Electronic Techniques: Shop Practices and Construction (7th Edition)

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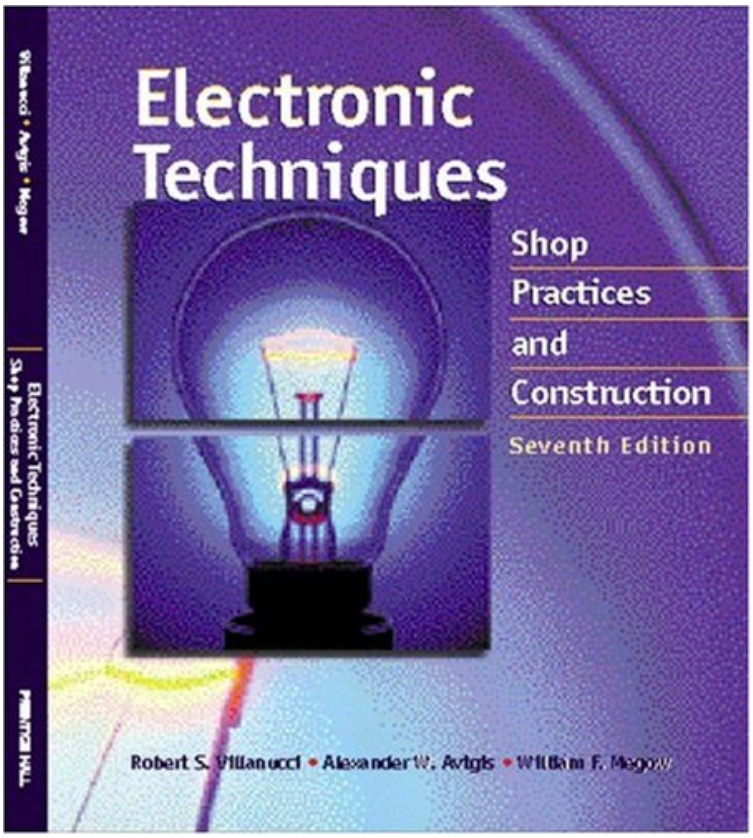

#2200107 in Books 2001-03-30Ingredients: Example IngredientsOriginal language:EnglishPDF # 1 10.79 x 1.34 x 8.19l, 3.38 #File Name: 0130195669688 pages | File size: 34.Mb

Robert S. Villanucci, Alexander W. Artgis, William F. Megow : Electronic Techniques: Shop Practices and Construction (7th Edition) before purchasing it in order to gage whether or not it would be worth my time, and all praised Electronic Techniques: Shop Practices and Construction (7th Edition):

0 of 0 people found the following review helpful. This is a great book for those learning the basics of designing and ...By Will WuThis is a great book for those learning the basics of designing and assembling your first part power supply. There was alot of material in this book that I found useful that my professor didn't mention.2 of 2 people found the following review helpful. Don't wast your moneyBy A CustomerI would not buy this book. [...]It is very much out of date and appears to be a textbook for a first semester electronics course. Even if I had read this book 10 years ago I would not be happy. It does not mention surface mount devices (they were in use at time of publication in 1986) and goes on at length about very simple subjects like drilling a holes in circuit boards. Don?t waste your money. has much better books in stock.2 of 2 people found the following review helpful. 10 Year Old TechniquesBy A CustomerThis book is in need of major updates in almost every way. I would not recommend this book to anyone who has had more that a year or two of experience in the electronics lab environment.

This solid, easy-to-read book is designed to fulfill the needs of technicians seeking competency in all aspects of electronic design and fabrication techniques. It serves as a practical and realistic guide for developing skills in planning, designing and constructing electronic equipment. Extensive coverage of important topics reflect the rapid, on-going changes continuously reshaping the electronic packaging industry and the specialized skills that go with them. These topics are discussed under the major headings of: Circuit Design And Project Planning, Designing Printed Circuit Boards With CAD Techniques, Printed Circuit Board Fabrication And Inspection, Printed Circuit Board Component Assembly And Soldering, Chassis Fabrication And Metal Finishing Techniques, And Chassis Hardware And Wiring. A final section contains a broad selection of introductory and advanced packaging projects that strengthen readers' understanding of the material covered, and further develops their interest in developing the skills discussed. For today's packaging technicians, and for use in industrial and military training programs.

From the PublisherElectronic Techniques: Shop Practices and Construction presents a practical and realistic approach for developing skills in planning, designing and constructing electronic equipment. Its logical presentation helps beginning technicians become competent in all aspects of electronic design and fabrication techniques. Due to the text's widespread recognition as a book that is practical and easy-to-read with a perfect balance of principle and practice, the Fifth Edition has retained much, incorporating additions, deletions and reorganizations only to strengthen and update the material.From the Back Cover The electronic packaging industry continues to undergo rapid change, and currently there is no end in sight to this progress. The adoption of new device packages for high-density assemblies in conjunction with more functionally-complicated, printed circuit board technologies bring about ever more sophisticated design, construction, and packaging techniques that require today's technician to possess special skills. The seventh edition of Electronic Techniques: Shop Practices and Construction continues to present a practical and realistic approach for developing the new skills necessary for planning, designing, and constructing state-of-the-art electronic equipment. The new material added to this edition serves to strengthen and update this highly successful text, designed to fulfill the needs of technicians seeking competency in all aspects of electronic design and fabrication techniques. Clear, detailed explanations are combined with a multitude of figures and drawings to provide the most up-to-date coverage anywhere. In addition, the end-of-chapter exercises (short-answer, true/false, matching, multiple choice, and problems) help to reinforce the objectives introduced within the chapter. Features new to the seventh edition include: Chapter 1 has been updated and uses a newer version of PSpice in explanations, examples, and exercises. Chapter 27 is entirely new. This innovative addition addresses the valuable topic of electronic devices for student projects. New appendices complement the new material introduced in chapter 27 and provide a quick reference to manufacturers' and suppliers' websites. Several new additions (to reflect changes made to the student text) have also been made to the Instructor's Manual (0-13-091363-4) .to accompany this text. Excerpt. Reprinted by permission. All rights reserved. As has been the case for many years, the electronic packaging industry continues to undergo rapid changes and there appears to be no end in sight to its progress. The adoption of new device packages for high-density assemblies, in conjunction with more functionally complicated printed circuit board technologies, has continued to bring about even more sophisticated design, construction, and packaging techniques that require today's technician to possess special skills. Furthermore, today's packaging technicians are expected to be more familiar than ever with the general theory of operation behind the components and devices with which they are working. Thus, it is the purpose of this seventh edition to continue to present a practical and realistic approach for developing these new skills in planning, designing, and constructing electronic equipment. Due to the wide acceptance of the first six editions of Electronic Techniques, much of the material has been retained. Several changes, mostly additions and updates, have been incorporated into the seventh edition and the Instructor's Resource Manual, both to strengthen and to add a new dimension to the material. What's New in the Seventh Edition? Material written specifically in order to strengthen the projects in Unit 7. A new Chapter 27 on Electronic Devices for Student Projects has been developed to provide the packaging technician with the theory of component and device operation as well as the practical background knowledge necessary to more completely understand and troubleshoot the student projects contained in the last two chapters of the book. While broad in overall range and coverage, the theoretical and practical material presented in Chapter 27 is specific to the devices chosen for student projects that follow and is of sufficient detail so as to be useful. The new chapter provides the following material: (a) Theory of operation and useful information on semiconductor diodes. Both the IN914 small signal and 1N4001 rectifying diodes are considered in detail. There is also a section that presents general information on common light-emitting diodes, or LEDs. (b) A section on both the operating theory and the usage of digital displays is included in this chapter on electronic devices. The MAN6760E seven-segment displayselected for its high visibility factor in most ambient light conditions3151;is considered first. Based on LED technology, these displays are chosen when power consumption is not an issue. For applications sensitive to excessive power drain, that is, portable battery-powered devices, a popular liquid-crystal display, or LCD, is discussed. (c) Because some of the projects in Unit 7 use discrete devices, a section on semiconductor transistors is provided. Both the 2N3904 NPN and complement 2N3906 PNP transistors are included. In this section, the general theory of operation is covered briefly, but applications are restricted to those BIT devices that are used as electronic switches.

(d) Another semiconductor switch included in chapter 27 is the silicon-controlled rectifier. Intended for DC applications only, the ubiquitous C106B1 SCR is discussed. Information on testing this important device provided. (e) A very popular and useful integrated circuit, or IC, used extensively in the student projects of this book, is the operational amplifier. In addition to some general theory of operation regarding this important group of linear ICs, information on their use as both a voltage comparator and as an amplifier is provided. The LM324, LM358, and the OP-07 op amps are used to detail the applications presented in this section. (f) While not employed extensively in the student project section, some devices that can only be grouped as digital logic are used, and therefore included here. Elementary information to form a basic understanding of use for both the 74H07 hex buffer and the CA4030 exclusive-OR gate is presented in a separate section of the chapter. (g) Many of the major topics in packaging presented throughout the body of this bookand also in both of the student project chaptersrevolve around popular power supply (AC-to-DC converter) circuits. Therefore, a section on high-power voltage regulator ICs, which covers both the theory of operation and some circuit design considerations, is presented here. The popular 7805 three-terminal fixed (5-V) regulator and the LM317 three-terminal adjustable (1.2- to 26.6-V) regulator ICs are covered because these are the devices unique to student projects. (h) Portable measurement equipment, operated typically from battery power, often requires a stable reference to facilitate a good design. To accomplish this task the circuit designer generally employs a low-power reference IC, either voltage or current, depending on the application. The REF-02, a precision, fixed 5.00-V stable reference; and the REF200, a precision 100-uA current source; are both discussed. Basic test procedures are presented. (i) The NE555 timer is introduced and both its internal architecture and its external pin configuration considered. This IC, which for some has reached almost universal status, is presented in two applications: a time-delay, power-on circuit and a basic square-wave oscillator. (j) Several of the student projects include sensors to measure physical parameters such as temperature and pressure. We have therefore included some basic practical information on the use of three sensors: (1) the UUA41Jl thermistora nonlinear device to measure temperature; (2) the AD590 current transmittera linear IC used also to measure temperature; and (3) the SCX-15 ANC sensora linear IC designed to measure absolute pressure. (k) Information on the general fabrication and the theory of operation of piezoelectric devices such as those used in an audible buzzer is included. This technology, used in the microcontroller project of Chapter 29, is a popular solution in such common household products as smoke and gas detectors, as well as burglar alarms. (1) Finally, we have included some technical information on a group of devices referred to as integrated circuit converters. The 7660 switched-capacitor inverter, used to create a dual-supply from a single DC source (that is, create -9 V from +9 V), is addressed first. The ICL7106 analog-to-digital converter (ADC), a common IC building block in many handheld electronic products requiring a digital display (LCD), is discussed in some detail. Finally, information on the CA3162E/CCA3161E ADC chip set, similar in functionality to the ICL7106 but chosen when power drain is not a consideration and an LED display is warranted, completes our discussion of student project devices. A new Section 13.10 has been added to complement the conventional single-sided, double-sided, and multilayer PCB fabrication process begun in Chapter 9 and completed in Chapter 14 of this book. Referred to in the industry as chemical or "wet" processing, the text material now includes information regarding the fabrication of prototype single- and double-sided PCBs using mechanical methodsa printed circuit board prototype fabrication system that employs only drilling, engraving, milling, and routing methods. Designed around a unique software-controlled XY milling/drilling machine specifically tailored to rapidly produce prototype PCBs, this technology is ideally suited for companies and universities that require making prototype PCBs more quickly than a conventional "wet" process and do not wish to incur the expense of establishing a conventional chemical process. Finally, this computer-driven XY milling machine technology can be expanded to produce prototype multilayer (MLB) PCBs. MLBs, however, require the addition of some chemical processing steps. Section 1.3 of Chapter 1 has been updated to include the use of a newer version of PSpice to simulate the unregulated or "raw" power supply section of the switching-regulator packaging design project. This update reflects the changes in this popular simulation software. New Appendices have been added to the seventh edition (a) to complement the new material presented in Chapter 13, Section 10 regarding fabrication of PCBs by mechanical means and (b) to provide a quick reference to manufacturers' and suppliers' Web sites. To the Educator This text has been designed to fulfill the needs of a typical electronic shop course, manufacturing processes program, or comprehensive package design project. The material is directed toward educational institutions such as technical-vocational schools, technical institutes, and junior colleges, as well as industrial and military training programs. The training of a skilled craftsperson requires not only clear and detailed explanations, but also visual and graphic aids. For this reason, over 500 figures and drawings have been included to illustrate fundamental techniques used in electronic design, construction, and packaging. In addition, many exercises have been included to help readers develop a thorough understanding of basic concepts. Although the chapters are grouped in units of similar material, individual chapters may be studied independently. No prerequisite knowledge of electronic circuits is necessary to understand the package design and fabrication techniques presented, although a deeper insight may be realized if the technician has a fundamental background in electronic circuits and devices. Chapter 1 does, however, require some background in electronics for a more complete understanding of material. presented therein. To this end, and to help the interested student gain more insight into the projects presented in

Chapters 28 and 29, a new Chapter 27 on electronic devices has been added to this edition. See the information under Unit 7 below for more information on this topic. Unit 1: In Chapter 1, the design of a 5-V switching regulator power supply with popular software tools is introduced and used as a teaching vehicle for all the remaining topics in this first unit. Chapter 2 discusses the general factors that must be considered in packaging any electronic system. Chapter 3 reintroduces the switching-regulator project and its packaging design. In Chapter 4, preliminary considerations of the package are converted to detailed engineering drawings and sketches. Unit 2: The four chapters in this unit detail the information necessary to design both single- and double-sided printed circuit boards. Chapter 5 supplies pertinent information on available printed circuit board material to make an informed selection. Chapter 6 covers the logical design process necessary to generate a "sketch" of the component placement and conductor pattern routing for single-sided PCBs. Then, in Chapter 7, using a general purpose CAD drafting package, detailed information on keystrokes and procedures necessary to convert the "sketch" into a conductor pattern artwork is covered. AutoCAD, Release 12, was chosen to illustrate this chapter, but the presentation of PCB design concepts can be adapted to other manufacturers' products. This unit concludes with Chapter 8, which presents the design of both double-sided and four-layer multilayer PCB. In this chapter a software tool developed specifically to design PCB, Eagle 2.6, was selected to illustrate the use of a Schematic Module, Layout Editor, and Autorouter to develop the top and bottom conductor pattern artworks for a simple double-sided PCB. Concepts such as Electrical Rules Check, Design Rules Check (DRC), and RATSNEST are presented. Unit 3: Chapters 9 through 15 provide detailed information on fabricating both single- and double-sided printed circuit boards. Chapter 9, which introduces the photographic process, includes information on diazo film to make positive phototools and covers the use of a densitometer. Chapter 10 supplies detailed information on the fabrication of single-sided printed circuit boards using the print-and-etch method. Chapters 11 through 13 cover the plated-through-hole process, the print-plate-and-etch technique for double-sided board fabrication, and the use of dry-film photo resist. Information on an entirely mechanical PCB prototype fabrication process is included at the end of Chapter 13. Chapter 14 provides basic design and fabrication procedures for multilayer boards (MLBs). Visual inspection and testing procedures for printed circuit boards are presented in Chapter 15, which also includes the use of a microprocessor-based bed-of-nails tester, a Caviderm, and microsectioning techniques. Unit 4: Chapter 16 covers printed circuit board hardware and component assembly, and Chapter 17 includes information on PCB soldering. Topics range from basic hand soldering to industrial processes such as wave soldering. This unit concludes with Chapter 18, which details information on surface-mount technology, including component assembly and soldering. New equipment and techniques, specifically intended for surface-mount component assembly, are introduced and covered in some detail. Unit 5: The layout, fabrication, forming, and finishing of sheet-metal chassis elements are covered in Chapters 19 through 24. Unit 6: Chassis hardware assembly and wiring techniques are covered in Chapters 25 and 26, combining the various elements into a finished system. Unit 7: This unit begins with Chapter 27, which covers the theory of operation for the. all of the devices to be encountered in the next two project chapters. While not generally considered necessary information from a strictly packaging point of view, this practical information is useful if one wishes to gain more insight into the total problem of electronic packaging. Chapter 28 contains a selection of simple exercises designed to strengthen the material in each unit. Chapter 29 provides a broad selection of advanced packaging projects to further develop student interest and provide practice in developing the skills discussed in this book. Software In keeping with the industrial trend of using more computer software packages to facilitate electronic designs, enhance quality, and improve productivity by reducing the packaging time cycle, five separate software packages have been presented in this edition. These software packages are: AutoCAD (general purpose drafting software), Eagle (PCB layout software), Switchers Made Simple (dc-to-do converter design software), PSpice (circuit analysis software), and HP VEE (data acquisition and process control software). Each application package was chosen as a representative example to illustrate the solution to a particular problem presented. Many other products, however, are available from a very large group of suppliers, a group that is expanding rapidly. Please note that the selection was made without regard to price. The prices of the software illustrated in this book range from free (available from the manufacturer) to industrial grade products-large programs that are rather expensive. A list of the names and Web sites of the manufacturers or suppliers for each is provided in Appendix XXVI. A Word About Safety Modern industrial printed circuit board fabrication processes require the use of hazardous chemicals, as described in this book. We cannot emphasize strongly enough that the handling, use, shipping, storage, and disposal of these chemicals must be performed under supervision by people trained in this area and who are familiar with local OSHA and EPA regulations. This is a learning text and, as such, describes in detail the chemical processes required. It, however, does not provide the necessary training or conditions required for the proper handling of these chemicals. We urge that the section on safety concerns and practices (following the Preface) be read carefully. This section is intended to help those interested in finding the necessary information on safety before attempting to work with any chemical or processes. Also the CAUTIONS in many chapter introductions should be consulted before attempting certain processes and procedures described throughout the text. Acknowledgments We express our gratitude to Dr. Robert F. Coughlin and Professor Frederick F. Driscoll, our colleagues at Wentworth, for their many helpful comments and suggestions. We thank the staff at T -Tech, Inc., Atlanta, GA, who furnished

photographs and technical support. We are also grateful to the many at Contact East, Inc., North Andover, MA, for their technical support. Our many thanks are extended to Kristen Marino for employing her formatting and image-setting skills in reproducing all of the new photos and artworks supplied electronically by manufacturers. Special thanks goes to the reviewers who provided helpful feed back: Leonard Leeper, Front Range Community College; Gilbert Ulibarri Jr., Salt Lake Community College; Garth Fisher, Walla Walla College; and Vincent Kasab, Erie Community College. Finally, we are grateful to our families for their continued support and patience throughout the preparation of the seventh edition of Electronic Techniques: Shop Practices and Construction. Robert S. Villanucci Alexander W. Avtgis William F. Megow