

# ESD: Design and Troubleshooting at the System and PWB Level

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## *A Fun and Educational ESD Seminar!*

This seminar is unique in the ESD world. Characteristics of ESD, equipment design principles, and design troubleshooting techniques are covered. Demonstrations are used to illustrate most of the concepts being taught unlike most seminars which are taught through the use of visuals as the main medium. A large portion of class time is spent in demonstrations. Complicated math is avoided. This format makes the seminar more interesting to the students and helps them to achieve a deeper understanding of the material covered.

Emphasis is placed on delivering practical knowledge to design engineers and technicians that can be used immediately on the job. Learning is further enhanced by making the “dry” subject of ESD actually *fun*. This may be the only ESD seminar to makes the students laugh!

**Description:** This seminar describes, in depth, ESD design, measurement, and troubleshooting principles. High frequency measurement techniques are used to reinforce these principles and to improve equipment ESD performance and improve the *overall reliability* of electronic systems.

### **Objectives and Benefits:**

- Understand principles of system level ESD including new and important forms of ESD that are not covered in any standard yet are significant sources of system level upset.
- Learn characteristics of ESD that have direct and practical application to system level design.
- Learn principles of circuit and system design that enhance ESD immunity in electronic systems.
- Understand and apply high frequency measurement techniques to troubleshoot design problems.
- Relate ESD immunity to EMC system level performance and reliability.
- Learn construction techniques for useful laboratory apparatus that is useful for troubleshooting system level ESD problems.

- Learn what kinds of problems have occurred in the past and how they were fixed. See how ESD can cause system problems that mimic other types of problems.

**Who Should Attend:** All circuit designers, design supervisors, EMC/ESD personnel.

**Prerequisites:** College level course on circuit analysis is desirable although the seminar will be useful to those with two year technical degrees.

**Instructional Mode:** Lecture/laboratory. About **50%** of class time is devoted to experiments and demonstrations.

**Course length:** One day.

### **Major Topics:**

- Properties of ESD
  - High frequency content of ESD
  - Hand metal vs. skin discharge
  - Contact vs. air discharge
  - Unusual forms of ESD
- Hardware design for ESD
  - Enclosure design issues
  - Mechanical design issues
  - Electrical design issues
- Software design for ESD
  - Processor issues
  - I/O issues
  - Memory issues
- Troubleshooting Techniques
  - Voltage measurements
  - Current measurements
  - Noise injection
  - Useful home-built test apparatus
  - Case histories
- Review of current standards activities