

# **ELECTROSTATIC DISCHARGE AND ELECTRONIC EQUIPMENT**

**A PRACTICAL GUIDE FOR DESIGNING  
TO PREVENT ESD PROBLEMS**

**Warren Boxleitner**



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# Electrostatic Discharge And Electronic Equipment A Practical Guide For Designing To Prevent ESD Problems

**Kenneth L. Kaiser**



## **Electrostatic Discharge And Electronic Equipment A Practical Guide For Designing To Prevent ESD Problems:**

Electrostatic Discharge and Electronic Equipment Warren Boxleitner, 1989

**Architectural Electromagnetic Shielding Handbook** Leland H. Hemming, 2000-08-02 The first volume ever to cover all aspects of the subject Architectural Electromagnetic Shielding Handbook provides the practicing architect engineer with a comprehensive guide to electromagnetic shielding This practical handbook is a one stop source for every form of shielding enclosure now used in commercial and government test laboratories communication and computer centers and electromagnetic hardened facilities designed to prevent electromagnetic interference EMI from reaching either a sensitive piece of equipment or an unauthorized agency Additional features include extensive supporting information on penetrations such as doors vents piping and electromagnetic filters for each type of shielding complete descriptions of modular welded and architectural forms of shielding as well as design checklists for shielded enclosure installation detailed descriptions of performance specifications and methods of testing necessary to prove performance Now you can have practical design and manufacturing techniques for solving ESD problems associated with sophisticated equipment used in a home or office environment This book takes the mystery out of ESD by showing how it is generated and how it affects electronic devices such as integrated circuits It provides practical guidelines and the rationale on how ESD solutions can work for you

**Electrostatic Discharge** Kenneth L. Kaiser, 2005-09-22 In chapters culled from the popular and critically acclaimed Electromagnetic Compatibility Handbook Electrostatic Discharge provides a tightly focused convenient and affordable reference for those interested primarily in this subset of topics Author Kenneth L Kaiser demystifies electrostatic discharge and explains the source and limitations of the approximations guidelines models and rules of thumb used in this field The material is presented in a unique question and answer format that gets straight to the heart of each topic The book includes numerous examples and uses Mathcad to generate all of the figures and many solutions to equations In many cases the entire Mathcad program is provided

Applied Electromagnetics and Electromagnetic Compatibility Dipak L. Sengupta, Valdis V. Liepa, 2005-11-14 Applied Electromagnetics and Electromagnetic Compatibility deals with Radio Frequency Interference RFI which is the reception of undesired radio signals originating from digital electronics and electronic equipment With today's rapid development of radio communication these undesired signals as well as signals due to natural phenomena such as lightning sparking and others are becoming increasingly important in the general area of Electro Magnetic Compatibility EMC EMC can be defined as the capability of some electronic equipment or system to be operated at desired levels of performance in a given electromagnetic environment without generating EM emissions unacceptable to other systems operating in the vicinity

Electromagnetic Compatibility Handbook Kenneth L. Kaiser, 2004-09-29 As the number of electrical devices in use continues to grow so do the challenges of ensuring the electromagnetic compatibility EMC of products and systems Fortunately engineers have at their disposal an array of approximations models and rules of thumb to help them meet those challenges Unfortunately the number

of these tools and guidelines is overwhelming and worse still is the thought of investigating their origins and confirming their results. The Electromagnetic Compatibility Handbook is an unprecedented compilation of the many approximations, guidelines, models, and rules of thumb used in EMC analyses, complete with their sources and their limitations. The book presents these in an efficient question and answer format and incorporates an extremely comprehensive set of tables and figures. The author has either derived from basic principles or obtained and verified from their original sources all of the expressions in the tables. Mathcad was used to generate most of the plots and solve many of the equations, and the author includes the Mathcad programs for many of these so users can clearly see the variable assignments, assumptions, and equations. Designed to be of long lasting value to engineers, researchers, and students, the Electromagnetic Compatibility Handbook is ideal both for quick reference and as a textbook for upper level and graduate electrical engineering courses.

*A Practical Guide to EMC Engineering* Levent Sevgi, 2017-03-31. This practical new resource explores the fundamentals of EMC engineering and examines the concepts and underpinnings of electromagnetics. This book highlights the procedures from design to market for both technical and non technical issues including market control, accreditation, calibration, EMC tests and measurement, and EMC protection. Basic electrical engineering theories, Maxwell equations, EM scattering, diffraction, and propagation in the electromagnetic model are presented. The circuit model including lumped parameter circuit elements, two port circuit definitions, grounding, common and differential mode currents, and microstripline circuits are explored. This book also covers antennas and antenna calibration including communication antennas, normalized site attenuation, NSA loop antennas, and loop antenna calibration. LAC Noise and frequency analysis on fundamental electromagnetic signals, noise, and transforms is explained. Readers find insight into EMC test and measurement environments and devices. Time saving MATLAB code is included in this resource to help engineers with their projects in the field.

**Wireless Sensor Networks** Jr., Edgar H. Callaway, 2003-08-26. Because they provide practical machine to machine communication at a very low cost, the popularity of wireless sensor networks is expected to skyrocket in the next few years, duplicating the recent explosion of wireless LANs. *Wireless Sensor Networks Architectures and Protocols* describes how to build these networks from the layers of the

Electromagnetic Shielding Kenneth L. Kaiser, 2005-09-13. In chapters culled from popular and critically acclaimed *Electromagnetic Compatibility Handbook*, *Electromagnetic Shielding* provides a tightly focused, convenient, and affordable reference for those interested primarily in this subset of topics. Author Kenneth L. Kaiser demystifies shielding and explains the source and limitations of the approximations, guidelines, models, and rules of thumb used in this field. The material is presented in a unique question and answer format that gets straight to the heart of each topic. The book includes numerous examples and uses Mathcad to generate all of the figures and many solutions to equations. In many cases, the entire Mathcad program is provided.

**Handbook of Engineering Electromagnetics** Rajeev Bansal, 2004-09-01. Engineers do not have the time to wade through rigorously theoretical books when trying to solve a problem. Beginners lack the expertise required

to understand highly specialized treatments of individual topics This is especially problematic for a field as broad as electromagnetics which propagates into many diverse engineering fields The time has come for a new book *ESD Program Management G. Theodore Dangelmayer*, 1999-01-31 This is a revision of the highly successful electronic manufacturing guide *ESD Program Management A Realistic Approach to Continuous Measurable Improvement in Static Control* This revision is comprehensive and explains how to develop implement and manage an ESD control program and includes up to date data many new chapters new case studies and much more New to this edition Extensive changes and additions to auditing techniques cost benefits data and materials evaluation Six new chapters on common myths issues related to smaller companies process controls ISO 9000 material characterization and training New case studies on field induced failures in the factory long distance central office system upsets and automation caused failures Expanded coverage of the needs of smaller companies including discussion of common problems and cost effective solutions A training breakthrough is presented Previously invisible ESD events can now be easily displayed for students at all levels Seeing is believing Inclusion of new testing instruments such as the event detector and resistance probe The 12 critical factors in an ESD program have been updated to reflect changes and refinements in program management The author has also included the latest information on handling procedures and requirements from the Lucent ESD Control Handbook *ESD Program Management A Realistic Approach to Continuous Measurable Improvement in Static Control Second Edition* is a refreshingly unbiased guide for electronic manufacturing and quality control professionals

Electromagnetics Engineering Handbook Paul R. P. Hoole, Paul Ratnamahilan P. Hoole, K. Pirapaharan, S. R. H. Hoole, 2013 Electromagnetic fields both static and dynamic form the foundational basis of all electrical and electronic engineering devices and systems Aimed at undergraduate students university teachers design and consultant engineers and researchers this book presents an in depth simple and comprehensive reference source on electromagnetics engineering In much of electrical and electronics engineering including analogue and digital telecommunications engineering biomedical monitoring and diagnostic equipment power systems engineering and sensor technology getting back to the fundamental principles that govern the technologies namely electromagnetic fields and waves has become crucial for future customer friendly technology and systems *Electromagnetics Engineering Handbook* has been written to enable undergraduate students studying electromagnetics engineering for the first time to gain an understanding of the essentials of the largely invisible but powerful electromagnetic fields governed by the four elegant Maxwell's equations Moreover the book helps to apply that knowledge through analytical and computational solutions of these frequency and material dependent electric and magnetic fields As electrical and electronic engineering grows and subdivides into many specialities this book aims to inform the reader of the basic principles that govern all of these specialised systems and on how to apply that knowledge to understand and design devices and systems that may operate at vastly different frequencies and in various media e.g semiconductor materials magnetic materials biological

tissues outer space and sea water It also deals with a range of different functions dependant on the area of application For example at very low power frequencies electromagnetic fields perform vastly different functions from device to device such as in power transformers current transformers infrared sensors synchronous generators superconducting devices electric motors and electric powered transport systems This handbook will be of great help to students engineers innovators and researchers working in a wide variety of disciplines *Fundamentals of Engineering Electromagnetics* Rajeev

Bansal,2018-10-08 Electromagnetics is too important in too many fields for knowledge to be gathered on the fly A deep understanding gained through structured presentation of concepts and practical problem solving is the best way to approach this important subject *Fundamentals of Engineering Electromagnetics* provides such an understanding distilling the most important theoretical aspects and applying this knowledge to the formulation and solution of real engineering problems Comprising chapters drawn from the critically acclaimed Handbook of Engineering Electromagnetics this book supplies a focused treatment that is ideal for specialists in areas such as medicine communications and remote sensing who have a need to understand and apply electromagnetic principles but who are unfamiliar with the field Here is what the critics have to say about the original work accompanied with practical engineering applications and useful illustrations as well as a good selection of references those chapters that are devoted to areas that I am less familiar with but currently have a need to address have certainly been valuable to me This book will therefore provide a useful resource for many engineers working in applied electromagnetics particularly those in the early stages of their careers Alastair R Ruddle The IEE Online a tour of practical electromagnetics written by industry experts provides an excellent tour of the practical side of electromagnetics a useful reference for a wide range of electromagnetics problems a very useful and well written compendium Alf Riddle IEEE Microwave Magazine *Fundamentals of Engineering Electromagnetics* lays the theoretical foundation for solving new and complex engineering problems involving electromagnetics **High-Voltage Engineering** Mazen Abdel-Salam,2018-10-03 Bridges the gap between laboratory research and practical applications in industry and power utilities clearly organized into three distinct sections that cover basic theories and concepts execution of principles and innovative new techniques Includes new chapters detailing industrial uses and issues of hazard and safety and review exercises to accompany each chapter

Transmission Lines, Matching, and Crosstalk Kenneth L. Kaiser,2005-09-20 In chapters culled from the popular and critically acclaimed *Electromagnetic Compatibility Handbook* *Transmission Lines Matching and Crosstalk* provides a tightly focused convenient and affordable reference for those interested primarily in this subset of topics Author Kenneth L Kaiser demystifies transmission lines matching and crosstalk and explains the source and limitations of the approximations guidelines models and rules of thumb used in this field The material is presented in a unique question and answer format that gets straight to the heart of each topic The book includes numerous examples and uses Mathcad to generate all of the figures and many solutions to equations In many cases the entire Mathcad program is provided Electrostatic Discharge in

Electronics William D. Greason,1992      **Foundations For Radio Frequency Engineering** Geyi Wen,2015-03-13 The book provides a comprehensive coverage of the fundamental topics in microwave engineering antennas and wave propagation and electromagnetic compatibility including electromagnetic boundary value problems waveguide theory microwave resonators antennas and wave propagation microwave circuits principles of electromagnetic compatibility designs information theory and systems Deals systematically with fundamental problems in radio frequency engineering this important volume provides an updated treatment of radio frequency theory and techniques The book can be used as a one semester course for senior and first year graduate students or as a reference for radio frequency engineers and applied physicists      Microelectronics Manufacturing Diagnostics Handbook Abraham Landzberg,2012-12-06 The world of microelectronics is filled with cusses measurement systems manufacturing many success stories From the use of semi control techniques test diagnostics and fail ure analysis It discusses methods for modeling conductors for powerful desktop computers to their use in maintaining optimum engine per and reducing defects and for preventing de formance in modem automobiles they have fects in the first place The approach described clearly improved our daily lives The broad while geared to the microelectronics world has useability of the technology is enabled how applicability to any manufacturing process of similar complexity The authors comprise some ever only by the progress made in reducing their cost and improving their reliability De of the best scientific minds in the world and fect reduction receives a significant focus in our are practitioners of the art The information modem manufacturing world and high quality captured here is world class I know you will diagnostics is the key step in that process find the material to be an excellent reference in of product failures enables step func Analysis your application tion improvements in yield and reliability which works to reduce cost and open up new Dr Paul R Low applications and technologies IBM Vice President and This book describes the process ofdefect re of Technology Products General Manager duction in the microelectronics world      Subsynchronous Resonance in Power Systems Paul M. Anderson,Basant L. Agrawal,J. E. Van Ness,1999-02-02 Mathematical calculations for subsynchronous system modeling Subsynchronous Resonance in Power Systems provides in depth guidance toward the parameters modeling and analysis of this complex subclass of power systems Emphasizing field testing to determine the data required this book facilitates thorough and efficient oscillation and damping modeling using eigenvalues of a system s linear model Expert discussion provides step by step instruction for generator network and turbine generator shaft models followed by detailed tutorials for model testing and analysis based on IEEE CORPALS and SSR eigenvalue analysis Comprehensive in scope and practical in focus this book is an invaluable resource for anyone working with frequencies below 60 Hz      *Engineering Electromagnetic Compatibility* V. Prasad Kodali,2001-01-19 Electrical Engineering Engineering Electromagnetic Compatibility Principles Measurements Technologies and Computer Models Second Edition This practical enhanced second edition will teach you to avoid costly post design electromagnetic compatibility EMC fixes Once again V Prasad Kodali provides a comprehensive introduction to EMC

and presents current technical information on sources of electromagnetic interference EMI EMC EMI measurements technologies to control EMI computer simulation and design and international EMC standards Features added to this second edition include Two new chapters covering EMC computer modeling and simulation and signal integrity Expanded assignments at the close of each chapter Illustrative examples that enhance comprehension Updated information in Selected Bibliography and EMC Standards chapters A new appendix that lists websites relevant to EMC EMI Engineering

Electromagnetic Compatibility Second Edition is presented in a concise user friendly format that combines a rigorous solutions based mathematical treatment of the underlying theories of EMC with the most recent practical applications It is ideally suited as a desk reference for practicing engineers and as a textbook for students who need to understand the form and function of EMC and its relevance to a variety of systems      *BiCMOS/CMOS Systems Design* James Edgar Buchanan,1991



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