

# Learning about ESD - Part 1

## ESD Protected Work Area

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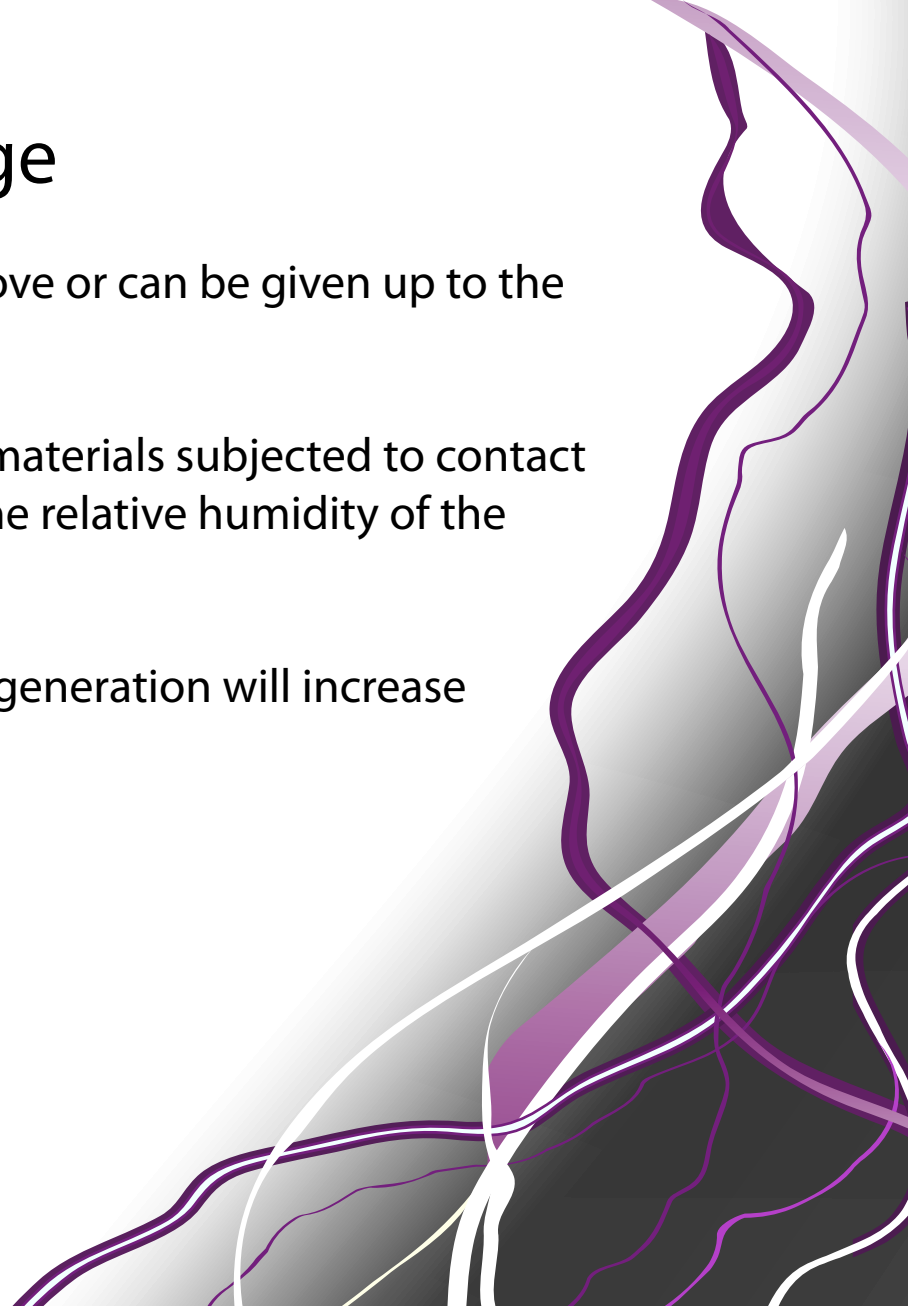
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# Static Electricity or Electrostatic Charge

When 2 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.

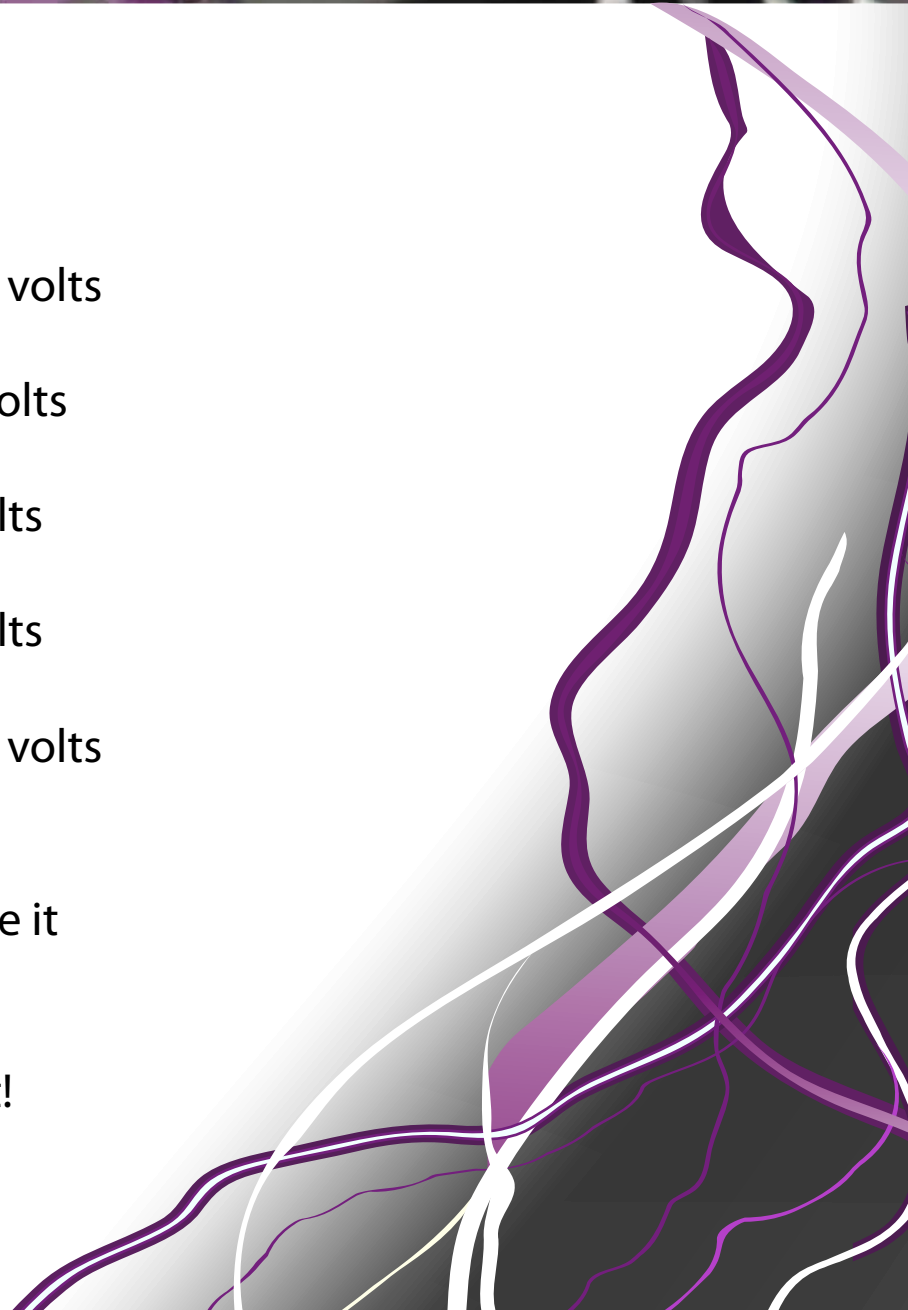


## Typical Electrostatic Voltages

|                                            |                      |
|--------------------------------------------|----------------------|
| Walking across a carpet:                   | 1,500 - 35,000 volts |
| Walking over untreated vinyl floor:        | 250 - 12,000 volts   |
| Vinyl envelope used for work instructions: | 600 - 7,000 volts    |
| Worker at a bench:                         | 700 - 6,000 volts    |
| Unwinding regular tape:                    | 9,000 - 15,000 volts |

People discharge frequently but for a person to feel a discharge it must be around 2,000 volts.

However, even less than 100 volts might damage a component!



# Static Electricity or Electrostatic Charge

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 2 types of materials to be aware of:

## 1. Conductors

Materials that are dissipative are conductors, with 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 “conduct” the charge away. Electrical current does not flow through insulative materials so they cannot be grounded.

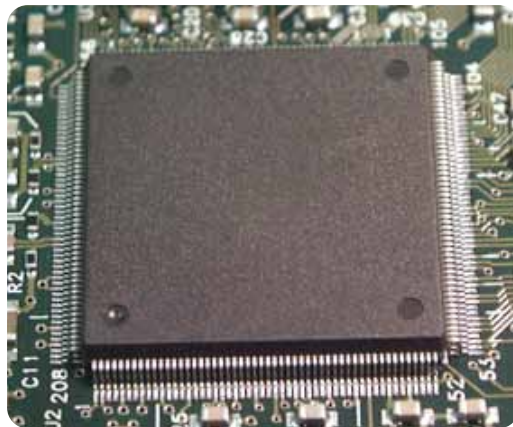
*Examples: Plastics, glass, and dry air.*

## Why worry about ESD?

Electrostatic Discharge (ESD) can damage sensitive electronic components, resulting in failures, reduced reliability and increased rework costs, or 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 this device. The static spark that damages devices may be too small for you to see or feel.

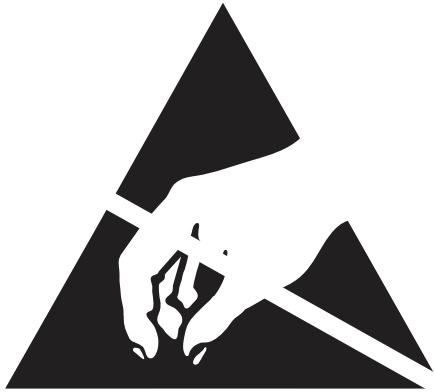


An electronic device or 'chip'.



Magnified view of the device interior

## ESD Symbols



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 means “Do not touch.” 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 Symbols



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.

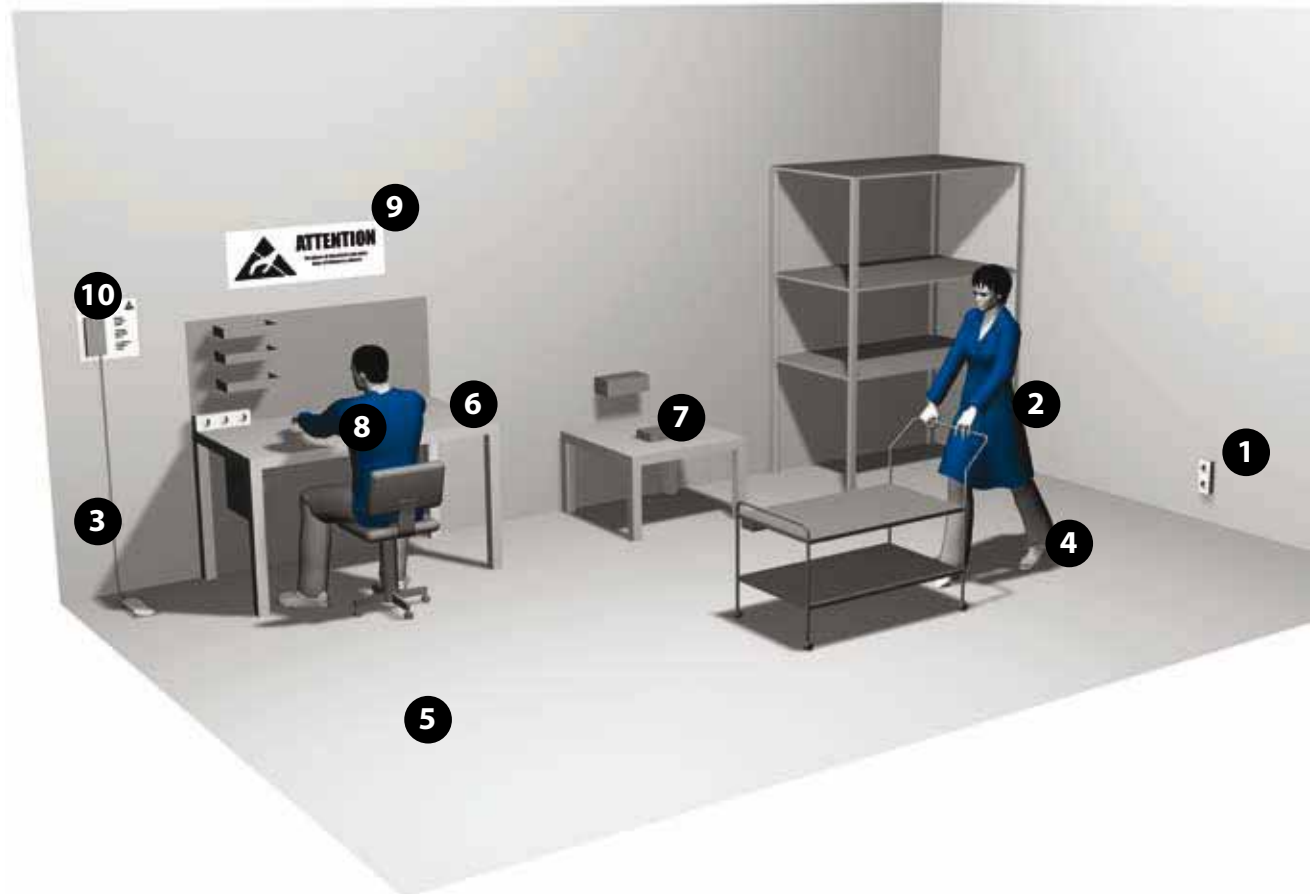
It is applied to mats, chairs, wrist straps, garments, packaging, and other items that provide ESD protection. It also may be used on equipment such as hand tools, conveyor belts, or automated handlers that is especially designed or modified to provide ESD control.

Neither symbol is applied on ESD test equipment, footwear checkers, wrist strap testers, resistance or resistivity meters or similar items that are used for ESD purposes, but which do not provide actual protection.

# The EPA Area

Devices can be protected from ESD when a work area is equipped with proper static control items.

1. Common Ground Point
2. Wrist Straps
3. Ground Cords
4. Foot Grounders
5. ESD Flooring
6. Worksurface
7. Protective Packaging
8. ESD Clothing
9. ESD Warning Signs
10. Wrist Strap Tester



# The Basics of ESD Control



Common Grounding Points

## Common Grounding Points

A common ground point allows all connected items to be at the same potential. Usually utility ground (mains ground) is used.



Ground Cords

## Ground Cords

Ground cords connect static control devices to the ground point.

# The Basics of ESD Control



Foot Grounders

## **Foot Grounders**

Foot Grounders allow people that stand or move on the job, to equalize static potential with ground. Always wear two grounders.

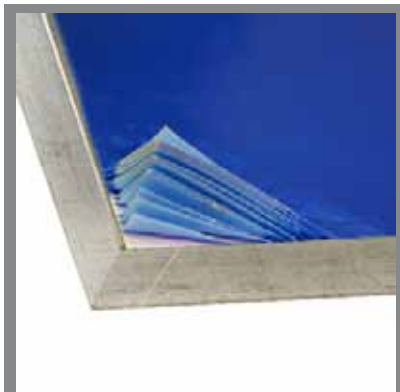


Wrist Straps

## **Wrist Straps**

People are the greatest source of ESD. 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.

# The Basics of ESD Control



Matting

## **ESD Flooring / Matting**

The Floor Mat connects Foot Grounders to ground. Without a grounded floor mat or ESD floor, foot grounders do not work.



Work Surface

## **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. Regular cleaners contain silicone, an insulator.

# The Basics of ESD Control



Protective Packaging

## **Protective Packaging**

Cards and devices must be placed in ESD protective packaging before being moved away from the ESD Protected Area.



ESD Clothing

## **ESD Clothing**

ESD Clothing suppresses static fields on synthetic clothing. They also protect clothing from dirt.

# The Basics of ESD Control



ESD Warning Signs

## ESD Warning Signs

ESD warning signs keep everyone mindful of proper handling requirements, and define a static protected area.



Wrist Strap Testers

## Wrist Strap Testers

Wrist Strap Constant Monitors ensure reliable ground connections while you work.

# The Basics of ESD Packaging

## Types of ESD Bags

There are essentially three types or categories: antistatic bags, dissipative bags and metallized bags. The latter two categories are typically the high-end of ESD packaging product offerings and tend to have three combined properties of protection, (1) antistatic, (2) dissipative and (3) shielding.

### **1. Antistatic Bags**

Antistatic bags are typically coated with a topical antistat agent that helps minimize static imbalance from triboelectric generation or contact and separation (i.e., definition of antistatic). Some antistatic bags are made with an antistat built into the films layers and tend to be more reliable and cleaner than the topically treated ones. A quality manufactured bag has antistatic properties on both the inside and outside of the film construction.

# The Basics of ESD Packaging

## 2. Dissipative Bags

Bags with surface resistance in the dissipative range are preferred because the charge dissipates across the surface at a controlled rate. Most dissipative bags also hold antistatic properties. These types of bags are generally used in non-critical environments.

## 3. Metallized Shielding Bags

Metallized shielding bags have either a metal film embedded into the film or coated onto an existing layer. This metal film acts as a shield against electrical discharges from outside the bag. Depending on the energy and duration of the discharge and the thickness of the metal film, an ESD event is typically spread out over the outer surface of the metal film and if the bag is sealed, then the charges current from the ESD event is held on the outer surface of the film, thereby protecting the contents within. This effect is known as the Faraday Cage Effect and is commonly used in controlling ESD via metallized shielding bags, conductive bags and conductive tote boxes with a covers.

# ESD Essentials

Antistat can provide all the items necessary for an ESD Protected Work Area. Please visit our website for further details on our ESD Essentials Range.



[www.antistat.co.uk](http://www.antistat.co.uk)

Alternatively if you need any advice please do not hesitate to contact one of our experience sales team members on +44 (0) 1473 836 200.