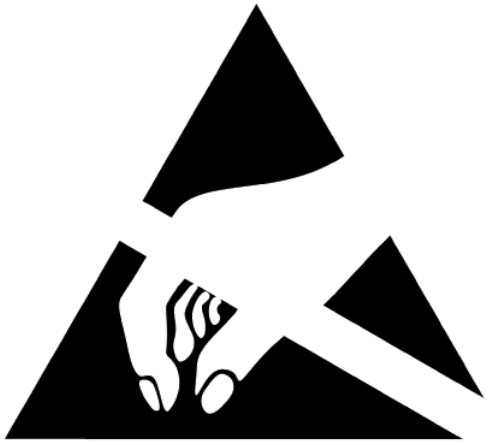
It's important to note that the specific standards and guidelines you need to follow may vary based on your industry, location, and the types of electronic components you handle.

When setting up an EPA, consider consulting with ESD experts, compliance officers, or relevant industry associations to ensure that you are meeting the appropriate standards and guidelines for your specific context.

ESD Symbols

ESD susceptibility symbol

The ESD susceptibility symbol consists of a triangle, a reaching hand, and a slash through the reaching hand. The triangle means “caution” and the slash through the reaching hand indicates that an item is susceptible to damage from an ESD event. Because of its broad usage, the symbol has become associated with ESD.



The ESD Symbol is applied directly to integrated circuits, boards, and assemblies that are static sensitive. It indicates that handling or use of this item may result in damage from ESD if proper precautions are not taken.

ESD protective symbol

The ESD protective symbol consists of the reaching hand in the triangle. An arc around the triangle replaces the slash. This “umbrella” means protection. The symbol indicates ESD protective material.

For all our ESD products, scan the QR code to the left.
We supply a wide variety of products from bags to matting to stationery to labels.

Notes:

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Updated 26 January 2024 11:53 am