

An Analog Electronics Companion Basic Circuit Design For Engineers And Scientists Author Scott Hamilton Published On June 2007

The text of the first edition has been extensively revised and supplemented to bring it up to date

This is a book about real-world design techniques for analog circuits: amplifiers, filters, injection-locked oscillators, phase-locked loops, transimpedance amplifiers, group delay correction circuits, notch filters, and spectrum regrowth in digital radio frequency (RF) transmitters, etc. The book offers practical solutions to analog and RF problems, helping the reader to achieve high-performance circuit and system design. A variety of issues are covered, such as: How to flatten group delay of filters How to use reciprocity to advantage How to neutralize a parasitic capacitance How to deepen a notch by adding only two components to the network How to demodulate a signal using the secant waveform and its benefit How to flatten the frequency response of a diode detector When to use a transimpedance amplifier and how to maximize its performance How to recover non-return-to-zero (NRZ) data when alternating current (AC) coupling is required Why phase noise corrupts adjacent communication channels Simple method to prevent false locking in phase-locked loops How to improve the bandwidth of amplification by using current conveyors A very simple impedance matching technique requiring only one reactive component How to use optimization Quadrature distortion and cross-rail interference This book is meant to be a handbook (or a supplemental textbook) for students and practitioners in the design of analog and RF circuitry with primary emphasis on practical albeit sometimes unorthodox circuit realizations. Equations and behavioral simulations result in an abundance of illustrations, following a "words and pictures" easy-to-understand approach. Teachers will find the book an important supplement to a standard analog and RF course, or it may stand alone as a textbook. Working engineers may find it useful as a handbook by bookmarking some of the step-by-step procedures, e.g., the section on simplified impedance matching or group delay flattening.

As the frequency of communication systems increases and the dimensions of transistors are reduced, more and more stringent performance requirements are placed on analog circuits. This is a trend that is bound to continue for the foreseeable future and while it does, understanding performance trade-offs will constitute a vital part of the analog design process. It is the insight and intuition obtained from a fundamental understanding of performance conflicts and trade-offs, that ultimately provides the designer with the basic tools necessary for effective and creative analog design. Trade-offs in Analog Circuit Design, which is devoted to the understanding of trade-offs in analog design, is quite unique in that it draws together fundamental material from, and identifies interrelationships within, a number of key analog circuits. The book covers ten subject areas: Design methodology, Technology, General Performance, Filters, Switched Circuits, Oscillators, Data Converters, Transceivers, Neural Processing, and Analog CAD. Within these subject areas it deals with a wide diversity of trade-offs ranging from frequency-dynamic range and power, gain-bandwidth, speed-dynamic range and phase noise, to tradeoffs in design for manufacture and IC layout. The book has by far transcended its original scope and has become both a designer's companion as well as a graduate textbook. An important feature of this book is that it promotes an intuitive approach to understanding analog circuits by explaining fundamental relationships and, in many cases, providing practical illustrative examples to demonstrate the inherent basic interrelationships and trade-offs. Trade-offs in Analog Circuit Design draws together 34 contributions from some of the world's most eminent analog circuits-and-systems designers to provide, for the first time, a comprehensive text devoted to a very important and timely approach to analog circuit design.

Engineers and scientists frequently find themselves having to get involved in electronic circuit design even though this may not be their specialty. This book is specifically designed for these situations, and has two major advantages for the inexperienced designer: it assumes little prior knowledge of electronics and it takes a modular approach, so you can find just what you need without working through a whole chapter. The first three parts of the book start by refreshing the basic mathematics and physics needed to understand circuit design. Part 4 discusses individual components (resistors,

The Circuit Designer's Companion covers the theoretical aspects and practices in analogue and digital circuit design. Electronic circuit design involves designing a circuit that will fulfill its specified function and designing the same circuit so that every production model of it will fulfill its specified function, and no other undesired and unspecified function. This book is composed of nine chapters and starts with a review of the concept of grounding, wiring, and printed circuits. The subsequent chapters deal with the passive and active components of circuitry design. These topics are followed by discussions of the principles of other design components, including linear integrated circuits, digital circuits, and power supplies. The remaining chapters consider the vital role of electromagnetic compatibility in circuit design. These chapters also look into safety, design of production, testability, reliability, and thermal management of the designed circuit.

This book is of great value to electrical and design engineers.

A practically based explanation of electronic circuitry.

Unlike books currently on the market, this book attempts to satisfy two goals: combine circuits and electronics into a single, unified treatment, and establish a strong connection with the contemporary world of digital systems. It will introduce a new way of looking not only at the treatment of circuits, but also at the treatment of introductory coursework in engineering in general. Using the concept of "abstraction," the book attempts to form a bridge between the world of physics and the world of large computer systems. In particular, it attempts to unify electrical engineering and computer science as the art of creating and exploiting successive abstractions to manage the complexity of building useful electrical systems. Computer systems are simply one type of electrical systems. +Balances circuits theory with practical digital electronics applications. +Illustrates concepts with real devices. +Supports the popular circuits and electronics course on the MIT OpenCourse Ware from which professionals worldwide study this new approach. +Written by two educators well known for their innovative teaching and research and their collaboration with industry. +Focuses on contemporary MOS technology.

Relevant applications to electronics, telecommunications and power systems are included in a comprehensive introduction to the theory of electronic circuits for physical science students.

In this companion text to Analog Circuit Design: Art, Science, and Personalities, seventeen contributors present more tutorial, historical, and editorial viewpoints on subjects related to analog circuit design. By presenting divergent methods and views of people who have achieved some measure of success in their field, the book encourages readers to develop their own approach to design. In addition, the essays and anecdotes give some constructive guidance in areas not usually covered in engineering courses, such as marketing and career development. *Includes visualizing operation of analog circuits *Describes troubleshooting for optimum circuit performance *Demonstrates how to produce a saleable product

A clear, detailed introduction to modern analog and digital electronics, complete with simulation and design exercises.

The operational amplifier ("op amp") is the most versatile and widely used type of analog IC, used in audio and voltage amplifiers, signal conditioners, signal converters, oscillators, and analog computing systems. Almost every electronic device uses at least one op amp. This book is Texas Instruments' complete professional-level tutorial and reference to operational amplifier theory and applications. Among the topics covered are basic op amp physics (including reviews of current and voltage division, Thevenin's theorem, and transistor models), idealized op amp operation and configuration, feedback theory and methods, single and dual supply operation, understanding op amp parameters, minimizing noise in op amp circuits, and practical applications such as instrumentation amplifiers, signal conditioning, oscillators, active filters, load and level conversions, and analog computing. There is also extensive coverage of circuit construction techniques, including circuit board design, grounding, input and output isolation, using decoupling capacitors, and frequency characteristics of passive components. The material in this book is applicable to all op amp ICs from all manufacturers, not just TI. Unlike textbook treatments of op amp theory that tend to focus on idealized op amp models and configuration, this title uses idealized models only when necessary to explain op amp theory. The bulk of this book is on real-world op amps and their applications; considerations such as thermal effects, circuit noise, circuit buffering, selection of appropriate op amps for a given application, and unexpected effects in passive components are all discussed in detail. *Published in conjunction with Texas Instruments *A single volume, professional-level guide to op amp theory and applications *Covers circuit board layout techniques for manufacturing op amp circuits.

While so many books on technology look at new advances and digital technologies, The Routledge Companion to Media Technology and Obsolescence looks back at analog technologies that are disappearing, considering their demise and what it says about media history, pop culture, and the nature of nostalgia. From card catalogs and typewriters to stock tickers and cathode ray tubes, contributors examine the legacy of analog technologies, including those, like vinyl records, that may be experiencing a resurgence. Each essay includes a brief history of the technology leading up to its peak, an analysis of the reasons for its decline, and a discussion of its influence on newer technologies.

A comprehensive collection of fundamental principles and applications of analog electronic circuits, including semiconductor diodes, bipolar junction transistors, field-effect transistors (FETs), operational amplifiers, power amplifiers, and feedback circuits. With abundant practical examples, it is an essential reference for researchers, students and engineers in electrical engineering and information processing.

Many instrumentation engineers and scientists often deal with analog electronic issues when approaching delicate measurements. Even if off-the-shelf measuring solutions exist, comprehension of the analog behavior of the measuring system is often a necessity. This book provides a concise introduction to the main elements of a low frequency analog acquisition chain. It aims to be sufficiently general to provide an introduction, yet specific enough to guide the reader through some classical problems that may be encountered in the subject. Topics include sensors, conditioning circuits, differential and instrumentation amplifiers, active filters (mainly for anti-aliasing purposes) and analog to digital converters. A chapter is devoted to an introduction to noise and electronic compatibility. This work is intended for people with a general background in electronics and signal processing, who are looking for an introduction to classical electronic solutions employed in measuring instruments involving low frequency analog signal processing.

This comprehensive volume covers both elementary and advanced analog and digital circuit simulation using PSpice. The text includes many worked examples, circuit diagrams, tables, and code listings. It also compares practical results with those obtained from simulation.

Understand Introductory Electronics Updated and expanded with new topics, The Electronics Companion: Devices and Circuits for Physicists and Engineers, 2nd Edition presents a full course in introductory electronics using a unique and educational presentation technique that is the signature style of the author's companion books. This concise yet detailed book covers introductory electrical principles (DC and AC circuits), the physics of electronics components, circuits involving diodes and transistors, transistors amplifiers, filtering, operational amplifiers, digital electronics, transformers, instrumentation, and power supplies. A Convenient, Student-Friendly Format Rich with Diagrams and Clear Explanations The level of coverage is introductory but at enough depth to enable students to undertake simple circuit design and construction. The book includes tutorial problems and a comprehensive set of laboratory experiments requiring conventional components and test equipment. Be sure to check out the author's other companion books: The Materials Physics Companion, 2nd Edition The Physics Companion, 2nd Edition The Mathematics Companion: Mathematical Methods for Physicists and Engineers, 2nd Edition The Chemistry Companion

Covers Ohm's law, current flow, switches, simple circuits, diodes, transistors, capacitance, inductance, resonance, tuned circuits, amplifiers, oscillators, transformers, and power supplies

The theme of this new textbook is the practical element of electronic circuit design. Dr O'Dell, whilst recognising that theoretical knowledge is essential, has drawn from his many years of teaching experience to produce a book which emphasises learning by doing throughout. However, there is more to circuit design than a good theoretical foundation coupled to design itself. Where do new circuit ideas come from? This is the topic of the first chapter, and the discussion is maintained throughout the following eight chapters which deal with high and low frequency small signal circuits, opto-electronic circuits, digital circuits, oscillators, translinear circuits, and power amplifiers. In each chapter, one or more experimental circuits are described in detail for the reader to construct, a total of thirteen project exercises in all. The final chapter draws some conclusions about the fundamental problem of design in the light of the circuits that have been dealt with in the book. The book is intended for use alongside a foundation text on the theoretical basis of electronic circuit design. It is written not only for undergraduate students of electronic engineering but also for the far wider range of reader in the hard or soft sciences, in industry or in education, who have access to a simple electronics laboratory.

Unlike books currently on the market, this volume attempts to satisfy two goals: combine circuits and electronics into a single, unified treatment, and establish a strong connection with the contemporary world of digital systems. Using the concept of abstraction, the authors attempt to form a bridge between the world of physics and the world of large computer systems.

Passive components; Passive circuits; Active components; Audio frequency signals and reproduction; Passive signal processing and signal transmission, Active signal processing in the frequency domain; Active signal processing in the time domain; Radio frequency circuits; Signal sources; Power supplies; Tricks of the trade; Appendices; Index.

A reference volume of analog electronic circuits based on the op-amp, containing practical detail and technical advice.

In the real world, most signals are analog, spanning continuously varying values. Circuits that interface with the physical environment need to be able to process these signals. Principles of Analog Electronics introduces the fascinating world of analog electronics, where fields, circuits, signals and systems, and semiconductors meet. Drawing on the author's teaching experience, this richly illustrated, full-color textbook expertly blends theory with practical examples to give a clear understanding of how real electronic circuits work. Build from the Essentials of Math, Physics, and Chemistry to Electronic Components, Circuits, and Applications Building a solid foundation, the book first explains the mathematics, physics, and chemistry that are essential for grasping the principles behind the operation of electronic devices. It then examines the theory of circuits through models and important theorems. The book describes and analyzes passive and active electronic devices, focusing on fundamental filters and common silicon-based components, including diodes, bipolar junction transistors, and metal-oxide-semiconductor field-effect transistors (MOSFETs). It also shows how semiconductor devices are used to design electronic circuits such as rectifiers, power supplies, clamper and clipper circuits, and amplifiers. A chapter explores actual applications, from audio amplifiers and FM radios to battery chargers. Delve Deeper into Analog Electronics through Curiosities, Key Personalities, and Practical Examples Each chapter includes helpful summaries with key points, jargon, and terms, as well as exercises to test your knowledge. Practical tables illustrate the coding schemes to help identify commercial passive and active components. Throughout, sidebars highlight "curiosities," interesting observations, and examples that make the subject more concrete. This textbook offers a truly comprehensive introduction to the fundamentals of analog electronics, including essential background concepts. Taking a fresh approach, it connects electronics to its importance in daily life, from music to medicine and more.

This comprehensive text discusses the fundamentals of analog electronics applications, design, and analysis. Unlike the physics approach in other analog electronics books, this text focuses on an engineering approach, from the main components of an analog circuit to general analog networks. Concentrating on development of standard formulae for conventional analog systems, the book is filled with practical examples and detailed explanations of procedures to analyze analog circuits. The book covers amplifiers, filters, and op-amps as well as general applications of analog design.

An up-to-date text on electronic circuit design, written from a practical point of view.

Analog circuit and system design today is more essential than ever before. With the growth of digital systems, wireless communications, complex industrial and automotive systems, designers are being challenged to develop sophisticated analog solutions. This comprehensive source book of circuit design solutions aids engineers with elegant and practical design techniques that focus on common analog challenges. The book's in-depth application examples provide insight into circuit design and application solutions that you can apply in today's demanding designs. This is the companion volume to the successful Analog Circuit Design: A Tutorial Guide to Applications and Solutions (October 2011), which has sold over 1000 3,500 copies in its the first 6 months of since publication. It extends the Linear Technology collection of application notes, which provide analog experts with a full collection of reference designs and problem solving insights to apply to their own engineering challenges. Full support package including online resources (LTSpice), plus publicity support from Linear Technology. Contents include more application notes on power management, and data conversion and signal conditioning circuit solutions, plus an invaluable circuit collection of reference designs.

Analog Electronics for Radiation Detection showcases the latest advances in readout electronics for particle, or radiation, detectors. Featuring chapters written by international experts in their respective fields, this authoritative text: Defines the main design parameters of front-end circuitry developed in microelectronics technologies Explains the basis for the use of complementary metal-oxide semiconductor (CMOS) image sensors for the detection of charged particles and other non-consumer applications Delivers an in-depth review of analog-to-digital converters (ADCs), evaluating the pros and cons of ADCs integrated at the pixel, column, and per-chip levels Describes incremental sigma-delta ADCs, time-to-digital converter (TDC) architectures, and digital pulse-processing techniques complementary to analog processing Examines the fundamental parameters and front-end types associated with silicon photomultipliers used for single visible-light photon detection Discusses pixel sensors with per-pixel TDCs, channel density challenges, and emerging 3D technologies interconnecting detectors and electronics Thus, Analog Electronics for Radiation Detection provides a single source for state-of-the-art information on analog electronics for the readout of radiation detectors.

Tim Williams' Circuit Designer's Companion provides a unique masterclass in practical electronic design that draws on his considerable experience as a consultant and design engineer. As well as introducing key areas of design with insider's knowledge, Tim focuses on the art of designing circuits so that every production model will perform its specified function – and no other unwanted function - reliably over its lifetime. The combination of design alchemy and awareness of commercial and manufacturing factors makes this an essential companion for the professional electronics designer. Topics covered include analog and digital circuits, component types, power supplies and printed circuit board design. The second edition includes new material on microcontrollers, surface mount processes, power semiconductors and interfaces, bringing this classic work up to date for a new generation of designers. · A unique masterclass in the design of optimized, reliable electronic circuits · Beyond the lab - a guide to electronic design for production, where cost-effective design is imperative · Tips and know-how provide a whole education for the novice, with something to offer the most seasoned professional

An Analog Electronics Companion Basic Circuit Design for Engineers and Scientists Cambridge University Press

The only method of circuit analysis known to most engineers and students is nodal or loop analysis. Although this works well for obtaining numerical solutions, it is almost useless for obtaining analytical solutions in all but the simplest cases. In this unusual 2002 book, Vorpérian describes remarkable alternative techniques to solve, almost by inspection, complicated linear circuits in symbolic form and obtain meaningful analytical answers for any transfer function or impedance. Although not intended to replace traditional computer-based methods, these techniques provide engineers with a powerful set of tools for tackling circuit design problems. They also have great value in enhancing students' understanding of circuit operation, making this an ideal course book, and numerous problems and worked examples are included. Originally developed by Professor David Middlebrook and others at Caltech (California Institute of Technology), the techniques described here are now widely taught at institutions and companies around the world.

This book aims to take undergraduates in science and engineering to an acceptable level of competence in network analysis.

(Book). Here's your complete guide to using MIDI synthesizers, samplers, soundcards, sequencers, computers and more! The MIDI Companion shows how a MIDI system or systems for a wide range of situations can be assembled quickly, easily and trouble-free. Describes how to synchronize MIDI sequencers, drum machines, multitrack equipment, SMPTE-based equipment, and other MIDI instruments. Describes each and every MIDI code and the techniques used in transmitting these codes between various MIDI devices. Explains how to get the most out of any musical situation that calls for the use of synthesizers and electronic musical instruments. This totally new edition includes more information on the actual applications and musical uses for MIDI. A complete chapter devoted to General MIDI, plus the

charts for GM sounds. Two additional new chapters on The MIDI Studio and MIDI And The Personal Computer. New diagrams, updated diagrams, new graphics. Profusely illustrated with pictures, photographs and diagrams, and also includes a detailed glossary.

Engineers and scientists frequently find themselves having to get involved in electronic circuit design even though this may not be their specialty. This book is specifically designed for these situations, and has two major advantages for the inexperienced designer: it assumes little prior knowledge of electronics and it takes a modular approach, so you can find just what you need without working through a whole chapter. The first three parts of the book start by refreshing the basic mathematics and physics needed to understand circuit design. Part four discusses individual components (resistors, capacitors etc.), while the final and largest section describes commonly encountered circuit elements such as differentiators, oscillators, filters and couplers. A major bonus and learning aid is the inclusion of a CD-ROM with the student edition of the PSpice simulation software, together with models of most of the circuits described in the book.

The fourth edition of this classic work on circuit design gives you the understanding and practical know-how to produce optimized, reliable, cost-effective electronic circuits. It bridges the gap between the theoretical learning that most university courses provide and the practical knowledge and application that comes from years of experience. Topics covered include analog and digital circuits, component types, power supplies and printed circuit board design, plus new coverage of the latest advances in electronics since the previous edition published. The Circuit Designer's Companion is ideal for Professional electronics design engineers, advanced amateur electronics designers, electronic engineering students and professors looking for a book with a real-world design outlook. Updated with new material on: Extreme Environment Design Design for Reliability Wide Band Gap Devices for Power Electronics Provides an invaluable companion for circuit designers and practicing electronics engineers that includes best practices Includes practical, real-world considerations for components, PCBs, manufacturability, reliability and cost Contains new material on design tools, high-speed circuits, variability and tolerances, noise, simulation methods and testing

Newnes has worked with Robert Pease, a leader in the field of analog design to select the very best design-specific material that we have to offer. The Newnes portfolio has always been known for its practical no nonsense approach and our design content is in keeping with that tradition. This material has been chosen based on its timeliness and timelessness. Designers will find inspiration between these covers highlighting basic design concepts that can be adapted to today's hottest technology as well as design material specific to what is happening in the field today. As an added bonus the editor of this reference tells you why this is important material to have on hand at all times. A library must for any design engineers in these fields. *Hand-picked content selected by analog design legend Robert Pease *Proven best design practices for op amps, feedback loops, and all types of filters *Case histories and design examples get you off and running on your current project

Analog circuit and system design today is more essential than ever before. With the growth of digital systems, wireless communications, complex industrial and automotive systems, designers are challenged to develop sophisticated analog solutions. This comprehensive source book of circuit design solutions will aid systems designers with elegant and practical design techniques that focus on common circuit design challenges. The book's in-depth application examples provide insight into circuit design and application solutions that you can apply in today's demanding designs. Covers the fundamentals of linear/analog circuit and system design to guide engineers with their design challenges Based on the Application Notes of Linear Technology, the foremost designer of high performance analog products, readers will gain practical insights into design techniques and practice Broad range of topics, including power management tutorials, switching regulator design, linear regulator design, data conversion, signal conditioning, and high frequency/RF design Contributors include the leading lights in analog design, Robert Dobkin, Jim Williams and Carl Nelson, among others

Packed full of real circuits to build and test, Hands-On Electronics is a unique introduction to analog and digital electronics theory and practice. Ideal both as a college textbook and for self-study, the friendly style, clear illustrations and construction details included in the book encourage rapid and effective learning of analog and digital circuit design theory. All the major topics for a typical one semester course are covered including RC circuits, diodes, transistors, op-amps, oscillators, TTL logic, counters, D/A converters and more. There are also chapters explaining how to use the equipment needed for the examples (oscilloscope, multimeter and breadboard) together with pin-out diagrams and manufacturers' specifications for all the key components referred to in the book.

The content has been carefully designed to meet the requirements of first and second year students of electronic engineering, communications engineering and telecommunications, following full honours degree programs or two-year courses including HNC/HND. A completely new analog electronics textbook for the digital age Coverage ideal for courses with a communications / wireless focus

Intuitive Analog Circuit Design outlines ways of thinking about analog circuits and systems that let you develop a feel for what a good, working analog circuit design should be. This book reflects author Marc Thompson's 30 years of experience designing analog and power electronics circuits and teaching graduate-level analog circuit design, and is the ideal reference for anyone who needs a straightforward introduction to the subject. In this book, Dr. Thompson describes intuitive and "back-of-the-envelope" techniques for designing and analyzing analog circuits, including transistor amplifiers (CMOS, JFET, and bipolar), transistor switching, noise in analog circuits, thermal circuit design, magnetic circuit design, and control systems. The application of some simple rules of thumb and design techniques is the first step in developing an intuitive understanding of the behavior of complex electrical systems. Introducing analog circuit design with a minimum of mathematics, this book uses numerous real-world examples to help you make the transition to analog design. The second edition is an ideal introductory text for anyone new to the area of analog circuit design. Design examples are used throughout the text, along with end-of-chapter examples Covers real-world parasitic elements in circuit design and their effects

Analog circuit and system design today is more essential than ever before. With the growth of digital systems, wireless communications, complex industrial and automotive systems, designers are being challenged to develop sophisticated analog solutions. This comprehensive source book of circuit design solutions aids engineers with elegant and practical design techniques that focus on common analog challenges. The book's in-depth application examples provide insight into circuit design and application solutions that you can apply in today's demanding designs. This is the companion volume to the successful Analog Circuit Design: A Tutorial Guide to Applications and Solutions (October 2011), which has sold over 5000 copies in its the first 6 months

of since publication. It extends the Linear Technology collection of application notes, which provides analog experts with a full collection of reference designs and problem solving insights to apply to their own engineering challenges Full support package including online resources (LTSpice) Contents include more application notes on power management, and data conversion and signal conditioning circuit solutions, plus an invaluable circuit collection of reference designs

Linear IC Applications is about practical applications of linear IC circuits. Although most of the circuits are based on the ubiquitous operational amplifier, other devices are examined as well. The material in this book will allow you to design circuits for the applications covered. But more than that, the principles of design for each class of circuit are transferable to other projects that are similar in function, if not in detail. A fiction voiced by the less perceptive observer of the electronics world is that analog electronics, i.e. the domain of linear IC devices, is dead, and that digital electronics is taking over every task. While it is true that digital electronics is growing rapidly, and has already taken over many functions previously performed in analog circuits, that doesn't mean that analog electronics is ready to die. There are still jobs that are either best done in analog circuits, or are more cost- effective when done in analog circuits rather than computers. Many digital instruments, for example, require a relatively extensive analog subsystem in order to work properly. In fact, demand for analog electronics, and for people well versed in it, is increasing. There is a worldwide shortage of skilled personnel. This book addresses that shortfall and equips the reader to apply linear ICs in a wide range of settings. Joseph J. Carr is a prolific writer and working scientist in the field of radar engineering and avionics architecture. He has written over 25 books and regularly contributes to electronics magazines. Another recent Carr title, Linear Integrated Circuits, also published by Newnes, is a perfect companion to this designer's guide, providing as it does a primer and first reference on linear IC technology. Companion to Linear Integrated Circuits by the same author Practical guide for designers Covers op amps and other linear devices

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