



Progress: [Progress bar]

ESD Precautions	
Introduction	✓
Overview	✓
Electrostatic Discharge	▶
ESD Damage	✓
Myths about ESD	▶
Precautions	▶
ESD-compliant Workstation	▶
Quiz	▶
Summary	✓
Course Evaluation	✓

ESD Precautions

Introduction



Course Description

The ESD Precautions course describes proper Electrostatic Discharge (ESD) precautions which service technicians must follow when handling service parts and customer equipment. This course also addresses several ESD myths.

This course is part of the Apple Service Fundamentals curriculum and is used to prepare for the Apple Service Fundamentals Exam (SVC-16A).



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Quiz	▶
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Course Evaluation	✔


ESD Precautions

Overview

Lesson Objectives

After completing this course, you should be able to:

- Correctly identify and practice ESD precautions.
- Correctly identify the effects of ESD damage on an integrated circuit.
- Correctly identify common ESD myths and why they are not true.
- Correctly identify the components of an ESD-compliant workstation.
- In a simulated environment, use the proper tools, equipment, and procedures to configure a workspace that minimizes or eliminates the occurrence of electrostatic discharge damage.

Audience	Prerequisites	Time Required	You will need...
 Service Technicians	 None	 25 minutes	 No additional materials or equipment

i Your course is organized by chapters and pages. Chapters are sections you see on the side navigation. Pages are now found within a chapter. You can navigate pages by clicking the grey radio buttons at the bottom of a window.



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ESD Precautions

Electrostatic Discharge

When two objects made of dissimilar materials rub against each other, excess electrical charge (static electricity), builds up on one object and simultaneously is removed from the other object. Over time, this friction causes some objects to have excessive electrostatic charge relative to surrounding objects. When this charge finds a means of equalizing, it will do so. In some cases, it discharges to ground. In other cases, it may discharge to an ungrounded object with a different charge level.



What are some common examples of dissimilar materials rubbing against each other to create a build up of static electricity on one object?

Shoes rubbing against carpeting when walking.

A person's body against the air as that person moves.





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ESD Precautions

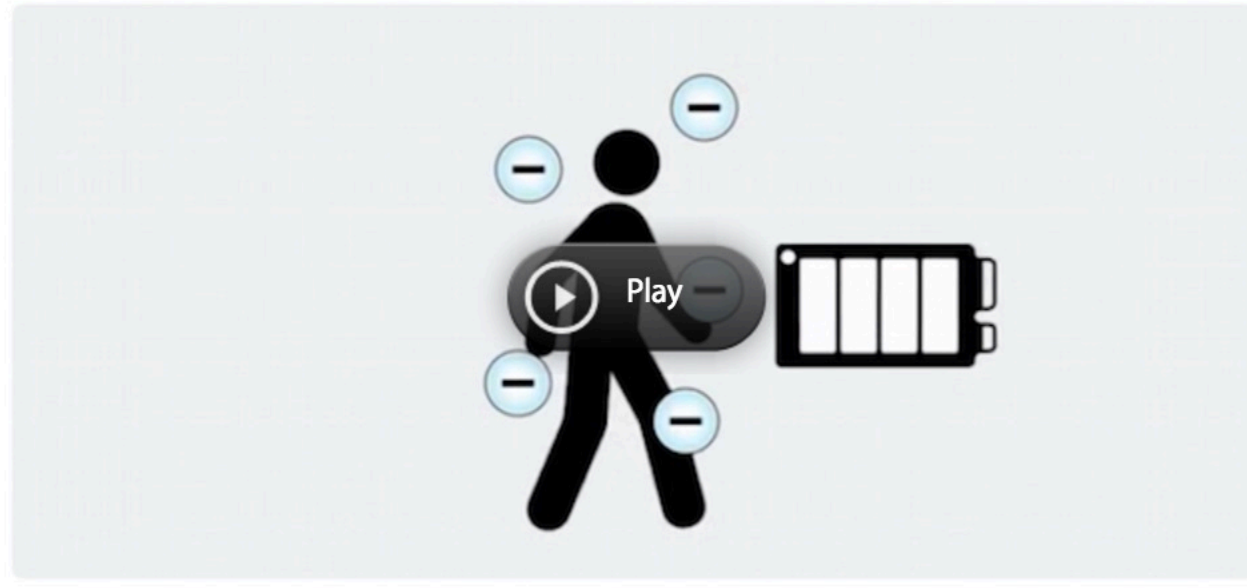
ESD Damage



ESD can damage service parts

Electrostatic discharge as low as 10 volts can damage integrated circuits, such as logic boards. In contrast, you will only feel a static shock if it is in the range of thousands of volts. This means you can be damaging the equipment you work on without knowing it.

ESD damage is difficult to identify because a microscopic part of the integrated circuit is usually impacted by the discharge. It might immediately affect the component or it might only show itself as an intermittent failure at a later time.





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ESD Precautions

Myths about ESD

There is a great deal of misinformation about ESD and the damage it can create. Following are some popular misconceptions:

- ▶ I do not have time to be tied down with wrist straps and mats.
- ▶ Only RAM and logic boards require ESD precautions. Everything else is shielded.
- ▶ You do not have to be hardwired to ground to practice correct ESD precautions.
- ▶ I do not use ESD precautions and have never had a problem.
- ▶ If Apple was really serious about ESD precautions, it would not tell customers to just touch metal before replacing DIY parts.



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ESD Precautions

Precautions



ESD Prevention Guidelines

The following precautions minimize the occurrence of ESD damage to integrated circuits.

- ▶ 1. Handle All Components by Edges
- ▶ 2. Ground Yourself
- ▶ 3. Make Sure You are NOT Grounded When
- ▶ 4. Do Not Place Components on Metal Surfaces
- ▶ 5. Do Not Touch
- ▶ 6. Use ESD Storage Bags
- ▶ 7. Avoid Synthetic Materials
- ▶ 8. Regulate Humidity
- ▶ 9. Use Additional Protection
- ▶ 10. Clean ESD Mats Regularly



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ESD Precautions

ESD-compliant Workstation

An ESD-compliant workstation has equipment and materials designed to prevent ESD damage.



Properly configured ESD-compliant workstation

- ▶ Conductive workbench mat and ground cord
- ▶ Wrist strap with a built-in 1-megohm resistor and ground cord
- ▶ Static-safe Storage Bags
- ▶ Ground polarity tester



ESD Toolkits

Apple has composed ESD toolkits that contain all the necessary components to set up an AppleCare-compliant ESD work environment.



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ESD Precautions

ESD-compliant Workstation

Setting up an ESD-compliant workstation

Below are the necessary steps for setting up an ESD-compliant work area:

- ▶ 1. Remove all synthetic materials from the work area.
- ▶ 2. Verify that you have a properly grounded electrical supply.
- ▶ 3. Attach workbench mat to ground.
- ▶ 4. Connect ESD wrist strap, or...
- ▶ 5. Connect ESD heel strap.

Once the work area is properly set up, equipment is grounded by the ESD mat or shielded in an ESD static bag. The technician is grounded by an ESD wrist strap or a heel strap combined with a grounded floor mat.



Onsite Service

When working at a customer site, be sure to use the outlined precautions to avoid ESD damage. Take time to make the work area ESD-safe. Use a workbench mat and a wrist strap. For travel convenience, you may want to use mats that fold up. Be sure everything is properly grounded, and never set parts on the floor.





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ESD-compliant Workstation

Alternate Methods for Grounding

In situations where you do not have an ESD-compliant work area available, there are two other methods that will reduce, but not eliminate ESD risks.

- Use an ESD wrist strap with an alligator clip attached to the chassis or power supply of the system you are working on.
- Periodically touch the chassis or power supply of the system. This is the least effective method of grounding.



These methods are NOT a replacement for a properly set up work area.





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ESD-compliant Workstation

Additional Tools

There are additional ESD-safe tools that are necessary when servicing iPhones and Apple computers.



Nylon Probe Tool, also known as black stick (922-5065)



ESD-safe plastic or nylon tweezers



ESD-compliant tape (also known as Kapton® tape)



ESD safe screw box with multiple compartments



The tools listed are those that are specific to ESD compliance. Additional tools may be necessary to complete repairs and can be found in the Service Guide for the device.





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ESD Precautions

Summary

Having completed this course, you should be able to:

- Correctly use, identify, and practice ESD precautions.
- Correctly identify the effects of ESD damage on an integrated circuit.
- Correctly identify common ESD myths and why they are not true.
- Correctly identify the components of an ESD-compliant workstation.
- Use proper tools, equipment, and procedures to configure a workspace that minimizes or eliminates the occurrence of electrostatic discharge damage.

This concludes the ESD Precautions course.

For other courses in the Apple Service Fundamentals curriculum, see Apple Support article, [HT205332: AppleCare Service Certifications](#), or search for Apple Service Fundamentals in ATLAS.