

THE MAGAZINE FOR PROFESSIONAL ELECTRONIC AND COMPUTER SERVICERS

ELECTRONICTM

Servicing & Technology

August 2001

COMPLYING WITH ENVIRONMENTAL CONSIDERATIONS

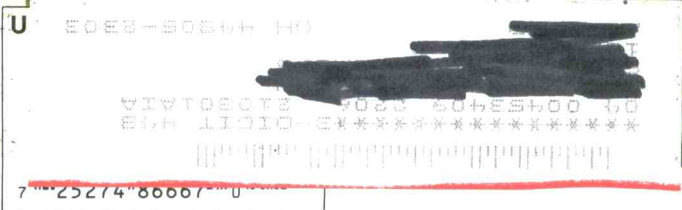
LIGHTING

REPLACEMENT PARTS
SHOWCASE
AN ADVERTISING
SECTION

**MULTIMETER
UPDATE**

**DIGITAL TELEVISION
UPDATE: DVB**

**GOOD GRIEF! IT'S IN
SHUTDOWN**



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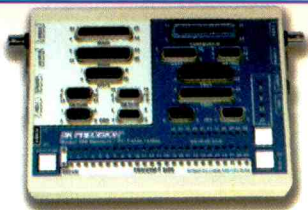
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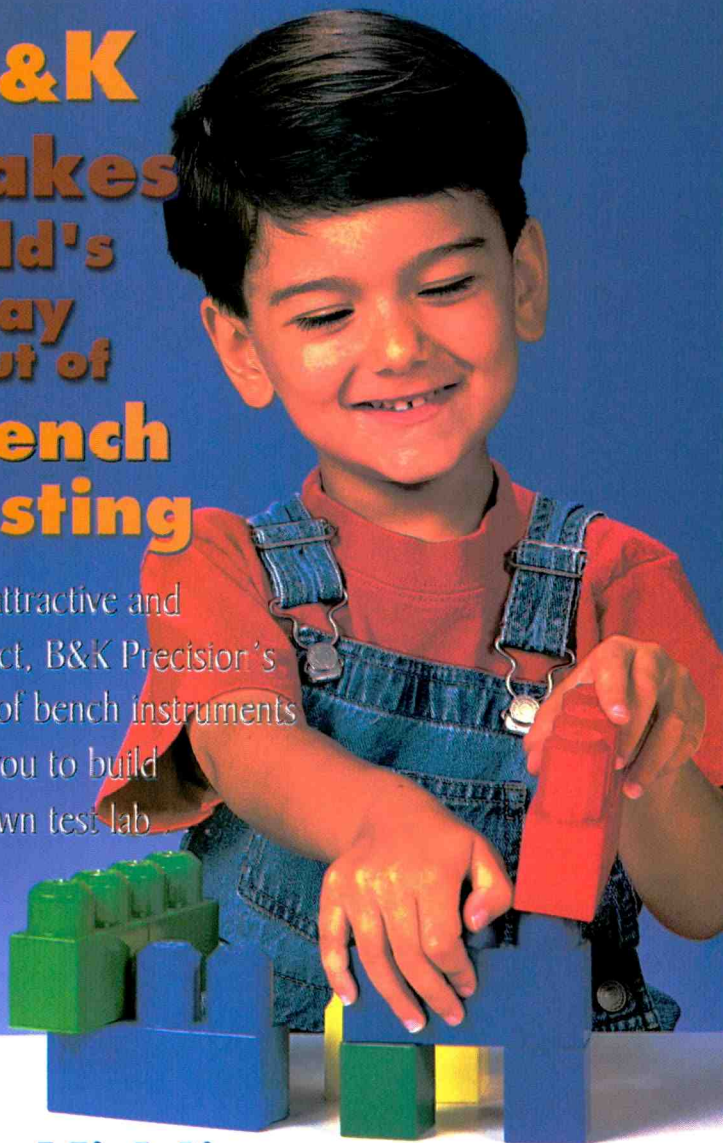
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of
Service

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John A. Ross

Digital Video Broadcast technology enables the point-to-multipoint transmission of very large amounts of data at high data rates, including audio, video, files or other information. Here is an analysis of how it works and how it affects your troubleshooting on new products.

THE HOME THEATER: LIGHTING _____ 14

By the ES&T Staff

Home Theater installations have made a number of new profit opportunities available to the installer/repair technician. Lighting is one of these new opportunities. This article examines lighting concepts for a full range of conditions from multi-purpose rooms to dedicated facilities to the new 'McMansions' with their throughout the house systems.

GOOD GRIEF! IT'S IN SHUTDOWN _____ 18

By Bob Rose

Because fuses and circuit breakers are not sophisticated enough to protect today's electronic devices, engineers turned to the next generation of circuits, the so-called "automatic electronic shutdown circuits." Some TV sets have as many as 22 of these circuits, each capable of shutting the set down.

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Replacement parts and their availability at fair prices from reputable vendors continue to provide the difference in getting a set repaired, back to the customer and getting paid...vs. being on the shelf and waiting. This advertising section of ES&T provides background information and offerings from several leading vendors.

MULTIMETER UPDATE _____ 37

This two part series begins with a review of the variety of features offered with multimeters with an inside understanding of what may be important and what may be just an extra cost item.

COMPLYING WITH ENVIRONMENTAL CONSIDERATIONS _____ 40

By the ES&T Staff

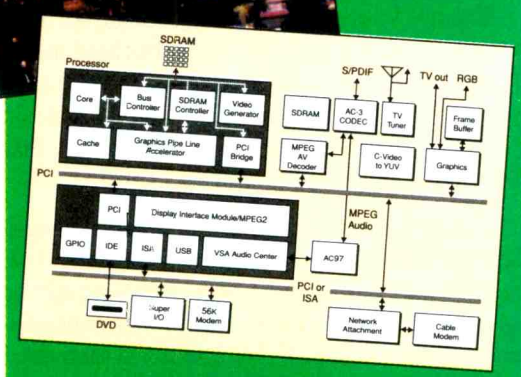
The impetus for a wide variety of regulations on the disposal of all types of electronic products and equipment is nationwide if not world wide. Here is a review of the unwanted materials within popular consumer electronics products, and some solutions presented.

CEDIA EXPO 2001 _____ 43

Here is a quick look at the senior event in the Home Theater design, installation and maintenance marketplace. 15,000 attendees and 700+ exhibitors make Indianapolis the center of the market each September.

SOLDERING AND DESOLDERING BACK TO THE BASICS _____ 45

It's a given that one of the essential skills of a qualified service technician is the ability to make good solder joints, and to desolder solder joints and to perform both of these operations without causing the printed circuit foil to delaminate from the substrate, or otherwise damaging the circuit traces.



REPLACEMENT PARTS SHOWCASE

AN ADVERTISING SECTION

Cover Photos Courtesy of
Wavetek Meterman Test Tools

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Editorial

by Nils Conrad Persson

HAPPY BIRTHDAY, PC

According to a number of sources, it's the 20th anniversary of the introduction of the personal computer by IBM. Of course, there were personal computers around before that, but it is generally acknowledged that the introduction of a personal computer by the company that many consider to be the premier technology company of our time legitimized what was up until then mainly a cult type of industry. Individuals and companies that could benefit from the use of personal computers took notice and said to themselves "hey, this technology could be for real." IBM expected to sell something in the range of a quarter million personal computers in five years. Millions were sold.

Because the PC was not established as a proprietary product, any manufacturer who wanted to make and sell PCs was free to do so. The ensuing competition encouraged rapid innovation and reasonable prices. A multitude of software manufacturers, recognizing that this computer, with its standardized operating software, DOS, would be a stable platform, began generating useful software for it.

The rest, as they say, is history. In fact, it's hard to know how to think about the fact that the PC has been around for 20 years. Do you think about it as "Wow, PCs have been around for 20 years. Was it really that long ago?" Or do you think about it as "Wow, PCs have been around for only 20 years. Look how they're transformed the world in so short a time."

It is truly amazing to look around at businesses today. A few still don't have computers to run the business, but not many. Go to any restaurant, medical office, movie rental store, or other small business. They'll ask you either for your name, or telephone number, and then see if they find you in their database.

The veterinarian to whom I bring my cat has all of his records in the computer. When I call to make an appointment, they just bring up his record on their computer screen and know if they need to update any of his inoculations, or if there are any tests related to his age that they need to do. When they print up the bill, it bears a photo of my cat that they've taken with a digital camera.

The influence of the personal computer on the lives of the millions of people who use them is even more remarkable when you consider what the combination of personal computers and the Internet has wrought. Today it seems that almost everyone has a personal computer and is taking care of a large portion of their personal correspondence via e-mail. Millions of young people are downloading music from the internet in the form of MP3 files, and carry the digital ditties around in tiny MP3 players that contain no moving parts. Internet radio stations allow people to listen to any kind of music they choose to hear from any place in the world.

And consider that by comparison with what is likely to come in the future, this technology is still in its infancy. When Jack

Kilby invented the integrated circuit just a few decades ago, the upper limit on the number of transistors that could be fabricated on a chip was around 10. The Intel Pentium contains in the order of 42 million transistors on a single chip. It is predicted that by the year 2007, they'll be routinely placing around one billion transistors on an integrated circuit chip. Experts say that with that immense processing power, voice recognition and language translation will be a piece of cake.

IBM is working toward offering a one-half pound computer by 2006. You'll carry all your computing power around with you, and just plug it into a docking station of some sort wherever you wish to work on it. And if the magnetic memory they're working on bears fruit, when you turn on the computer it will come on instantly; no boot up time required. Unlike today's RAM memory, this magnetic memory is non-volatile, so it will not lose the information stored there when the computer is turned off. It will be there ready to go any time the computer switch is turned on.

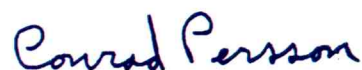
In light of all the wonderfulness that computers afford us, something never ceases to amaze and mystify me; a significant number of service centers still don't use computers. Just the other day a reader called me with a question. I couldn't give him an answer right away, so I asked him for his e-mail address, and said I'd get him an answer as soon as I could and e-mail it to him.

This reader confessed that he didn't have a personal computer, so, of course, no e-mail address. He explained that he wasn't fond of all this new technology. Then he, without prompting, acknowledged that it was the height of irony that he, a person for whom repairing products that represent the cutting edge of electronics technology should have such a view of technology. But he has quite a bit of company.

All of you holdouts against computerization, here's a notice: you will eventually have to embrace computers. Do you have a telephone? No one today can exist without a telephone. Well, I exaggerate. You can. But few people do, and to operate a business without a telephone is next to impossible.

Consumer electronics manufacturers are increasingly relying on personal computers, CD-ROMs and the Internet to disseminate service literature and conduct business with service centers. If you don't have a computer, you'll be totally out of the loop. Moreover, computer technology has progressed to the point that a personal computer is not terribly expensive, and pretty easy to use, so there's really no longer any excuse.

But enough of that. Once again, happy birthday, PC. You've accomplished so much in a mere 20 years. We can hardly wait to see what you're capable of as you enter adulthood.



THE MAGAZINE FOR PROFESSIONAL ELECTRONIC AND COMPUTER SERVICERS

ELECTRONIC

Servicing & Technology

Electronic Servicing & Technology is edited for servicing professionals and managers who service consumer electronics equipment. This includes owners, managers, service technicians, field service personnel and avid servicing enthusiasts who repair and maintain audio, video, computer and the new digital consumer electronics equipment.

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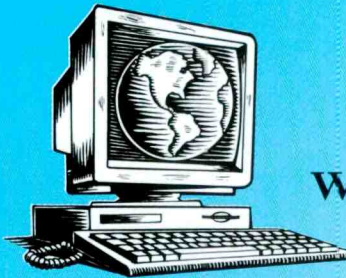
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ECI Launches New Version of Warranty Claims Processing eCommerce Solution

ECI, builder of network-based eCommerce trading hubs introduced and demonstrated ecClaims, a new warranty claims application at the NESDA conference in Las Vegas. This module adds to the current solutions that the company offers for conducting ecommerce, collaborating, and business process integration between enterprises. The solution-set includes online procurement, fulfillment, logistics planning, inventory visibility/planning, supply chain management, warranty claims processing, product catalog capabilities and related performance statistics and reporting.

The new application is designed for servicers and manufacturers and features a robust, user-friendly, web-based user interface, according to ECI. The system utilizes an Oracle 8i relational database that gives it tremendous data flexibility and the ability to process claims and reports in a real-time environment.

"We spoke with approximately 50 servicers and manufacturers to come up with a state of the art warranty management solution. The positive feedback we've received has been tremendous. We've been told that there is nothing comparable in the marketplace today," says

Michael Johnson, Vice President of Product Management at ECI.

ecClaims reduces error rates and the amount of work required to submit and manage warranty claims. Running in a real-time environment, Service Centers can make claim submissions and changes at any time without having to re-submit a claim and verify payment. Changes made to a claim are instantly recognized and processed. Claims may be submitted via a dial-up connection, via FTP, data import routines, or by entering the data directly into the system using ecClaim's web-based forms.

Manufacturers have access to all claims and edit rule information utilizing a host of data management and report options enabling better management of data. All

claims are validated against the manufacturer's model and serial numbers, and labor rates ensuring the claim information is correct for payment. Providing a low cost solution to the warranty claims process results in better customer service for both the Manufacturer and the Service Center.

ECI has entered into partnerships and has launched marketing efforts with Custom Data Associates and Blakely's Computer Support. Utilizing the bi-directional interface, warranty and purchasing data may be transferred from each of these systems to the ECI system and then routed electronically in the correct format to the trading partners creating a plug-and-play capability for the users of these software packages.

ECI and Custom Data Associates Team Up To Offer a True ECommerce Solution to Improve Purchasing and Warranty Processes

Custom Data Associates has partnered with ECI to provide and implement an eCommerce ordering and warranty management solution to their customers.

"We are excited by our partnership with ECI and will now offer an integrated purchasing and warranty management eCommerce solution taking customer service to a new level," said Dan Frezza, President, Custom Data Associates. Using version 8.3 of CDA Service Manager, order and warranty

information is automatically transferred out of the software system utilizing ECI's trading network and sent on to the correct manufacturer for processing. CDA launched version 8.3 in July 2001, which incorporates a bi-directional interface that enables Servicers to send purchase orders, receive purchase order acknowledgments, send warranty claims and receive credits into the CDA Service Manager system.

In Memoriam

It is with sadness that we report that J.A. Sam Wilson passed away on January 31, 2001 in Melbourne, FL. Sam was a teacher, writer, inventor, and one of the originators of the CET program, and writer of the first CET tests.

Sam wrote two columns for ES&T: "What Do You Know About Electronics?" and "Test Your Electronics Knowledge." Sam started writing for ES&T in 1982, and his columns appeared in this magazine almost continuously until now. Readers found Test Your Electronics Knowledge to be a challenging, and sometimes controversial, feature of this magazine.

Sam was a friend as well as a writer to the magazine. He will be missed.

Sony Closes 17 In-House Repair Centers in U.S.

Sony has announced the closing of 17 of their 23 U.S. in-house repair centers and satellite operations. According to a Sony spokesperson, the closings are due to "a decrease in the number of repairs needed because of the introduction of new digital products that require less maintenance, as well as the development of a stronger Sony Authorized service network and the fact that (Sony) customers primarily use mail-in repair service rather than drop-off service.

A sampling of independent servicers

produced additional thoughts including the possibility that the Sony in-house efforts were not profitable and that the advent of big screen, home theater products required in-home service more easily accomplished through the Sony network of authorized servicers.

The centers that will remain open include: Westwood (Boston), MA; Bristol, PA; Chicago, IL; Fremont, CA; Detroit, MI.

The 17 closings are scheduled for the end of September.

Panja Changes Name Back to AMX

RICHARDSON, TX -Panja Inc. is changing its name back to AMX. The announcement was made at the International Communication Industries Association (ICIA) sponsored show, INFOCOMM 2001.

The Company will immediately begin doing business as AMX Corporation following approval by the Company's shareholders at its August 22, annual meeting and its NASDAQ ticker symbol will change from PNJA to AMXC. "The name

AMX has always been associated with the high level of customer service and support upon which we were founded, and better represents the value of our 20-year history in the marketplace and our accomplishments," said Scott Miller, Chairman, President and Chief Executive Officer. "The name also symbolizes the core capabilities we are building in world-class control systems, such as NetLinx, and the vast array of professional services for our dealers."

AMX CORPORATION is the world-wide leader in advanced control system technology targeting commercial and residential markets. AMX delivers convenient, easy-to-use solutions that incorporate advanced programming and network applications through technology. AMX's strategy is to work with leading dealers and distributors to integrate its products with other electronic devices, while continuing to lead the industry in control technology.

Philips Moves Service Operations — Announces New Contact Numbers

The Philips Service Operations has moved to One Philips Drive, P.O. Box 14810, Knoxville, Tn. 37914. Here are the new contact numbers for authorized

and non authorized servicers as announced by Tom Briggs, Manager of Field Service ASC:

Authorized ASC: Tech Assist/Parts ID	865-525-0234	Fax 865-521-4555
Non ASC: Tech Assist/Parts ID	900-896-8324	
Field Service Office	865-525-9516	Fax 865-521-4529
Publications	865-521-3144	Fax 865-521-4711
Training	865-521-2317	Fax 865-521-4319
Service Contracts	800-237-9006	Fax 800-535-3715

Techspray Promotes Jimmy Witcher

Techspray announces the promotion of Mr. Jimmy Witcher Effective May



James Witcher
President of
Techspray

31,2001 Jimmy Witcher, presently Vice President of Marketing for Techspray, assumes the responsibilities of President of Techspray; Mr. Witcher has been with Techspray for fourteen

years. He began his career in the lab as a part time chemist, and came on board after graduating from West Texas A&M University, as a research chemist.

As well as serving as Vice President of Marketing, Mr. Witcher also serves as a member of the Executive Financial Committee.

PTS Expands Cellular Phone Depot Service

Bloomington, Ind.—PTS Electronics Corporation, has announced a new program for cellular phone repair. PTS now offers repairs at a flat rate of \$49.95 for most models of Nokia and Motorola cell phones, as well as other major brands.

Dave Melwid sales/marketing director for PTS, sees this as a potential windfall for the company's servicer customers. "We are constantly looking for additional opportunities for our service dealer base, and the cellular industry certainly presents that opportunity," said Melwid.

"The cellular phone industry is presenting a whole new profit center for repair operations."

PTS has been providing cellular phone repair for the past several years. "We process thousands of cellular phone repairs every week," said Melwid. "These have traditionally come direct from the manufacturer or carrier." The company is qualified to perform component-level repair (level III), and currently provides 72 hour in-house turnaround on all cellular repairs.

Fund Announced for the Family of Greg Herrin

Greg Herrin, son of industry figure and Hitachi Service Leader Walt Herrin died suddenly at the close of the NPSC conference in Las Vegas. Greg is survived by his wife and a five year old son.

Greg Darling, Field Service Representative, Hitachi America, Home

Electronics Division has announced that a fund has been established to support the family in this most difficult time. Donations to the fund may be made to: Greg Herrin Fund, Acct: 3320229234, Bank Plus, 5100 Highway 39 North, Meridian, MS 39302.

Texas Instruments Parts now Available from Digi-Key

Distributor Digi-Key has added more than 13,000 Texas Instruments parts to its line of product offerings.

TI datasheets are also available by request with many linked online.

Digi-Key is a national direct order distributor with more than 240 product lines and 180,000 products.

Crown Media Signs New Agreement With DIRECTV, Inc. Increasing Hallmark Channel U.S. Distribution To 40 Million Subscribers

Crown Media Holdings, Inc. and DIRECTV, Inc., announced they have entered into a strategic relationship under which the Hallmark Channel U.S. will be repositioned to DIRECTV's TOTAL CHOICE® Package. With this repositioning, the total distribution of the Hallmark Channel in the United States will be expanded to approximately 40 million subscribers by the end of September 2001. In addition, the two companies will explore the distribution of additional programming services, new interactive broadband applications and applications and paper-per-view distribution of programs from the film library to be acquired by Crown Media and additional programs of Hallmark Entertainment. As part of this relationship, DIRECTV will receive approximately 5.4 million shares of

Crown Media Class A Common Stock, representing 4.7% of the fully diluted equity of Crown Media after closing of the pending films transaction with Hallmark Entertainment Distribution.

As part of the collaboration between DIRECTV and Crown Media, DIRECTV will work with Crown Media and Hallmark Entertainment, Inc., to explore the feasibility of the pay-per-view distribution of longform titles, as well as the development of new interactive applications, including an application known as "V Greetings." Discussions will also be held with Binney & Smith to explore possible opportunities involving the Crayola brand. Binney & Smith is owned by Hallmark Cards, Inc.

"We have started on numerous occasions that the success of our business is

dependent on our efforts in three strategic areas-brand, content and distribution," stated David Evans, president and CEO of Crown Media Holdings. "On the brand and content front, we've successfully completed the global rebranding of the Hallmark Channel and are in the process of finalizing the acquisition of over 700 titles from the award-winning Hallmark Entertainment library. Now with this agreement, we are able to advance our goals on the distribution front, putting the Hallmark Channel U.S. on par with some of the most recognized networks on television today. With a recognized brand name, high-quality programming industry and are pleased to add DIRECTV to the impressive list of strategic partners with whom Crown Media is fortunate to be allied."

PTS Electronics Corporation Announces Free Shipping Promotion

Bloomington, Ind. — PTS Electronics Corporation, the nation's largest source for replacement and repair of television tuners and modules, is pleased to announce the implementation of a new shipping promotion to provide an added benefit to its customers. For a limited time, PTS is providing free pickup of tele-

vision modules for repair in the event that the replacement part is not in stock.

PTS, one of the nation's largest independent electronic service centers to handle the repair and rebuilding of television tuners and mainboards for most major product lines. PTS also keeps an inventory of products that can be

shipped the same day from their warehouse.

If a service center contacts PTS regarding replacement of a mainboard and the item is not in stock, PTS will send UPS to pick up the module free of charge. PTS will then repair the item and immediately send it back to the service center. This offer applies to mainboards for television product lines including Zenith, RCA, Philips, Hitachi, and many more. PTS also services certain models of HDTV sets for Zenith, RCA and Hitachi brands.

According to Dave Melwid, sales/marketing director for PTS, "We wanted to make it even more convenient for our television service customers to provide quick turnaround on TV repairs. Traditionally, we have been able to offer a fill rate on replacement parts of around 80 percent, which is the quickest way to repair these items. We wanted to even further increase our benefit to customers by allowing faster turnaround on the items we don't have in stock." This is a limited time offer and certain restrictions apply. For more information, call PTS customer service at (800) 844-7821.

Stratus Announces Russell as President

Stratus announces the promotion of Mr. Grant Russell. Effective May 31, 2001, Grant Russell, presently Vice President of Sales for Stratus, becomes President of Stratus.

Russell has been with the company for eight years. He graduated from the University of Arizona with a degree in communication. He worked a year and a half for Danka Corporation in Phoenix, being recognized several times for sales and motivational skills.

Russell joined Techspray as a regional manager in Chicago, covering the upper Midwest. Not satisfied with just

the standard methods of marketing Techspray products, he embarked on a marketing plan to expand our market beyond the traditional distribution and into the competitive private label consumer arena.

While maintaining excellent growth in traditional products, he provided that the company could enter a new market that would prove to be both profitable and a strategic fit to the overall company, eventually convincing management that a new division needed to be formed; thus, the creation of Stratus.

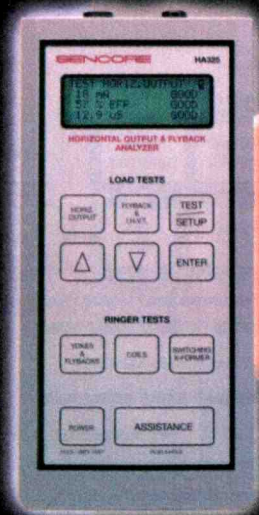


Grant Russell
President of Stratus

HDTV Service... Are You Ready?

HA325 Portable Horizontal Output & Flyback Analyzer

- Improves The Skill Of Your Service Technicians For Faster More Profitable Repairs.
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- Cuts Down On Replacement Repair Costs
- Increases The Accuracy Of Your Estimates
- Durable, Hand-Held and Battery Operated

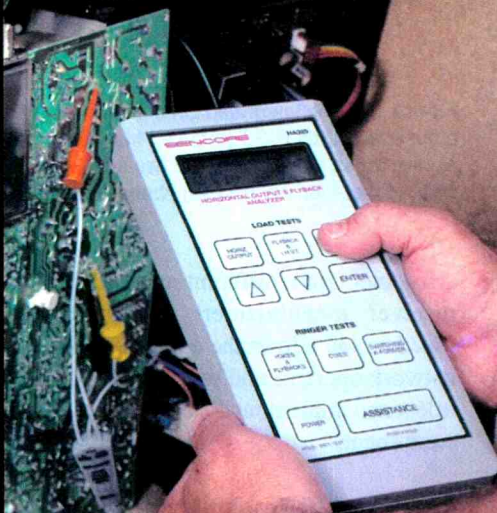


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Circle (8) on Reply Card

Digital Television Update: DVB

By John A. Ross

Founded during 1993, the DVB Project consists of a consortium of public and private sector organizations in the television industry. Digital Video Broadcast technology enables the point-to-multipoint transmission of very large amounts of data at high data rates. Moreover, the DVB standards establish protection against transmission errors. Data sent through the DVB system may include audio, video, files, or other information.

DVB and MPEG-2

Because the DVB Project selected MPEG-2 (MPEG stands for Moving Picture Experts Group) for the source coding of audio and video and for the creation of program elementary stream, the consortium has the goal of setting a framework for the introduction of MPEG-2 based digital television services. Given the use of MPEG-2 as a stream of data containers, DVB provides the receiver with the location, network, broadcast and program information needed to jump from one element of the multiplex to another and between multiplexes without disrupting the received signal. The MPEG-2 data containers have labels that contain full addressing and processing instructions. Using MPEG-2 as a data container stream allows the system to decode HDTV, SDTV, and data while automatically setting the optimum system parameters.

DVB Interoperability

DVB technologies establish a high level of interoperability and an open systems approach. Because of the use of common standards, DVB systems can transport programs across different delivery media with no problems. For example, DVB-T receivers utilized in Europe operate with many of the same components used within the DVB-C receivers used for cable reception and the DVB-S receivers used for satellite reception.

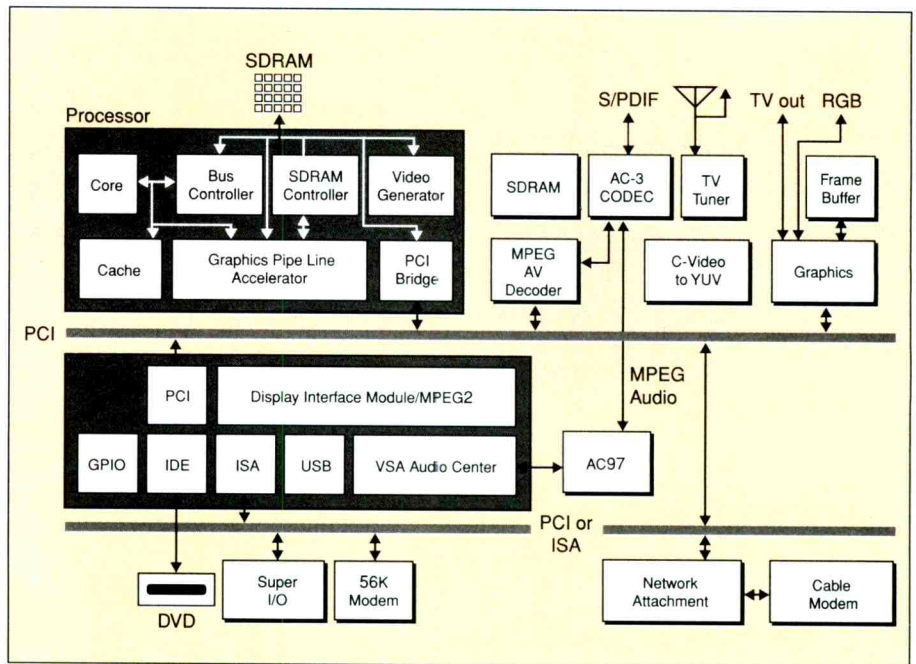


Figure 1. Three integrated circuits provide the basis for the set-top box system. A powerful embedded 32-bit RISC (reduced-instruction-set computer) processor with integrated peripherals also adds a serial port and two additional DRAM (dynamic random access memory) and DMA (direct memory access) channels to the system.

Equipment from different set-top box and receiver manufacturers can function together and allows the content provider, network operator and service provider to select and implement the best added value equipment.

DVB Transmission

A series of transmission specifications make up the core of the DVB system standards. Approved during 1994 and based on QPSK (quadrature phase shift keying), the DVB-S satellite transmission standard has become the world satellite transmission standard for digital TV applications. While related to DVB-S, the DVB-C, cable delivery mechanism has a basis in 64-QAM and also supports higher order modulation schemes. Introduced after DVB-S and DVB-C, DVB-T works from coded orthogonal frequency divisional multiplexing, (COFDM), along with QPSK, 16 QAM

(quadrature amplitude modulation) and 64 QAM modulation.

DVB Interface Options

DVB offers a range of interface options for professional, IRD and conditional access applications. While the DVB Professional Interfaces divide into parallel and asynchronous serial interfaces, the DVB Common Interface based on a PCMCIA (personal computer memory card international association) connector provides a key interface for multicrypt conditional access (CA). IRD Interfaces include the standard set of interfaces intended for DVB set-top-boxes and include interfaces such as RS-232, video connections, and SCART (Syndicat des Constructeurs

D'appareils Radiorecepteurs et Televiseurs, which, roughly translated by the editor, is the Association of Radio and Television Receiving Device Manufacturers). Also

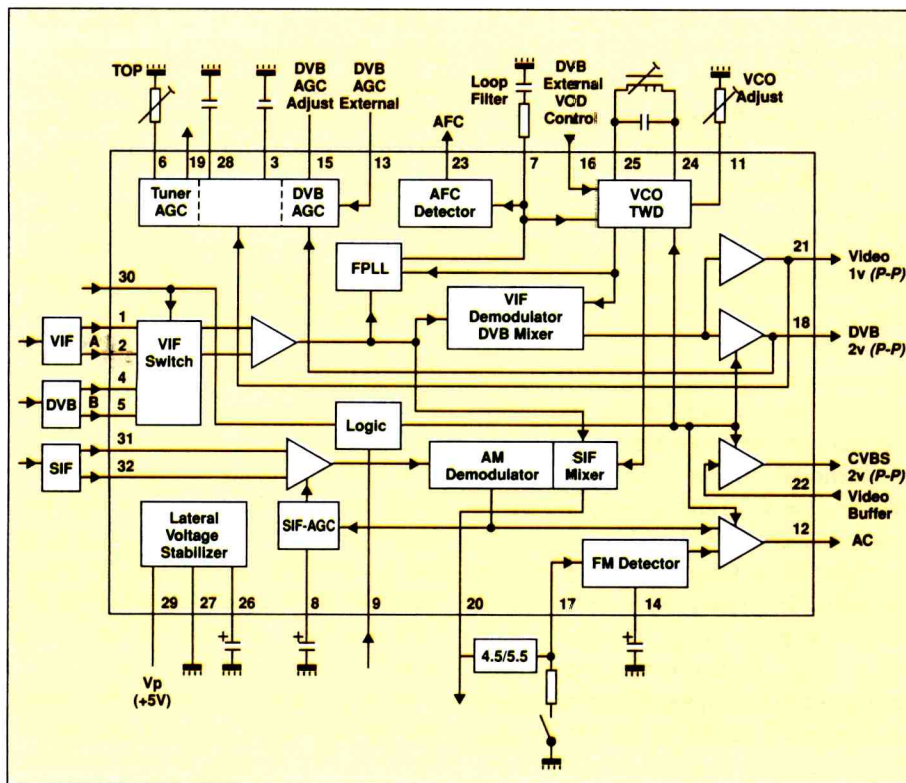


Figure 2. The Philips Semiconductor TDA9819 combines DVB-IF processing with multistandard vision and sound-IF signal processing and a single reference PLL demodulator. The vision IF amplifier consists of three ac-coupled differential amplifier stages. Each differential stage makes up a feedback network controlled by emitter degeneration to control the IF gain. Two pairs of emitter followers extend the first stage for the purpose of providing two IF input channels.

known as Peritel, SCART provides an inexpensive multisignal connector to domestic TVs and other video equipment.

DVB and Conditional Access

A series of tools establish methods for conditional access in DVB systems. SimulCrypt allows a single transport stream to contain several CA systems and enables different CA decoder populations to receive and correctly decode the same video and audio streams. MultiCrypt specifies a common interface installed in the set-top-box or television and permits the user to switch manually between CA systems. If a viewer finds a conditional access system not recognized by the set-top box, the insertion of a different interface card can provide a solution.

DVB and Interactivity

Digital Video Broadcast divides interactive services into a set of Network

Independent Protocols and a series of medium-specific return channel specifications. For example, the DVB Return Channel provides a method for carrying bi-directional interactive services over cable networks with bit-rates up to 3 megabits. Other specifications cover interactivity through telephony or satellite communications.

Built around a series of Java application programming interfaces for DVB set-top-boxes, Multimedia Home Platform provides a domestic platform that defines the application lifecycles, security and data download mechanisms for enhanced broadcast, interactive and indeed full Internet applications. Multimedia Home Platform supports the seamless transition from analog TV to a digital interactive multimedia future.

Set-top Boxes

Set-top box designers can provide addi-

tional functionality through the use of embedded software that initiates creative, powerful applications and well-designed user interfaces. Applications include:

- electronic mail
- Internet connections
- Web browsing
- interactive shopping through catalogs, merchant web pages, and online malls
- the selection of different entertainment options through electronic program guides, digital audio/video, video-on-demand and near-video-on-demand,
- improved game capabilities through telegaming and accelerated graphics, sports, and finance options such as banking, bill payments and the trading of stocks and mutual funds.

In addition, software engineers can use the development tools that accompany the embedded software to create demonstration software, use live feeds, highlight OSD functions and user interfaces, and for applications such as electronic program guides, pay-per-view, and video on demand. An application developer can develop and run an application such as electronic program guides, pay-per-view options, or video on demand while displaying the results on a television.

Set-top Box Hardware

As shown in Figure 1, three integrated circuits provide the basis for the set-top box system. A powerful embedded 32-bit RISC (reduced-instruction-set computer) processor with integrated peripherals also adds a serial port and two additional DRAM (dynamic random access memory) and DMA (direct memory access) channels to the system. In addition to decoding the MPEG stream, the MPEG-2 audio/video decoders control On-Screen Display functions. Because the MPEG-2 decoder operates independently of processor intervention, it frees the processor for other tasks including user interactions.

A significant number of the input/output functions required for a typical set-top box have been integrated into a single peripheral controller IC. The

peripheral chip provides two serial ports, a smart card interface, an IEEE bi-directional parallel port, general-purpose I/O, three Pulse Width Modulation channels, a serial bus controller, and two DMA channels. Along with the functions provided by the peripheral controller, the use of a QAM demodulator module provides a method for working with streams from cable TV delivery networks. The addition of custom front-end boards can improve the operation of the set-top box and add functions such as conditional access.

The TDA9819 IC

The Philips Semiconductor TDA9819 (Figure 2) combines DVB-IF processing with multistandard vision and sound-IF signal processing and a single reference PLL demodulator. The vision IF amplifier consists of three ac-coupled differential amplifier stages. Each differential stage makes up a feedback network controlled by emitter degeneration to control the IF gain. Two pairs of emitter followers extend the first stage for the purpose of providing two IF input channels.

TDA9819A Tuner and VIF AGC Signals

During operation, the AGC output current is generated through the transfer of AGC capacitor voltage to an internal IF control signal and the feeding of the voltage to the tuner AGC. Adjusting the tuner AGC takeover point allows the matching of the tuner and the SWIF filter and achieves the optimum IF input level. From there, the AGC detector charges and discharges the AGC capacitor to the required voltage needed for setting of VIF (video if) and tuner gain. All this maintains the video signal at a constant level.

While the circuit detects the sync level of the video signal for the negative video modulation, it detects the peak white level of the video signal for positive video modulation. To set a large time constant for positive modulation, an additional level detector increases the discharging current of the AGC capacitor if the VIF amplitude decreases. The black-level detector

voltage provides the additional level information.

Frequency Phase Locked Loop Detector

The VIF-amplifier output signal feeds into a frequency detector and a phase detector through a limiting amplifier. When the circuit acquires a signal, the frequency detector produces a dc current proportional to the frequency difference between the input and the VCO signal. After the circuit locks in the frequency, the phase detector produces a dc current proportional to the phase difference between the VCO and the input signal. A loop filter controls the VCO frequency through the conversion of the dc current of either frequency detector or phase detector to a dc voltage through the loop filter. With positive modulated signals, the circuit avoids signal distortion caused by over-modulated VIF signals through the gating of the phase detector with composite sync signals.

Video Demodulator and Amplifier

A multiplier designed for low distortion and high bandwidth establishes the operation of the video demodulator. As the circuit operates, it multiplies the vision IF input signal with the in-phase signal of the traveling wave divider output. The demodulator stage can switch the video signal polarity to match the received television standard. The demodulator output signal feeds through an integrated low-pass filter for attenuation of the carrier harmonics to the video amplifier. While an operational amplifier designed for internal feedback and high bandwidth provides video amplification, a low-pass filter attenuates the carrier. The video output signal is 1VPP for nominal vision IF modulation.

Sound IF Amplification and AGC Control

The sound IF (SIF) amplifier consists of two ac-coupled differential amplifier stages that make up controlled feedback networks. The SIF AGC detector uses the average level of AM or FM carriers to control the SIF amplifier and provide a con-

stant SIF signal to the AM demodulator and single reference QSS mixer. Although the SIF AGC circuit has a slow reaction time for nominal video conditions, it has a fast reaction time for conditions that feature a decreasing VIF amplitude set by the VIF AGC detector. In the FM mode, a standard switch sets a fast reaction time.

The SIF amplifier output signal is fed to the single reference QSS mixer where it is converted to intercarrier frequency through the regenerated picture carrier. In addition, the mixer output signal feeds through a high-pass filter for attenuation of the video signal components. As a result, the system can achieve high performance hi-fi stereo sound processing. For a simplified application without a sound-IF surface acoustic wave (SAW) filter, the single reference QSS mixer can switch to the intercarrier mode.

With this, the sound I-F signal passes the VIF SAW filter and the composite IF signal feeds to the single reference QSS mixer. The sound I-F signal converts to an intercarrier frequency through the multiplication of the IF signal by the TWD output signal for converting the sound-IF to intercarrier frequency. By using this quadrature detection, the circuit removes low frequency video signals. The attenuation of the sound IF in the VIF filter decreases the audio signal-to-noise figure.

AM Demodulation and FM Detection

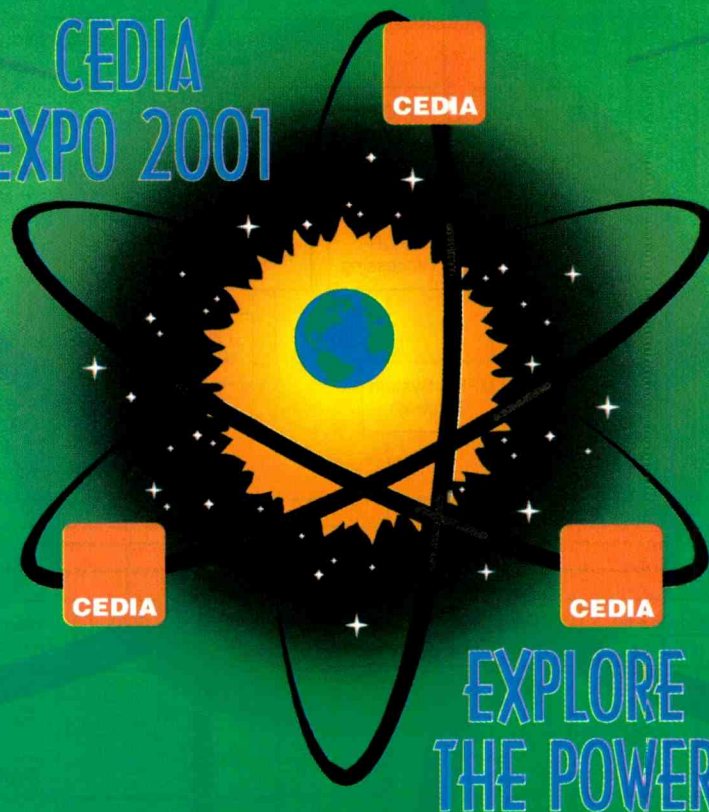
The action of a multiplier establishes am demodulation (Figure 2). The modulated SIF amplifier output signal multiplies in phase with the limited SIF amplifier output signal. Then, the demodulator output signal feeds through an integrated low-pass filter for attenuation of the carrier harmonics to the AF amplifier.

The FM detector consists of a limiter, a FM-PLL and an AF amplifier. Before demodulation occurs, the limiter provides the amplification and limitation of the FM sound intercarrier signal and yields high sensitivity and AM suppression. Operating as an FM demodulator, the FM-PLL consists of an integrated relaxation oscillator, an integrated loop filter and a phase detector. With the oscillator

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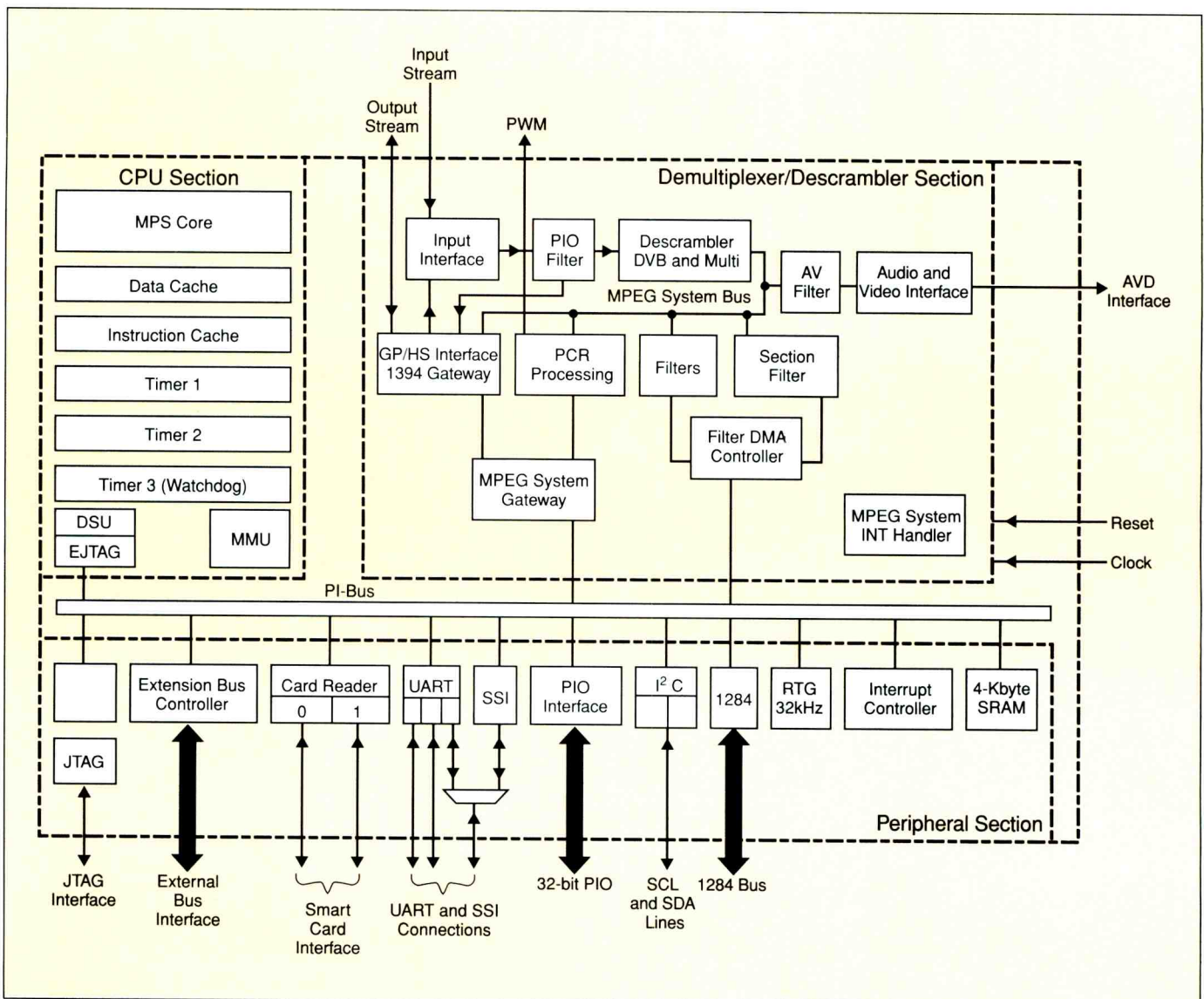


Figure 3. The Philips SAA7219 MPEG-2 Transport RISC Processor contains the hardware and software required to receive and decode MPEG2 transport streams and provides functions needed for descrambling and demultiplexing. The device includes a 32-bit MIPS RISC-based CPU core that supports the MIPS 16 instruction set.

locked to the FM intercarrier signal, the oscillator frequency tracks with the modulation of the input signal. As a result, the AF voltage is superimposed onto the oscillator control voltage.

The AF amplifier consists of an AF pre-amplifier for FM sound and operates as an operational amplifier that has internal feedback, high gain and high common mode rejection. Using a small output signal, the AF voltage taken from the PLL demodulator is amplified by approximately 30 dB. Given the low-pass characteristic of the amplifier, the circuit

reduces the harmonics of the intercarrier signal at the sound output terminal. An additional dc control circuit maintains a constant dc level.

DVB Operation

Again referring to Figure 2, an external signal can control the VCO and provide a carrier for the down-conversion of the DVB-IF signal. DVB operation activates a peak AGC detector. During operation, a variable VIF amplifier detects and controls the value of the digital QAM signal.

The output buffer for the DVB signal

has a high bandwidth and zero gain. For non-DVB standards, the circuit mutes the buffer and reduces the output signal level. Hardware section filtering consists of 32 different packet identifiers (PID) with a flexible number of filter conditions per PID and a total filter capacity of 40 or up to 80 filter conditions. The operation of the TS/PES (transport stream/program elementary stream) filters allows the retrieval of subtitled test and private data. In addition, the circuit features flexible DMA based storage of the 32 section sub-streams and 4 TS/PES data substreams in

the external memory. A GP/HS (general purpose/high speed) filter serves as an alternate input from for IEEE 1394 devices. When set to the IEEE 1394 GP/HS mode, the circuit supports packet insertion, has an internal SRAM for storing 2 packets, and can output either scrambled or descrambled signals to IEEE 1394 devices.

SAA7219 MPEG2 Transport RISC Processor

The Philips SAA7219 MPEG-2 Transport RISC Processor (Figure 3) contains the hardware and software required to receive and decode MPEG2 transport streams and provides functions needed for descrambling and demultiplexing. The device includes a 32-bit MIPS RISC-based CPU core that supports the MIPS 16 instruction set. With this, the SAA7219 can reduce memory requirements and operate several peripheral interfaces. As a result, the Philips circuit can perform all controller tasks in digital television receiver applications such as set-top boxes. In addition, the operation of the SAA7219 remains compliant to DVB and MULTI2 standards.

In brief, the SAA7219 includes:

- a 32-bit microcontroller extension bus that supports DRAM, SDRAM, Flash, (E)PROM and external memory mapped I/O devices. The bus also supports a synchronous interface to communicate with the integrated MPEG Audio Video Graphics Decoder.
- a Centronics interface.
- an interface to IEEE 1394 devices
- two RS-232 data ports with Direct Memory Access capabilities and support for RXD, TXD, RTS and CTS signals
- a Synchronous Serial Interface (SSI) to connect an off-chip modem analog front-end
- two dedicated smart-card reader interfaces
- two I2C bus master/slave transceivers with DMA capabilities, supporting the standard (100 kbit/s) and fast (400 kbit/s) I 2 C-bus modes
- one Pulse Width Modulated (PWM)

- output with 8-bit resolution
- an 8 kilobyte, 2-way set associative instruction cache
- a 4-kilobyte, 4-way set associative data cache
- a programmable low-power mode circuit
- a memory management unit, and
- 24-bit timers.

SAA7219 Operation

The SAA7219 receives transport streams through a versatile stream input interface capable of handling both byte-parallel and bit-serial streams in various formats, supporting data streams up to and including 13.5Mbyte/s (108 Mbits/s). The stream data is first applied to an on-chip descrambler incorporating a DVB descrambling algorithm, on the basis of 14 control word pairs stored in on-chip RAM. Demultiplexing is subsequently applied to the stream, to separate up to 32 individual data streams. The demultiplexer section includes clock recovery and timebase management. Program Specific Information (PSI), Service Information (SI), Conditional Access (CA) messages and private data are selected and stored in external memory, for subsequent off-line processing by the internal PR3930 CPU core.

The SAA7219 features a low-power sleep mode that sustains set-top box standby functionality. As a result, the device eliminates the need for a separate front panel controller. The SAA7219 requires a supply voltage of 3.3V and most devices input and output interfaces are 5V tolerant except the extension bus which is 3.3V only.

SAA7219 in a DVB System

The SAA7219 works in tandem with the Philips SAA7215 device to provide optimum performance when used for MPEG2 AVG decoding. Synchronous bus interface transfer occurs at 40.5MHz. The SAA7215 dedicates SDRAM for the handling of MPEG-2 audio and video, graphics operation, and the transfer of CPU data. Dedicating the memory in this way establishes higher bandwidth for downloading graphics or executing appli-

cation commands.

It's a Whole New Animal

To the viewer, DTV presents a considerable improvement in the viewed program: sharp picture, high-fidelity surround sound, wide-screen viewing. To the manufacturers, broadcasters, and the service technicians who will be servicing these sets, it represents a completely new technology, far more complex than the complex system it will eventually replace.

It will not be necessary to have a detailed understanding of the nature of the DTV signal or the circuitry that is used to process the signal, but the more a technician understands about the technology, the better prepared he will be to diagnose problems in the sets when they malfunction. ■



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Lighting

By the ES&T Staff

The term home theater is a pretty broad term. It can mean simply an audio video system that encompasses a TV or monitor, a receiver capable of generating a good video image and reasonably high fidelity 5.1 channel sound. Or it might mean a real "home theater" with a large screen, top of the line receiver and speakers, theater seating, all in a special theater-like room. Or it can mean anything in between. Therefore, the term "home theater lighting" can run the gamut from simple standard room lighting to special dramatic lighting with exotic controls. This article won't try to define any specific theater lighting system. Rather, it will take a look at some of the things that are possible in home theater lighting today.

The States of Home Theater Lighting

Home theater lighting isn't static. Sometimes it's on. For example, if the home theater is in something less than a palatial estate, it will likely be used for more than one use. It will be a living room, or a family room that contains a home theater system. Sometimes it will be lighted for conversation, reading, game playing, crafts, etc., and sometimes it will be turned into a theater. Thus there will be four conditions of the lighting in this room:

- Room illumination,
- Home theater illumination,
- In transition (from home theater to room, or from room to home theater)
- Off

A properly designed home lighting system must take into account all of these conditions, as well as the budget of the homeowner.

Lighting Design

Having written that head, now it must be said that lighting design, as such, is truly beyond the scope of this article. Actually, it's beyond the scope of this magazine. However, if a technician is going to be involved in lighting control, it would certainly be useful to have a passing familiarity with a handful of lighting terms and concepts.

For starters, there are generally three

types of lighting in any room in a home: ambient, task, and accent.

- Ambient lighting provides the overall lighting that illuminates the space. Ambient lighting may be mounted in or on, or suspended from, the ceiling, it may be mounted on the walls, or on the floor aimed upward for an upwash, or it might be provided by floor or table lamps.

- Task lights are used where light is required to illuminate some task for which the ambient lighting is not adequate. The task might be reading, sewing, knitting, doing a crossword puzzle; any activity that involves intensive use of the eyes and requires good light.

- Accent lighting provides light to illuminate objects of particular interest. This light might be provided by a lamp that clips on to a picture frame and illuminates the picture. Or it might be a ceiling, wall, or shelf mounted fixture that is aimed at a statue, a vase, or other accent piece on a shelf.

Light the Walls

Anyone who is involved in any way with lighting should know that it is important for ambient lighting to provide adequate illumination of the walls of a room. Illumination of the walls defines the space. If the walls remain dark while the center of the room is lighted, the effect can be cold, even spooky. Lighting gives warmth and shape to the space.

Controlling the Lighting

These days, every VCR, DVD player, TV, receiver, or other consumer electronics product comes with a remote control. Given that level of sophistication in control of electronics devices, should the control of the lighting in the room be less sophisticated? In many cases the lighting control is less sophisticated; someone gets up, turns on the subdued movie viewing lights, turns off the ambient lights, then sits down and uses the remote control(s) to play the DVD, adjust the volume, etc.

With today's sophisticated home automation products, it's possible to go through the entire process while seated in the best seat of the home theater, using a single remote control.

Most of the details of this control technology will have to do with one product: X10. This should not be construed to suggest that this magazine endorses that product, or that this is the best way to control home theater lighting. We simply chose this technology because it has been around for a long time, is readily available, and can be achieved without installing any wiring, or making any holes in walls, ceilings, or whatever.

Controllers and Modules and Wires, Oh My

The system we'll be talking about uses the home wiring not only as a source of power, but to carry signals that control lights, appliances, etc. In general, each light that is to be controlled is plugged into what the manufacturer calls a "module." The module is, in turn, plugged into an outlet.

Each module has a specific address that consists of a "house code" (letter A through P) that is selectable by a red dial on the face of the module, and a "unit code" (number 1 through 16) that is selectable by a black dial on the face of the module. If you assign the same address to more than one module, all the modules with the same address will respond when signalled to turn on or off, or dim or brighten. The reason that modules have house codes is that in some rare instances in which two homes connected to the same transformer are using X10 devices, there is potential for interference. By changing the house code, that interference is dispensed with.

Anywhere else in the house, you plug a "transceiver" into an outlet. The manufacturer suggests plugging the transceiver into an outlet in a central location of the house for maximum range when controlled by a remote. The transceiver is programmed in the same way as the module(s), with the same address(es) as the modules the homeowner wishes to control. The transceiver has a small antenna that should be fully extended to make the unit as sensitive as possible.

The Remote Control

This system responds to what the manufacturer calls a "6-in-1 super remote."

This remote control unit features both infrared and rf output, and can be used to control all of the lights and appliances in the home that are plugged into the power line via modules, as well as all of the audio and video devices in the home theater. The remote control handheld unit controls the audio and video using infrared technology, and controls the items connected to the power line via rf, which, of course, penetrates walls to activate the controller(s), which, in turn, send their control signals via the power line to the corresponding modules.

The remote control includes a very large number of codes that the user can enter that will allow it to control most popular products available from most well-known (and some obscure) manufacturers. The manual for the system comes with complete instructions for setting up the remote to control the client's home theater system.

Wall Switches and Receptacles

So far we've been able to provide control over the A/V system, and to devices plugged into modules, but what if we want to control lights, such as overhead fixtures, that are controlled by wall-mounted switches? And what if the homeowner thinks that those modules look clunky plugged into receptacles?

Let's take this question one part at a time. And let's keep in mind that it might be necessary, in order to make sure you're complying with the law and codes, to enlist the services of an electrician to do any wiring.

With respect to the first question, the manufacturer offers wall switches that can receive rf signals from the remote control and responds by turning the connected light fixture on or off, or dims or brightens it, just like a regular dimmer. Also available are remote controllable wall switches for "three-way" operation or that control fluorescent lamps.

With respect to the second question, the manufacturer offers duplex receptacles that include the control module as part of the receptacle itself, so that everything is in the wall behind the receptacle plate. One of the receptacles is controlled by the controller that has the same address as the receptacle, and the other receptacle is always on.

Computer Control

Most home theater rooms probably don't have a computer in them, but, on the other hand, if someone affluent is shelling out thousands of dollars for home theater system, why not? If there happens to be a computer in the room, and the homeowner wants to control either just the lights in the room, or even the entire house from the computer, you can set the computer up to do that.

The "computer interface" connects to the computer's serial port. Software from the manufacturer called "ActiveHome" software is installed on the computer. After you have programmed the software to perform certain functions, such as turn on a group of lights, turn lights on and off in some sequence, etc., any time the program is run the computer downloads those functions to the interface. The interface even has batteries that keep its clock running if there is a power failure, so when the power comes back on any timed events are resumed automatically.

Here's what the manufacturer's manual says about what you can do with the software:

- Create a graphical representation of modules on the computer screen and then control lights and appliances controlled by those modules from the computer.
- Create schedules of timed events that automatically run your home 24 hours a day, 7 days a week.
- Define macroinstructions (a number of instructions that are carried out as a unit, also called a "macro") that control groups of modules. For example, a "coming home" macro might turn on the porch lights, the living room light and the stereo. A "home theater" macro might dim all the lights in the home theater, then bring up the lights that are to be on while the movie plays. The manufacturer's literature includes step-by-step instructions that explain how to create macros.
- Define schedules that make the home look lived-in when the occupants are away, by turning lights, stereos, and other appliances on and off at times set by the homeowner.
- Create printed reports showing different aspects of the home automation system, such as what modules are

installed, and what timed events have been set.

Home Theater Control Kit

Here's another way for you to provide clients with control of their home theater equipment and lighting; the SmartLinc Home Theater Kit. You can find it at www.smarthome.com. According to the verbiage at that site, "with this kit's intuitive TouchLinc 4.0 touchscreen interface (see previous page for more detail) and powerful intelligent controller, you can bring your home theater system to life with a single touch. Turn on all your A/V equipment, set it to the correct modes, and dim the lights with just one screen touch. Change channels simply by touching a menu option marked NBC, Disney, or whatever station you'd like. The TouchLinc 4.0 touchscreen features a graphical desktop and "virtual" remotes, as well as completely customizable text-based sub-menus.

In addition to A/V equipment, the kit also controls X10 compatible lighting and appliances, so you can integrate lighting scenes into your home theater control. And the HouseLinc intelligent controller in this kit is capable of powerful conditional logic, so you can create macros that occur only under certain conditions. For example, let the system pause a movie you're watching if your X10 motion sensor detects a visitor at the door. Or, let the system queue up a movie for your kids, but only if it's not on a school night or after bedtime. The Home Theater Control Kit brings all this automation power to your fingertips, and at a surprisingly affordable price.

The kit comes with pre-configured home theater control software so you can begin using it as soon as it's set up (may require some modification, depending on your local channel line-up). Simply select the components you want to control (from the on-board IR library of commonly available A/V components), and you're ready to go! Once you're familiar with the system, you can customize the touchscreen control menus with your favorite channels, additional lighting control, and macros or lighting scenes you create in HouseLinc with the included Windows-based software (3.1, '95, and '98). With up to 16 screens (each with 15 customizable menu

options), you can create personalized menus for every member of your family.

Expanding your system is a cinch, too. This kit can control any X10 compatible device in this catalog. Expand your system with additional TouchLinc 4.0's (see previous page) and/or TouchLinc 2.0's (see page 32) to control your X10 devices and the HouseLinc intelligent controller from other rooms in your home. And HouseLinc allows you to schedule hundreds of timed events using its built-in seven-day celestial clock. It can even be controlled directly from a PC, although it does not require a PC to operate after programming is downloaded.

The Home Theater Control Kit simply plugs into existing outlets, making installation easy for any home. By using powerline carrier technology (X10) the screen can easily be moved from room to room or moved around the home. Anywhere there's an outlet, you can control your home's audio and video gear plus home automation controls!

Complete Hardwire Kit Includes: 1 PLC TouchLinc with Black Frame & blue backlight, 1 Lexan Stand (Smoke), 1 Single Cord Solution, 2 Powerline Interfaces, 1 HouseLinc, 1 HouseLinc BOB, 1 TV ProbeLinc, 1 Video ProbeLinc, 1 AC ProbeLinc, 1 Light ProbeLinc, 1

Lamp Module, 2 Dual IR Emitters, cabling, and SmartLinc Suite Software.

Why Not Control the Drapes As Well

The lighting in a home theater also involves the light coming in through the windows. When you want to watch a movie, generally you want to keep that light out. The website at www.smarthome.com offers a remote-controlled motorized drapery rod that, they say, installs as easily as a standard drapery rod, and costs considerably less than a very expensive product they mention by name (we won't). What follows are the words used at the website to describe the product. "In addition to its low cost, this system is also incredibly strong. It's powered by an aluminum worm drive bar (as opposed to steel wires, nylon straps or chains), ensuring that pulleys won't slip, break or get jammed. This makes the system ideal for installations when you need to control drapes weighing as much as 80 lbs.

"The motorized drape system is also extremely easy to install, typically taking just 30 minutes or less. The rods come in fixed lengths, so no hacksaws are necessary! All you need is a screwdriver and the included template and mounting hard-

ware. Just mount the drape bar, plug the controller and power supply cable into the terminals hidden at the end of the drape bar, plug the power supply into an AC outlet, and you're done!

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Circle (11) on Reply Card



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Good Grief! It's in Shutdown

By Bob Rose

Brian unloaded a 55-inch Toshiba projection TV and pushed it into the shop. I glanced at the note on the repair tag and sucked in my breath, "Plays for a few minutes and shuts off." I wasn't in the mood to deal with a shutdown problem, but then am I ever in such a mood? Maybe the note was wrong. It wouldn't be the first time a customer was mistaken about the problem that plagued his product. Keeping my fingers crossed, I plugged the jolly giant in, attached an antenna, turned it on, and focused my attention on another problem while I listened to it, occasionally glancing to see if the picture was okay.

Sure enough, in less than ten minutes, the TV turned itself off, a fact the blinking red power on indicator on the front panel heralded. I disconnected it from the

ac line, reapplied ac, and the TV came back on. This time it played for less than a minute. Subsequent attempts to get it to come on failed because it shut down almost as soon as ac was applied. Good grief! It did have a shutdown problem after all.

Shutdown Problems

As I have said on other occasions, shutdown circuits, and therefore shutdown problems, have been around for lots of years. They aren't new, and they aren't going away. As a matter of fact, those circuits seem to have reproduced like rabbits. The other day I took the time to look over the training literature for Zenith's B-Line projection televisions, the ZP88, ZP90, and ZP92, that came out in 1999. You may recall that Hitachi manufactured

them for Zenith. According to the literature, these sets have 22 separate monitoring circuits capable of shutting them down (Figure 1). No, shutdown circuits aren't going to disappear.

Fuses and circuit breakers are the simplest forms of shutdown devices because they interrupt the flow of current when the current drain exceeds their specified limits. Because these devices aren't sophisticated enough to protect today's electronic devices, engineers turned to the next generation of circuits, the so-called "automatic electronic shutdown circuits," to do the job. You probably know that they began their career as a means to disable the high-voltage section of a television when it increased beyond the level deemed safe. These "automatic" circuits have since found their way into VCR's,

camcorders and stereo equipment as well as all sizes of TV's.

But our concern right now is with the television. Every shutdown circuit is designed to protect certain critical and expensive parts in the TV into which they have been configured. In addition to monitoring the high voltage, these circuits protect expensive power supply components, the picture tube (or picture tubes), and other critical and expensive components in the deflection circuits.

Four Examples

Shutdown circuits are often configured to turn the power supply off or interrupt horizontal drive. Figure 2 illustrates a typical

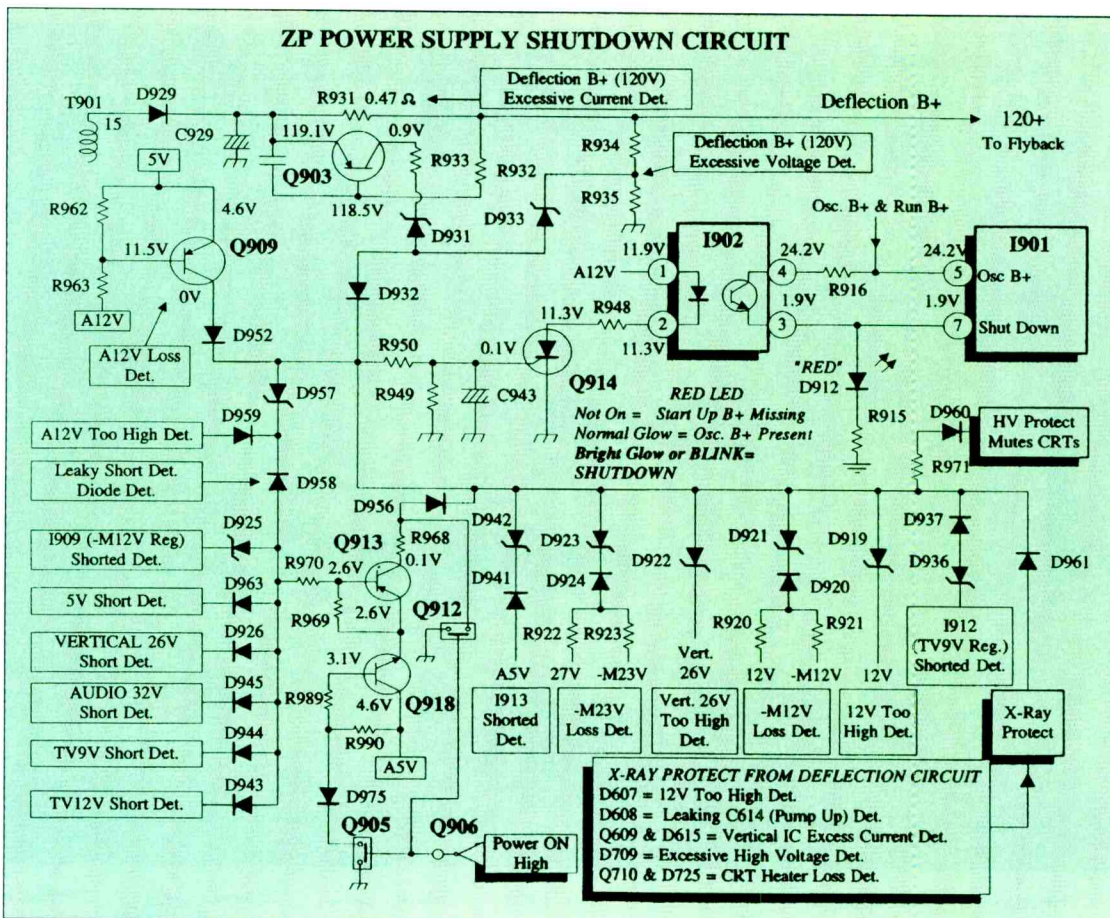


Figure 1

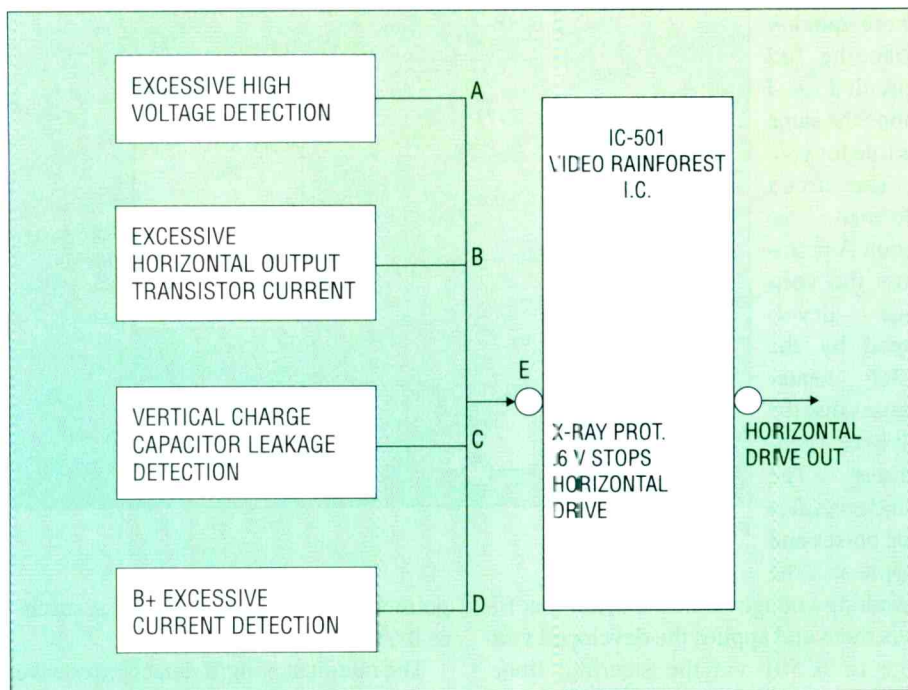


Figure 2

application in which all shutdown inputs terminate at the x-ray protection input of the "rain forest" IC. You know, of course, that this IC develops horizontal drive, meaning if it doesn't output horizontal drive the TV simply won't work. It therefore is an easy task to turn the TV off by means of an automatic protection circuit just by controlling the voltage at the x-ray protection input of IC501. In this instance, when the input to the x-ray protect pins reaches 0.6V, the rainforest IC ceases to develop horizontal drive, and the TV turns off. It is a simple and effective configuration.

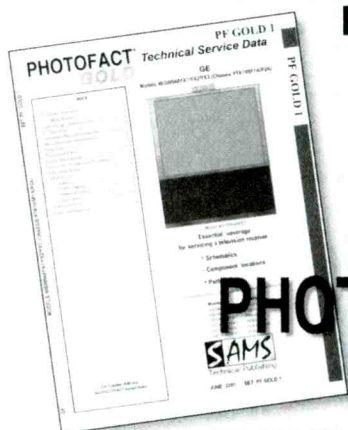
Like a lot of other shutdown circuits, the ones depicted in Figure 2 fall into two categories: those that sense excessive voltage (circuits A and C) and those that sense excessive current (circuits B and D). Figure 3 gives you a better idea of how the four circuits work; therefore, I shall reference my remarks to it. The let-

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Circle (13) on Reply Card

ter designations refer to the same points in Figures 2 and 3. Before proceeding, make a note of the capacitor configured between point E and ground (Figure 3). It has to charge to 0.6V to initiate shutdown. Because it is in the circuit and must charge to initiate shutdown, the shutdown circuits aren't affected by minor instantaneous fluctuations of voltage or current. Such fluctuations exist because of the varying demands placed on the power supply (or power supplies) when the picture goes from a relatively dark scene to a light one. They may also arise due to variations in the ac line voltage due to power surges or near lightning strikes. In short, the capacitor prevents nuisance shut downs.

Let's get back to the shutdown circuits themselves. Keep in mind that each circuit has been simplified for the sake of illustration. That is, the actual circuits have more components in them than I am showing. However, the simplified circuit permits me to understand how it works

more quickly than the full circuit does. I hope the same is true for you.

The circuit defined as point A monitors the voltage developed by the CRT heater pulses that the flyback generates. The diode rectifies the pulses and applies the resulting voltage to the capacitor that filters them and applies the developed voltage to IC501 via the steering diode. Because the CRT heater pulses track the high voltage, the voltage developed by this circuit closely follows the high voltage. If the high voltage increases to the

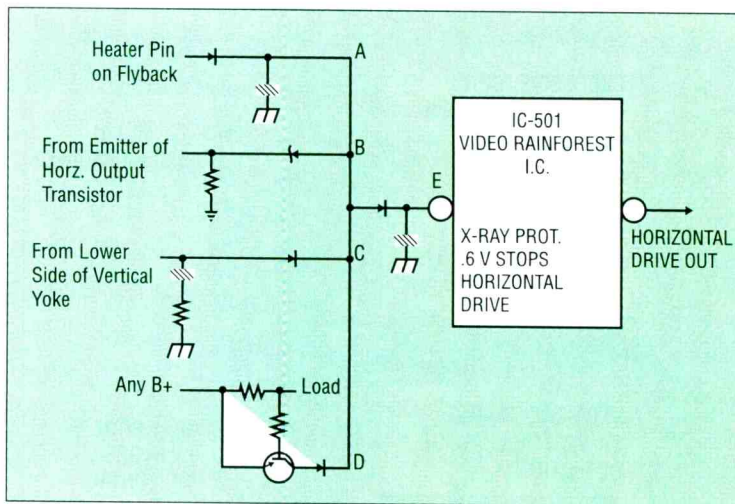


Figure 3

point where the voltage at point A reaches 0.6V, the x-ray circuit trips.

The circuit at point B detects excessive current by monitoring the voltage across a resistor placed between the emitter of the horizontal output transistor and ground. If the current through the transistor increases beyond safety level, the voltage across the resistor increases and causes the zener diode in the circuit to "zener." The voltage is applied via the steering diode to IC501, and horizontal drive stops.

The circuit at point C monitors leakage current in the relatively large value vertical charge capacitor connected to the low side of the vertical yoke (We're looking at a Hitachi circuit that is a few years old.). The capacitor in question goes to ground through a low value resistor. The voltage drop across the resistor is usually on the order of 0V. If the capacitor develops a leak, a dc voltage begins to develop across the resistor. When the developed voltage reaches a certain level, the diode becomes forward biased and steers the developed voltage right to IC501. Modern "vertical fail safe circuits" keep tabs on vertical deflection by using one of the micro-processor's dedicated ports, thus eliminating circuits like this one.

The circuit at point D is a kind of generic one that can be put into any B+ source. Note the resistor in series with the B+ source and load because it is the key to understanding how the circuit works. Current flowing through it naturally caus-

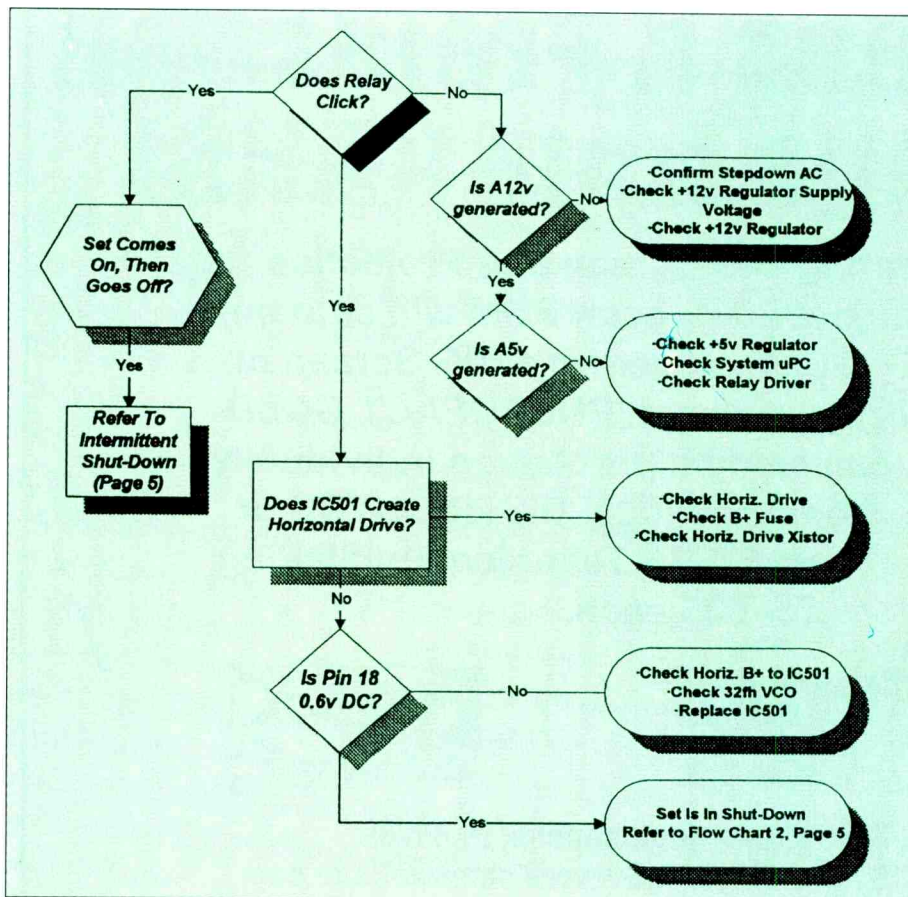


Figure 4a

es a voltage drop to develop across it. The voltage drop increases as the current flowing through it increases. When the voltage drop becomes sufficient to turn the PNP transistor on, current flows through the transistor right to IC501. It's a neat circuit that continues to see lots of use.

Thinking that you might find a use for them, I include three flow charts that are taken from a Hitachi newsletter (Figures 4a, 4b, and 4c). The material is a bit dated but still quite useful. I have found it helpful dealing with sets other than Hitachi. In such instances the test points are, of course, different, meaning the procedure has to be modified, but the concept is still as fresh as the day it was written.

Remember that these flow charts are designed to simplify a typical shutdown problem by establishing a step-by-step procedure to isolate the defect. Having fought them for a long time, I know how futile trying to solve shutdown problems with a "hit and miss" technique is. Any organization is better than none. Use them in conjunction with these guidelines:

- Always use an isolation transformer. I'm being obvious, but sometimes we need to be reminded of the obvious.
- The shutdown input won't be the same as the one I have used as an illustration, but you should be able to find it without much difficulty. It may even be an input to the microprocessor.
- Shutdown voltages disappear when the TV turns off. You either have to monitor the test point constantly or connect a sample-and-hold meter to it while you go about your business.
- When you have found the defective part, whether it is in the shutdown circuit itself or a defective component on the chassis, use exact replacement parts if you can. Generic parts work fine in some circuits, but they aren't worth the trouble they cause when they are put into critical circuits.

Shutdown Circuits in the Newer Zenith PTV's

Since I'm talking about Hitachi products, I thought it might be a good idea to look at a few shutdown circuit in all of their gory details. As I mentioned earlier in this article, Hitachi began manufacturing at least some TV's for Zenith in 1999. The chassis to which I shall refer are the ZP88, ZP90, and ZP92. The ZP power supply has 22 circuits that monitor various circuits in the chassis (Figure 1). Since the deflection circuits make the heaviest demands on the power supply (including the scan-derived voltages), shutdown circuits typically just disable horizontal deflection either directly or via the power supply.

Look at Figure 1 again even if it turns your stomach. Locate Q914, which is just off I902, and remember it because it is the key to "dividing and conquering" these circuits. Each of the shutdown circuits terminates at this SCR. It turns on when one or more of the circuits it monitors applies a voltage greater than 0.7V to its gate. When it turns on, Q914 not only disables the power supply but also stays on as long as the power supply is plugged into an ac outlet.

The triggering voltage may rise gradually or come as an instantaneous pulse. However it comes, the 0.7V causes Q914 to conduct and latch. When it conducts, Q914 provides a ground return for the cathode of the LED inside I902, permitting the

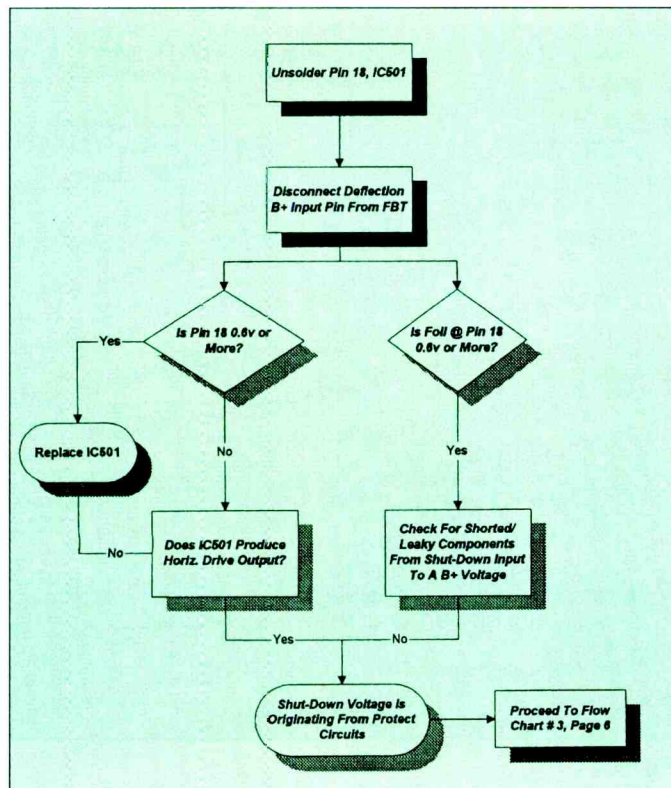


Figure 4b

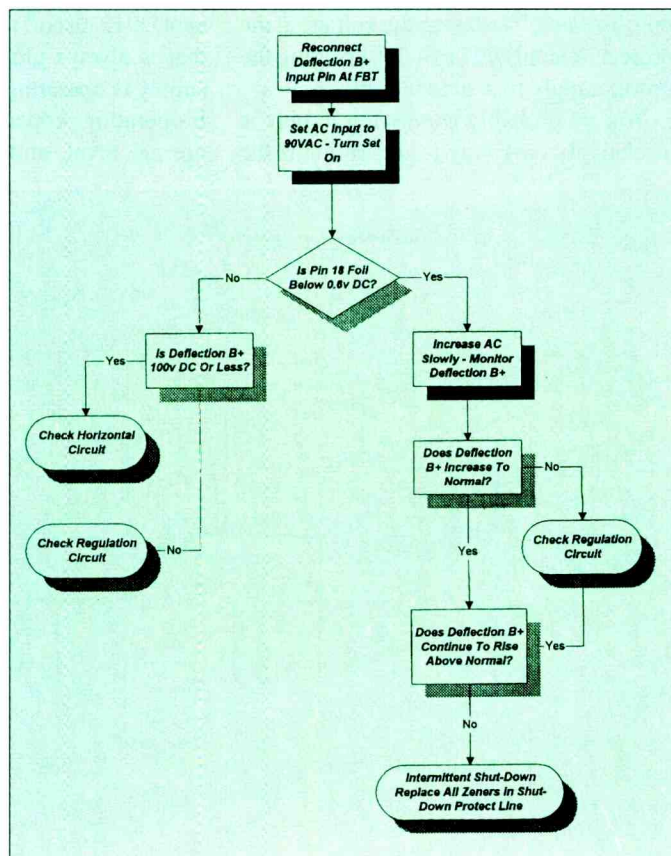


Figure 4c

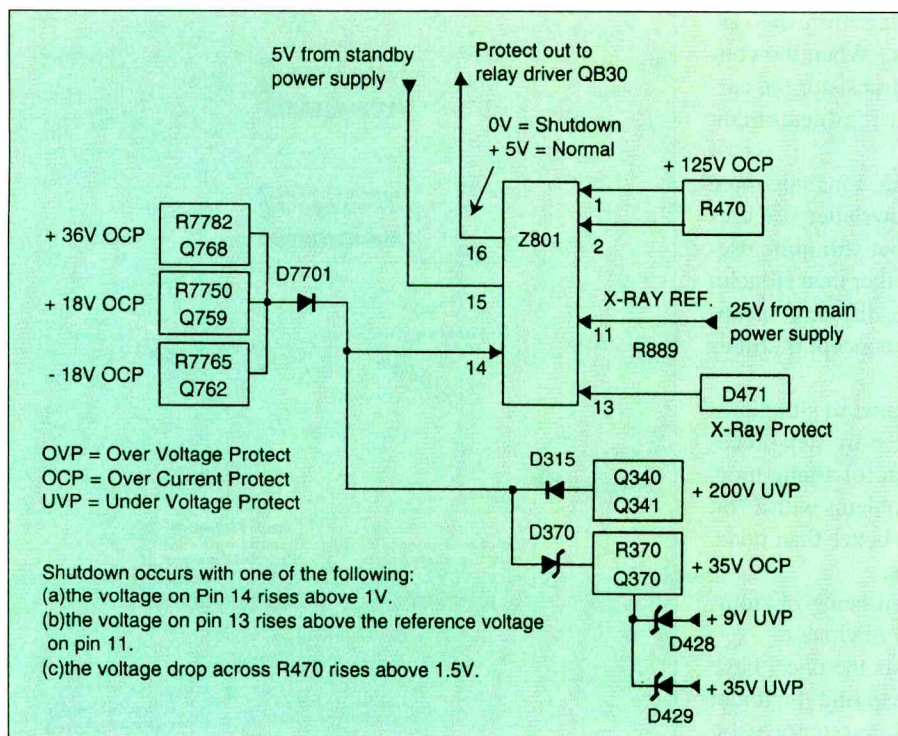


Figure 5

LED to turn fully on. The glowing LED turns on the phototransistor portion of the opto-isolator, increasing the voltage at the protect input of I901 to 4.7V, bringing the power supply to a sudden halt.

You are probably wondering if there is a relatively easy way to determine if the

TV is in shutdown or power supply failure. Would you believe there is! Did you spot D912 just off pin 7 of I901, a red LED that is always glowing when the power supply is operating? If the power supply is operating properly, the LED glows at a normal level, and the dc voltage at its

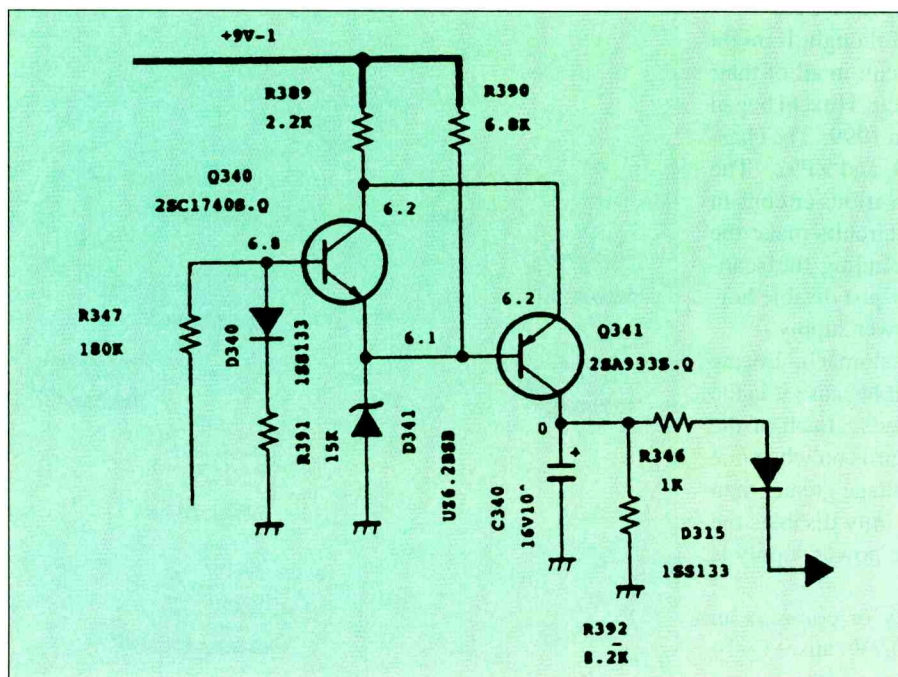


Figure 7

anode will be at approximately 4.0Vdc. However, when the TV is in shutdown, the LED glows brightly, and the voltage at its anode will be around 7.0Vdc. If, however, the LED is simply blinking, you are more than likely looking at a shutdown that originates in the x-ray protection circuit. If the LED isn't glowing at all, the power supply isn't working.

I know, 22 monitoring circuits seems to be overwhelming, but the situation isn't as bad as it looks. For example, the 22 monitoring circuits are routed to Q914 through four separate inputs: D932, D957, D956, and D952. Simply monitor the voltage on the anode of each diode till you find the one that is triggering shutdown, and proceed from there till you have located the problem area and problem component. I know I said "simply monitor the voltage" as if it were a simple thing to do. Even though it's easier said than done, the situation isn't as hopeless as it might look.

A Few Notes About These Shutdown Circuits

And now for want of a better way of putting it, here are a few "miscellaneous" notes about the shutdown-protection circuits in the newer Zenith PTV's that aren't covered anywhere else.

The power supply has an overvoltage protection (OVP) circuit built into I901. When the dc voltage at pin 5 reach 30.8V, the OVP circuit triggers an input to three input OR gates inside I901, resulting in power supply shutdown. D905 (not shown) provides a sample of the secondary voltage to pin 5 as an input for the internal OVP switch. It is utilized in an instance where the load is so small that the power supply can't regulate to a sufficiently low level to prevent dc levels higher than the filter capacitor's rating. The most common causes of OVP shutdown are a shorted horizontal output transistor, a shorted vertical output IC, or a shorted audio output IC.

I901 also has a circuit that monitors the temperature of the heat sink on which it is mounted. The circuit triggers shutdown when the temperature exceeds 125 degrees C. The circuit is called "thermal shutdown detection circuit."

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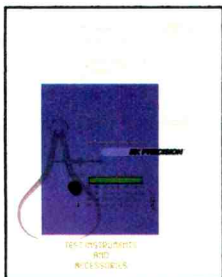
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Circle (14) on Reply Card

The Toshiba Shutdown Problem

Well, I began talking about a Toshiba projection television. Perhaps I ought to finish the story now. According to Toshiba's "Quick Shutdown Troubleshooting Guide 2" (the guide to use for troubleshooting this model), there are three inputs to the shutdown circuit which is pin 6 of Z801 (Figure 5). If the input from either section causes the voltage at pin 6 to reach about 1V, Z801 responds by turning the power supply off. Following is a description of the circuits that make a connection with Z801. This schematic diagram is not shown here. For the points these comments refer to, see the manufacturer's service literature.

- Section one monitors the convergence circuits for an overvoltage or overcurrent condition by monitoring the +18V, -18V and +36V lines. The test points are Q759 and Q768.

- Section two monitors the +9V and +35V supplies that go to the deflection circuits. The test points are D428, D429, and Q370.

- Section three monitors the working TV for excessive high voltage, the horizontal output transistor for excessive current flow, and the +200V B+ supply to the video output transistors. The test points are pin 13 of Z801, pin 11 of Z801, the voltage across R470, and Q341.

The flow chart (Figure 6) that accompanies the troubleshooting guide instructs the technician to remove F470, apply power to the TV, and see if the power supply shuts down. If it shuts down, the problem lies in the convergence circuits. If it doesn't, connect a light bulb between the hot side of F470 and isolated ground and check for regulated +125V. If the voltage doesn't regulate at 120V, troubleshoot the power supply. If it does regulate, replace the fuse and check the collector of Q370 with a peak response meter. If the voltage rises to about +9V, look for the problem in section two.

These checks moved me through sections one and two, leaving section three. I quickly checked pins 11 and 13 of Z801 and found nothing amiss. I was left with just one check, the collector of Q341 (figure 7). Q341 and associated components look constantly at the 200V supply going to the video output transistors. If something like a defective video output transistor or shorted CRT pulls the line low, Q340 and Q341 latch on, placing a voltage on the shutdown line high enough to activate Z801. The voltage at the collector of Q341 normally rests at 0V. In this instance, it began at slightly more than 0V and slowly rose until shutdown occurred. Either the 200V source was dropping or something was amiss with the monitoring circuit.

A quick check of the 200V supply revealed that it was rock steady at 215V. Since it wasn't dipping low, the problem had to be in the monitoring circuit. Q340 and Q341 checked good in circuit. Since the bias voltages on both were not at normal levels, I decided to check the value of the resistors in the circuit. The problem turned out to be R347, a 1/8W resistor that had

increased from 180k to 270k. A new resistor fixed the TV.

I'm not saying that all shutdown problems are as easy to solve as this one because some of them aren't. However, I spent more time looking for Q341 than fixing the problem after I found it. Incidentally, it is located on the DPC (digital pincushion circuit) daughter board, a vertically oriented circuit board standing behind and to the right of the flyback.

Summary

Shutdown conditions are among the most vexing problems a technician faces. When I read the note on the Toshiba TV, I felt my stomach knot and began to wish Brian had left the TV where he found it. It was gratifying to know that I had fretted over nothing really, and I had a jolly good time writing the bill for the repair. That's the way it goes when dealing with shutdown problems. I can honestly report that a little understanding and patience go a long way toward resolving them. Maybe the same is true for you. ■

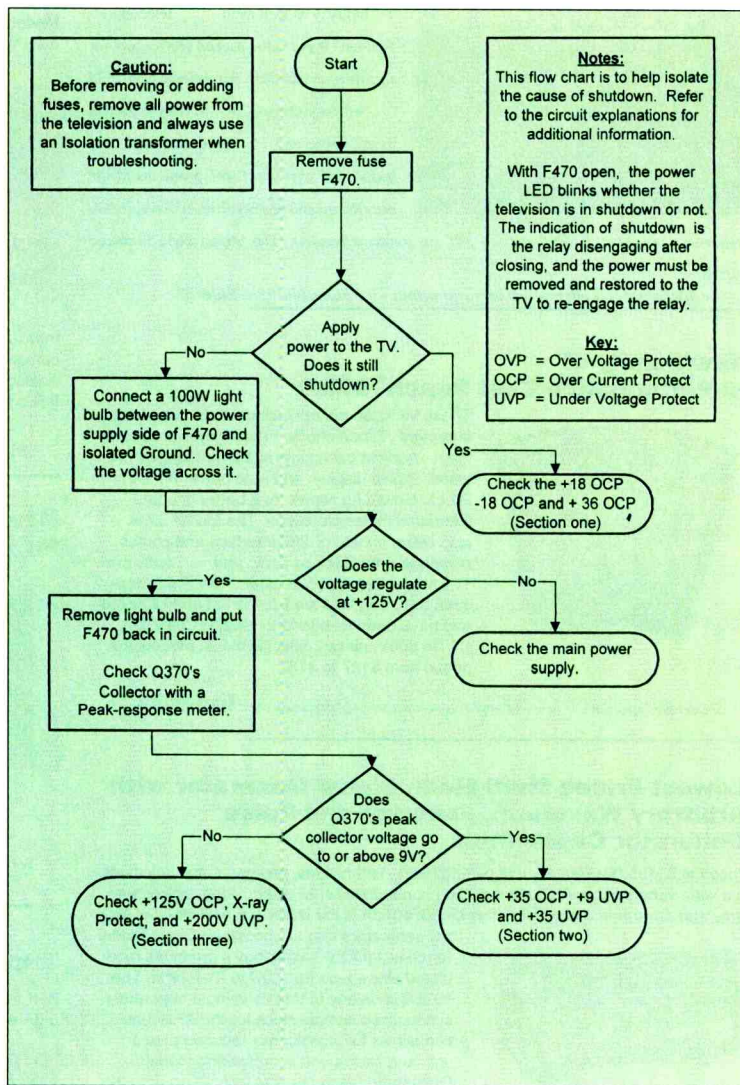


Figure 6

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Multimeter Update

**MULTIMETER
UPDATE**

When making a purchase, it's hard not to succumb to the siren song of features, bells and whistles. When you're buying a car, you want the one with the big engine, power everything, great sounding stereo. These days, maybe even a GPS system. When you're buying a computer, you want the Pentium 4, 60-gig hard drive, 512 meg of RAM, CD-RW, DVD-ROM. But do you really need that level of performance.

When you're purchasing a DMM, the same lure of features applies. Someday you might need to record readings using a computer, so you need the RS-232 connection. Who knows what other feature you might someday need, so best to go for the top of the line.

If you're in the market for a DMM, a read through the first of the two segments in this article might help you get your feet back on the ground, save a little money, and avoid confusion that too many features could cause.

The second segment of this article discusses some of the tests that a technician might make in troubleshooting a home appliance. Since many of our readers have been giving some thought to servicing home appliances, this seemed to be timely information to include in a DMM update.

HOW MUCH METER IS ENOUGH? by Terry LaBrue

When it's time to purchase a new digital multimeter, roll up your sleeves. There are so many models on the market a scorecard is needed to compare them all. Yet, literally millions of digital multimeters (DMMs) are sold every year to all sorts of buyers. Most are purchased for under \$100 but they can range up to \$300, or more, for test tools that have specialized uses or are laden with advanced features for the serious professional.

In many ways, DMMs can turn test-and-measurement cartwheels around the shop providing a quick return on your investment. By adding a couple of accessories, test leads, specialized probes and adapters,

the functional possibilities are out of this world. And so can be the price tag.

When the additional, hidden costs involving specialized training and the potential for user errors are fully calculated, the unit's final price is higher still. It's a real issue with users when they need to measure only three or four things but the meter is far more complicated and the dials are confusing.

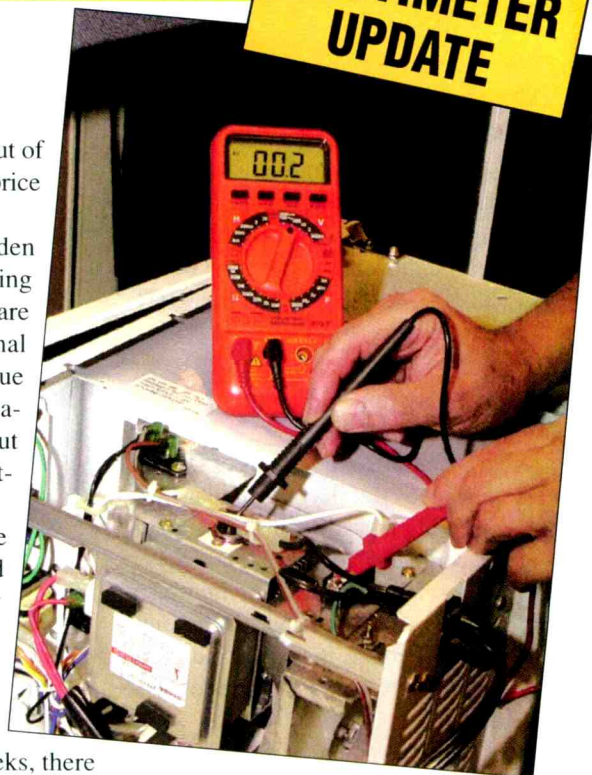
Several questions soon come to mind. "Which features and functions are necessary? How much is enough? Which is right for me?"

Short of conducting an in-depth DMM product research project that could take days weeks, there are seven crucial factors that you need to consider. The answers to your questions will affect your ultimate purchase price — and your eventual satisfaction.

What is the Hidden Cost of Buying "Too Much" Meter?

Digital multimeters are like any electronics purchase, whether it's audio equipment or computers. It's possible to spend plenty and get a multi-function, multi-task, and multi-complicated unit with all the fancy bells and whistles.

- Be aware however, that as the options and features mount, so do the potential problems associated with the units' complexity. For instance, a meter designed for data logging or with an RS 232 interface may be reflective of "top of the line" meters. But if all you need to measure are ac/dc current, voltage and ohms, you can get along fine with a much simpler DMM.
- When using a complicated or unfamiliar DMM there is significant risk of accidentally conducting the wrong test, possibly damaging the UUT and/or injuring the user. Recent industry research by leading manufacturers indicates that some consumers actu-



ally prefer a simpler meter.

- There is also the cost of learning to correctly use the extra features, employing the proper measurement protocols that assure precise measurement. Learning to use mA readings in % takes training and skill for a function that most users will not use. For example, it's possible that a user measuring mA could think the readings represent a percentage of the DMM current range.
- "Over three digits on the display is merely noise" according to a high level industry engineer, who is familiar with the dynamics of user confusion.
- High-end meters often offer features that you will seldom, if ever, use. Conversely, you can select a quality, basic meter that is quite straightforward in its feature set, and is easy to use and read. Such a plan thereby saves money and avoids potential problems while decreasing your necessary learning curve. An example of this could be measuring rms acV and power supply dcV. A simple three-function meter (adding ohms and continuity functions) is about as simple to

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Phil Salditt is general manager, Wavetek Meterman Test Tools*

understand and use it as it gets. If that's all the function capability you realistically need, why purchase more?

- When using a complicated or unfamiliar DMM there is significant risk of accidentally conducting the wrong test, possibly damaging the UUT and/or injuring the user.

For What Purpose Will the DMM be Used?

There are currently hundreds of DMMs on store shelves that have a similar look and feel. Without asking this basic question, you could end up with either a meter with the wrong feature set or improper ranges for the tasks at hand. Determine early on what there is to do. And then, frame your search along the lines of specific needs.

- Will the measurement of voltage, current, ohms or a combination of all three be needed?
- Is frequency, temperature or capacitance necessary? Or will these functions ever be used?
- What range is needed? Some popular DMM models are specifically designed for low voltage, low energy electronics troubleshooting (CAT I and II) while others are right for low voltage with high or low current as found in home and automotive applications (CAT I to III). While still others are offered for outdoors high-voltage use (CAT IV) such as found in pumps or utility service extensions. Make certain your new meter fulfills the basic electrical requirements you need. Select the right one for safety (including overvoltage protection) rating.

In What Environment Will the Test Tool be Used?

- Do you work in a shop or in the field? Will your meter need to be heavy duty, waterproof and rugged? Or will you mainly perform delicate, precise measurements indoors? The answer can be obvious.
- Will you be working in daylight or inside a dark electrical closet? Backlighting LCD displays are a

necessity where lights and visibility are low. There are meters shaped and backlit for all situations.

- For example, you may be in a well-lit room but measuring under a desk or inside a large cabinet. These are places where a backlit display really comes in handy.

How Do You Handle Your Tools? What is Your Work Style?

- Will your meter stay indoors or will you carry it with you on a tool belt? Or, will you keep it mainly on your workbench? Some DMM models incorporate handy pop-up stands while others feature integrated holsters, resilient
- enough for the most demanding on-the-job situations. If you use your meter in a tough environment, a few dollars spent for a meter carrying case or holster to protect your investment is well worth the money.

Is This Purchase a Long- or Short-Term Investment?

Will your meter perform as the primary tool? Or will it be a backup to another more high-end meter? Many workers demand the confidence of always having a backup DMM so they are always prepared. Others have only occasional needs for their DMM. Either way, a mid-priced, multi-function DMM fits the bill nicely.

Do You Need a Complete Kit or Will You Buy Accessories Separately?

Fortunately, many suppliers offer complete ranges of test leads, probes, thermocouples and more. Several companies also have task-related kits that employ everything you'll need to undertake specific measurements.

What are the Factors of After-Purchase Service and Warranties?

With many meters and test tools being manufactured in other countries, the basic meter warranty is of primary consideration. Who will repair it? Where will it be sent for warranty work? Or, does the manufacturer offer an on-the-spot

replacement program that saves time, money and hassle? The answers could save a great deal of angst when timely measurements are needed.

Carefully reading a meter's specifications before you buy can make your next test tool purchase a simple task rather than a frustrating exercise. Tackle the process as you would a major investment worthy of your time and effort. Buy and operate the right meter for you.

TROUBLESHOOTING HOME APPLIANCES

by Phil Salditt

Most home appliances take ac voltage from the house supply and use it to make heat, light or turn a motor or, commonly, all three at the same time. In the case of a washing machine for instance, a step switch driven by a timer motor controls the wash cycle by sequential application of ac voltage to various control elements of the washer. Troubleshooting appliances comes down to checking for the application of voltage to circuit components and checking the integrity of components.

AC Voltage

Home appliances run on the voltage found coming from the ac outlets of the home. Most outlets supply 110Vac to 120Vac. Clothes dryer and stove outlets normally operate from two 120V circuits that can produce a maximum voltage potential of 220V to 240V. To troubleshoot home appliances, a digital multimeter or DMM that will measure at least 240V or more.

Power Cords

Power cords connect the appliance to the house voltage supply system. Over time, and sometime through accidents, these cords can break internally while they appear perfectly normal on the outside. The best way to check a power cord is to disconnect it from the outlet and then take a resistance measurement between one prong of the plug and the point where the power cord connects to the appliance. This may require the removal of appliance covers. Extreme care must be observed while these protective panels

are removed from the appliance. Leaving them off while power is applied may present a shock hazard to adults, children and animals. A good power cord will have less than one ohm of resistance when good. Higher values can indicate a cord that is starting to breakdown and could become overheated when in use and therefore pose a fire hazard.

Current Draw

Current draw is measured in one of two ways. Either the circuit is opened and the DMM is placed in series with the circuit, or a current clamp is used around a conductor. DMMs usually come with a current rating from a couple of amps to 20A. Check your DMM manual for the specified current rating. Troubleshooting heating circuits will probably require a higher current measurement than a DMM can handle. These are applications where a current clamp accessory can be used to measure ac current in a circuit without having to open the circuit. To take a current measurement with a current clamp, insert the clamp leads into the current jacks of the DMM. Clip the clamp around one conductor of the circuit to be measured. The current clamp will act as a step down transformer, taking the higher current and transforming it to a much smaller current (usually 1000 to 1) which the DMM can handle.

This is a good technique for determining if a dryer heating element is working or not. Start the dryer using a heat cycle. First check to be sure voltage is being applied to the heating element by taking a voltage measurement across the element. With the meter leads attached to the voltage input jacks, select the Vac function. If the DMM is not auto-ranging, place the DMM in the highest range. Place a probe on each end of the heating element and adjust the DMM range for a full range reading. If voltage is present, then take a current reading using a clamp connected to the DMM. If the element is open and needs replacement, the current will be zero.

Switches

You can check switches in a couple of ways. The first way is to measure voltage through the switch by checking both the input side and output side of the switch for voltage. In the on position, the voltage should be present on both input and output lugs. Another way is to check the continuity through the switch. Remove power from the switch first. Isolate the switch by removing the wire or wires from one side of the switch. Set the DMM on continuity and place one lead of the DMM on the input lug and the other lead on the output lug. When the switch is on, the DMM should sound the audible continuity signal and the DMM should read zero ohms. When the switch is open, the signal should stop and the DMM displays OL.

Connectors

A lot of appliances use solderless connectors to make the various interconnections inside the appliance. A special connector is crimped onto the end of a wire. The connector is then slipped onto lugs of switches, elements and other components of the

appliance to complete the electrical connection. These connections can become loose. When they are loose, they present a higher than normal resistance to the current flowing through them and produce heat. Over time this heating corrodes the connection and increases the resistance even more; sometimes to the point that they make an open circuit. With power removed, you can measure the continuity of the connections using the DMMs continuity feature. Open one end of the circuit by removing a connection from a component adjacent to the connection to be measured. With the DMM in continuity mode, place a lead on either side of the connection you are testing. The DMM should sound the audible continuity signal and the DMM should read zero ohms. Higher resistances may indicate a faulty connection.

Temperature

For those appliances that generate heat, the ability to measure temperature comes in very handy. Some DMMs have the ability to measure temperature as one of the functions. For those that don't, a special adapter can be purchased to allow the use of temperature probes (thermocouples). One very common appliance depends on the proper regulation of heat: the oven. Using a thermocouple rated over 500 degrees F, attach the probe to your DMM or through an adapter if necessary. Position the thermocouple in the oven so that it does not get direct heat from the oven element(s). Use a cookie sheet if necessary to block direct heat from the element. Turn on the oven and set the temperature dial to say 300F. Once the oven warms up to the selected temperature (oven starts cycling the heat) check the reading on the DMM. Watch the DMM reading through one or two cycles of heating. The reading should move around the desired heat setting by no more than 20 degrees. Larger differences may indicate a bad temperature sensor.

Motors

Motors can be set up to rotate in different directions or at different speeds. In all cases, there are windings in the motor through which current flows, causing the generation of torque. Once it has been determined that voltage is being applied properly to a motor that is not turning, the windings can be checked using the continuity feature of the DMM. You can also identify the rare situation where the motor winding insulation breaks down and shorts to the motor case. Measuring the continuity between the winding and the motor case identifies this problem. Disconnect the motor from the circuit. Using a DMM in the continuity mode, place one lead on the motor case and the other on one of the motor's input leads. The DMM should not indicate continuity (no audible signal). If it does, then the insulation of the motor windings may have broken down and has made a connection to the motor case. ■

Complying With Environmental Considerations

by the ES&T Staff

There was a time when we humans thought that once we tossed something into the dump, that was the end of it. It would just sit there forever in suspended animation, or it would moulder and rot, or whatever, and return to nature to become part of the earth.

Now we know that that is not so. Even with the best of sanitary dumping facilities, sometimes our waste turns up somewhere where it's not desired. When trash is dumped into poorly designed landfills, hazardous wastes, such as heavy metals, dioxins, or petroleum distillates can end up in our drinking water.

In other words, we, as a species, now know that the earth is not the limitless planet we once believed it was, and our waste can come back to haunt us. This is especially true when events combine to generate waste, some of it hazardous, on a scale never anticipated.

The Computer Monitor/TV Tube Problem

The personal computer, introduced a mere twenty years ago, was a boon to developed societies. These magical machines allowed small businesses and consumers to generate correspondence, maintain data, perform calculations, communicate, and more, in a far more efficient manner than was ever before possible.

At first personal computers could only display letters and numbers. Then technologists quickly added graphics, sound, then moving images. Moreover, available programs multiplied, and required more space, and manufacturers responded with more and more sophisticated machines.

Each new generation of machine made the previous generation obsolete, or at least, less desirable. The public responded by embracing each new generation of machine and, frequently, tossing machines of the previous generation away. This has caused huge quantities of computers to find their way into landfills.

The sheer bulk of these abandoned computers has caused problems for landfills,

many of which have filled up long before it was anticipated that they would. But the bulk of the material is only the beginning of the problem. Computers contain hazardous wastes, which, when they are placed in landfills, can leach out and find their way into sources of drinking water.

The CRTs in the monitors contain lead to shield the users from x-radiation; as much as six pounds or more. As long as the tube is intact the lead is not a problem. But if the glass is smashed, rainfall or other sources of water can leach this lead out. Moreover, there is lead in all of the solder in these products, to say nothing of cadmium, and many other hazardous chemicals, all of which can contribute to a deadly soup.

What has been said of computers is also true of consumer electronics products such as televisions. These products don't become obsolete as quickly as do computers, and so don't find their way into landfills in such numbers, but they do contribute to the problem as well.

Unfortunately, policies of manufacturers, and retailers' merchandising methods contribute to the problem. For example, it is our understanding that it is the policy of one of the largest manufacturers (or perhaps more correctly, branders) of personal computers that the monitor is not a serviceable item. They don't offer service literature, and they don't provide replacement parts. So, if a resistor, diode, transistor, or other tiny part fails, the entire unit goes onto the scrap pile. Fortunately, in spite of the adamant refusal of many monitor manufacturers to provide service literature or replacement parts, many service centers have found a way to service some of these units, keeping them out of the landfill, saving the monitor's owner the cost of a new monitor, and making a little profit as well.

And the mass merchandisers carry their share of the blame as well. Most companies that sell computers to the general public offer them in a bundle: CPU, RAM, ROM, drives, modem, mouse,

keyboard, monitor. Most well made monitors will continue to operate long after the computer for which they were bought as a display device becomes obsolete, but the store can make a little more margin by selling a new monitor as well, so why not?

Keeping Stuff out of the Landfills

So, what is to be done about this problem. Simply put, a couple of states in the United States have already done something about it. Massachusetts and California have passed legislation that prohibits CRTs in landfills. In these states, CRTs must be recycled in one way or another. Many other states are studying the problem, and will no doubt come up with their own solutions to the problem.

It's not possible for us to provide a state by state rundown on environmental regulations as regards computer monitors or other CRTs, but it would behoove service centers everywhere to remain attuned to environmental requirements in their state and municipality. Moreover, service centers can help in the effort to keep undesirable waste out of landfills by finding companies that recycle electronics products and turning useless products over to them for recycling rather than sending them to the landfill. There may not be recycling centers in all areas, but they do exist in most major metropolitan areas.

Other Hazardous Waste

Lead and other heavy metals are not the only hazardous materials that are generated by service centers. Service centers use solvents, cleaners, lubricants and more that fall into the category of "hazardous waste." I visited the website of Johnson County, Kansas, the county in which I live. On it they have definitions of household hazardous materials, but the definitions apply to most small businesses as well.

The characteristics of household hazardous materials are:

- Flammable: Can be easily set on fire or ignited.

- Corrosive/Caustic: Can burn and destroy living tissues when brought in contact.
- Toxic/Poisonous: Capable of causing injury or death through ingestion or absorption. Some toxic substances are known to cause cancer (carcinogens), genetic damage (mutagens), and fetal harm (teratogens).
- Explosive/reactive: Can detonate or explode through exposure to heat, sudden shock, or pressure.
- Radioactive: Radioactive substances are known to cause cancer, mutations and fetal harm.

Common types or hazardous materials include:

- Automotive products: Oil, gasoline, lead/acid batteries, brake fluid, body putty, ethylene glycol coolants.
- Cleaners: Spot remover, toilet bowl cleaner, bleach, disinfectants, tub and tile cleaner, oven cleaner.
- Paints and solvents: Oil/latex paint, varnish, thinner, stain, paint remover, sealers.
- Pesticides: Herbicides/weed killers, insecticides/bug sprays, fertilizers, poisons.

Local/County Governments Help

A visit to several municipal and county government websites makes it clear that these bodies are doing a great deal to keep hazardous materials out of the waste stream, and can help small businesses dispose of such materials in a responsible and environmentally friendly manner. Again quoting the Johnson County, Kansas website, here's what they say:

"The Johnson County Environmental Department offers Johnson County businesses that generate small quantities of hazardous materials (less than 55 pounds, or less than 2.2 pounds of acutely hazardous waste per month) a safe alternative for disposal." The article goes on to cite some statistics.

"Since it began in 1996, more than 100 businesses have safely disposed of:

- More than 2,600 gallons of latex paint,
- 4,100 gallons of flammable liquids,
- 6,200 pounds of various materials.

"Waste collected in this program is recycled, reused, or disposed of as hazardous waste. Disposing of such waste through this program can help to reduce uncertainty about future liability for participating organizations."

Read the MSDS

Most materials used in servicing seem relatively innocuous, but many of them are in fact considered hazardous materials, and, by law, must be properly disposed of. If you have never done so, it would be a good idea to read the material safety data sheets provided by vendors of servicing chemicals. If you don't have the sheets, they are generally available on the manufacturers' websites as pdf files. Most of these sheets have a section that reads "Dispose of in accordance with all federal, state, and local regulations. Water runoff can cause environmental damage." If you don't know what those laws are, compliance is difficult.

Ethylent Glycol

Let's take a look at a substance that's becoming more and more common as the number of projection sets increases: ethylene glycol, the chemical that is used to keep the projection CRTs cool. An MSDS for that stuff says: "Warning! Harmful or fatal if swallowed. Harmful if inhaled or absorbed through skin. May cause allergic reaction."

It's not our intention to be alarmist with this article. Most likely service technicians don't handle ethylene glycol a lot, and when they do, are probably careful, so the hazard is not great. However, that same MSDS says that "vapor inhalation is generally not a problem unless heated or misted. Exposure to vapors over an extended time period has caused throat irritation and headache. May cause nausea, vomiting, dizziness and drowsiness. Pulmonary edema and central nervous system depression may also develop. When heated or misted, has produced rapid, involuntary eye movement and coma."

The MSDS says also, if you drink it, it can make you sick or kill you. It also says "repeated small exposures by any route can develop severe kidney problems. Brain damage may also occur. Skin allergy can develop. May damage the developing fetus."

The sheet also suggests protective measures when handling: goggles, lab coat, vent hood, proper gloves.

In other words, this is hazardous material. If you have to replace contaminated coolant you may not flush the stuff down



ETA-I

Electronics Technicians Association, International



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Electronics Technicians Association, International

502 N. Jackson Street
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Circle (18) on Reply Card

the nearest drain. You must collect it and dispose of it as hazardous material.

Other Electronics Servicing Chemicals

A look at material safety data sheets for such things as audio/video cleaners, lubricants and degreasers reveal that the manufacturer suggests that they be treated in a similar fashion. All such materials should be used with adequate ventilation, goggles should be worn to avoid getting the stuff in eyes, and any residues should be collected and disposed of as hazardous waste "in accordance with all federal, state and local regulations."

Keeping our Planet Clean and Green

Everything we "dispose of" goes somewhere. When you toss something out as solid waste, it goes into a landfill. Unless it's a properly designed and constructed facility, eventually, after years of rain, soil shifting, heat, cold, the stuff leaches through the soil and winds up in our drinking water. When you flush something down the sink or toilet, it can wind up back in the river after treatment, to become part of the drinking water for someone downstream.

It is the responsibility of all of us, consumers, small businesses, large manufacturers, to do everything we can to keep hazardous wastes from damaging the environment, or harming other living organisms. ■

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Professional Servicers know the best troubleshooting tips often come from other servicers. Now you can share your best technical and business tips with the audience of ES&T and earn \$50.00.

Each month we will publish submissions from our readers: one for technical tips and one for business ideas. The individuals submitting the winning entries will receive \$50.00 each for their ideas.

Whether it is a new revenue stream, a way of shortcutting a tedious diagnostics, or other cost cutting measures, share them with your fellow ES&T subscribers and maybe you will receive a check for \$50.00 next month, and a certificate of recognition from ES&T.

All selections will be made by the ES&T staff and their decisions will be final. In the case of duplicate entries, the first received will be selected. By submitting your entry you give permission for ES&T to use it in the magazine, on the internet and all other related promotional materials.

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THE MAGAZINE FOR PROFESSIONAL ELECTRONIC AND COMPUTER SERVICERS

ELECTRONIC
Servicing & Technology

Photofact® Index

SAMS TECHNICAL PUBLISHING HAS JUST RELEASED THE FOLLOWING PHOTOFAC T® SETS

GE	VS-50705.....PF GOLD 2	CTC179CM.....PF4474	ZENITH
TX808A	VS-55705.....PF GOLD 2	F32730SBFM1.....PF4474	B27A24Z5.....PF4480
TX808E.....	VS-60705.....PF GOLD 2	F32730SBJX1.....PF4474	B27A24ZF5.....PF4480
TX808R.....	VZ7	F35755MBFM2.....PF4474	B27A74R5
13GP341F11	VZ7+.....PF GOLD 2	F35755MBJX2.....PF4474	B27A76R5
13GP341F21		G35831ATLM1	C13A04LB
13GP344F11	PANASONIC		C13A04LG
19GT243F11.....	AAP331.....PF4479		C13A04LP
	CT-3272SE	SANSUI	C27C41T
	CT-3272SUE	TVM0903 Version APF4472	C27C41TF
			C32C41T
JVC		SANYO	C32C41TF
AV-27D501	PHILIPS MAGNAVOX	DS27880.....	C32C84R
AV-32D501	TS2556C121.....	27880-00.....	C32C86R.....
AV-32D501 (Suffix A).....	XS2556C121.....		C36C41T
PF4471	25PT15C121.....	SHARP	C36C41T8
AV-36D201	25TS56C121.....	27N-S50.....	C36C41TF
AV-36D501	25TS56C221.....		C36C86R.....
		SONY	LGB29A24ZM5
MITSUBISHI		KV-35S42	
VS-45605.....PF GOLD 2	RCA	SCC-07P-A	
VS-50605.....PF GOLD 2	CTC179CK	SCC-07R-A	

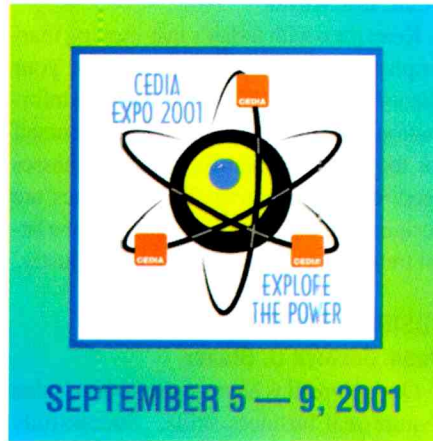
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CEDIA Expo 2001

Home theater has become a reality for all consumers. Systems are available for every budget. "Radio" is being broadcast via the internet and received into homes. Soon, reception of television via the internet will be commonplace. Homes with multiple computers want to network them and be able to access the internet from any computer. Consumers want to distribute audio and video throughout the house. Appliances are becoming smarter, and it may one day be a reality to link them together, and connect them to systems like the furnace, air conditioning, hot water heater.

Electronics in the home has been growing and evolving over the last half century or so. In the beginning it was the crystal radio. If the family could afford the luxury of such a thing, the patriarch would sit in the evening with headphones on his head listening to the news of the world coming over the airwaves and would then relay the news to the awestruck family members sitting at his feet.

Gradually tube-type, powered radios, with loudspeakers were introduced. The phonograph provided music from records. Soon there was television. Over time, all of these devices were improved and became cheaper, then products such as the VCR,



camcorder, the CD, DVD and personal computer were introduced each in its season.

Today we're seeing a revolution in consumer electronics, no longer evolution.

There's an association of approximately 2,000 individuals and businesses whose job it is to provide all of the infrastructure in homes to make all of these things possible. This group, CEDIA holds their EXPO in Indianapolis Tuesday September 4 through Sunday September 9. CEDIA attracts some 16,000 custom electronic designers and installers to more than 800 exhibits. Following is a description of some of the seminars, the trade show, and special events that attendees at the CEDIA EXPO can expect to see.

Educational Tracks

CEDIA EXPO offers a number of educational tracks for attendees as follows. The wording of the information as presented on the CEDIA website has been preserved. Each of the tracks involves a number of different, separate, seminars related to the subject.

ESSENTIAL TECHNOLOGIES

Deans: Jim Clements/Joe Wallace

By having a firm grasp on today's technologies, you will have clearer insight into tomorrow's. The Essential Technologies Track curriculum has been developed to provide you with the knowledge necessary to advance as fast as product and installation technologies do. The curriculum also prepares you for the Custom Electronic Installer Certification examination. The Essential Technologies Track provides you with the means to move forward as the industry does.

WHOLE-HOUSE SYSTEMS

Dean: Helen Heneveld

Different subsystems abound in today's homes. These subsystems include whole-house audio, video, telephone, security and lighting. This curriculum features how each of the subsystems work

CEDIA SCHEDULE AT A GLANCE

TUESDAY, SEPTEMBER 4

8:30 am CEDIA's sixth annual golf tournament
3:00 pm – 6:00 pm Attendee registration, Indiana Conv. Center

WEDNESDAY, SEPTEMBER 5

8:00 am – 5:00 pm Attendee registration, Indiana Convention Center
7:00 am – Midnight Attendee registration in select hotels
10:00 am – 7:30 pm Educational courses

THURSDAY, SEPTEMBER 6

8:00 am – 9:00 pm Attendee registration, Indiana Convention Center
7:00 am – Midnight Attendee registration in select hotels
8:00 am – 7:30 pm Educational courses

FRIDAY, SEPTEMBER 7

7:00 am – 7:00 pm Attendee registration, Indiana Convention Center
7:00 am – Midnight Attendee registration in select hotels
8:00 am – 9:30 am Keynote breakfast
10:00 am – 11:00 am Press opening
10:00 am – 11:30 am Educational courses
11:00 am – 7:00 pm Show Floor Open

Noon – 5:30 pm
5:00 pm – 7:00 pm
6:00 pm – 7:30 pm

Educational courses
Opening reception on the Show Floor
Educational courses

SATURDAY, SEPTEMBER 8

7:00 am – 5:00 pm
7:00 am – Midnight
8:00 am – 11:30 am
10:00 am – 5:30 pm
Noon – 1:30 pm
2:00 pm – 5:30 pm
7:30 pm – 10:00 pm
10:15 pm – 11:45 pm

Attendee registration, Indiana Convention Center
Attendee registration in select hotels
Educational courses
Show Floor Open
Annual meeting and keynote luncheon
Educational courses
Awards ceremony & John Cleary Concert
Private concert with Bonnie Raitt

SUNDAY, SEPTEMBER 9

8:00 am – 2:30 pm
7:00 am – Noon
8:00 am – 9:30 am
10:00 am – 3:00 pm
10:00 am – 11:30 pm
9:00 am – 6:00 pm
Noon – 1:30 pm

Attendee registration, Indiana Convention Center
Attendee registration in select hotels
Educational courses
Show Floor Open
Educational courses
Shuttle to Indianapolis Int'l Airport
Educational courses

independently, and teaches how to link them together. Participants also look at the importance of control and the user interface. Here, you'll find technical courses with real-world applications.

HOME THEATER

Dean: Jeff Kussard

The Home Theater Track curriculum is designed to develop the skills necessary to maximize the performance potential of multi-channel audio/video installations. We will focus on specific disciplines in order to maximize your learning experience in the following areas: acoustics & space development, multi-channel audio, and video-display technologies. From conceptualization to calibration, this track offers answers to the tough questions for those just developing their theater design or installation skills as well as for masters of home-cinema spaces.

HOME NETWORKING

Dean: Robert Perry

Throughout the 1990s and now in the new millennium, we've seen widespread consumer adoption of home theater, wireless communications, multi-line in home telecommunications, lighting control, security, audio/video distribution and home computing. The convergence of these technologies, and the integration into one simple-to-use control system has created a good business for many of us. But are we ready for the explosive growth opportunities that Internet information and entertainment will bring to home networking and our industry?

NEW & EMERGING TECHNOLOGIES

Dean: Eric Rossi

Keep pace with today's fast-moving marketplace. As industry professionals, your clients rely on you for state-of-the-art information and guidance. To position yourself for the future, forward-looking businesses need to stay informed. These courses are designed to keep you up-to-date with the latest trends and technologies in our industry.

BUSINESS MANAGEMENT

Dean: Jocelyn C. Stover

Our companies have grown to levels that require real business skills. Successfully managing all aspects of a modern, custom-installation business has become a greater challenge than delivering the technical expertise to our clients. We have to become good managers to grow and survive! This track focuses on the requisite business management skills needed to run an efficient, profitable, productive and growing company. This track addresses all levels of the company, including finance, human resources, project management, and general business operations and planning skills.

VISION & EXCELLENCE

Dean: Steve McNaur

Are you ready to ratchet your career to a new level, and committed to doing it? In this track, you will learn the secrets used by successful corporate executives, CEOs, public speakers, and political leaders around the world. Find out how to run effective meetings, set your company's goals, use your time more efficiently, and manage the performance of your employ-

ees. Also, you will learn how to make powerful presentations, develop your creative side, and understand what leadership really means. This track will help you take your company into the next millennium with the horsepower it needs at the helm.

MARKETING STRATEGIES

Dean: Cat Fowler

As an industry professional, you are ready to elevate your business even further and target key customers. Learn how to completely solidify your company in your clients' minds, attract new business through strategic planning, develop a winning marketing plan, and be the leader in your market. If you are ready to turn up the heat in your business, and attract clients from places you would not have previously considered, then this track is for you!

SALES RELATIONSHIPS

Dean: Kristin Lederman

Developing a long-term sales relationship with your customer is critical in our business. Whether a single-piece transaction or productive client involvement within the many phases of large-scale installation, these classes will increase your skills in developing successful sales relationships.

SPECIAL PRESENTATIONS & CERTIFICATION REVIEW

Sam Runco...Werner Berger...Gateway with Ken Smith & Helen Heneveld...Installer I & II courses; these are special presentations. More than a course, yet full of information, these special presentations are deserving of a special section of their own. ■

ES&T Calendar of Industry Events

CUSTOM ELECTRONICS DESIGN AND INSTALLATION ASSOCIATION (CEDIA)
SEPTEMBER 5 — 9, 2001
Indianapolis Convention Center
Indianapolis, IN
CEDIA Headquarters
9802 N Meridian Street Suite 200
Indianapolis, IN 46260
800-669-5329
www.cedia.org

NETWORLD+INTEROP
SEPTEMBER 9 — 14, 2001
Georgia World Congress Center
Atlanta, GA
Key 3 Media Group
781-433-1500
www.key3media.com



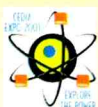
WESCON 2001 FALL
OCTOBER 16 — 18, 2001
San Jose Convention Center
San Jose, CA
800-877-2668
www.wescon.com



EH EXPO FALL
OCTOBER 24 — 27, 2001
Long Beach Convention Center
Long Beach, CA
925-284-5750
www.electronicshome.com



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Soldering and Desoldering Back to the Basics

It's so fundamental that sometimes we don't even think about it, but wherever components are connected to form some kind of circuit, whether it's as simple as a one or two transistor radio, or as complex as one of today's consumer electronics products, the components are invariably connected mechanically and electrically using solder. Solder is essentially an alloy of tin and lead that melts at relatively low temperatures. A good solder joint will last almost forever, providing an electrical connection of very low resistance.

It's a given that one of the essential skills of a qualified service technician is the ability to make good solder joints, and to desolder solder joints in order to remove a faulty component from the circuit, and to perform both of these operations without causing the printed circuit foil to delaminate from the substrate, or otherwise damaging the circuit traces.

Soldering

Whether it's done to construct a new piece of equipment, or to install a replacement for a component that has failed, making a good, solid solder joint requires a number of things:

- The leads to be soldered must be clean,
- The soldering iron has to be hot enough to properly melt the solder,
- The iron must be held against the conductors long enough to insure that the solder was properly melted in order to form an electrical, as well as mechanical, connection between them,
- Enough solder must be applied to the joint.
- You should use some kind of fixture to make sure that the circuit where the solder joint is to be made doesn't move during the repair process.

All of these elements are important, but cleanliness is the most important. If there's grease or oil on the leads, or if there's more oxidation than the flux can

reduce, the joint will be flawed. It might work fine just after the repair, and it might work fine for a long time, but there is the likelihood that at some time it will fail, and the unit will have to be serviced again. Of course, there is the possibility that a bad solder joint will render the unit inoperative immediately.

One way to make sure that solder joints are properly made is to thoroughly clean all of the conductors to be soldered. Everything to be soldered should be shiny. If the replacement component is, say, a resistor, and its leads are dull, you should take a little fine sandpaper, or steel wool, to the leads until they're shiny.

And look at the circuit trace on the PC board. It should be clean and shiny too. Don't take a chance. If there's solder left on the land from the removal process, take the soldering iron and some desoldering braid and remove it. If the surface looks dull, brighten it up by running a pencil eraser over it. Gently.

One more thing. Don't touch any of the conductors to be joined with your fingers. Our skin has oils on it, and those oils can contaminate the conductors and cause a less than perfect solder joint. If you need to bend the leads, use a pair of pliers, tweezers, or similar tool to bend them.

Most technicians know how to make a proper solder joint, but for those who are still learning, the proper way to make a solder joint is to heat the conductors that are to be soldered together, then place the end of the solder on those conductors, and let the solder melt and be drawn into the joint. Sometimes it's helpful to add a little solder to the tip of the iron to help conduct the heat to the joint, but the joint should never be made in this fashion.

It's important to make sure that the soldered joint is not disturbed while it is cooling. This can cause a bad joint. A good solder joint is smooth and shiny. If the joint appears dull, you may have jostled it as it was cooling. In this case, reapply the iron and reflow the solder until it has the correct appearance.

Desoldering

In these days of super fine traces on printed circuit boards, hundred lead chips, and heat sensitive components, the most important advice about desoldering is: unless you're sure that the component you're thinking about desoldering is the bad component: Don't. Of course even the most competent technician will sometimes come up against a situation where he can't be sure, but he has to do something. In that case, there is little choice. But otherwise, desoldering components willy nilly is a bad idea.

If you encounter a multileaded component that has to be removed from the circuit, there are several ways to do so. One way, of course, is to use a vacuum pump, either part of the iron or separate, to remove the solder from the leads and pads. Another way is to use solder braid to wick up the solder as you melt it with the iron. The conventional wisdom is if the part you have removed is heat sensitive, especially if it's multileaded, if it turns out it wasn't bad before you removed it from the circuit board, it will be bad after you have removed it, so don't think about putting it in the circuit. The likelihood of a callback if you do is extremely high.

Sometimes you'll find that the solder at some of the joints doesn't seem to want to melt, making the removal of the component difficult or impossible. In such a case, it might be helpful to first add some fresh solder, and then apply the iron to the joint. Frequently this is all it takes to get the old solder flowing. Then you can use the solder pump, or braid, to remove all the solder.

Low-melting Solder

Another alternative to removing solder is to use a solder that melts at extremely low temperatures. Kits featuring this product are available from some distributors. Using this product, you apply the low-melting solder to the joints and cause it to mix with the solder that's already there. This new alloy will remain molten

at far lower temperatures than does regular solder, allowing you to use a Q-Tip to whisk the solder off the board.

Repairing Damage to the PC Board

Even the most skilled and careful technician, faced with a difficult fix, occasionally causes damage to the printed circuit board traces. If it's an inexpensive board, it might be cost effective to just scrap it and buy a new subassembly. But if it's a very costly board, the service center might not want to eat the cost of the board to return the product to the owner. If this happens, there are a number of ways in which a technician can repair the damage.

If the problem is just a hairline break

in the trace, the technician may be able to flow solder over the broken spot, thus restoring the connection. If there's a piece of foil missing, the technician may be able to place a short piece of insulated wire across the break and solder both ends.

How about the case in which the technician left the soldering iron on the solder pad too long, or at too high a temperature, and the pad lifted from the board. A number of manufacturers and distributors offer kits that allow the technician to repair even such a problem as this. Some of these kits come with an assortment of self-adhering replacement pads, solutions to clean up any adhesive from the old pad, and everything else needed to repair just about any circuit foil problem.

Soldering is Fundamental

If there's one skill that's basic to electronics servicing, other than the ability to troubleshoot problems, it's soldering. Most repairs to consumer electronics products require that a faulty component(s) be desoldered, and replacement component(s) be soldered in. It's a skill that should be practiced by technicians, on simulated circuits, until they're proficient.

It's so basic that several companies offer courses in soldering. At least one company makes dummy circuit boards and components for developing technicians to practice on. The importance of the ability to solder/desolder properly should never be underestimated. ■

ELECTRONIC
Servicing & Technology



2001 CALENDAR

Watch for these Features, Special Reports, Technical Updates and other articles designed to help Consumer Electronics Service and Maintenance Professionals stay current and grow.

SEP	CEDIA SHOW, NETWORK+INTEROP SHOW ISSUE	HOME THEATRE SHOWCASE and Review	Telecom Test Equipment	HDTV	Transformers	Power Management	Home Theatre Opportunities	CEDIA, Sept 5-9, Indianapolis Convention Center, Indianapolis, IN. NETWORK+INTEROP, September 9-14, Atlanta, GA
VISIT ES&T AT CEDIA BOOTH #869								
OCT	CEDIA, NETWORK REVIEW, COMDEX PREVIEW	MANUFACTURERS PRODUCT BRAND Directory	PC Testing Tips	Keyboards/Organs	SMD	Servicing \$10,000+ TVs	50th Anniversary – History Part 4	ELECTRONIC HOUSE EXPO October 25-27, Long Beach Convention Center, Long Beach, CA
VISIT ES&T AT EH EXPO BOOTH #821								
NOV	COMDEX SHOW ISSUE		Computer Software Diagnostics	Cassette Mechanisms	Power Supplies	Rear Projection	Servicing TVs Today	COMDEX-FALL 2001, Nov. 12-15, Las Vegas Convention Center, Las Vegas, NV
DEC	COMDEX REVIEW CES PREVIEW	TEST EQUIPMENT SHOWCASE and Review	Internet Access	CD Players	MPU's	Security	New Technology Update	

IN EVERY ISSUE: New Products, New Literature, News, Association News, Book Reviews, Photofacts and Profax.

To be scheduled or added as available: Test Your Electronics Knowledge (TYEK), Troubleshooting Tips, Video Corner, Computer Corner, Audio Corner, Business Corner, Communications Corner, The Smart Building, Successful Servicing, What Do You Know About Electronics (WDYKAE), Service Organization Profiles. Advertising Space Reservations: 10th of the month preceding issue. Materials Due: 15th of month preceding issue.

As of 8/01

New Products

Bench Top Ionizer

The Bench Top Ionizer XL from ESD Systems.com (Item #43106) provides maximum neutralizer of electrostatic charges in the workplace. It features a patented Faraday balance system that provides for an automatically balanced ion



output. The XL is 50% wider than the previous models and emits ions in a true laminar flow that reduces ion recombination and emitter contamination. A fixed temperature heater removes chill from air, thus enhancing worker comfort and productivity. The Bench Top Ionizer uses an ac ionizing system that allows neutralizing static charges at great distances. ANSI/ESD-S20.20 specifies in section 6.2.3.1. that "Ionization or other charge mitigating techniques shall be used at the workstation to neutralize electrostatic fields on all process essential insulators if the electrostatic field is considered a threat." The unit is UL listed.

ESD Systems.com
Circle (19) Reply Card

Wrist Straps

The new Jewel line wristbands and coil cords from Desco combines superior features providing a reliable path-to-ground with high visibility colors. Features include lifetime warranty on the wristband stud and coil cord strain reliefs, patented contoured banana plug spring



resists deforming, rapid retraction polyurethane cords provide high memory and less dragging on work surface, resistor connection strain relief provides ESD S1.1 reliability in excess of 28,000,000 cycles, five highly-visible colors allow supervisors to verify compliance and adds fashion for workers.

The wrist strap includes a six foot coil cord and is UL listed. A 1MΩ resistor is standard.

DESCO
Circle (20) Reply Card

AC/DC Clamp-on Meters

The AEMC Models 511, 512 and 514 are general-purpose professional clamp-on meters that measure ac amp to 1000A, acv and dcVolt to 600V, ohms, continuity, frequency (using either the V or A measurement) and have a diode test function. The Model 514 also uses Hall sensor technology that provides both dc and ac current measurements to 1000A. The Model 511 is average sensing while the 512 and 514 provide True RMS measurements.

AEMC Instruments
Circle (21) Reply Card

Fiber Optic Power Meters

Exttech's Fiber Optic Power Meters, Models FO600 and FO610, measure over a wide 75dB dynamic range with ±0.15dB accuracy and 0.01dB resolution. The standard power model, FO600, measures, from +5dBm making to -70dBm. The high power model, F610, measures from +25dBm to -50dBm making it useful for direct measurements of laser output power.



A user friendly interface with alpha numeric membrane keypad permits easy input of test parameters including site name, date, fiber type, fiber length, and connectors and splices. The internal memory stores up to 1000 labeled data records for up to 4 sites. Stored information can be viewed selectively on a large, backlit LCD with user prompts and with options to re-measure, print, or delete. The built-in calculator determines the maxi-

mum allowable optical loss and provides simple Pass/Fail certification. The RS-232 interface and Windows compatible software allow professional certification reports to be produced that compare readings to cabling industry standards. Models FO600 and FO610 with 2.5mm universal fiber adapter accept ST, SC, FC, DIN and E2000 fiber connector types. An optional 1.25mm universal adapter is available for the LC type connector.

Exttech
Circle (22) Reply Card

LCR Meter is Micro-Processor-Controlled

GLOBAL Specialties-instruments division, has introduced their new 10,000 count dual display LCR Meter, Model 3200, part number (105-3200).



The GLOBAL meter offers maximum performance and function in small footprint. In addition to being compact and lightweight at 3.5lbs. (<2Kgs), the meter is rugged and useful in the plant as well as field use.

Features include: Ease of operation-all push button controls are front panel mounted, auto and manual ranging selection, choice of two or four-wire measurement, unique parallel and series measurement modes, data-hold, min-max-average record mode, relative mode, tolerance sorting, frequency selection, and L, C & R measurement modes.

Specifications Measurements ranges:

L (inductance)	0 ~ 9999 H,
C (Capacitance)	0 ~ 9.99 mF,
R (Resistance)	0 ~ 10M Ohms,
D (Dissipation)	0 ~ 999,
Q (High Quality Factor)	0 ~ 999,

Test Frequencies 120 Hz and 1 KHz (User selectable)

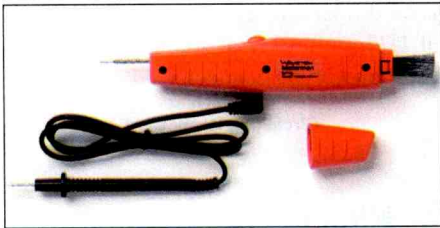
Global Specialties
Circle (23) Reply Card

New Products

Electrical Short Finder

Wavetek Meterman, has launched the Meterman SF-10 Electronic Short Finder.

This test tool uses a patented wire brush feature to quickly "sweep" printed circuit boards under test to find electrical shorts. Shorts are one of the most common fail-



ures for electronics equipment and one of the most difficult problems to detect, according to the company.

With this unit many test points can be covered in a single sweep, quickly isolating the suspected short to a very small region of the board. Then, the individual probe point is used to identify the specific components that are affected.

The SF-10 was designed specifically for electronics service technicians.

Wavetek Meterman
Circle (24) Reply Card

Cable Ties

Advanced Cable Ties releases a newly developed low profile cable tie line, the "Cobra" series. The design incorporates many features that provide easy installation and added safety. The tail features finger grips for easy handling and allows partial closure, without engaging the pawl.



The one-piece design, transition rails, and teeth provide a low insertion force while maintaining a high tensile strength. The

grooved head design provides maximum strength, while allowing the head to easily flex around the contour of bundled wires or tubing. The reduced head height and rounded edges eliminates cuts or abrasions to wires, cables, hoses, products, and users, therefore increasing safety in confined

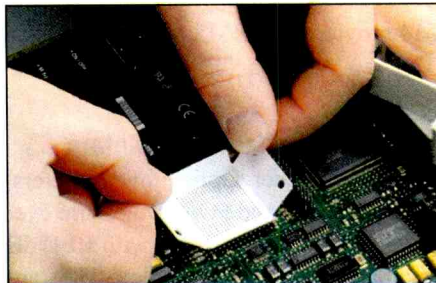
spaces and around children. The pawl, located under the tie's head, makes it inaccessible and tamper proof when bundled.

Advanced Cable Ties, Inc.
Circle (25) Reply Card

Flextac Self-Adhesive Stencils Simplify BGA Rework

Haverhill, MA - Innovative Flextac Stencils simplify BGA rework. These self-sticking laser cut, polymer solder paste stencils use a residue-free adhesive similar to Post-it® Notes to seal around BGA pads to ensure that solder paste will not bleed under the stencil when the paste is applied. Disposable Flextac Stencils are easy to use and will not leave any residue on the board surface.

Innovative Flextac Stencils are laser cut from high quality, anti-static polymer film that is the same thickness as metal stencils. If Flextac Stencil is not correctly positioned, it can simply be removed and repositioned. Side tabs serve as solder dams, preventing



overspill. No external taping or fixturing is used to hold Flextac Stencils in place. Since the self-tack adhesive seals around each BGA pad, the operator can make as many passes as necessary with the squeegee to assure proper aperture filling with solder paste. The Flextac Stencil is then peeled up leaving a perfect deposit of solder on each pad. Although Flextac Stencils are disposable, they can be used several times. They eliminate tedious stencil cleaning and reduce operator exposure to solder paste.

Circuit Technology Center
Circle (26) Reply Card

AEMC Introduces Intrinsically Safe Digital Multimeter

The Model MX 51EX is an intrinsically safe digital multimeter used in dangerous or explosive atmospheres. This instrument is considered a passive device without inductive or capacitive issues that



are problematic in such environments. This meter meets EN 50-014 and EN 50-020 standards as well as temperature class T6. The current range is protected by a 500mA intrinsic safety fuse.

This 5000-count meter measures AC & DC volts, AC & DC current, resistance, continuity, and logic level, as well as performs diode tests. It provides MIN/MAX functions with memory to store up to 5 values. It's rugged design is waterproof and IP66 rated. Price: \$845.00

AEMC® Instruments
Circle (27) Reply Card

Global Specialties Introduces A Low Cost Dual Display 4 Digit Hand-Held Capacitance Meter

Global Specialties, has introduced a new



Hand-Held Capacitance Meter, Model 3100, part number (105-3100) List Price \$119.00.

Features of the GLOBAL Specialties Model 3100 Capacitance Meter include:

- Auto ranging & Auto Shut -Off;
- Static recording for min/max & average measurements
- Memory records up to ten High/Low limit settings
- 10 special function modes
- Optional RS232 Computer Interface

Specifications of the GLOBAL Specialties Model 3100:

Measurement ranges: 0~5000nF;
5000µF; 50mF

Resolution: 0.0001nF

Digital Display: Large 5000 Count
LCD Display

Battery (Supplied): 9V Alkaline-type

Dimensions: 13/4" (H) x 3 1/2" (W) x 7 1/2" (L)

Weight 0.8 Lbs.
GLOBAL Specialties
Circle (28) Reply Card

Literature

Tools Catalog

This new, full color Menda catalog features detailed photos and descriptions of the company's famous dish-type, fluid dispenser pumps and bottles. Also included in the catalog is a new selection of precision hand tools and work bench accessories for electronics assembly. New items such as electronics vacuums, The Extractor smoke diverter, and testers round out the product offering.



Menda
Circle (29) Reply Card

Installation, Maintenance and Repair

Specialized Products has added over one thousand new items to its comprehensive Spring 2001 catalog. The new 400-page publication features an expanded assortment of the latest products for virtually every service-related application.

These include Telecom, Cable, LAN, Fiber Optic, Wireless, Computer, Electrical Contracting and Medical Electronic industries. The company includes convenient peel-n-stick bookmark tabs to help reference selected items.

Technicians, field service managers and engineers can choose from over 100 standard tool kits, hand tools and electronic test equipment including component testers, digital multimeters, frequency counters, function generators, oscilloscopes, power supplies and the largest selection of instrument/shipping cases in the industry. LAN test equipment choices include analyzers, Category 5 testers, and continuity testers. The telecom selection provides bit error rate testers, digit grabbers, digital butt sets and transmission test sets. For fiber optic installation, maintenance and test equipment, choose from precision cleavers and



scribes, new Fujikura fusion splicers, light sources, optical time domain reflectometers, power meters, strippers, tool kits and more.

Any standard tool kit may be modified to suit a customer's specific application or budget.

Specialized Products Company
Circle (30) Reply Card

Holding Tool/Mount Catalog

PanaVise Products, Inc. has released its latest catalog, the first to include the company's complete product line. The catalog combines work holding tools, communication mounts, security mounts and speaker mounts into one presentation. The 60-page catalog features product photos, specifications, suggested uses, and company information.



Panavise
Circle (31) Reply Card

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Servicing & Technology

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of Service

NOVEMBER, 2001

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MATERIALS DUE: OCTOBER 19, 2001

COMDEX Show Issue
Computer Software Diagnostics
Cassette Mechanisms
Power Supplies
Rear Projection
Camcorders
Servicing TVs Today

DECEMBER, 2001

AD SPACE CLOSING: NOVEMBER 12, 2001

MATERIALS DUE: NOVEMBER 16, 2001

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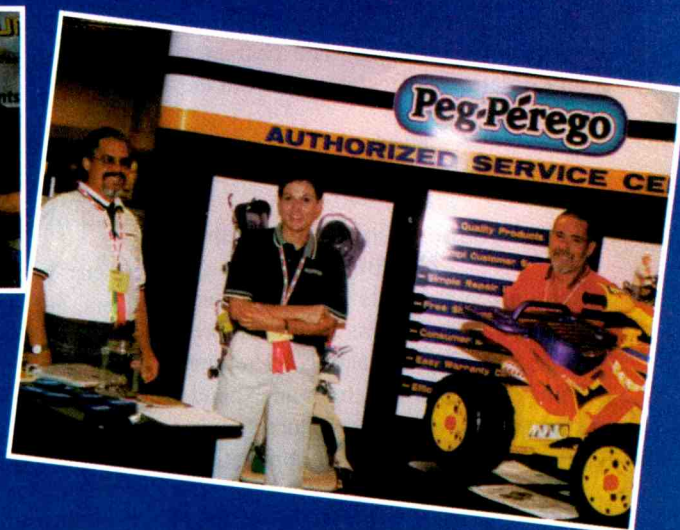
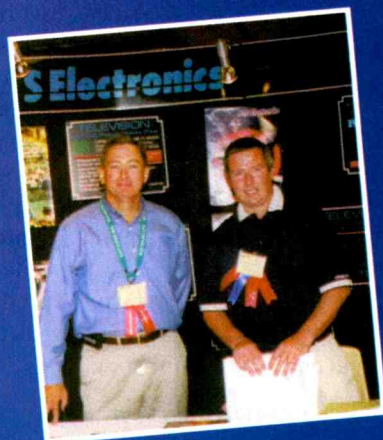
Joni Jones at 516-944-8068, jmjones@ix.netcom.com
Barbara Arnold at 781-259-9207, bhacat@tiac.net
Dave Allen at 516-883-3382, dallen@mainlymarketing.com

EDITORIAL CONTACT:

Nils Conrad Persson at 913-492-4857 cpersedit@ao.com.

Association News

NPSC 2001 FEATURES DIVERSITY



2001 NPSC Las Vegas Riviera Hotel and Casino

An Abundance of Technical Training

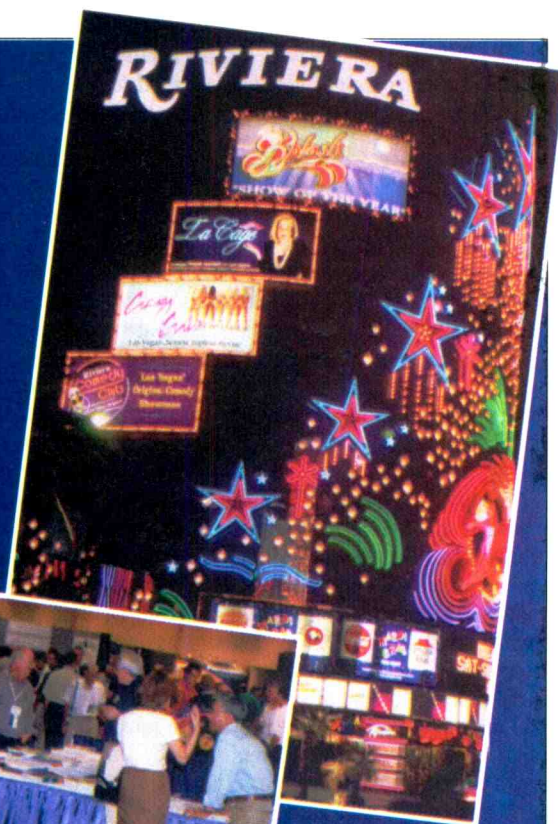
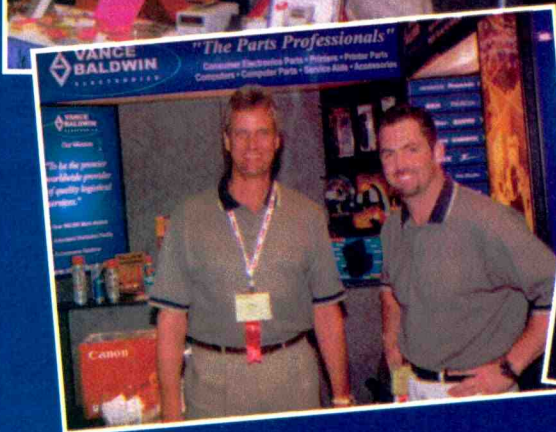
One of the highlights of the NPSC for technicians is the slate of technical training seminars offered. This year's educational opportunities reflected the changing world that technicians are facing; such things as home theater, home networking and websites for service centers. There were two seminars that dealt with home theater, one on servicing of flat panels, a presentation on digital convergence, digital light processing, and more.

- Maximizing Home Theater Performance
- Servicing Sony DVDs
- Digital TV Convergence Training
- Hitachi HDTV Servicing Update
- Basics of Digital Light Processing
- Introduction to Plasma Display
- Professional Fish Wiring
- Home Theater Boot Camp
- RCA Digital Projection Design
- Principles of Structured Wiring
- Building a Service Center Website
- Best Ideas Contest

Moderated by Jerry McCann

In addition to all of the above educational seminars, a group of savvy servicers attended a "Best Ideas Contest," moderated by Jerry McCann. Ideas suggested included a number of aspects of a service business: from increasing business, to keeping in touch with advocates of the business, to mundane things like using coffee filters to clean video heads.

MORE NPSC 2001



New NESDA Executive Director Named NPSC 2001

Mack Blakely, Executive Director of the Texas Electronics Association (TEA), has been named to succeed retiring NESDA/ISCET Executive Director Clyde Nabors. The announcement was made July 31 at the 2001 National Professional Service Convention in Las Vegas, Nevada.

Blakely is a native of Tyler, Texas, and has owned and operated Blakely's Computer Support in Tyler for the past several years. Concurrently, he has served as Executive Director of the Texas Electronics Association for the past four years.

After earning an Associate in Electrical Engineering from Tyler Junior College in 1962, he served three years in the U.S. Army. Stationed in Austin, Texas, he also worked part-time for a television sales and service center. Later, he owned and operated a consume electronics sales and service center for 33 years, employing seven individuals

at its peak, becoming the first computerized television sales and service operations in Texas in 1979.

After completing an IBM programming school, he developed a receivables and floorplan management program for electronics businesses, selling the package to companies in Texas. In 1939 he began the process of developing a service management software package for electronics service centers, again selling to companies in Texas. In 1993 he negotiated a contract with Sencore Inc. of Sioux Falls, South Dakota to market the SM2001 Service Center Manager software package across the U.S. Over 700 service centers in all 50 states have purchased the package since it was first offered. Blakely provided updates and software support to Sencore until 1997, when support was returned to him.

Interaction with the owner/managers of electronics service centers all across

the U.S. for the past twelve years has given him a unique insight into the needs of the individuals involved in the electronics service industry.

He has attended all NESDA conventions since 1989 and attended numerous NESDA/NASD Schools of Service Management. He has held various offices in NESDA, including NESDA Region 6 Director, National Treasurer, and Chairman of Data Standards Computer Committee. He received the Outstanding Officer Award from NESDA in 1998.

Civic activities include serving on the Tyler Junior College Electronics Advisory Committee for the past ten years.

Blakely will relocate to Fort Worth, Texas, where he will assume the new responsibilities January 1, 2001. He is married to the former Carolyn Neeley, a native of Bullard (near Tyler), and they have one adult son.

Guest Editorial

The following is a report Randy Whitehead recently gave to independent retailers. They have been concerned about the recent changes in service policies and wanted to better understand what was happening in the industry and how it would affect them. The very issues that affect them, affect all independent service providers.

The service industry is in the midst of rapid and turbulent change. Everyone is looking for ways to survive the economic slowdown. Manufacturers are under intense pressure to be profitable. Retailers are likewise looking for ways to save money. Both are cutting costs in areas that were not issues during the past period of economic expansion. Traditional business practices of the past are being eliminated and their replacements are in a state of evolving flux.

Traditional service, as we have known it during the past decade, is dying rapidly. This is primarily due to the extreme drop in retail prices that makes replacement of many items less expensive than their repair. In order to respond to this change, manufacturers have begun to eliminate warranty repairs on many items that have had a "carry-in" warranty.

Mitsubishi, Thomson, Philips and others have already eliminated or preclude warranty repairs on many VCRs and DVD players. These products had been the most profitable repairs that service centers replied upon for a decent bottom line.

This decline in carry-in product casts a dark future for traditional service providers. This is because the majority of service providers have derived most of their revenues and PROFITS from servicing the carry-in products that provided a good margin. Those high-margin products allowed the service provider to subsidize the below-cost warranty work for the manufacturers.

With the significant decline of the profitable carry-in repair work, service providers are no longer able to exist if they perform warranty work at a loss. Unfortunately, most servicers have met with little success in negotiating reasonable (profitable) warranty rates with the manufacturers. They have been forced to continue to provide service at a loss. Since the profitable work has diminished, the warranty work has become a major proportion of their total business. It is not surprising that almost 40% of all servicers have gone out of business in the last 3 years as they have given away so much of their work at a loss.

The volume of COD in-home service is now small compared to the past amounts of carry-in work that was available. This means that unless manufacturers are willing to immediately raise the warranty rates significantly, service providers will probably continue to go out of business at an ever accelerating pace.

In other events that further hurt the service industry this year, we saw Sharp turn to Sears for on-site service for microwave ovens and window air conditioners. Panasonic also contracted with Sears to perform a safety related upgrade on commercial microwave ovens.

In order to counteract these changes, retailers have reacted in various ways. Many have stopped selling the product of those manufacturers with service policies that require the retailer to send their customers to a competitor for service or that require the retailer to increase their own expense by exchanging the product with no reimbursement for their additional costs. Other retailers like Circuit City, Best Buy and even Sears have already reacted to the drop of profitable carry-in service by significantly cutting back on their service facilities. They have closed several regional centers.

Both Circuit City and Best Buy have been losing money on their service operations. These changes in policy indicate their unwillingness to continue to fund such losses in their service operations and their belief that the trend is away from in-shop service. Those service facilities that continue to focus on in-shop repair should carefully evaluate their future and make changes immediately. Service volume has generally dropped from 25% to 35% of the volumes two years ago. A large portion of that drop has been seen in just the past 6 months.

On-site service has generally been promoted as the future of service. This is because larger products cannot be exchanged, shipped and

replaced very easily. The growing success of HDTV and larger video offerings seems to support the notion of focusing in on-site service. However, it is important to be aware that the dollar volume of the on-site market is much smaller than the in-shop repair market has been. This is because there is much less on-site service than there has been of carry-in service. There is also less on-site service than before because the new products are much more reliable than the products of just 5 years ago. The new products are also more difficult and time consuming to repair.

At CES, in January, I set up meetings with 5 independent service providers, Best Buy and Circuit City. We then met with largest manufacturers to discuss the future of carry-in service. The premise was that we needed to understand the manufacturer's needs and future service delivery models so that we could plan for the future.

Without exception, during the formal meetings they expressed their desire to maintain field-repair of carry-in products. However, after the formal meetings and during discussions one-on-one, the service representatives stated that they were uncertain of their own future and see a changing service model on the horizon. Some foresee selected regional repair facilities set up in strategic geographical areas around the country that minimize shipping costs. All of them see a great contraction in the number of authorized repair centers.

It is interesting to note that Circuit City has recently gotten out of the on-site service business. They laid off most of their field techs a few months ago and outsourced it all to AON. Just recently, Circuit City dropped AON in favor of GE.

What does all of this mean? For retailers, it means that you may see some increased expenses related to warranty issues. Many manufacturers have requested retailers to handle the physical exchanges for product that fails. This means increased inventory levels, additional customer service interaction, increased accounting requirements and increased logistical processes within the store.

From the service side, on-site service will become the dominant area of focus as the in-shop repairs continue to decrease. The volume of on-site service calls will probably decline slowly for the next few months and then gradually increase as analog products are replaced with digital products.

The only way to survive in service is to become extremely efficient. Take advantage of every opportunity to train your technicians in the new digital product so that they can repair the product as quickly as possible. Limit the product line that you sell so that your technicians do not have to learn many models. They will be far more proficient if they repair many of the same models rather than few of many models. This will also allow you to maintain your repair parts inventory at a more manageable level. Invest in laptop computers with CD ROMS so that the techs can have ready access to service literature out in the field. Equip those computers with internet access so that manufacturer websites can readily provide service bulletins and repair tips. Invest in test equipment to service HDTV and digital products. Above all, negotiate profitable warranty rates with the manufacturers. They are now becoming more willing to negotiate. Don't give up. If a manufacturer will not negotiate reasonable rates, then establish relationships with those that will.

In summary, service is getting more difficult, but it will still allow you to differentiate yourself from others. If it becomes more of a burden than it is worth to you, then look to outsource to a reputable independent service provider. Most importantly, make sure you take into consideration your future customer service and warranty repair expenses as you negotiate with the manufacturers on the products you wish to sell.

Randy Whitehead President NASD, Vice President NARDA, Past President NESDA, President Service West

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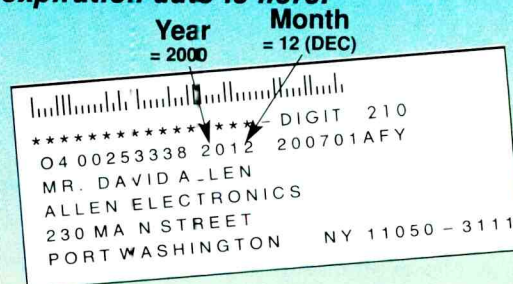
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Atari 800, 1050 disc drive, Heath HVA 122A monitor, all for \$75-pick up preferred with all manuals. Heath H8 computer with manuals \$50, Stancor isolation xformer (500w) \$40, Sola constant voltage xformer (250w) \$30. Leonard Duschenchuk 1519A NW Amherst Drive, Pt. St. Lucie, FL 34986-2445.

Must sell because of stroke and retirement. Electronic equipment: Sencore VA62 \$495, VC63 \$100, SC61 \$495; TenTelometer model T2-H7-UM \$225; Torque Gauge model TQ-600 \$165; Microfiche reader with Dual Carriage screen size 13" x 20" \$100; Bell & Howell Model ABR-1060. If you buy all I will include all my microfiche and other technical data mostly Panasonic. VCR & TV a large amount. Donald K. Schlueter 816-330-3341.

A Fluke model 77 multimeter, made in the USA, complete with holster, leads and owner's manual in like new condition, \$100 plus freight. Has been used approx. 5 times. T. Walton, 4400 N. Holiday Hill Rd. #506, Midland, Texas 79707, phone 915-520-6553.

Sencore VA62A Universal Video Analyzer, with all manuals & probes. Excellent working condition \$800.000 plus shipping. Electronic Servicing & Technology magazines years 1976-2000, most sets are complete. Popular & Radio Electronic magazines 1989-2000. Most sets are complete. Call or write for lists & prices on above magazines. RCA field service manuals years 1971-1985. \$10.00 each or all 7 for \$50.00 plus shipping. Contact John Brouzakis, 247 Valley Circle, Charleroi, PA 15022, phone 724-483-3072.

VA-62 TV/Video Analyzer with VC-63 VCR Test Accessory, SC-61 60MHz Oscilloscope, LC-76 "Porta-Z" LC Tester, CR-70 "Beam Builder" CRT Tester, "Handy 53" RC Subber, TF-26 "Cricket" Transistor/FET Tester, 40kilovolt HV Probe with meter, Variac, RCA Isolation Transformer, DC Power Supply. Will accept best offer(s) for all or part. Ask for Bruce at 1-208-983-1310 (Pacific time zone, daytime).

WANTED

Zenith Audio output IC for Z2 chassis 9-214-1. Chip # on heatsink A-9982-02A. 20 pins. Zenith

Part# 221-178. Fax Jim at SCTV Canada - fax 604-885-2900, or email jim_connors@sunshine.net.

Service manual for Sansui model G-6000 AM-FM stereo amp. Corrado Electronic Repairs, 603-774-7864. Will pay fair price.

Want to buy original or copy of complete repair manual (paper), for Pioneer model CT-F9191 tape deck. Have microfiche, too hard to read, and no repair instructions. Send price to McCombs Electronics, 703 Old Cedar Rock Road, Easley, S.C., 29640.

Sylvania Polymeter model 221Z, output transformer for Crosley radio model 124, power Transformer for Atwater Kent radio model 40. Paul M. Williams 2364 Beaver Valley Pike, New Providence, PA 17560-9622, Tel: 717-786-3803.

Doing camera work - need technical training manuals: Panasonic, Sony, JVC and Sharp. Contact ABC Electronics-1252 Crescent Drive, Glendale, CA 91205.

Three amplifiers-any condition: Two, late 1940's theater amps-International Projector Corp. (also manufactured as Simplex) Model AM-1026 (60watt) and AM-1027 (20watt). Also need EICO HF-32 integrated mono amp. Have one of each-would like pairs for stereo. John Agugliaro, CET, 845-947-2748. JAGUGL4546@aol.com

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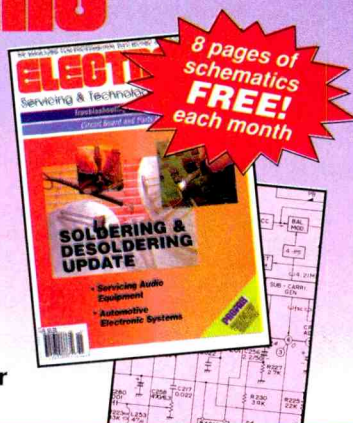
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Circle (36) on Reply Card

Watching the Elephant Tracks at NARDA

My oldest daughter attended a wonderful small college in Central Illinois. Blackburn College had a strong cooperative work program and all students were required to participate. This program had many benefits, not the least of which was it made a very private, affordable college with a high instructor-to-student ratio.

Yes, the students did most of the real work other than teaching. This included the physical tasks of maintaining and constructing required buildings. We got involved just as the new library was completed...without any approaching sidewalks.

Why no sidewalks? Simple...The administration wanted to see what paths the students and instructors created in their daily travels between the dorms, cafeteria, classrooms and the library... "Then we will build the sidewalks along those paths" said the school administration.

How simple...as my partner Marie describes it: "Watching the Elephant tracks" for clues as to what is happening and what we should do next.'

October 12 -15 the North American Retail Dealers Association (NARDA) will have their annual get together in Leesburg, VA. The theme is "Prospering n Turbulent Times".

We are certain the retailers attending the Conference will learn much from the sessions and their peers.

From a quick read of the program, there is much for Consumer Electronic Service Professionals to think about also.

The opening invitation paragraph: "Now is the time to get back into product service with your past customers who are now repairing rather than buying".

Did we read that correctly?

The people who sell the products you service say the pendulum has moved and people are now repairing rather than buying.

Among the things the brochure says attendees will learn at the conference: "Why this is the best time to be in product service and how to do it profitably."

Among the Marketing track descriptions:

A Product Service Department will increase your sales. "It's time to get back in the product service business. Consumers are looking for a complete shopping experience including installation and repairs."

The Service track includes these items and descriptions:

How to Have a Profitable Service Department

"Service should add to your bottom line and deliver a high level of customer satisfaction that builds long-term relationships and future sales"

How to Find, Hire and Retain Quality Technicians

"You can maintain a staff of skilled technicians by paying careful attention to each step in the hiring and retention process...."

How to Manage Technicians

"You need to manage technicians in a different way than salespeople."

We suspect the Conference will be a success in each of the ways one measures these things...

We also suspect a number of Consumer Service Center Managers and Owners should be watching these "Elephant Tracks".

Marie Marcellino

Paul Allen

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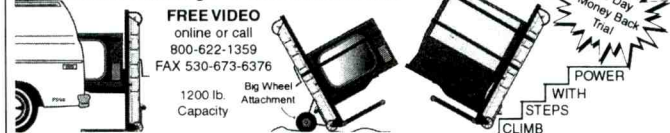
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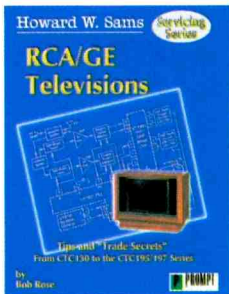
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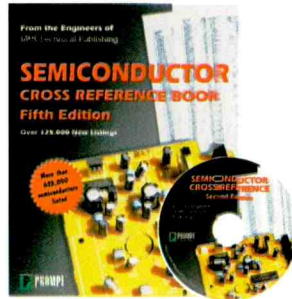
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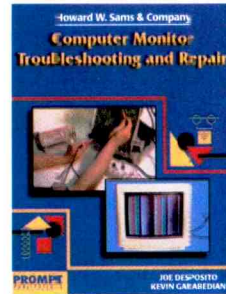
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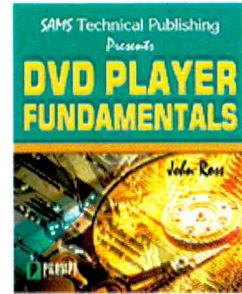
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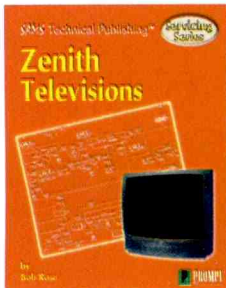
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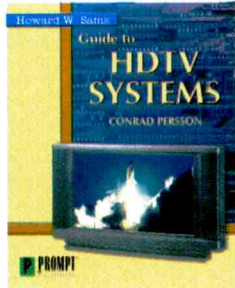
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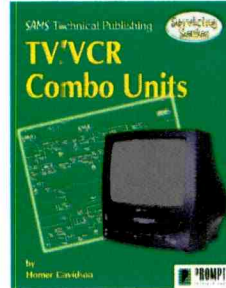
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