THE MAGAZINE FOR PROFESSIONAL ELECTRONIC AND COMPUTER SERVICERS

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October 2000

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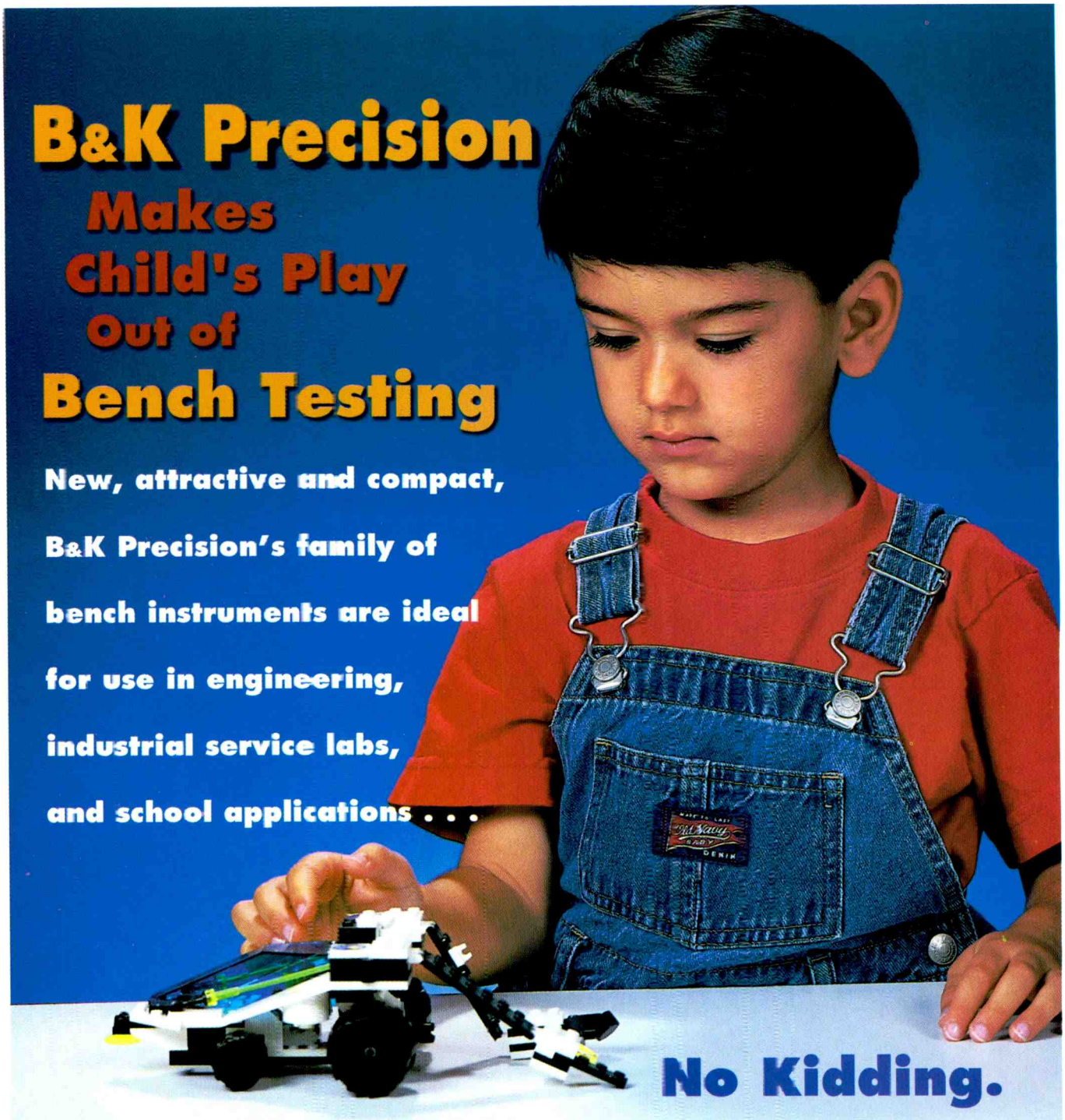

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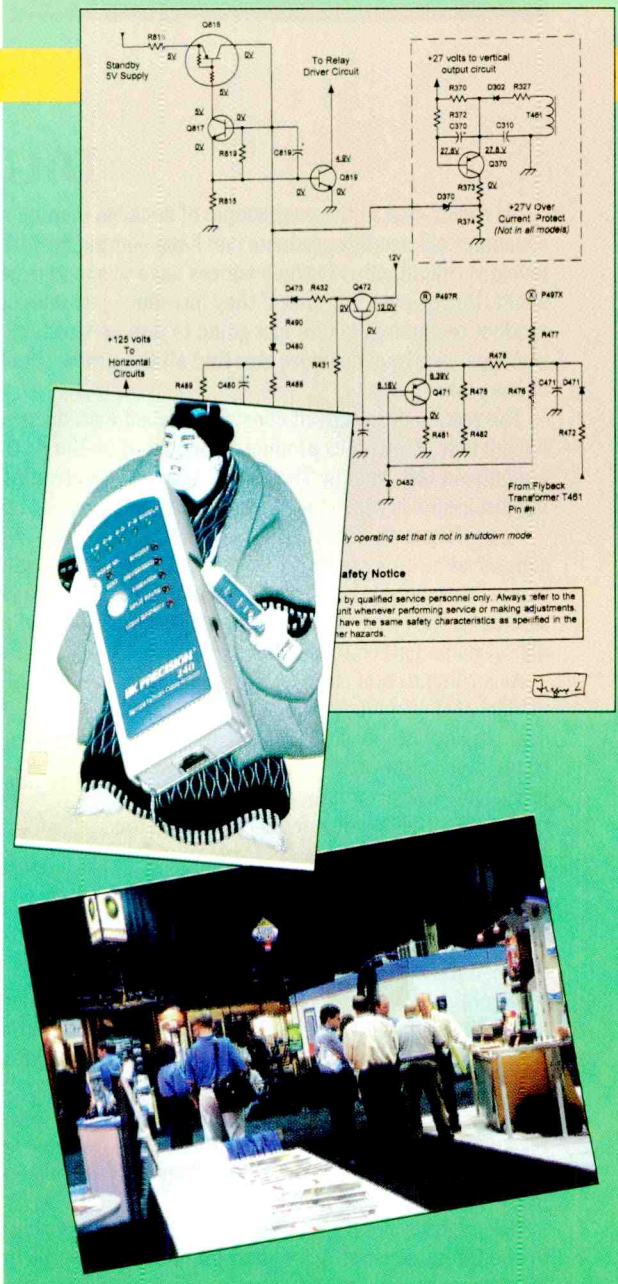

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CEDIA welcomed attendees with an elaborate neon entrance.

Infinity Home Products Prelude Line of Speakers.shown at CEDIA.

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Editorial

by Nils Conrad Persson

DIGITAL DISTRESS

It seems that in the past couple of decades manufacturers of consumer electronics products just keep coming up with new technologies that all of us in the business have to spend time learning about. Do you ever feel that if they introduce just one more new product technology you're just going to give up and take up gardening? Apparently, consumers also find all the new technology difficult to keep pace with.

The results of a study of consumers faced with decisions about buying new electronics products, conducted by Harris Online, were announced last June by Thomson Consumer Electronics. The following discussion is reproduced from the Thomson press release.

According to the study, more than one-third of American consumers admit to suffering from "digital distress." A digital depression, of sorts, digital distress is the latest ailment to concern consumers as they try to keep up with the dizzying pace of technology in digital home entertainment products.

According to that study, whether the distress comes from a digital phobia while standing in the home electronics department of their favorite store or simply trying to keep up with the "digital Joneses," identifying the symptoms and appropriate remedies can help consumers relieve the anxiety experienced when they consider purchasing digital products.

According to the poll, Digital Distress seems to be caused by confusion and misconceptions about what it takes to "go digital." As affirmed by several survey respondents, consumers want manufacturers to keep things simple and wonder about the possibility of using digital technology in devices they are already familiar with and know how to use, "like VCRs."

Confusion further confounded nearly 70 percent of total survey respondents who claimed to not own any digital home entertainment products; yet, of those 70 percent, 10 percent already own a DVD player and 13 percent own Digital Satellite Receiving Systems.

Other survey results show that consumers are put into a tailspin by the frequency in which digital products seem to be introduced into the marketplace. Sixty percent of those surveyed said they have simply stopped trying to keep up with the latest technology. And one respondent pleaded for manufacturers to slow down, saying "There is too much stuff to consider give us time to enjoy our new stuff before you introduce something else!"

"What most Americans who suffer from digital distress are really in need of are simple explanations about what digital means, and how it can benefit them," says Wil Shriner, talk-show host and technophile. A self-confessed gizmo guy, Shriner says that once consumers are educated about digital products, they no longer feel overwhelmed by digital definition overload. "And, once they experience the difference in sound and picture - their view of the world is forever changed," he concludes.

So, where do consumers turn to alleviate their digital distress? Not surprisingly, of those who have embraced technology into their lives, most cite the Internet as their best source for the most recent news about the latest in home entertainment. Other popular sources for information are friends, consumer magazines and family members.

What else did consumers want to relieve their digital distress? Easy instructions, easy integration of pieces, and "quality, quality, quality." For the approximately 64 percent of those surveyed who cite price as their reason for avoiding the digital revolution, they will learn that "digital" does not automatically have to equate with "expensive," and that there are easy and reasonable ways to integrate digital technology into their lives.

The good news is that people find themselves equally put off by new technology both at home and at work. And, yet, more than 30 percent will still brag that they know more about technology than their friends.

Not surprisingly, the 44 percent of the survey participants who claim not to suffer from any digital distress confess that they get more than just a little excited by the continuing developments in technology and the new products coming down the pipe. They, along with the nearly two-thirds (62 percent) who've met the digital revolution head on by adding one or more digital products to their home entertainment system, are well on the way to finding an antidote for their own nasty case of the digital blues.

"The ceaseless introduction of complex new technology happening today affects all of us."

Thirty-five percent of people admit to being digitally distressed - of these folks, 37 percent are male and 63 percent are female. Sixty-four percent cite price as a major factor in their decision not to go digital — they think that digital automatically means expensive.

Fifty-two percent say they are not scared off by rapidly changing technology. Sixty-nine percent of the total number of respondents claiming they don't have any digital in their home, yet, 10 percent currently own a DVD player and 13 percent own a Digital Satellite Receiving System. 44 percent of those who claim not to have any symptoms of digital distress get excited about new products they hear about and 62 percent of those who've already begun to incorporate digital into their lives can't wait to add more.

What the study seems to be saying is that the ceaseless introduction of complex new technology happening today affects all of us, not just those of us who are in one way or another connected with it. For servicers, the obvious problem is learning enough, and possibly having to buy new tools or test equipment to service products that feature the new technologies. For consumers, the problem is learning enough about the new technologies so that when they buy a new product, or products, that they have the performance and features they need at a reasonable price, and that they don't become obsolete quickly.

And while we all wish, along with that consumer quoted above, that the manufacturers would slow down a little and give us a chance to take a few deep breaths before plunging into the next new technological product, we really know that that isn't going to happen. So we'll all just have to keep up with it as best we can, be a little selective about those technologies we will concentrate on, and recognize that technological stress is just a fact of life we'll have to get used to.

Conrad Persson

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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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News

ATSC approves enhancements for PSIP standard

Directed channel change provides broadcasters with new capabilities

The Advanced Television Systems Committee (ATSC) in June revised its Program and System Information Protocol (PSIP) Standard. The ATSC PSIP Standard provides a methodology for transporting digital television system information and electronic program guide data. The revised standard includes an amendment that provides new functionality known as "Directed Channel Change (DCC)" and also clarifies existing aspects of the standard.

This new feature will allow broadcasters to tailor programming or advertising based upon viewer demographics. For example, viewers who enter location information such as their zip code into a DCC equipped receiver may receive commercials that provide specific information about retail stores in their neighborhood. Segments of newscasts such as weather reports may also be customized based upon this location information. A channel change may also be based upon the subject matter of the content of the program.

Nearly 140 categories of subject matter have been tabulated that can be assigned to describe the content of a program. A broadcaster may use this category of DCC request switching to direct a viewer to a program based upon the viewer's desire to receive content of that subject matter.

Mark Richer, ATSC Executive Director explained, "Broadcasters may transmit multiple programs simultaneously using the ATSC Standard. The DCC equipped receiver will automatically switch to a specific program or commercial based upon the information voluntarily entered by the consumer."

The Advanced Television Systems Committee (ATSC) is an international, non-profit organization developing voluntary standards for the entire spectrum of advanced television systems. The ATSC has over 200 member organizations.

Standards activity to explore VSB enhancements

The Advanced Television Systems Committee (ATSC) in July announced that it is launching a formal standards activity aimed at addressing emerging digital television (DTV) applications, including mobile services. In a unanimous vote, the ATSC Executive Committee directed its key standards group to develop enhancements to the FCC-approved VSB transmission standard. This initiative builds upon the work of the ATSC Task Force on RF System Performance, which was formed in March to examine technical issues related to DTV RF system performance. Other work of the Task Force will continue in parallel with the new standards activity.

"This effort responds to broadcaster requirements for more flexibility while ensuring the continuity and momentum of the DTV transition," said Mark Richer, ATSC Executive Director. The new standards work will begin with a detailed analysis of the market requirements. Based upon these requirements, the ATSC will develop appropriate enhancements to its DTV standard. This new activity will follow the normal open standards setting process of the ATSC.

Specs support new data and multimedia applications

The Advanced Television Systems Committee (ATSC) in July approved a new standard for data broadcasting. The ATSC Data Broadcast Standard defines protocols for transmission of data via digital television signals.

Mark Richer, ATSC Executive Director said, "The ATSC Data Broadcast Standard provides the flexibility necessary for implementation of a variety of consumer data and multimedia applications. This will enable broadcasters and other providers with the ability to offer rich new data services to the public."

The ATSC Data Broadcast Standard defines protocols for data transmission compatible with digital multiplex bit streams constructed in accordance with ISO/IEC13818-1 (MPEG-2 Systems). The standard supports data services that are both TV program related and non-program related. Applications may include enhanced television, webcasting, and streaming video services. Data broadcasting receivers may include PCs, televisions, set-top boxes, or other devices. The standard provides mechanisms for download of data, delivery of datagrams and streaming data.

CEA releases video product sales figures

Shipments of factory level video products reached 4.9 million units during the month of August, an 8 percent increase over last August, according to figures released by the Consumer Electronics Association (CEA). Year-to-date growth resulted in double-digit gains boosting dealer sales to 38.7 million units, a 13 percent increase over 1999 figures. While statistics for year-to-date product categories improved, monthly sales were not as robust. With the exception of analog direct-view televisions, all other categories experienced incremental growth during the month.

TV/VCR combinations demonstrated the largest increase in August, advancing six percent to 389,000 units. End-of-summer sales resulted in camcorders and VCR decks fast-forwarding ahead by 5 percent. DVD players, building on their phenomenal momentum, ended the month with stellar sales of 557,617 units. "Despite an unremarkable August, year-to-date figures continued to flourish especially for cornerstone products like VCR decks and analog direct view TVs. In the coming months, sales will abound as retailers gear up for the holiday buying season," noted Todd Thibodeaux, CEA's vice president of market research.

So far this year, TV/VCR combinations are up 13 percent to 3 million units, while camcorders are up 19 percent with 3.4 million units shipped so far this year. Confirming that bigger is better, projection TV sales reached 771,000 units, an increase of 19 percent. DVD players completed the year-to-date period reaching 3.8 million units.

Thomson DVC accelerates design process

To hasten the product design process, reduce costs and bring products to market faster, Thomson multimedia has implemented a new development tool at its U.S. headquarters in Indianapolis. The Design Visualization Center (DVC) utilizes state-of-the-art

3D computer visualization technology, which enables the design group to create and showcase new product concepts. Thomson is also using the DVC to develop retail environment concepts, which depict exactly how products will look on store shelves.

The DVC features an 8' tall by 18' wide high resolution rear projection screen and utilizes an SGI/Cray Onyx2 Infinite Reality supercomputer as well as Apple Mac G4s to display full size 3D computer generated images and animations. Rather than building an actual product mockup, Thomson designers now use the DVC to create a 3D rendering of a new product to show to the product team and management. Changes can be made almost instantly based on feedback.

"In this highly competitive retail environment, manufacturers are constantly seeking ways to get to market faster," stated Dennis Erber, General Manager, Americas Design Organization. "To design a new large screen television set typically takes about 13 weeks, of which four are spent building a mock-up by model shops. By eliminating the need for initial product mock-ups, combined with the ability to make design changes rapidly, we expect to achieve approximately a 20 percent reduction in the product development cycle. This time savings will enable us to deliver new products to retail faster," he added.

Currently approximately 25 percent of RCA and PROSCAN products are being designed with the DVC, including all digital and high-definition TV products as well as new flat screen TV models. The ultimate goal is to design the entire product line for all brands using this unique facility.

"The DVC also allows us to bring the product to life - in a real market environment and not just in the showroom," commented James Gatman, Vice President, Brand Management, Marketing and Design. "We now have the ability to view new designs in a consumer's home and to find the right match for various types of room decor. The same can be said for the retail environment and how a new design can fit in," Gatman said.

Designers are also using the DVC to show how different models look using various colors and finishes. Rather than being limited to one color for a mock up, they can now render images in different colors resulting in more creative concepts in the future.

Microsoft, DirecTV and Thomson Multimedia combine

Microsoft Corp., DIRECTV Inc. and Thomson Multimedia announce they have formed an alliance to bring to market a new advanced RCA DirecTV System with the new Microsoft® UltimateTV service.

The all new DS4290RE System with UltimateTV and DirecTV service integrates DirecTV programming, digital video recording, interactive television and Internet access in one complete package. This package will allow viewers to watch two shows on DirecTV at the same time (picture-in-picture), watch one show while recording another, and record over 30 hours of digital quality programming for later viewing on their own "personal lineup." Viewers can choose from more than 500 hours per week of interactive television, respond to promotions with the click of a remote, and stay in touch with family and friends via e-mail. The new receiver is scheduled to be available for retail purchase by the 2000 holiday shopping season.

Comments on House decision on HDTV

In June, Zenith Electronics Corporation applauded the U.S. House Telecommunications Subcommittee for calling on America's broadcasters to quickly provide high-definition television (HDTV) programming to U.S. consumers.

Speaking at a packed hearing on high-definition TV yesterday, Chairman Billy Tauzin (R-LA) reminded broadcasters that Congress expects them to provide HDTV programming to consumers and return loaned spectrum to the government as quickly as possible. Anything else, the chairman said, would be a "deal breaker," and could lead to Congress' reconsidering its decision to loan U.S. broadcasters free spectrum for the transition to digital television (DTV).

"We strongly support members' comments on the importance of every American television viewer having the opportunity to receive DTV programming in their home," said Zenith Senior Vice President Richard Lewis, who testified at the hearing. To drive home that point, Zenith and other manufacturers demonstrated crystal-clear HDTV reception in the House hearing room using simple indoor antennas and currently available DTV products.

The majority of witnesses at the hearing, representing manufacturers, retailers and others, voiced their support for the U.S. DTV transmission standard, known as 8-VSB, and rejected suggestions to consider adding a non-compatible transmission scheme to the standard. "Calls for changing the existing system are completely unfounded," Lewis said in his testimony.

In addition to its significant advantages with regard to data rate capacity and interference rejection, the 8-VSB standard meets or exceeds the present NTSC service area, maximizing digital broadcasting access for Americans, Lewis said.

Lewis pointed to growing sales and high levels of consumer satisfaction with HDTV equipment as indications of the transition's momentum. He went on to stress that any change in the current transmission standard would be disastrous for consumers, broadcasters and manufacturers.

"A new standard would significantly delay the implementation and provision of DTV services to the public, and jeopardize the return of the analog spectrum by 2006 as mandated by Congress," Lewis said. "And it would prevent Americans from enjoying the benefits of HDTV."

At the time of the hearing, more than 145 television stations were already airing digital programming covering about two-thirds of the possible viewing audience in America. More than 300,000 DTV products have already been sold, according to the Consumer Electronics Association.

CEDIA EXPO REPORT

The Custom Electronics Design and Installation Association (CEDIA) held their 2000 Expo at the Indianapolis Convention Center, September 6 through September 10. This was the first CEDIA Expo that ES&T has attended. Not only did we attend the Expo, we had a booth in the convention center as well.

The September issue contained a complete rundown of the events planned for the expo, so we won't publish a list of them here. Instead, we'll go over some of the trends, highlights and forecasts we encountered.

What does custom design and installation deal with?

As if we all didn't know it already, the unrelenting flow of new products from consumer electronics manufacturers is changing the way we all live, work, and play in the home. A large percentage of homes, for example, have at least one personal computer. Many homes have more than one. And huge numbers of households have access to the Internet.

Exposed to high quality audio and video in movie theaters, and seeing affordable large screen TV sets with their spectacular sound, people have been seduced by the idea of having the theater experience in their own homes. In large numbers, those people are buying big-screen sets, audio/video receivers and high-quality speakers, and installing or having them installed in their homes.

But many of those people aren't content with having the computer with its Internet access, or the audio/video system, available in just one room in the home, so they're increasingly looking to home networking systems.

As a result of micro miniature electronic circuitry that can add intelligence into appliances in which they're installed, and do it inexpensively, it's now possible for homeowners to have "smart" appliances that can talk to each other. Here's an example of how that can benefit the homeowner.

Say the resident has opted for an electrical billing scheme that includes rewards for not exceeding a certain peak electrical usage. Now, let's suppose that the dishwasher has been programmed to go on at the current time, but before it does it contacts the electrical system controller to check the current status. The air conditioner is running, drawing a large amount of power. If the dishwasher comes on now, it will push electrical usage over the preset peak, triggering a large increase in the electric bill. In this case, the dishwasher waits until the air conditioner shuts off to start up.

So?

Before we go any further, it might not be a bad idea to consider why a consumer electronics service center should be interested in custom design and installation. Actually there are several.

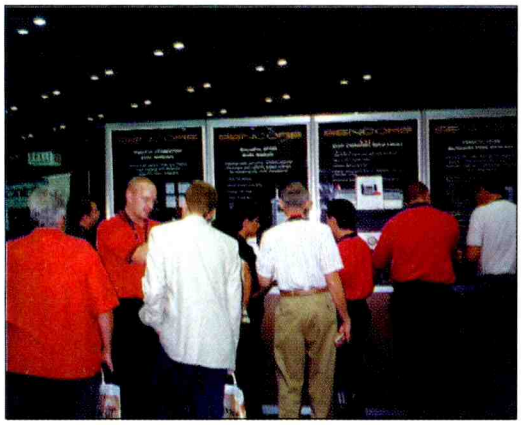
One reason a service center might be interested in custom design is that it's a good area to branch out into. We're not suggesting that readers go out and get the tools and materials and start installing sheetrock or wood, or other building materials, but someone has to hook this stuff up and make it work to the satisfaction of some very demanding homeowners, and who better to perform those tasks than someone who has made his living at servicing those products. Any consumer electronics service center that is interested in performing this kind of work might do well to contact companies that advertise home theater or home network installation to see if they have need of someone to perform those services.

Moreover, not all of these systems, home theater, and even networking, require any displacement of walls, floors, or what have you. Many homeowners wish to enjoy the delights of home theater, but don't want to spend a lot of money building a theater, building speak-

CUSTOM ELECTRONIC DESIGN AND INSTALLATION DEALS WITH ALL OF THESE CONCERNS IN THE HOME:

- **Entertainment**
  - **Audio**
  - **Video**
  - **Home theater**
- **Home automation**
  - **Lighting**
  - **Curtains**
  - **Appliances**
  - **Heating, ventilation and air conditioning (HVAC)**
- **Home networking**
  - **Computers**
  - **Communication**
  - **Audio/video**
- **Security**

CEDIA EXPO REPORT



ers and other components into walls, etc. They just want the equipment installed, hooked together, and adjusted.

And even though networking involves connecting together computer, communications or audio/video systems in different rooms, RF technology and network systems that use the already installed power lines allow this kind of network without drilling any holes or pulling any wires.

Which brings us to thoughts about sales. Many service centers stopped selling products because they couldn't compete with the mass merchandisers: the WalMarts, the KMarts, the Circuit Cities, the Best Buys. Those mass merchandisers don't sell installer-grade (for lack of a better term) products. The only competition for sales of these products is other installers.

At the Expo

The CEDIA Expo consisted of several portions: classes, the trade show, special exhibits and more. Classes were divided into two broad categories: general instruction, and manufacturer-specific classes.

As an example of one of the general instruction classes, here's a description of the class entitled "A/V Networking with 1394/HAVi."

In the near future, A/V system racks won't have to be crippled by the rat's nest of wire and connectors we typically suffer with during installation. An all-digital interface called IEEE 1394 (aka Firewire) will relieve the installation congestion while improving the functionality of many of our systems. With 1394 the promise of "plug and play" comes even closer with the new standards of interoperability. HAVi (Home Audio Video Interoperability) is a software standard that has been adopted by a large number of CE manufacturers to work with 1394 products to enhance interoperability, which means easier and more effective integration. The instructor will show us exactly how a 1394-based system works, how HAVi standard components communicate with each other, and what the future of A/V system design might be.

Many of the other classes dealt with similarly cutting-edge topics including universal plug and play system design and device integration, home networking technologies and standards, and applications of digital equalization.

The trade show

Exhibitors at the trade show represented a cross-section of manufacturers who sell products to the custom electronic design and installation market. There were manufacturers of television sets, receivers, speakers, wire and cable, software, lighting, seating, satellite TV programming, networking, and home control. There were also some vendors of test equipment that's used to test and adjust all of those products.

There were a lot of names that readers of this magazine would recognize: Thomson, Sony, Samsung, Sharp, Microsoft, DirecTV, Fujitsu, Hitachi, Jensen Tools, JVC, Panasonic, Philips, Sencore, Toshiba, Zenith, and a few others. As you might guess, there were also a number of exhibitors that readers most likely have never heard of, but who figure prominently in the design and installation business. We'll enumerate a few of them below.

Home networking and control

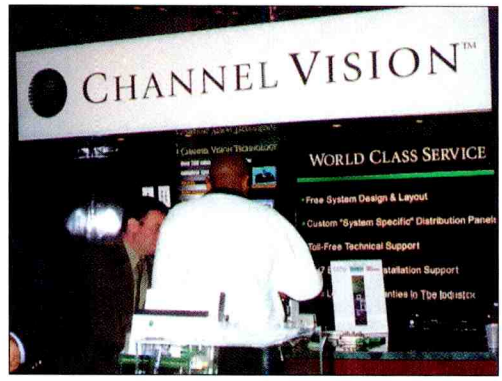
The concept of home networking and control encompasses a considerable area. Control, for example, might have to do only with controlling the elements of a home theater system. In that case, we're talking about using remote controls to control any or all of these functions: turn on the system, select different inputs, select a channel, control volume, close blinds/drapes, adjust lighting, etc. More broadly, it could mean the ability to control other areas of the home at the same time, distribute the audio and video signals to other rooms, access the Internet via the home entertainment system, and more.

Two companies in the home networking and control business who had strong presences at the trade show were Panja and Crestron. Following is a little information about those companies.

Panja started as AMX Corporation with its first product, the MX20, a simple (by today's standards) wireless controller for 35mm slide projectors, which provided a way to advance and reverse slides remotely. The company continued to introduce control devices for various applications.

In 1998 the company began developing leading edge technology to integrate the Internet with the millions of everyday devices that they had already connected. Recognizing the potential of the Internet

CEDIA EXPO REPORT



to change the way control systems are used, the company re-launched itself in 1999 as Panja Incorporated. Utilizing this technology, devices that were originally installed in various buildings can be connected to, and controlled via, the Internet.

For more than 25 years, Crestron Electronics has designed and manufactured remote control systems. Found worldwide in corporate boardrooms, training and conference rooms, videoconferencing and distance learning centers, entertainment facilities and high tech homes, they allow operation of a wide range of electronic equipment as a single, integrated system. Audio, Video, Projection, Lighting, Screens, Shades and Blinds, Security and Communications Systems can all be operated with the touch of a finger using remote controls.

Crestron offers modular design and Internet compatibility, allowing connection and control of most any AV or environmental device via a LAN/WAN/Internet connection. The company says that they're expanding into vast new markets like home automation with control systems designed for the home, and their new 16-channel intelligent amplifier.

A new technician certification and training

Because custom electronic design and installation requires a unique set of skills of its technicians, a group of associations involved in this industry formed a consortium to develop criteria for those technicians. The group, The Consortium for Electronic Systems Technician Training has announced the launch of its Electronic Systems Technician (EST) training program at Coyne American Institute in Chicago, Illinois. Following is a description of this training provided by the consortium.

The electronic systems industry is a sizable force with a bright future according to an employment survey that was conducted by the Consortium for Electronic Systems Technician Training in 1998. Not only did the industry employ 630,000, its workforce of some 180,000 Electronic Systems Technicians (ESTs) earned $6.3 billion in wages and benefits from Consortium member companies. Continued growth and competitive compensation are forecast through 2002.

"The need for Electronic Systems Technicians is incredible and the opportunity outstanding," said Richard Goldman, President of The Consortium for EST Training. "It's the career for those who want to use their brains but not be stuck behind a desk or workbench all day. You get to use cutting-edge technology and work in many different settings."

Other schools that will begin teaching the EST curriculum this Fall are Montgomery College in Rockville, Maryland and Sir Sanford Fleming College in Peterborough, Ontario. The Consortium continues to look for schools to adopt the Electronic Systems Technician curriculum.

About the consortium

In February of 1998, leading trade associations representing electronic systems contracting companies and their suppliers banded together to form the Consortium for Electronic Systems Technician Training. The Consortium's initial goals were to identify and clarify the specific technical competencies sought in technical personnel and to consider options for addressing a chronic shortage of entry-level technical employees. One outcome was the development of the Electronic Systems Technician curriculum, which can be used by technical schools and colleges, adult education and apprenticeship programs to train students on the basics of electronic systems and installation practices. Electronic systems contracting businesses can also make use of the instructor and trainee texts in their own in-house training programs for new hires and existing personnel who need refresher training on the fundamentals.

Skilled Electronic Systems Technicians design, integrate, install, and provide field maintenance and service on products that do the following: transport voice, video, audio, and data signals in commercial or residential premises; capture and display or otherwise annunciate signals; control signals; and use signals to control mechanical and electrical apparatus. Familiar names for electronic system contracting companies include: Alarm Companies, Home Automation Companies, Custom Designer/Installers, Data Cabling Companies, Electronic Security Companies, Home Theater Designers, Sound & Communications Contractors, Systems Integrators & Systems Contractors, and Telecommunications Contractors.

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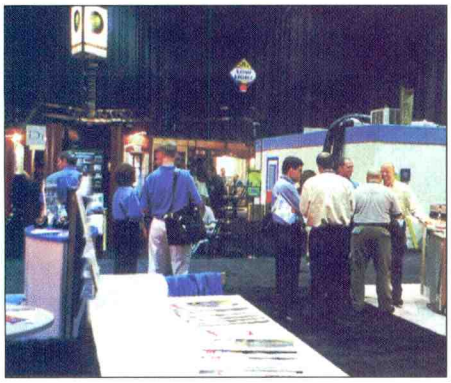

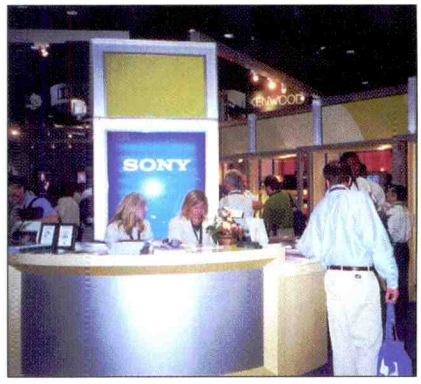

The Consortium for Electronic Systems Technician Training is a not for-profit corporation, incorporated in the Commonwealth of Virginia. Regular membership is confined to not for-profit associations and business leagues that have as members companies that manufacture or install electronic systems.

The following organizations are members of the Consortium: Associated Locksmiths of America (ALOA), Automatic Fire Alarm Association (AFM), Building Industry Consulting Services International (BICSI), Canadian Alarm Security Association (CANASA), Consumer Electronics Association (CEA), Continental Automated Buildings Association, (CABA), Custom Electronic Design and Installation Association (CEDIA), Home Automation Association (HAA), International Communications Industries Association (ICIA), National Burglar & Fire Alarm Association (NBFAA), National Joint Apprenticeship & Training Committee for the Electrical Industry (NJATC), National Systems Contractors Association (NSCA), and Security Industry Association (SIA). For more information, You can visit www.high-techjobs.org or call 703-998-0936.

Implications for consumer electronics service

The implications of all this for consumer electronics service is that there are opportunities for service centers in not only servicing these products, but in installing them, connecting them together, and adjusting them so that they work properly together. As with most opportunities, these do not come without some kind of cost. One of the realities of any of these systems, however many areas they may control, or whether they're part of a home network, is that computers and computer software are at the heart of the matter. Whatever other education a state of the art technician will need, he will need to be able to trace his way through complex connections, and he will need to be able to understand the role of software in the operation of cutting-edge systems.

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CEDIA NEW PRODUCTS

NEW PRODUCTS AT CEDIA

There were many booths at the trade show, each with dozens of new products to display. Obviously, we can't bring even a fraction of those to you. But the following is a minuscule sampler of what we saw. It's sort of a mixture of various types of products: a tool for aligning speakers in a home theater, a software system for design and installation companies, a high performance antenna, and a few others, just to give an idea of the variety of products that were displayed.

Sound alignment system

Checkpoint Laser Tools presents a compact, stand-alone and easy to use laser alignment tool designed to allow professional installers to align and direct sound systems with pinpoint accuracy.

The SA-S C-700 enables exact laser directional placement of any monitor, satellite or home theater sound system relative to the exact seating or listening station with consistency and accuracy.

The alignment tool allows the user to quickly move from speaker to speaker, locking in the directional sound to an exact listening location. Precise component placement, degree offset and directional criteria can be achieved quickly and certifiably because the SA-S protocol includes angle layout guides, layout plot sheets, and a complete technicians course for certification.

Circle (3) on Reply Card

Design, Engineering, Documentation and Estimating Software

D-Tools Inc., a worldwide leader in system design software, introduces Custom Install (Ci) Version 2.0 and DataXchange. Providing a comprehensive solution for equipment manufacturers and their custom installers, these programs work together to simplify the complex design processes facing today's custom systems.

Ci software allows dealers to design, engineer, document, and estimate residential and commercial custom installations while supporting multiple design methodologies. In addition, users exclusively benefit from current and accurate equipment data accessible through DataXchange, a web-based data-sharing environment that centralizes product information for manufacturers, dealers and installers.

Circle (4) on Reply Card

Wireless keyboard

Wireless Computing, developers of leading-edge presentation control technologies for professional and home applications, TM has shipped its newest product, the Wireless SurfBoard. A high-performance radio-frequency (RF) keyboard for IBM-compatible computers. In a corporate environment, the wireless keyboard just like its predecessor, the RF-50 Wireless Keyboard and Mouse Touchpad, provides complete keyboard and mouse control for people operating a computer in front of an audience. Using it, business presenters can operate the computer from anywhere in the room, rather than being anchored to the PC.

At home, the keyboard can be used on computers equipped to display their output on televisions or other large-screen display devices.

The keyboard consists of a compact, 83-key keyboard, a touch-sensitive mouse touchpad with dual mouse buttons, and an RF transmitter/receiver. It provides all the functionality of a standard (corded) keyboard and mouse, but without cords or cables. The product includes ports for connecting a joystick or mouse, so those devices can be operated wirelessly, too. And, since the Wireless keyboard uses RF rather than infrared signals as its technology base, there are no line-of-sight limitations or data integrity problems, even at its full operating range of 50 feet.

A relatively new computer peripheral, the wireless keyboard is not yet standard equipment on personal computers. Nonetheless, wireless keyboards are being adopted early, and rapidly, in two unique environments.

In corporate A/V settings, wireless keyboards are being used by presenters, trainers and product demonstrators. In addition to addressing the audience from virtually anywhere in the room, the convenience factor helps presenters overcome natural reluctance to rely on computers in audio/visual settings.

Also, a visible cable on or underneath a corporate conference table constitutes both aesthetic and practical negatives,

CEDIA NEW PRODUCTS

whereas the wireless devices' "no wires" effect enhances both professionalism and dignity of the surroundings.

The home setting, where wireless keyboards are making inroads, is being driven by a new generation of televisions capable of being used as computer monitors. Also, PCs have been migrating from home offices and dens into family rooms and living rooms, and may well be the platform of choice for the home entertainment center. This migration makes 'net-surfing', game-playing, and running standard PC applications available to families in the same setting in which the view television. For better or worse, once computers are equipped with wireless keyboards, they can be operated from the same place television is most often viewed — from an armchair or sofa.

Circle (5) on Reply Card

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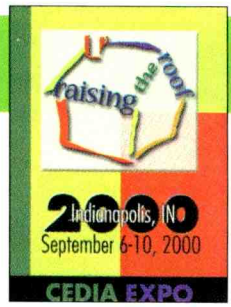

High-performance antenna

The unobtrusive, compact Terk TV55 can be mounted indoors or out on a rooftop, windowsill, or in any number of locations near or away from a TV. Optimized for maximum high-definition and analog (UHF/VHF) television signals, the antenna utilizes advanced antenna technologies for clear, powerful reception at all frequencies.

The product has versatile installation applications for optimum consumer-friendliness. it is approved for the new Consumer Electronics Association (CEA) standard for indoor, amplified antennas. Engineered to the CEA's antenna mapping program, the antenna's design and performance standards solves most of the reception challenges for the maximum number of consumers; anyone living in the light green, green or yellow areas of the CEA's maps. In order to find the best antenna, consumers can type in their address on the company's Web site, www.terk.com, and the CEA map will guide them as to which antenna will provide the optimum performance.

All mounting hardware (mast-mount kit, wall mount brackets, and windowsill brackets) is included. This means only one trip to the store is required for a easy installation. TERK designed the TV55's packaging to keep it simple and safe, especially when climbing a ladder during the installation process. The TV55's box features a unique, pull-out, over-the-shoulder carry strap to keep your hands free for convenience, safety and installation ease.

The unit utilizes helical coil technology (patent-pending) to achieve its compact, unobtrusive design while maintaining the performance of the large antenna element that is necessary to capture low frequencies (VHF broadcasts). In addition, a patented dual-mode ultra-low noise amplifier allows users to select the optimum gain setting for maximum reception of HDTV and analog signals. The amplifier is set to high-gain mode to correct for signals that are too weak and can be bypassed for optimum reception of strong signals (urban areas). The amplifier is connected directly to the antenna element for the shortest signal path and lowest noise. The antenna's specially designed flat coaxial connecting cable is designed for windowsill mounting so the window closes completely.

Circle (7) on Reply Card

Power-line controller firewall

Lightolier Controls introduces the Compose PLC Firewall, a solid-state, microprocessor-driven power line filter, amplifier and repeater for remotely controlled lighting applications. It performs three key functions to insure the reliability of industry standard line carrier lighting control communications.

The unit (1) isolates selected circuits from the rest of the electrical service, (2) cleans noise, harmonic distortion and wave cancellation effects from the portion of the power line frequency spectrum used to communicate between line carrier devices, and (3) amplifies and repeats valid signals to the line carrier devices. The result is robust and reliable communications free from inside and outside electrical interference.

A single unit can handle up to eight separate electrical circuits, and multiple units can be linked with a single CAT 5 cable to extend clear, reliable communications from one end of the largest building to the other. The unit installs adjacent to the existing electrical panel and is available in watertight enclosures for exterior mounting.

The product is a basic component of the company's Compose power-line carrier (PLC) multi-scene dimming system and multi-room centralized control system, but works with all industry-standard line carrier protocols and equipment.

Circle (8) on Reply Card

Structured wiring system

Multiplex Technology introduces OpenHouse, a structured wiring system that offers a complete range of products that integrate telecommunications, entertainment, safety and home automation into a complete system solution. Designed with the installer in mind, each module quickly snaps into the grid system. The system is instantly configurable so that the installer can start wiring in a short time.

This system is different from other home networking or structured wire products, because it offers versatility of connected devices. Many manufacturers are already making products specifically to fit this grid. As a result, homeowners will not be locked into products from a single manufacturer. With this system the homeowner can choose a remote control keypad from one manufacturer, a security

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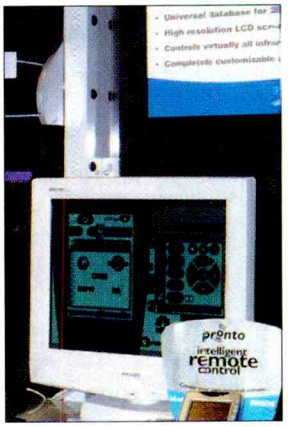

camera from a second, an audio system from a third and have them all fit together on one grid. Partner companies include, CommScope, Genesis Cable Systems, Linear Security, Tropical Telecom, Russound and Xantech. More partner companies are slated to follow in the coming year.

Circle (9) on Reply Card

Video signal processor

This was an interesting product at the trade show, and we thought we should tell readers about it. We also thought we should let readers know up front the prices of such units, since they're not exactly mass-market units. The product described here sells for almost $26,000.

The DVP5000 video signal processor will input the 1080i interlaced HDTV signal (a typical terrestrial HDTV signal) and recombine the information to yield artifact free 1080p progressive HDTV. While removing interlacing artifacts it also increases light output on CRT projectors. Large venue Electronic Cinema applications with fixed panel display projectors such as DLP and D-ILA projectors require a progressive signal for optimum performance, which the DVP5000 can provide.

The product combines patented technology with an extensive list of features to optimize any multi-scan projector, providing excellent video quality. CRT, DLP,LCD and Plasma displays all benefit from the DVP5000 performance.

Features include: HDTV 1080i to 1080p Conversion;Scan Rate scaling of DTV 480i to computer rates VGA, SVGA, XGA and SXGA;Scan Rate scaling of DTV 480i to DTV/HDTV rates 480p, 1080i, 720p, 960p (Quadrupling) and even 1080p; Scan-Lock Bandwidth Expansion optimizes detail settings for each scan rate; New Directional Correlation Deinterlacing (DCDi TM) for artifact free deinterlacing of original video material.

Other features include the ability to accept progressive DVD signals for upconverting to higher scan rates; Internal Aspect Ratio control for Letterbox, Anamorphic and 4:3 sources; Patented Picture PlusTM technology for superior color decoding, deinterlacing and detail processing; and 10-bit Adaptive color decoding with Time Base Correction.

Circle (10) on Reply Card

Multimedia video generator

The VP300 Video Pro Multimedia Generator from Sencore provides signals needed for fast and accurate alignment of all of the video modes.

The unit will provide all the HDTV, NTSC and Computer Display video signals necessary for home theater installation, alignment and calibration. The unit provides the patterns required for black level, white balance, focus and convergence alignment in all of the display's operating modes. The generator is portable, lightweight and battery operated (8 hours on one charge).

Features of the unit include: ATSC HDTV and Standard Definition Formats (1080i, 720pÖ); 4:3 and 16:9 Aspect Ratios; Component Video (YPbPr) and RGB Video Output; Composite and S-Video NTSC/PAL Outputs; Monitor Output (SVGA, XGAÖ); Setup and Alignment Test Patterns; Handheld, Portable, Battery Operated (8 hours on one charge).

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Recordable Disc Technologies: DVD Products

by John A. Ross

Those of you who are servicing personal computers have to be familiar with not only the personal computer, but displays, mass storage devices, RAM, ROM, and more. Just a short time ago, mass storage meant some form of magnetic medium: a hard drive, a floppy disk or a Zip Disk. The optical disk has changed all that. First came the CD-ROM, using essentially the same technology as that of the compact audio disk. Now along come higher data density disks based on DVD technology. The proper operation of these devices requires properly operating hardware, of course, but it also requires the right software, properly installed and smoothly operating. It may not be necessary for technicians to know enough to try to repair one of these units, but it can help immensely to have at least a rudimentary knowledge of these devices in case you encounter one that's causing problems. To that end, we present this article.

DVD ROM vs DVD RAM

The storage capacity and data transfer capabilities possible with DVD-ROM technologies provide solutions for operations that require access to large amounts of data. In addition, the speed and capabilities of DVD-ROM technologies have become a factor in supplanting the use of CD-ROMs with DVD-ROMs. Recordable versions called DVD-RAM, DVD-R, DVD-RW, and DVD+RW build on the potential of the DVD-ROM technology. DVD-RAM discs carry all the benefits of DVD-ROM along with providing the added advantage of rewritability. As a result, a DVD-RAM user can record and re-record from 2.6gigabytes to 5.2 gigabytes of information onto one disc. Because of this, DVD-RAM works well as an option for backing up data, creating document archives, and generating multimedia titles and presentations.

DVD-RAM

Single-sided DVD-RAM discs manufactured before the latter part of 1999 have a storage capacity of 2.6 gigabytes. Decreasing track pitch and pit lengths allowed manufacturers to produce a single-sided 4.7 Gb DVD-RAM for distribution during 2000. Single-sided type 2 DVD-RAM discs arrive either enclosed within a cartridge or without a cartridge. As a result, a DVD-ROM drive can also read a DVD-RAM disc. The following segments describe some of the characteristics of DVD-RAM.

Data transfer rates

The transfer rate for DVD-RAM is determined by the media specification. The 2.6GB disc has a transfer rate of 1,385Kbps, and the 4.7GB disc will have a transfer rate of 2,770Kbps. Access times improve with an increase in disc rotational speed and reduced drive latency. Mechanical improvements, better servo technologies, and improved optical pick-up technologies make further reductions in access time possible.

Phase change recording technology

DVD-RAM discs and drives rely on a phase change recording technology that uses a laser to heat the inner surface of the disc and create a change in the magnetic polarity. Phase change technology uses an information layer based on an alloy of silver, indium, antimony, and tellurium. In the initial phase, the alloy remains in an amorphous state. Heating small zones of the surface with a high-energy laser causes the amorphous material to change into a crystalline state. Before recording begins, the phase change material remains in a crystalline state and has high reflectivity. The use of a different power laser during the recording process causes the material contained within the active layer of the disc to change between an amorphous and a crystalline state. Modulating the light intensity of the laser beam writes data marks to the surface of the disc. To do this, the 10mW laser spot melts a reflective recording layer. Increasing the temperature of the laser beam and then rapidly decreasing the laser power to 5mW causes rapid cooling of the disk surface. Phase change material in the area affected by the laser pulse remains in a low-reflective amorphous state and becomes a recorded data mark. The distinct states have different levels of reflectivity detectable by the optical readers found in DVD drives and allow the reading of data. As the energy of the laser beam strikes the disc surface again, the surface temperature reaches the crystallization point and causes the material to revert to the highly reflective state and erases the data mark. Called direct overwriting, the emission of a low power spot onto a layer and the subsequent doubling of the power spot deletes previously stored data and writes new data.

Universal disc format

Along with utilizing phase change recording, DVD-RAM discs use the Universal Disc Format file system. Developed by the Optical Storage Technology Association, or the OSTA, UDF provides a standard file system providing compatibility across all platforms for DVD. While preserving the data interchange benefits of the ISO 9660 format, UDF adds re-writeable file system features such as the ability to create, extend, modify, or delete a single file.

UDF supports files and directories, soft links, hard links, and special file types. With no name length restrictions, file storage begins with a basic set of attributes that seem similar to UNIX-style attributes. UDF also allows the storage of Extended Attributes to accommodate the requirements of operating systems such as Windows NT, OS/2, and the Macintosh Operating System.

With the implementation of UDF version 1.50, the file system operates with sequentially recorded media such as CD-R and packet written erasable media such as CD-RW. The Micro UDF format provides a bridge format for DVD-ROM discs. By placing the UDF and an ISO9660 file systems on the disc, Micro UDF supports compact disc and DVD disc technologies.

Zoned CLV

In addition to the phase change technology, DVD-RAM discs also rely on the Zoned CLV, or ZCLV, method rather than the traditional Constant Linear Velocity method. ZCLV writes and reads data using the CAV (constant angular velocity) method to specific zones on the disc and provides higher capacity and faster access speeds. Compared to the CLV method, in which the angular velocity continuously changes, ZCLV changes the angular velocity from zone to zone and maintains a constant average linear velocity, constant data rates throughout the disc surface, and constant data recording rates. The technique writes data on both the land and groove of the disc while molding the address information in the form of pits.

Defect Management

As shown in Figure 1, the DVD-RAM disc rewritable data area is divided into 24 zones matched with an associated spare area that replaces any defective sector in the user area. Referring to the figure, the DVD-RAM disc has rewritable data areas and read-only embossed data areas. Four defect management areas handle defective sector addressing. Two defect management areas reside in the lead-in area while the other two reside in the lead-out area. Because the four areas contain the same information, each provides an additional level of redundancy for improved reliability.

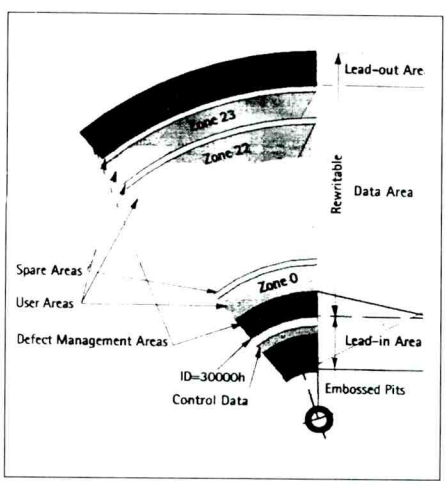


Figure 1

DVD-R

DVD-R offers full compatibility with DVD-ROM, DVD-Video and DVD-Audio discs. As a result, DVD-ROM drives and DVD video players can play back information recorded onto a DVD-R disc. DVD-R discs utilize the equivalent of the CD-R multi-session writing with two types of incremental writing. The following segments describes the characteristics of DVD-R.

Dye Recording

Along with the CD-R and other Write Once Read Many (WORM) disc formats, the DVD-R employs dye recording. In this process, the disc consists of a dye layer sandwiched between a polycarbonate substrate and a gold reflective layer. The use of the dye layer requires that the reflective layer have the reflectivity needed for successful playback while remaining chemically inert. DVD-RAM disc recording layers may use a metal-stabilized cyanine green dye, a phthalocyanine golden brown dye, or an azo blue dye.

When the laser heats the disc during the recording of data, the dye layer absorbs heat and causes a physical change in the polycarbonate and reflective layers. In addition, the optical properties of the dye change. The combination of these three factors causes an optical contrast between recorded and non-recorded areas to occur.

DVD-RW and DVD+RW

Developed by Pioneer and based on the DVD-R standard through the use of a similar track pitch, mark length, and rotation control, DVD-RW discs will remain compatible with most DVD drives and players. Also marketed as DVD-Rewritable discs, a DVD-RW disc is a rewritable version of a DVD-R disc that offers 1000 rewrites. A DVD-RW disc has a 4.7 gigabyte capacity.

Like DVD-RAM, the DVD-RW and DVD+RW technologies are built around the phase-change erasable formatting technique and offer compatibility with most DVD drives and players. However, a DVD-RW formatted disc differs from a DVD-RAM formatted disc in that the former sequentially records data. In contrast, a DVD-RAM formatted disc provides random access to recorded data.

Proposed and developed by Hewlett-Packard, Philips, and Sony with the support of Verbatim, Ricoh and Yamaha, the DVD+RW standard offers discs that have a three-gigabyte per side capacity and do not require the use of a cartridge. DVD+RW discs can record using either the CLV format for sequential video access or the CAV format for random access. DVD-RW and DVD+RW discs function as an excellent platform for authoring tools or archived data.

As with DVD-RAM discs, both the DVD-RW and DVD+RW formats utilize the wobbled groove recording technique that places address information on land areas for synchronization when data is written to the disc. As a combination, the use of a wobbled groove, the CLV format for sequential video access, and the CAV format for random access ensures compatibility between the DVD-RW and DVD+RW discs and existing technologies. According to manufacturers, DVD-RW and DVD+RW discs will accept 1000 erasures and rewrites.

Hardware requirements and support for DVD technologies

Given the versatility of DVD technologies, personal computers must support the playback, authoring, and the storage capabilities of DVD-Video, DVD-ROM, DVD-RAM, DVD-Audio, and DVD-RW. Much of this support begins with a bus that supports high-speed transfer of multiple data types. In addition, the system must include processing power and either hardware or software decoding for the video and audio streams. In addition, DVD drives must support the functionality of compact disc technologies and include some type of defect management.

Bus mastering requirements

Bus mastering decreases the bandwidth required to move video and audio information from a DVD player or drive to the computer and then to the decoder. Each video, audio, navigation, or subpicture stream requires a set of sixteen logical buffers. Consisting of physical data

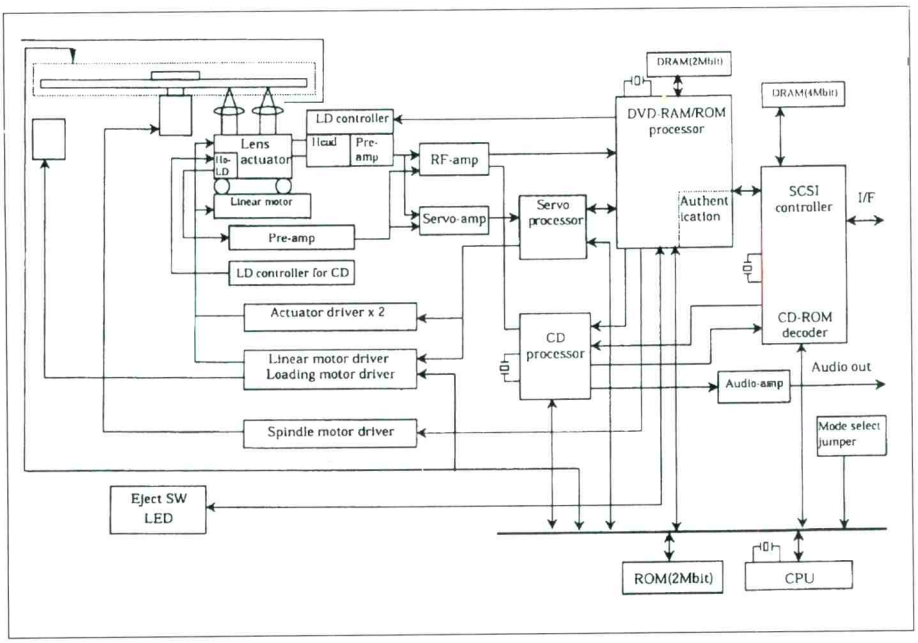


Figure 2

segments, each logical buffer can begin or end on any byte position in physical memory. Consequently, the first and last physical data segment may have smaller sizes than a physical memory page. However, all other segments must remain as contiguous multiples of the physical-memory page size.

Hardware decoders

During operation, the hardware decoders use a video overlay to insert the video information into the computer display. In most cases, manufacturers place the decoder on the graphics adapter or within the graphics processor. The video overlay may take the form of either an analog VGA signal output from the graphics card and keys found in the video or a direct digital connection called video port extension.

Software support for DVD technologies

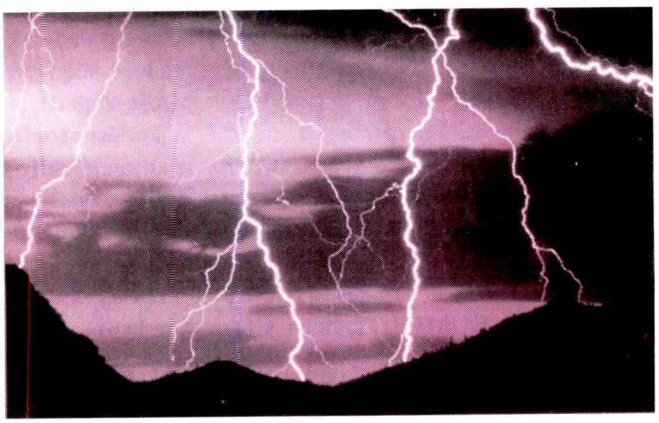
With the addition of DVD drives and players to the computing world, operating system and application must support the regional codes defined by the DVD standards. In addition, the software must include methods to maintain the licensing to descramble copy-protected movies. Either the operating system, application software, or add-on drivers must support the copy protection of movies through the implementation of CSS, APS, and regional codes. In addition, the software must remain compatible with the UDF and ISO 9660 file structures used with the DVD and compact disc standards. Moreover, the operating system must support the interactive features found with the DVD standards. As an example, the software must support subpicture compositing and closed captioning. Software drivers must, therefore, have the capability to set subpicture properties and set parameters.

Software decoders

Software decoders require a minimum of a 233 MHz Pentium II processor and a DVD-ROM drive that features bus mastering DMA. With DMA, data is transferred from a device to RAM through the device controller card without using the CPU. A DMA data transfer provides the fastest method for multitasking operating systems. As a result, the DVD drive can achieve 24 frames per second film or 30 frames per second video rates. For most applications, a video accelerator improves the performance of the software decoder software. The accelerator card improves the decoder performance by processing MPEG-2 decoding tasks.

DVD-ROM/RAM drives

While all computer manufacturers offer systems that include DVD-ROM drives, many also offer the availability of DVD-



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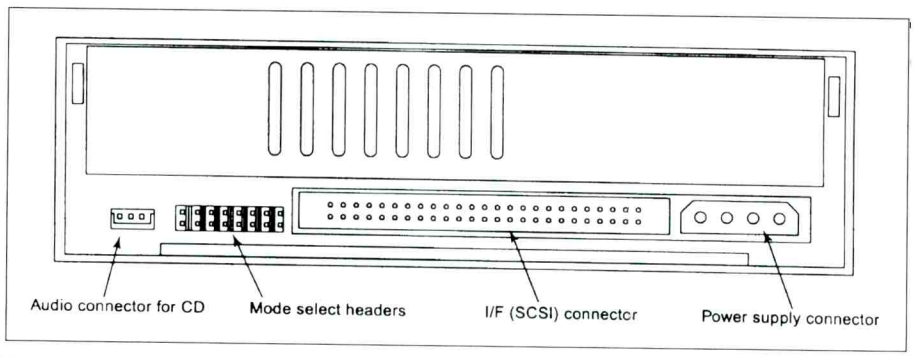

Figure 3

ROM/RAM drives. As we have already seen, the DVD format offers greater capacity and multimedia capability. When considering that capacity in terms of computing, a 1x DVD-ROM drive provides a 90mS to 200mS seek time and a 100mS to 250mS access time. Data is transferred at a rate of 1.321MBPS with burst transfer rates that can exceed 12MBPS.

However, DVD-ROM drives spin the disc at a slower rate than comparable CD-ROM drives. The dramatically higher throughput possible with DVD-ROM drives occurs because of the data density of the DVD disc. As a result, a 1x DVD-ROM drive that has a data transfer rate of 1,350kBPS yields the same data transfer speed as a 9x CD-ROM drive.

Newer 2x DVD-ROM drives transfer data at a rate of 22.2MBPS and read CD-ROMs at 20x speeds. The faster 6x, 8x, and 10x DVD-ROM drives read CD-ROMs at 32x speed and provide the potential of transferring data at a rate of 55.4MBPS. Enlarging the memory cache in the DVD-ROM increases the capability of the drive to transfer data at a faster rate. The higher speeds apply to the transfer of data rather than the ability to reproduce a video image.

In addition, the data transfer ratings of CD-ROM and DVD-ROM drives depend on the method for reading the data. Constant Linear Velocity drives spin the disc at a lower slower rate when reading data located near the outside of the disc. Tracks located near the edge of the disk have a greater physical surface than tracks located near the center of the disc. Faster drives rely on Constant Angular Velocity where the rotational speed remains constant and a buffer compensates for differences in the data transfer speed. As opposed to CLV drives, CAV drives have the fastest speed when reading data at the outside edge of the disc.

Figure 2 is a block diagram of a DVD-ROM/RAM drives. The drive offers both backward and forward compatibility through the use of a dual laser optical pick-up unit. The dual-laser optical pick-up unit (OPU) ensures compatibility with CD-ROM and CD-audio discs by incorporating dedicated lenses and semiconductor laser diodes that allow the reading of all compact disc and DVD disc formats. When the drive checks the inserted disc, it automatically selects the appropriate lens and laser by rotating the assembly.

Along with the dual lens OPU, the servo-control circuits also ensure compatibility with both optical disc formats. For DVD discs, the drive achieves an access time of 200mS and a random seek time of 130mS. The transfer mode includes both the Programmed I/O, or PIO, mode and the Direct Memory Access mode. Data transfers occur at a rate of 13.3MBPS in burst mode. When operating with a CD-ROM, the drive offers the performance of an 8-times rotational speed CD-ROM drive.

Drive interface cable connections

Figure 3 shows the back portion of a typical DVD-ROM reader and the locations of the interface connectors. Because manufacturers provide DVD-ROM drives that support both EIDE and SCSI-2 connections, connectivity remains the same with both CD-ROM and DVD-ROM drives. While the EIDE interface cable attaches directly from the drive to the computer motherboard, a SCSI-2 connection requires the installation of a SCSI controller card and different interface connector and cable.

Device configuration jumpers

Figure 4 shows several possibilities for using device configuration jumpers to set master and slave drives. The device configuration jumper is a 6-pin, right angle and header with three marked positions. With CSEL placement, the device shall use the host interface signal CSEL to configure the device. While the MA position sets the device as a master unit, the SL position sets the device as a slave unit.

Understanding the operation helps in servicing

Mass-storage technology is moving ahead rapidly, as are all other aspects of personal computer technology. Understanding how these newest drives operate is certain to be helpful when a technician encounters a PC system that features one of these drives.

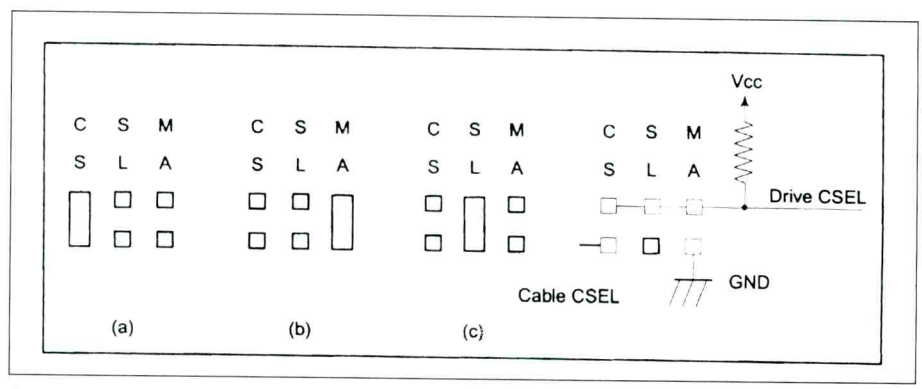

Figure 4

Understanding and Servicing Scanners

Graphic files, photographs, drawings, and the like require large files to represent them in a computer. As the speed and memory capacity of computers has grown at a prodigious rate over the past few years, so has their ability to store, display, and transmit such large files. Thus today, computer users are manipulating graphics files just as easily as they did with text or other files a few years ago.

As manufacturers of computer peripheral devices watched the capability of computers to handle large files increase, they recognized an opportunity to develop devices that could convert ordinary images, such as photos, into computer files. Such devices, called scanners, already existed, but they tended to be large and bulky and expensive. Applying innovative technology, those manufacturers were able to develop and manufacture scanners that were compact, inexpensive, and that produced files that could be converted into high-quality images on a computer screen or printed onto a piece of paper.

While most of today's scanners that are used by consumers are so inexpensive that they would be more likely to be replaced than repaired, some scanners are expensive enough that they would be repaired. Moreover, a technician who services computer products might encounter a scanner problem that was software related, or that couldn't be corrected by replacing the scanner, so a rudimentary knowledge of scanner technology and operation would be helpful. With that in mind, the article that follows is a basic article on the state of scanner technology and use today.

There are, of course many types of scanners, but the most common scanner in use by consumers is the flatbed scanner. We will confine this discussion to flatbed scanners.

Scanner principles

A scanner uses a light source to shine a bright light at an image that has been placed on a transparent bed. The sensors that sense the light reflected from the image are built into the transport mechanism along with the light source. This mechanism is approximately as wide as a standard sheet of paper. In most scanners, the light source is a "cold cathode" lamp, and the sensors are charge-coupled devices (CCDs).

As the transport mechanism moves beneath the image, the light from the source is reflected onto the sensors. Since most scanners these days are able to generate a computer file of a color photograph, there must be some components in the scanner that can separate white light into its color components. Different scanners accomplish color separation in different ways.

One method of color separation is to place a prism between the reflected light and the sensors. In this case, the CCD sensor contains a set of CCDs for each of the three primary colors. A more common method is to use a set of CCDs that consist of groups of three, each coated with a colored film. In this scheme, each CCD only senses light within the spectrum of it's film covering.

Pixels and the scanner transport

As you know, any image, whether words on a page or a color or monochrome photograph, can be represented by a series of dots, or groups of dots. Each of these dots constitutes a picture element, or "pixel." The scanner converts the image on a page to a computer file by dividing the page into a number of vertical "stripes" and then dividing each of these stripes into dots.

The light source for a scanner is a cold cathode tube equal to about the width of a standard 8-1/2 X 11 page. The CCD sensor assembly is the width of the page, and hundreds of pixels wide but one pixel high. This transport mechanism is drawn across the image to be scanned by a stepper motor, that is, a motor that moves in discrete steps rather than continuously. After each step, or a preprogrammed number of steps, the image area illuminating the CCD sensor is recorded and converted into digital bits. Once the contents of the entire page have been scanned in this manner, the digital information representing the image is assembled into a file.

Analog to digital

When the raw picture information has been sensed by the sensors, the information for each of the three color components of each pixel is in analog form: a quantity describing the color of the pixel, and a quantity describing the light intensity, or brightness. The next step is to convert those analog quantities into digital bits that can be handled by the computer. This process is accomplished in an analog-to-digital (A/D) converter.

The mechanics of a scanner

The mechanics of a scanner may range from quite complex to very simple. I'll describe the scanner that's on my desktop. When I scan an image, I place it on the transparent flat bed of the scanner. Beneath the bed is the transport mechanism. A smooth, narrow, cylindrical tube is affixed at each side of the scanner. The light source/scanner assembly has a bearing hole on each side that slips over the tube.

At rest, the transport assembly rests at the back of the scanner. A lightweight cable is attached to the front of the transport mechanism, runs to the front of the scanner, loops around an idler wheel, and runs back to the back of the scanner. There it takes several turns around a nylon gear/pulley and then runs toward the front of the scanner and attaches to the back of the transport mechanism.

Thus, when the computer user loads up the scanner software and clicks on "scan" the motor begins turning in steps. The motor shaft is connected to a gear that drives the pulley/gear. As the pulley turns, the cable pulls the transport forward one step for each step of the motor. Once the transport has been pulled as far forward as dictated by the vertical size of the image to be scanned, it stops, the motor reverses, and turns continuously, returning the transport mechanism to its rest position.

Different types of art

As we said at the outset, most scanners are quite inexpensive, and thus not candidates for service, generally speaking. However, many of the problems that a computer user encounters are caused either by software problems, or a lack of understanding on the part of the user as to the correct operation of the software. For example, most scanning software allows the user to scan in one of three methods: color, gray scale or gray image (black and white photo) or line art (things like schematics, block diagrams, etc.) . It also allows the user to scan at any of a number of levels of resolution from 100 dots per inch (DPI) to, depending on the software, 9600 DPI. If the user doesn't set these choices correctly, he might encounter problems.

Here's an example, if the user is scanning line art using the "gray image" setting, the lines that he wants to see clean and crisp will come out gray, a series of black dots. Here's another problem: if the user selects too low a resolution, the picture will not come out as clear as he wishes. If the user selects too high a resolution, the computer may lock up trying to handle too much information at one time.

As an example of the latter problem, I just noticed that my software says it will allow me to scan at 9600 DPI. When I looked over at the number of bits it would take at that resolution to scan an 8-1/2 X 11 color photo, it would be about 25 gigabytes. There's a one-gigabyte hard drive on this computer. Not only that, but the meager amount of RAM on this computer would choke in a hurry trying to process that amount of data and it would freeze up.

Scanner troubleshooting

Scanner problems may take any of a number of forms. The scanner might fail to do anything at all. Or it might activate but not operate properly. Or the scanner might operate seemingly normally but not produce usable results.

The first step in troubleshooting a scanner would be to make sure that it's receiving power from the ac line. If the customer is using a power strip, make sure that the outlet for the scanner is switched on. Next make sure it's properly connected to the computer. Unplug the cable and plug it back in a few times, with power off, of course.

Try the scanner with the software the customer usually uses, but if it doesn't work with that software, see if there's any other scanning software on the computer. If you try operating the scanner with another software program and it works, the problem must be with the software. If you find this to be the case, or if for any other reason you strongly suspect the software, reinstall the software. Check the hard drive. If there's very little remaining room on the computer's hard drive, suspect that some disk write operation may have overwritten part of the scanner software.

If the customer has another scanner, or if you have a laptop computer with you that you know has a good scanner program on it, try the customer's scanner with your laptop. If it works, you know the problem lies elsewhere. Conversely, you might try another scanner with this computer. If a different scanner works ok the problem is probably the scanner. Replace it. If the test scanner doesn't work, continue to look at software/interface problems.

Operating problems

As our technological products become more complex, more flexible, and more feature rich, people have more problems operating them. How many times has a service center had to rescue a customer who has gotten into the TV's on-screen menu and made a change that he then couldn't figure out how to change back? With computers it's even worse, of course. Documentation is notoriously bad for computers, peripherals and software, and even if it were good, the customer would not read it, and would probably lose the manual anyway. Moreover, while on-line help is available, it can be hard to follow.

The result of all of the above is that many people have problems operating their computer systems and its software, and sometimes get strange results. An example is the story, probably not true, but wonderfully funny, about the customer who called in to the service center after the drawer on the CD-ROM drive failed to operate, and said that his computer's cup holder was broken. Scanning software has ample opportunities for improper operation.

For example, if a customer says his scanner operates too slow, or doesn't produce the results he wants, or locks up while he's trying to use the scanner, there are many possible errors that he may be committing. Scanning software offers many choices. An image may be scanned as a color image, a gray image, or line art. An image may be scanned at 100DPI or 9600DPI. Images may be stored in any of a number of formats: tiff, or .tif (tagged information file format); jpeg, or .jpg (Joint Picture Experts Group); .bmp (bitmap); to name just a few. Furthermore, some of these formats may have both compressed or uncompressed versions, which you can't tell just from the file extension. And they come in different "flavors," whatever that means.

And different software programs handle different graphics file formats with varying degrees of success. I have at least four graphics programs on my computer, counting "Paint," but not counting my drafting program. I would love to get rid of a couple of them to make more room on the hard drive, but each of them has features that the other programs don't have, and handles one or the other of the file formats better than the others do. For example, one of the programs just quits and tells me there's an error if I try to load certain tiff files into it. I have to reload it, or load another program.

Scanner operates too slowly, or pictures look odd

If the customer complains that his scanner operates too slowly, it might be that he's trying to scan at a resolution that is too high, looking for picture clarity that's really not there anyway. Anything over about 300DPI for ordinary use: pictures of the family, etc., is probably too high. Even at 200DPI a good color photo will look pretty good and the file will take up

less space on the hard drive.

Most scanner software will allow the user to select a portion of an image to scan. The user selects "pre-scan," then after the scanner scans once and returns an image (this is a fast process because it's at low resolution) the user can use the cursor to move and resize a box with a dotted-line outline to select only the portion of the image he wants to scan. However, here's another possible area for user error.

On the user's screen, there is a drop-down box that allows the user to select a number of image sizes: 3 x 5, 5 x 7, letter size, or custom size. If the user uses the virtual box to select a portion of the image, then inadvertently selects "letter," instead of leaving the selection at "custom," the scanner will scan the entire page.

Know the software

It's true of scanner servicing, but it's true of servicing any kind of computer problem: operator error and software problems cause many more failures than hardware causes. If you plan to service scanners, printers, computer sound systems, or any other type of computer problem, learn not only the hardware, but the software as well. It will save a lot of time and grief in the long run.

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Varieties of Internet Access

by the ES&T Staff

Just a few years ago, hardly anyone had ever heard of the Internet, and now it's impossible to read a newspaper or magazine, watch TV, talk to a friend, or even see a movie without hearing about some dot.com somewhere. The Internet has grown at an amazing rate over the past few years, as has piqued the interest of people in using the Internet.

Part of the reason for the growth of interest in the Internet in recent years is the changes that have taken place in the types and format of information available. Another factor is the growth in the number and variety of Internet service providers (ISPs). Less than two decades ago, there were only a handful of providers, at least those with any kind of visibility. Moreover, computer screens presented information in text form only. Add to that the fact that most personal computer software at the time was command driven: that is, a user of the software had to learn a set of arcane commands in order to make it work. And as often as not, connection to the Internet required a long distance telephone connection, which meant telephone charges in addition to any Internet access charges.

In the intervening 20 years, spectacular changes have taken place in computers and the Internet. Processor speeds and capabilities have increased by factors of hundreds. Hard drives became available for personal computers, and then increased in capacity by factors of thousands. With all of that capacity, the ability to process and deliver high quality video and audio was gradually added. This incredible capability is underscored by the fact that DVD drives are now commonplace on computers, and can be use to play DVD movies on computers.

Yet another development that has increased interest in the Internet: WebTV, and other "non-computer" Internet access devices. With devices such as WebTV, telephone based products that can provide e-mail capability, and a host of other products that don't look like computers but can connect to the Internet; the Internet has become an important channel for information delivery. Moreover, recently introduced Internet access devices such as cable modem and digital subscriber lines (DSLs) provide a huge information pipe from the Internet into the home or business.

Internet exchange of critical information and

If all of the above weren't enough to convince even a skeptic that the internet is no longer a curiosity but is now a key factor in information exchange and commerce, along with the telephone and fax, the fact that so many companies and organizations are now relying on the internet as their primary medium for information exchange should help in that convincing. Let's consider consumer electronics companies. Many companies have now established websites for their service information. As just one example, if you are a service center (you don't even have to be authorized), you can get a user name and password to access the Hitachi service website. There you'll find hundreds of service manuals, bulletins, and a host of other information.

But there's more. Now it's possible for authorized service centers for a number of manufacturers to file warranty claims via the Internet, either directly, or through a third party company that processes claims for the manufacturer. In many cases, the determination whether the claim was accepted or rejected is available the next business day. For service managers who are concerned about cash flow, that can speed up the process considerably.

How about ordering of parts? Most, if not all, manufacturer parts departments, as well as distributors, can be accessed via the Internet, and parts can be ordered instantaneously.

Internet service providers

There are a number of ways to gain access to the Internet. Almost everyone who has been awake during the past few years has heard of AOL (America On Line). This is one of the biggest Internet service providers throughout the world. This company got big by getting CD-ROM disks with the AOL browser into the hands of everybody in the country, via mail, bound into magazines, tossed onto lawns with the morning newspaper, or referred by friends; by offering local telephone access via telephone networks; and by offering a premium set of services. But there are countless other companies that provide Internet access, such as CompuServe, Microsoft Network (MSN) and others.

The cost of Internet access varies considerably. AOL charges $19.95, as do, I believe, CompuServe and Microsoft. There is an ISP called Prodigy that charges something like $15.95. Others offer varying degrees of service for prices less than that.

For individuals who just aren't sure if Internet access is worth spending money on, there are ISPs that are free. Well, of course, nothing's free; someone has to pay for it. The free sites pay for their hardware, software, telephone networks, buildings and salaries by selling advertising. On the other hand, even the ISPs that charge as much as $19.95 subject subscribers to various forms of advertising. I find plenty of advertising to be annoyed about at AOL.

The free ISPs

For someone who has a personal computer and who has been thinking about gaining access to the Internet, but questions the value of doing so, trying out the ënet through one of these free providers might make a useful experiment. Here are the names and addresses of two of those free providers:

- Freei.Net
  909 S 336th St Suite 110
  Federal Way WA 98003
- Juno
  1540 Broadway 27th floor
  New York NY 10036

No doubt there are many others, it just takes a little research to find them. They all provide access to the Internet, e-mail service, and even allow users to build a

website and post it on their system. And it's all free.

I heard of Freei.Net when they advertised on television several months ago. I haven't heard much about them since that time. I wrote to them and ordered their CD-ROM disk, and promptly put it in my desk; there never seems to be time to install it, and besides, I have a lot of other stuff on my 1gig hard drive. The one from Juno came in the mail one day, and it has sat in my desk drawer since then.

But, during the time I was writing this article, I logged onto AOL and directed my browser to go to both the Freei.Net site and the Juno site, and they were both operating. Moreover, I used their sites to search for a couple of subjects of interest, and the search turned up some sites where I found some very useful information. More importantly, if a service center chose to use one of the many free ISPs available, they would have access to the Internet for all transactions available to the customers of the paid sites, including access to manufacturers, on-line purchase of parts, and on-line filing of warranty claims.

Cost of a computer and Internet service

As we have mentioned before in this magazine, the power of computers has increased to a degree that is nothing of astonishing. They are now, in fact, all-purpose information processing machines; they can process numbers, words, pictures, sound, video, control information, and more. And even more astonishing, they have decreased in price dramatically while doing it.

Today you can buy a powerful personal computer with a color printer for less than $1,000, then, if you chose one of the promotional Internet access deals you get an instant rebate for the amount that you'll spend for Internet access (at a rate of about $19.95/month) over the next three years. There is no longer any reason or excuse not to move ahead into the information age.

To use a common expression these days, if you don't take the on ramp to the Internet, you're going to get run over. If, on the other hand, you choose to enter the information age, and spend a little time exploring what the Internet can do for you, you will be astounded.

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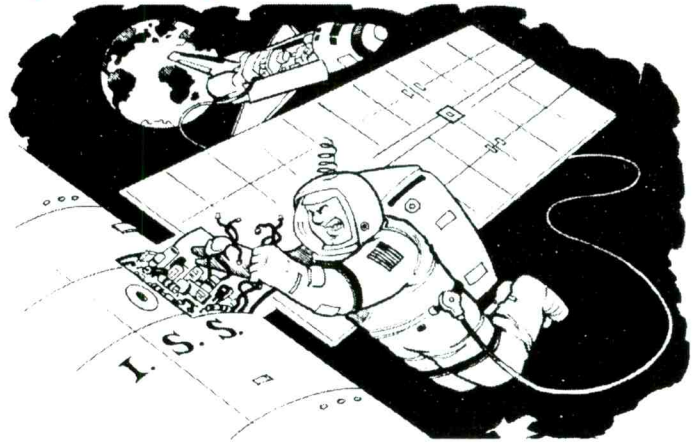

Technicians at NASA's Space Shuttle Logistics use the ***CapAnalyzer 88A*** to be sure equipment is in perfect condition before being launched where service calls could be somewhat of a problem. The ***CapAnalyzer 88A*** is also used by NBC TV, General Motors, Sears Service, Time Warner Communications, Panasonic, Matsushita Industrial, and Pioneer Electronics technicians, as well as thousands of independent TV, computer monitor, VCR and industrial service technicians. They prefer the ***CapAnalyzer 88A*** because it checks electrolytic capacitors for leakage and ESR *in-circuit*, accurately.

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Shutdown Problems in Toshiba Television

by Bob Rose

Shutdown circuits have been around for a long, long time. The first were mandated by the government to protect television viewers from potentially harmful x-ray emissions in the event that high voltage to the picture tube increased to an unsafe level. It was called the HEW circuit, getting its name from the Department of Health, Education, and Welfare. In certain situations, the circuit is still called the "HEW" circuit, but we know it by its popular designation,"x-ray protection" circuit.

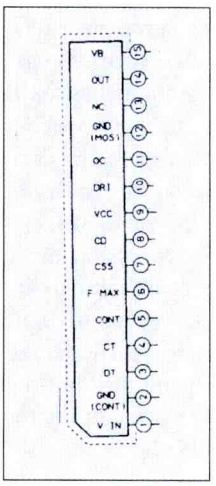


Figure 1. Replacing Q801 in a dead Toshiba CE36G18 caused the power supply to begin operating, but the set remained dead.

With the passing of time, engineers devised other circuits that were designed, not just to protect from x-ray radiation, but to protect the television itself from catastrophic failures of one type or another. The most recent is a circuit that shuts the TV down when vertical deflection fails. You may wonder about the wisdom of such a circuit, especially given the challenges it presents to service technicians. However, your doubts will most surely be put to rest when you see a thirty-six inch picture that has a line burned in the phosphor because its owner kept the set on after the vertical circuit had failed.

Another circuit might monitor horizontal drive and cause the unit to shut down when it fails. This is especially true in projection television sets. Still another group of circuits might monitor various "sub-power" supplies and have the responsibility of turning the TV off when they detect excessive current demands, which usually herald the failure of other circuits such as the convergence amplifiers in projection television sets. These circuits serve as sentinels that protect the TV against a cascade of parts failure and, don't forget this, potential fire hazards.

There is one twist that I must mention, a twist that complicates the already difficult job of repairing shutdown problems. A shutdown circuit may activate because of a parts failure within the circuit itself, not because the circuit has sensed a problem in the television. The TV may be in perfect working condition, but it won't work because a fifty-cent diode or one-dollar transistor in a shutdown circuit has failed.

Well, let's leave the realm of the abstract and get down to particulars. I intend to illustrate what I've been talking about by using a direct view set and a projection set manufactured by Toshiba. Based on my experience, I'm going to label these examples as typical of the kinds of problems you face when you tackle the dreaded shutdown problem.

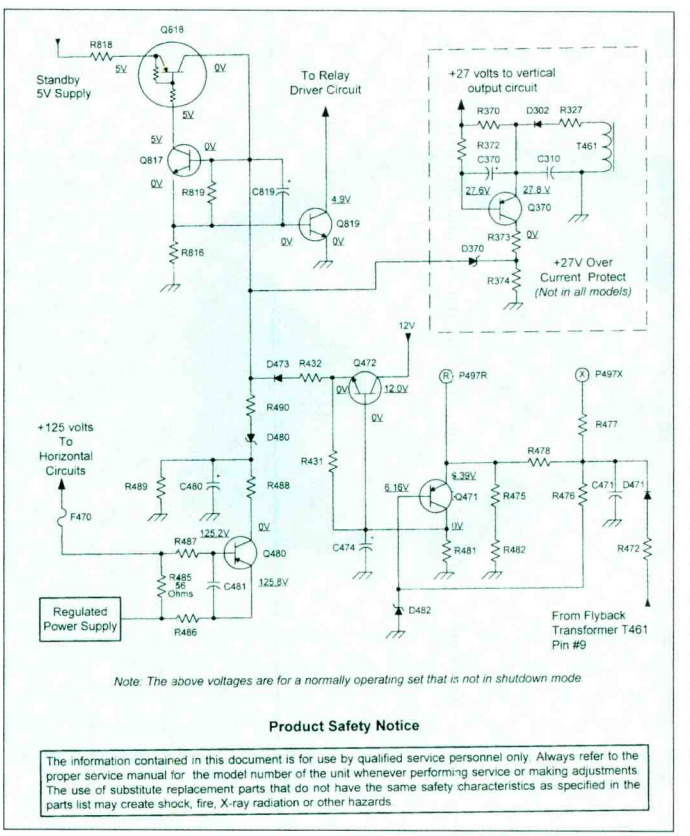


Figure 2. This schematic diagram, along with Figure 1 gives you the basics of the shutdown circuit in a CE36G18. This diagram is helpful because it abstracts and enlarges the circuit, making the schematic easier to read.

Tools of the trade

First, however, a few words about the equipment you really do need to have at hand before you begin to chase a shutdown problem. Toshiba tells you that your best tool is a peak response or a minimum-maximum meter. If you don't have one, then a scope is your next best bet. However, the Toshiba engineers underscore their belief that the former is the preferred tool for troubleshooting. Having dealt with shutdown problems more often than I care to remember, I agree that a peak response meter is the preferred piece of equipment most of the time.

It is absolutely necessary to take voltage measurements at several points in the chassis as you try to find the problem area. By "several," I mean as many as a dozen or more points. The problem is complicated by the fact that the set might not stay on for more than a couple of a seconds, or it might stay on for five minutes or a couple of hours before it turns itself off. A peak response meter goes a long way toward helping you to find the problem, especially if the problem is intermittent. If the set plays for a long time before it acts up, you need simply to attach the meter to a particular test point and go about your business. When the TV turns off, check the meter. If the point that you are monitoring has acted up by causing a

voltage to ramp high or by losing the voltage altogether, your meter will store the reading. See how easy it is?

Your next best instrument is a good scope, particularly if the TV shuts off almost immediately after turn on. If the set on which I am working shuts down a few seconds after turn on, I usually reach for the probe attached to my oscilloscope. I can usually, but not always, tell if the circuit I am monitoring is the culprit by watching the trace rise and fall. If your oscilloscope also has a digital readout, you might also be able to determine the voltage level at the test point.

Credit where credit is due

Before getting to the technical discussion, I want to give credit where it is due by acknowledging the source for much of my information. I have found Toshiba to be an excellent company to work with. The engineers who work their technical assistance hotline are courteous and knowledgeable and take the time to help you out. And their web site has loads of useful information, including service bulletins, service tips, and troubleshooting guides. I suggest you avail yourself of it by accessing http://techsupport.toshiba.com.

Now let me mention three abbreviations that I shall sprinkle liberally throughout this article: OVP, overvoltage protection; OCP, overcurrent protection; and UVP, undervoltage protection.

Toshiba Model CE36G18

This thirty-six inch monster came in as a dead set. Though the owner didn't tell me, I suspected that it had been struck by lightning. I carefully inspected the chassis using my senses of sight and smell and found nothing amiss. Using the meter that I trust the most for checking diodes and transistors (a Simpson 260), I checked for open fuses and shorted diodes and found nothing amiss. Since I had the necessary voltages to Q801 (Figure 1) and found no open resistors or defective diodes, I opted to replace it using a STR-Z4151B.

The power supply came on line when the new chip received B+, but the set was still dead. No horizontal deflection, in other words. I checked the horizontal VCC to the rainforest IC (not shown) and found it to be 0V, a condition that indicated a problem with the B+ source or the chip itself. When I lifted the pin from the trace, horizontal VCC rose to normal. The chip was shorted. I replaced the rainforest IC and heard high voltage come up and just about as quickly die down.

All of that work to face a shutdown problem.

Figure 2 along with Figure 1 gives you the basics of the shutdown circuit. I suggest you pay attention to Figure 2 because it abstracts and enlarges the circuit, making the schematic easier to read.

The latch circuit itself consists of switching transistors Q817, Q818, and

Test Your Electronics Knowledge

by J. A. Sam Wilson — WA8RMS

1. A 500nF capacitor in series with a 1000Mohm resistor would have a time constant of T = ____ sec.

2. Can you find the value of x in the following equation?

$$x = \frac{(x + y2)}{(x \tilde{n} y) + (y \tilde{n} x)}$$

3. Another name for a serial counter is a _____ counter.

4. Name three required sections in a phase locked loop:

   _____

   _____

   _____

5. Superheterodyne radio receivers came into use in the (1920's, 1930's, or 1940's)? _____.

6. To obtain the overall dB gain of three cascaded amplifiers, multiply their dB gains: ☐ True ☐ False.

7. Whatever you do to increase the voltage gain of an audio voltage will decrease its bandwidth: ☐ True ☐ False.

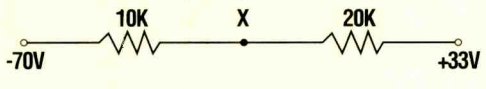
8. What is the color code for a 10Mohm resistor?

   _____

9. How much change should you get from a two dollar bill when you buy eleven resistors at $.05 each?

   _____

10. What is the voltage at point x in Figure 1?



See answers on page 52

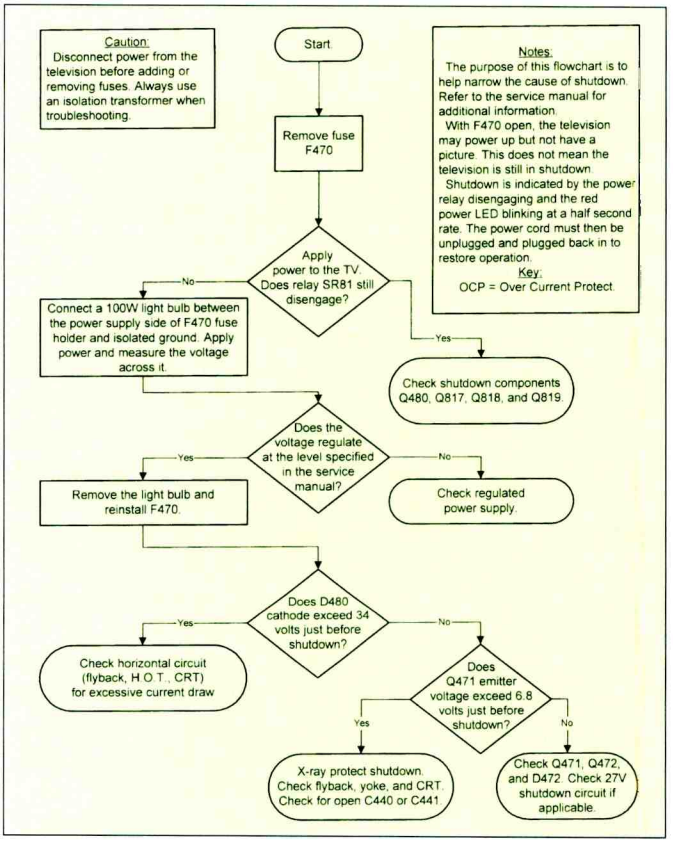


Figure 3. I downloaded this information, "Shutdown Troubleshooting Flowchart 5" from the Toshiba website and had the TV fixed within 30 minutes.

Q819. When a fault triggers one of the monitoring circuits, current begins to flow through the base of Q817 causing all three transistors to turn on. As current begins to flow through the collector-emitter junction of Q819, the transistor turns on, grounding the turn-on signal to relay driver transistors Q843 and Q830, which causes the relay (SR81 in Figure 1) to deenergize and turn the full power supply off.

The latch circuit is powered by the +5V standby supply, meaning that the set has to be disconnected from the ac supply before it will unlatch and permit the set to be turned back on. Of course, when the latch circuit activates, the condition that caused it to activate disappears. Therefore, you need a piece of test equipment like a peak response meter or a scope to help you locate the fault.

Now what about the circuits that cause the latch to trip and put the television into shutdown? There are three of them, which are described below.

Overcurrent sensing: +125V B+ OCP

The +125V to the horizontal section passes through resistor R485 (Figure 2) while transistor Q480 monitors the voltage drop across it. If the current increases and causes the voltage drop across R485 to exceed 1.5V, Q480 turns on, increasing the current to the base of Q817. The latch circuit energizes and shuts down the TV.

You may be asking, "What could cause the current to increase?" The answer is:

- a shorted horizontal output transistor,
- a shorted flyback,
- an arcing CRT,
- a shorted yoke, or
- an increase in B+ to the horizontal deflection circuit.

Let me complicate the issue just a bit by pointing out that the latch will trip if resistor R485 increases even slightly in value. As I am sure you are aware, I have listed more-or-less in order the components that might cause current through R485 to increase. Unfortunately, other things might also trigger the circuit, like loss of resonance in the horizontal deflection circuit because one of the timing capacitors has changed in value.

X-ray protection

The HEW or x-ray protection circuit monitors a dc voltage derived from the horizontal pulses at pin 9 of the flyback, the same pin that provides power to the CRT filaments. The pulses are rectified by D471, filtered by C471, and the resulting DC voltage is applied to the emitter of Q471. If the emitter voltage rises to more than 0.7V above the reference voltage on the base of Q471, the transistor turns on which turns on Q472, and triggers the latch.

What might cause the voltage on the emitter of Q471 to rise? The flyback, the yoke, the CRT, and a timing capacitor, among other components. The problem could also be caused by a rise in the +125V B+ to the horizontal output transistor.

Overcurrent sensing: +27V OCP

The third circuit monitors the current from the scan-derived +27V line via resistor R370 and works pretty much the same as R485 and Q480. Excessive current through R370 causes Q370 and D370 to conduct. When D370 conducts, current flows into the base Q817, and the latch triggers. Shall we get back now to the CE36G18? I replaced the switching regulator and rainforest IC to get the TV to turn on, only to find that it promptly shut down. The logical question is, "What next?" Fortunately, Toshiba came through like the cavalry to the rescue. I downloaded "Shutdown Troubleshooting Flowchart 5" (Figure 3) from their website and had the TV fixed about thirty minutes later.

The chart instructs you to take F470 out of circuit, disabling B+ to the horizontal section and apply power to see if relay SR81 disengages. Don't merely use your ears, but use a meter connected between the power supply end of the fuse holder and cold ground. In the case at hand, the relay did not disengage.

Next, with the set disconnected or turned off, I connected a 100W light bulb between the power supply side of the fuse and cold ground, turned the set back on, and monitored the B+ line. The voltage held steady at +125V. The power supply wasn't the culprit.

I turned the set off, removed the meter and light bulb, installed the fuse, and turned the set on while I checked the voltage at the cathode of D480. The voltage was practically zero. I moved the meter probe to the emitter of Q471 and measured just about 0V.

The trouble tree instructed me to check Q471, Q472, and the +27V OCP circuit if it were applicable. I began by check-

ing Q471 and found that it was shorted between base and collector. After I replaced Q471, the TV fired up and acted like a champ.

The point is this. The latch wasn't setting because of a fault in one of the circuits the latch monitored, but because of a fault in one of the monitoring circuits. If you have worked on many televisions, you know that such a problem is far from unique.

Toshiba Model TP55H50/60

Okay, the time has come to get a bit more complicated by moving on to a 55-inch projection unit that went into shutdown about three seconds after the main power supply came on line. These shutdown circuits, though they work about the same as the TV I just discussed, are a bit more complicated and far more common, as you can see by looking at Figure 4. Following Toshiba's suggestion, I shall divide the shutdown circuits into three sections. Each section has three shutdown-monitoring circuits in it. Once isolated to a particular section, you should be able to use a peak response meter (or scope) to determine which monitoring circuit is triggering shutdown.

Section one

Section one monitors the +18V, -18V, and +36V supplies that go to the convergence circuit. Here are the test points:

+18V OCP Check the collector of Q759 for 0V when the TV is operating normally. If the voltage reaches 0.08V, the TV will shut down.

+36V OCP Check the collector of Q768 for a normal voltage of 0V Shutdown activates when it reaches 0.08V.

-18V OCP Check the collector of Q762 where the normal voltage is 0V with shutdown taking place at about -0.08V.

Section two

Section two monitors the +9V and +35V supplies for deflection circuits. If these supplies decrease (UVP) the collector of Q370 goes high and triggers shutdown. An overcurrent protection circuit (OVP) also monitors the +35V supply that keeps a eye on the voltage supply to the vertical and high voltage regulation circuits. If the collector of Q370 goes high but the +9V and +35V lines are not going low, then the +35V line is drawing excessive current.

Here are the test points:

+9V UVP Check the anode of D428 for about +9V. Shutdown occurs when the voltage drops to about +5V.

+35V UVP Check the anode of D429 for about 27V. Shutdown occurs when the voltage drops to about 5V.

+35V OCP Check the collector of Q370. Shutdown activates when the voltage reaches about 9.7V. Note: use this test only if the +9V and +35V supplies

YOU ASKED FOR IT!

DVD Player Fundamentals

by John Ross

DVD Player Fundamentals provides a most pleasant path to enlightenment, covering nearly every aspect of this exciting new technology. While carefully considering the theory and characteristics of optical disc technologies, this in-depth reference volume also takes a close look at the assemblies and circuits that allow DVD players to function.

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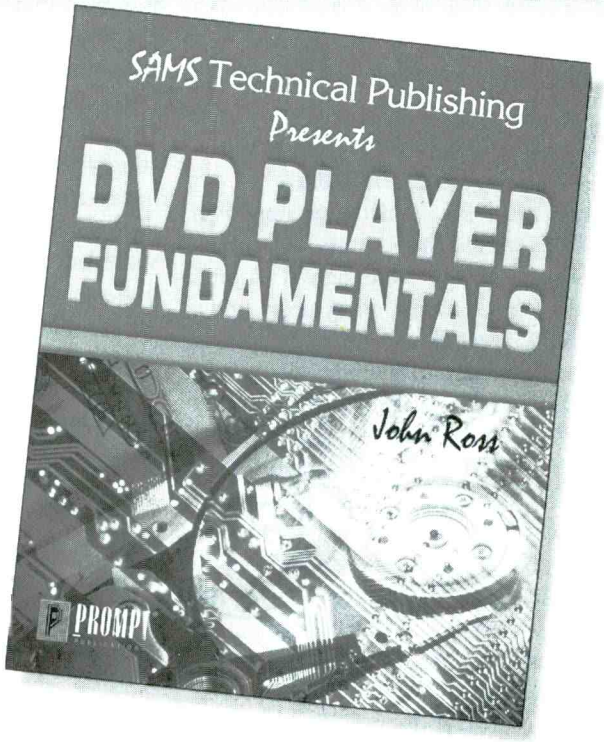

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Section three

Section three is the x-ray protect circuit whose job it is to monitor the TV for excessive high voltage. The +125V OCP monitors the current flow from the main power supply to the horizontal circuit. The +200V UVP monitors the +200V supply to the CRT driver boards. Here are the test points: x-ray protect: Check pins 11 and 13 of Z801. The normal voltage at pin 11 is 25V (the reference voltage) with shutdown taking place when it drops to less than 22V. The normal voltage at pin 13 is 22V with shutdown occurring when it rises to about 25V.

+125V OCP: Monitor the voltage across R470 where you will normally find about 0.5V. Make a note that this voltage will surge to twice that value at turn on. Shutdown occurs when it reaches 1.5V.

+200V UVP: Check the collector of Q341. You will normally find 0.0V.

Shutdown takes place at about 3.6V.

Troubleshooting using the troubleshooting flowchart

Well, there you have it; nine shutdown circuits divided into three categories. Where do we go from here? Again, Toshiba comes to our aid by providing a troubleshooting flowchart (Figure 5). I debated whether to include schematics and decided leave them out because I don't believe schematics would be helpful. Besides, if I laid them out, they would cover the top of a table three feet wide by nine feet long. Moreover, the components the trouble tree asks the technician to check are located literally all over the chassis. As a matter of fact, I spent more time locating test points than I did actually repairing the TV. I hope, therefore, that you will forgive my not providing actual schematics. By the way if you want to purchase the manual, you may do so by ordering File No. 020-9806 for the TP50H60, TP55H60, and TP61H60 from Toshiba. The first thing you must do is confirm operation of the power supply.

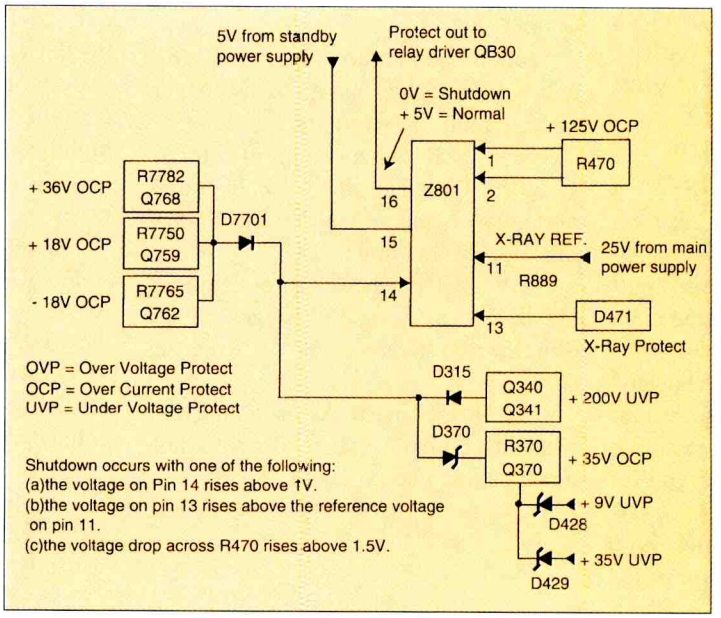

Figure 4. A Toshiba Model TP55H50/60 (55-inch seconds after the main power supply came on line. These shutdown circuits, though they work about the same as those in the the CE36G18, are a bit more complicated and far more common.

Begin by removing F470, the fuse in the B+ line to the horizontal section, apply power, and determine if the set still goes into shutdown. The best way to accomplish this is connect a meter to the power supply side of the fuse. Don't merely depend on your ears to hear the relay engage and/or disengage. If the set still shuts down, check the components in section one. The PTV on which I was working did not shut down with F470 out of circuit. The next step is to confirm power supply regulation. Connect a 100W light bulb from the power supply side of F470 to cold ground, turn the set on, and confirm that the power supply regulates at 125V. If it does, turn the set off, remove the light bulb, and put the fuse back into its holder. My set passed these tests.

Third, check the collector of Q370 for a voltage of about +9V. Q370 is in the "protect" line. Its emitter is linked to a voltage developed from a pulse taken off pin 6 of the flyback. I measured a voltage of close to 0.0V. Since its collector voltage didn't rise to +9V, the trouble tree instructed me to check the components listed in section three. I began by checking the voltages on pins 11 and 13 of Z801.

Z801 is a 17-pin-SIP chip located on the power supply CBA. In this case, Pin 11 read about +22Vdc; pin 13 read about +25.5V. It seemed as if I had stumbled across the circuit that was shutting this PTV down. Something was triggering the x-ray protect circuit, but what?

A call to technical service

I am not bashful about asking for help; so, I called Toshiba technical service. The engineer with whom I spoke suggested four possibilities. I had already thought about most of them, but I needed a second opinion. The tech suggested these possibilities:

(1) one of the picture tubes,

(2) a safety capacitor in the collector of the horizontal output transistor which he put very low in the list of probabilities

(3) the flyback, or

(4) one of the yokes.

He mentioned as a sort of passing comment that a component in the safety circuit itself might have failed. I wondered if this ordeal would ever end. I even got the urge to throw the monster out the front door. Such an act of pure violence would have made me feel better, but it wouldn't have solved the problem. I must confess, though, that the urge to do it damage was a real temptation.

For some reason, I think it is my experience with Thomson TV sets, I added a little extra capacitance across the existing capacitors in the collector circuit of the horizontal output transistor. The TV came on, but the raster was compressed on all sides and slightly out of convergence. The horizontal retrace waveform looked good at a

value of about 1200VPP, resting on +125V B+, and at a period of slightly less than 13microseconds. In other words, everything about it looked good.

Things heat up

It was at that point that I decided to ring the yokes. But before I did, I detected an odor that let me know a component was getting hot. However, I could see nothing amiss on the chassis, and, believe me, I gave it a thorough exam. Make a note that the TV had been turned off. I popped the speaker grill off and opened the access panel to the picture tubes. On a hunch, I felt the yokes. The yoke on the red tube felt just a little warm, as did the yoke on the blue tube. However, and my heart almost skipped a beat when I discovered this, the yoke on the green tube was hot; very hot. The story ends on a happy note. I was able to fix the set by replacing the yoke on the green tube.

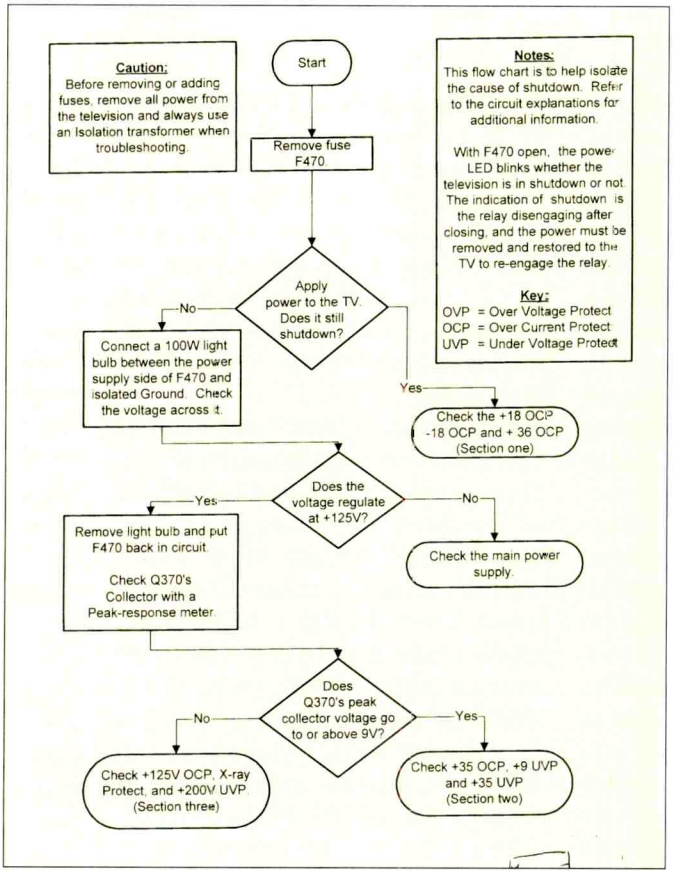

Figure 5. The troubleshooting flowchart for the Toshiba TP55H50/60 provides a great deal of information for troubleshooting these sets.

Toshiba TV's are just beginning to sell well in my part of the South, meaning I don't have a lot of experience servicing them. Like you, I learn by doing. I have since found out that the problem I solved isn't uncommon, not common, but not uncommon. Thomas, the technician who does a lot of in home service for us, says that he keeps a spare yoke on hand and uses it as a substitute to test each of the three yokes in a Toshiba PTV without taking the old yokes off the tubes. He says he knows he has the problem solved when he makes a substitution and the TV stays on. Not a bad idea. I think I'll order an extra one or two.

Well, shutdown problems are problems, aren't they? I don't know of anything that makes them a cinch to solve. But thank goodness that some are easier to solve than others. I hope my experience makes the shutdown problems you face just a little easier to resolve.

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Installing and Servicing Commercial Sound Systems

by Alvin G. Sydnor

After reading the editorial in the September 1999 issue of ES&T one very important point that became obvious was that independent service technicians must diversify and be prepared technically to adapt quickly to opportunities within the electronics field. One area that is wide open is commercial sound systems sales, service and installation. There is an incredible shortage of experienced audio field technicians capable of performing systems design (performing an evaluation of a customers needs) installing, servicing of new as well as upgrading old existing systems. The Customer is waiting to hear as well as pay for that acoustical miracle he has been yearning for. All too often, the sound contractor (often a subcontractor) is doing the bidding, selling, installing and servicing these systems as a sideline to their existing electronic service business. Before we get started in discussing specific technical details we should point out some of the various terms that are being used to describe commercial sound systems;

1. Public Address Systems
2. Commercial Sound Systems
3. Audio/Video (A/V) Systems
4. Home Theater Systems
5. Sound Reinforced Systems
6. Custom Sound Systems
7. Inter-Com Systems

Let's call it commercial sound

Of the eight descriptions, "Commercial Sound Systems" seems to be the most appropriate term to be used. It has been predicted that sales and service of commercial sound systems will increase in the year 2000 in the following areas:

1. Religious or social organizations: +7%
2. Home theater systems: 41%
3. Higher education institutions: +9%
4. K to 12 education: +8%
5. Government: +10%
6. Small and medium business: +25%
7. Fortune 1000 companies: +31%

A practical working knowledge of basic sound-system design and trouble shooting will allow the electronic technician to gain entry into a field that is growing. To mention only a few, commercial sound systems are performing many services in schools, offices, stores, factories, shopping centers, hospitals and retirement centers. These systems may be installed to provide music for entertainment or background as well as paging. There is more and more need for systems to aid security.

Establishing system requirements With the advent of much activity in digital-audio and the high-fidelity field, we are beginning to be exposed to many "requirements" as far as frequency response, distortion, and noise are concerned. Some claim that the frequency response range must be very wide (some are saying as low as 5Hz and as high as 100kHz), distortion must be practically at the vanishing point. perhaps even less than one-tenth of 1%, and noise must be virtually non-existent in a good well-designed system. Microphones, auxiliary input devices (CD and tape players), power amplifiers, pre-amplifiers, lines, line-matching transformers, and speakers all must be chosen for their performance, reliability, and economy factors that are particular to the specific application. Components that are selected for a specific application will produce the most satisfactory system installation.

Designing for intelligibility

For the design and installation of a system in which the need of intelligibility of voice, as an example, a high-level paging system in a noisy industrial area, a frequency response of 200Hz to 3000Hz is preferred and adequate, a distortion level of up to 15% can be tolerated, and the amplifier noise level could be 1% of the average voice power produced by the sound system (20dB below average voice power). Trumpet-type horns with limited frequency response and high power and long life, rather than low distortion, broad frequency response, and low noise would be preferred. In ordinary one-way or two-way voice systems an over-all frequency response of 80Hz to 5000Hz, a total distortion of 10% or less, and a noise level of approximately 1/10 of 1% of the average sound power of the voice (30dB below average voice power) will provide good voice communications and allow identification of voices. For such systems, cone type speakers and ordinary amplifiers ranging in power from 2W to 100W would be used. From experience, it has been found that room air conditioners and fans contribute a background noise level at frequencies of about 200Hz and below, and in such cases it is advisable to limit the low frequency response of the system.

Designing a system for music reproduction

The requirements of a system for the distribution of music vary widely depending upon the use and individual preference. An "ideal" music distribution system might have an over-all frequency response of 20Hz to 20KHz, a total distortion of 1% or less, and a noise level of 0.001 of 1% of the average music level of the music system (50dB below average music power). In shopping centers, noisy offices and other locations where the background noise level is high, a top frequency response of 5KHz is sufficient. An important consideration in selecting equipment for music systems is selecting equipment that has been designed for continuous usage.

Selecting equipment

When selecting equipment, attention to some of the detailed equipment specifications and the environment under which the equipment will be operating will save the technician time and money and provide the customer a reliable system. In general, the following requirements are very important characteristics in selecting equipment to build a good sound system. 1. Power amplifier's overall gain 2. Input and output impedance capability 3. Total output wattage 4. Overall frequency response 5. Pre-amplifier's input capability 6. THD (total harmonic distortion)

Speakers

One of the most difficult questions that face the audio technician when planning a sound system is what loudspeaker is best and what placement is best to use. Unfortunately there is no simple and easy answer, however there are a number of suggestions and some guidelines that can help in dealing with this question. In designing and setting up a sound system, it should always be kept in mind that the quality of the reproduced sound can be no better than that produced by the poorest component in the system. Generally, the poorest component in the system is the loudspeaker. The loudspeaker and its enclosure should be the best that can be afforded. What are the guidelines in selecting a speaker? Consideration must include size (maximum acceptable), cost, and above all the quality of the sound it produces. A good quality speaker should reproduce everything well and sound natural doing it. If a speaker at a low price sounds better than one at twice the price don't automatically assume that quality is equated with cost. Use the speaker that sounds the best for the specific application. On the question of speaker size, any discussion among audio technicians on the subject will result in many opinions. Good speaker systems and bad speaker systems come in all sizes. Speaker size does not relate in over-all speaker quality. There are some very small speakers that give excellent sound reproduction. Some eight-inch speakers sound better and out-perform some twelve-inch speakers. Speaker size relates only to power handling capability. When looking at speakers always look for a heavy frame, a strong magnetic field, a spider or diaphragm-mounted voice coil, and a cone treated for moisture if the speaker is to be used in a moist environment, these features will contribute much to the efficiency and the service life of a speaker. Speaker line cables should be flexible and smooth for easy conduit pulling, and should be designed to operate at the ambient temperature to be encountered in the particular installation. In designing and installing a sound system, the use of components with the best "laboratory-type" specifications is not necessary, but quality components should be selected. In addition to frequency, distortion, and noise considerations, the "regulation" of a power amplifier should be considered. The output voltage of an amplifier with good regulation should not drop more than about 20% from no-load to full load. A drop of 20% in output voltage represents a reduction of about 1.5dB. In a system of multiple speakers, speakers may be switched on and off without providing compensating loads, if the power amplifier has good regulation. There should be no noticeable change in volume as speakers are switched in and out of the system.

Dealing with old vacuum tube amplifiers

Before solid-state sound equipment, those old vacuum tube amplifiers were notorious for poor regulation and an old trick was to use compensating resistors to eliminate objectionable volume changes as speakers were switched. The technician encountering such systems must be aware of seeing some complex switching used to insert and remove compensation and such switching often caused annoying scratches and pops in all speakers tied to the system whenever switching takes place. In some cases you will find a permanent "idling" resistive load across the amplifier's output terminals. This resistor was selected to dissipate about 3 to 5% of the rated amplifier output continuously as heat, which improved regulation. Thus, the amplifier will not be required to operate from no-load to full-load but from a 3 to 5% load to full load. The old vacuum tube amplifiers always regulated poorest at very light loads and component damaging electrical transients are the greatest at light loads. The use of the "idler" resistors did result in better regulation and in some cases increased amplifier component life.

Speaker connections

The proper connection of a speaker load, no matter if it's a single speaker or a number of speakers to a power amplifier, is a major factor in providing good quality sound distribution. Amplifiers employing output transformers have a secondary winding that provides several impedance taps which are labeled in ohms and the most common are 4, 8, 16, 125, 250, and 500 ohms. As we all know, the maximum power transfer occurs when the load is matched to the output impedance, and a common way to connect a speaker to an amplifier is to an output tap of like impedance. When using this method of impedance matching, a speaker with less power handling capability than the output capability of the power amplifier can be damaged or burned out by high volume settings. A speaker should never be connected to an impedance tap of higher value than the speaker impedance, since under these conditions the system will generate frequencies and harmonic distortion due to overloading and impedance mismatching.

Parallel connected speakers

If the power amplifier's load consists of more than one speaker, the speakers would be connected in parallel. Connecting a number of speakers in series will present problems. Individual speaker variations and varying acoustic speaker loading makes it very difficult to calculate sound levels in a series speaker circuit. Since sound power being radiated by each speaker requires a definite voltage drop across each speaker, as an example, the voltage drop across a 16-ohm speaker drawing 10W of audio power would be almost 13V. Connecting speakers in series would require a power amplifier with a constant current output and a varying voltage output. Connecting speakers in parallel requires a power amplifier with essentially constant voltage output and a varying output current. This is why it is more practical as well as economical to use quality power amplifiers with good output voltage regulation, i.e., essentially constant voltage output and varying output current. By using parallel speaker connections we avoid the problem of having one speaker in a series circuit "open" thus causing all other speakers to be inoperative. It is not practical to connect very many parallel speak-

ers at voice-coil impedance to an amplifier output tap. Remembering that the output tap must be equal to or less than the group impedance to avoid distortion, four 16-ohm speakers connected to a 4-ohm tap represents a practical limit of this type of distribution. Five 16-ohm speakers in parallel will have a group impedance of 3.2 ohms and would overload a 4-ohm tap, causing the amplifier to be unable to deliver the rated power output with the minimum distortion inherent in its design.

The market is ripe

Considering the fact that the criteria for good sound system design are documented, there's really no excuse for many of the sound systems we encounter in airports, malls, and sports arenas that are so poorly designed that no one can understand the individual speaking, and any music played sounds bad as well. We can conclude that the designers and installers of such systems didn't bother to use the proper technical approach in their work. An individual with a technical background and the proper motivation could create better systems and make a pretty good living at it.

Intel Science and Engineering Student Project and Survey

ES&T has received the following note and backup from a student participating in the annual Intel Science Scholorship Competition.

"Please participate in this research project — your health may depend on it!"

Abstract of Mr. Giuffrida's Project presented to the Long Island Science Congress.

Are the Reproductive Systems of Electronics Technicians Affected by Radioactive Emissions?

Through an extensive analysis of the {Preliminary}surveys that were completed and returned, there seems to be a connection between the occupation and the reproductive system of the technicians.

I used the Department of Vital Statistics as a basis to be the correlation with my statistics and the United States population. The results turned to to support my hypothesis and show that a technician is more likely to have a female, rather than a male, child.

There are two different types of electronic repair, industrial and consumer. From the gathered surveys, a technician who works with consumer electronics is more likely to have a female than an industrial technician is.

Many of the people who work as technicians have had previous work experience, and some do not. There is a great significance between the people that do and do not: the people who work solely with electronics have more females than males, but the people who have dad other professions will be more likely to have a male child.

This study showed that there is an issue here that needs to be addressed, and that my study did not research the chemical aspect of this discovery. This could have been an extremely large coincidence, but from the 400 mailed surveys and the 322 replies, my hypothesis can be more than proved. I am in the process of searching for a professor at a respectable university to further my research into the sole reason for this disparity.

The Bureau of Vital Statistics showed that there was a 105:100 birth ratio of males to females, during the time period of 1960 through 1985. My survey results show that there exists a 3:1 birth ratio of females to males (among technicians families). So, between these two statistics, a clear differential can be seen.

While investigations by both the Department of Radiological Health and the National Institute for Occupational Safety and Health are still being conducted, most of these deal with a considerable portion of Cancer-related issues.

Although my statistics are from a limited range, I feel from my study that there is a definite environmental issue or even hazard, which needs to be both further investigated and dealt with.

The survey is simple and we encourage your participation.

"My name is Louis Giuffrida, I am a student at Bethpage High School, Bethpage, NY.

I am conducting a research survey for 2001 Intel Science and Engineering Fair.

This study examines the effect of elf/emf radiation upon the reproductive system of electronics technicians.

My results so far show that the current population of Electronic Technicians DO HAVE a high percentage of female offspring -vs.- the general population.

This research project is a finalist in the 2000 Long Island Science Congress.

Please participate in the survey found on our website: www.voltagebabies.com.

Your contribution is greatly appreciated.

Louis Giuffrida
Cranium11@yahoo.com"

THE SURVEY
located at www.voltagebabies.com.

1. **What is your gender? Male Female**
2. **What is your age?**
3. **Have you ever worked in any other field(s) besides electronics? Yes NO -if yes please state in provided box below-**
4. **List the birth year and gender of your children? (I.e. + 1980, female)**
5. **Do you work with Consumer or Industrial**
6. **At what age did you start working with electronics? (this date can be as a hobby, before employment)**
7. **What is the state (ie: N.Y.) in which you did the longest period of electronics service?**

Thank You again for your contribution

VIDEO PROBLEMS WITH ZENITH'S NEW "RAINFOREST" IC

by Bob Rose

I believe it was Matsushita, now Panasonic Services Company, that came up with the designation "jungle IC" to describe the multifunction integrated circuit that stood at the heart of their solid-state televisions. Since a jungle is such a complex ecological system, the "jungle IC" nomenclature was supposed to convey the complexity of the chip. Because the term was already in use, Zenith, among other manufacturers, chose the designation "rainforest IC." Whatever you choose to call it, the name can't quite encompass all the jobs such ICs perform. For example, they process audio and video, develop horizontal and vertical drive, integrate on screen display information with the video, develop red, green, and blue drive, and control contrast, brightness, color, tint, and sharpness. Even though this list of functions is daunting, it by no means exhausts the tasks these ICs perform. They are truly an engineering marvel.

In this article I will focus on certain video problems that Zenith's rainforest IC causes. To make the discussion more concrete, I will refer specifically to Zenith's model number A27A74R, a television that belongs to the A-Line GA-3 category (Sam's Photofact number 4223). But any model in any of Zenith's various lines that uses the IC in question could develop the set of problems that prompted me to write this article.

I suspect that the problems I am about to discuss also plague the products of other manufacturers, but it is a suspicion I have not been able to confirm. Well, there has been one exception. In a few paragraphs, I will talk about how Zenith's new tuner is able to cause a no-raster and no-video condition. I have found that the same phenomenon can occur in the new Sanyo products. I serviced one not long ago that had those symptoms. Acting on my Zenith experience, I removed the tuner and got a rush of sound from the speakers and snow in the raster. But there was a difference. Instead of pulling the clock and data lines low, the defective Sanyo tuner pulled the +9V line low, creating the same group of symptoms.

The Rainforest IC

The chip in question bears the designation TA1268N (Zenith part number 221-01165). Zenith's engineers describe it as "an integrated circuit I2C bus controlled NTSC" component. A very complicated product; it is the heart of the video processing circuit. Depending on where you buy it, the cost of the chip varies from a little less than $13.00 to more than $20.00. It looks as if the price of the chip depends on its availability. The law of supply and demand strikes again! To compound the problem of cost, I must report that I know of no generic replacement. If you do, would you be kind enough to let me know?

How it works

The Rainforest IC, and some of its connected components, are shown in Figure 1.

Video IF enters the chip at pins 7 and 8, is processed, exits at pin 47, and reenters at pin 37. Auxiliary video from the jack pack appears at pin 39. Please note that the chip internally switches between tuner and external video. The selected video exits at pin 41 where it is processed by transistor Q2201 and DL2200 and their associated components to separate luminance from chrominance. Luma (the "Y" portion of the video signal) goes back into the chip at pin 43 while chroma (the part of the video signal that contains the color information) enters at pin 45. OSD (on screen data) from the microcontroller enters at pins 15, 16, and 17. The "finished" red, green, and blue signals exit at pins 19, 20, and 21 on their way to the video output module, which is mounted on the picture tube. The 4.5MHZ audio IF signal is extracted from the video signal by filter U1200 and coupled to pin 52 of the chip where it is processed to extract audio information. Note that the detector coil (L1205) is connected to pin 4. Composite audio leaves the chip at pin 2 on its way to the audio circuitry, which in this case produces MTS sound.

"To compound the problem of cost, I must report that I know of no generic replacement. If you do, would you be kind enough to let me know?"

Make a note of the fact that this IC is in a "slave" relationship to the system microprocessor. It receives all of its instructions via the I2C bus, and if something interferes with the I2C bus, the chip simply won't function. More about this later on. For now, however, let's assume you want to adjust the pictureís brightness and contrast. You call up the video menu and give the microcontroller a command to increase both of these parameters. The microcontroller receives the instructions and relays them via the serial bus to the TA1268N. The chip responds by adjusting its internal circuitry to accommodate the new requests, and as a result the contrast and brightness of the picture are increased. The entire exercise takes place in about the amount time I need to snap my fingers.

Troubleshooting the chip

The literature says that troubleshooting the chip (designated as ICX2200 in Zenith's literature) is straightforward and instructs the technician to look for these key signals:

- selected (or switched) video out to the microcontroller at pin 47,
- IF coming from the tuner at pins 7 and 8,
- tuner composite video at pin 37,
- luminance in at pin 43,
- chroma in at pin 45,
- composite audio out at pin 2,
- horizontal drive out at pin 32,
- vertical drive out at pin 24,
- blue video out at pin 3 of connector 2C5,
- green video out at pin 2 connector 2C5,
- red video out at pin 1 of connector 2C5,
- +9 volts (B+) at pins 9, 23, 46, and 48, and
- clock and serial data at pins 27 and 28 respectively.

Problems not related to the Rainforest IC

Now a word to the wise; if you have a problem with the video circuits in one of these sets, don't automatically assume that ICX2200 is the culprit. A friend called the other day and asked for the part number of the chip. Acting on a hunch, I asked him what kind of problem he faced. He said, "Well, I've got no audio and a black screen. Absolutely no video. By the way, the menu functions still work." I said, "Unsolder the tuner and see what happens." He called back a few minutes later and reported that with the tuner removed from the circuit he had a rush of white noise in the speakers and a raster filled with snow. He didn't need the IC, but he did need the tuner.

You may be wondering why a defect in the tuner has such a profound affect on the TV. Remember I pointed out that ICX2200 is configured as a slave. If it doesn't receive instructions from the master chip (the microprocessor), it just won't work. If my friend had used his scope and checked the clock and data lines either at the tuner or at the IC, he would have found them considerably below the 5VPP level that the system requires. You see, the tuner controller chip had shorted and pulled those lines low. It was a case of the tuner causing the system to malfunction by pulling the I2C communication bus lines low.

I really must emphasize the fact that both clock and data lines have to be at the 5V level. I have seen at least one instance in which the data line was low while the clock was high. The result was good audio but no video. So, be absolutely certain that you scope both lines. By the way, I make certain that I have several tuners in stock at all times, especially in the storm season.

The tuner in question is 175-2721. I used to buy them from Zenith for less than $30.00. The last batch I ordered was over $35.00 each. You might like to know that Zenith has also changed manufacturers. L. G. Electronics made the last batch I ordered. When you install one of them, you must make certain modifications to the control circuit, or the new L. G. Electronics tuner won't work. Fortunately, the instructions for the modification come with the tuner.

Three unusual problems

The above discussion takes care of the usual stuff. Shall we turn our attention to three unusual problems?

No audio and no video, but menu works.

Yes, I know I just discussed this set of symptoms. I propose to confuse you by pointing out that the rainforest IC itself can also cause them. The "trick" to determine where the problem lies is to unsolder the tuner and see if you get a rush of white noise in the speaker and snow in the raster. If you don't, check the clock and data lines with a scope. If the lines are low when the tuner is out of circuit, wick out pins 27 and 28 of ICX2200 and see if clock and data pulses climb to a 5-volt level. If they do, change the chip.

Washed out picture

I don't know of a better way to describe the picture than to use the phase washed out. Contrast and brightness-especially contrast-have no effect on the picture regardless of how you set them.

Begin by checking pins 36 (ABL or automatic brightness limiter) and 38 (ACL or automatic contrast limiter) for approximately 3V each. If the voltage is considerably below the 3V level, wick out both pins and check them (the pins, not the pads) again. If the voltage rises, suspect an external component or components, like D2202, D2203, Q2209, Q2210, or an associated capacitor. If the voltages stay the same-and they probably will, change the chip.

By the way, you can confirm the solution by applying 3V from an external power supply to the circuit. When you do, the picture clears up as if my magic. However, change the chip if you want to fix the circuit.

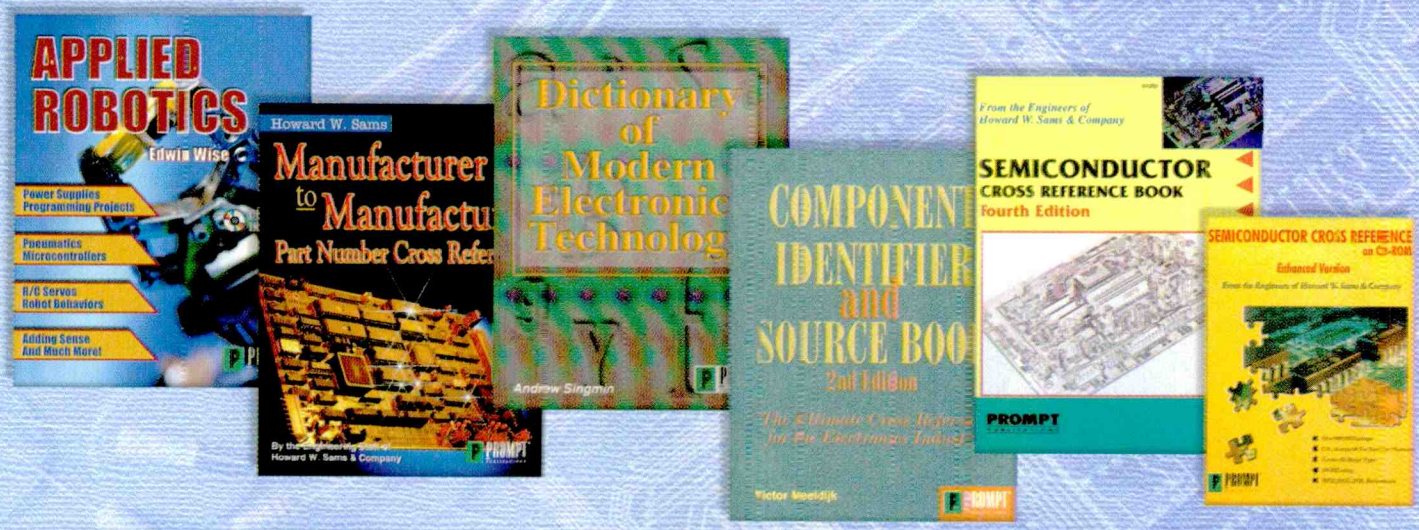
Black raster, audio good, and menu functions okay

Turn up the G2 voltage to see if you have any sign of video. If you don't, measure the voltage on pins 36 and 38. If it is close to 0V, and it probably will be, wick out pins 36 and 38 to see if the voltage rises. If it does, suspect a shorted external component. If the voltage doesn't rise but stays the same, change the chip. In the set I fixed, the voltage did rise when the pins were separated from the circuit board. I found that Q2210 had shorted collector to emitter, pulling both lines low. When I replaced it with a universal replacement, the set returned to proper operation.

If a picture does appear, it will have a washed out look as if it has no contrast. I just serviced a Zenith that had just such a set of symptoms. Pin 36 of ICX2200 had about 3 volts on it while pin 38 had just above 1V on it. I noticed no change in voltage when I wicked pin 38 out. A new chip brought the TV to life again.

I have had occasion to chat with a Zenith engineer since my discoveries. He verified what I had begun to suspect, that the TA1268N is susceptible to the kind of zaps that power surges and lightning cause. I won't say that the problems I have discussed (with the exception of the tuner problem) are common. I do tell you that I have placed two TA1268N's in permanent parts inventory.

ES&T BOOK SHOP



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A hands-on introduction to the field of robotics, this book will guide the hobbyist through the issues and challenges of building a working robot. Each chapter builds upon the previous one, extending a core robot project throughout the book. Examples of chapters include: Mechanical Platforms, Power Supplies, Adding Sense, Microcontrollers, Insect Robots, Pneumatics, More Behavior and Intelligence, Programming Projects, Robot Behaviors, and much more.

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New Products

Oscilloscope/Multimeter

Extech's New Mini MultiScope II, Model 381265, combines a handheld Graphical Oscilloscope with a True RMS MultiMeter. The dual mode display (2.8x1.5") includes a Graphical display

for observing actual voltage and current waveforms an Numeric display with 3-3/4 digit resolution and analog bargraph. The tester features a dc to 100kHz oscilloscope with a sample rate of 1 million samples/second and 500ns glitch capture. An adjustable trigger level and slope allows the user to observe more complex waveforms. Up to 15 waveforms can be stored. MultiMeter functions include True rms ac voltage and current, dc resistance, capacitance, frequency, diode and continuity tests. A Comparator function with user defined MIN/MAX levels allows the user to perform HIGH/LOW/PASS tests in voltage, current, resistance, and capacitance. Features include Record/Recall of MIN/MAX/AVERAGE with time stamping. A Generator output provides 10Hz to 20kHz logic Level Output.

Complete with holster, built-in stand, fuses, test leads, alligator clips and 6AA batteries, Model 381265. Dimensions: 3.6 x 7.4 x2.2" (92 x 189 x 55mm). Price: $249. Delivery from stock.

Extech Instruments Corporation
Circle (17) on Reply Card

Remote/network Cable Analyzer

BK Precision announces the addition of the Model 240 Remote Network Cable Analyzer and Model 240P Probe to its line of cable testers. The Model 240 is a small hand-held tester which enables the user to quickly read the status of the Ethernet twisted pair cables. When used in conjunction with the tone generator function, the probe can trace cables and locate faults, even when cables are in a bundle or hidden in a mess of punch down blocks or wall plates.

The product is a small hand-held tester which enables the user to quickly read the status of Ethernet twisted pair cables. It tests for faults such as open circuits, shorts, crossed pairs, reversed pairs and split pairs, in unit's tone generator feature can be used to trace installed cables and locate areas of discontinuity.

B+K Precision Corporation
Circle (18) on Reply Card

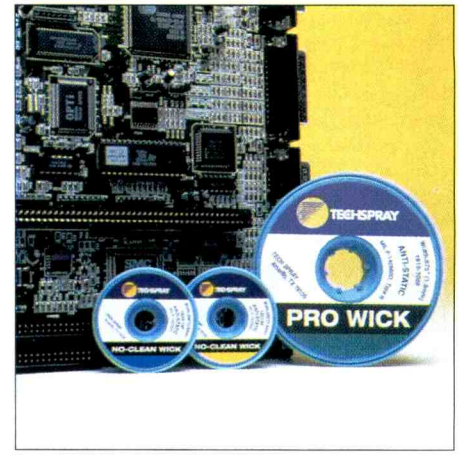
Precision multimeter

Extech Instruments introduces the new MultiMaster Series of precision True RMS multimeters for the most demanding applications. Model MM570 provides basic accuracy of 0..2% and resolution to 0.0001mV. The backlit LCD with bargraph displays 500,000 counts for dcV and Hz and 50,00 counts for other functions. Measurements functions include ac/dc voltage and current, resistance, frequency, duty cycle, and capacitance. Dual Type K temperature inputs are displayed as T1, T2, and T1-T2 in F or C. Advanced features include ac+dc measurements, 100kHz ac bandwidth, True RMS, RS232 PC interface, 4-20mA process measurements displayed as 0-100%, Max/Min recording with autoranging, dBM measurements with 20 selectable impedances, peak capture of transient pulses, Relative, and Hold. Optional Windows 95/98 compatible PC communication software and optically isolated cable are available for data collection. 1000V input protection on all functions. UL listed. Meets CAT III - 1000V. Complete with CAT test leads, Type K thermocouple probe, Heavy-duty protective holster, and 9V battery.

Extech Instruments Corporation
Circle (19) on Reply Card

ESD-safe packing for desoldering braid

Techspray introduces ESD-Safe, static dissipative, oversized bobbins for its Pro Wick, No-Clean Wick, and Unfluxed



Wick desoldering braid product lines. Added to the 5' and 10' sizes are new 50', 100' and 500' lengths. Designed with an advanced braid design and proprietary flux technology,. The company's entire range of desoldering braid is now available in ESD-SAFE packaging. The manufacturer's desoldering braid is vacuum packed for protection against humidity extending shelf life.

Techspray
Circle (20) on Reply Card

New Products

Hot air Tool Kit

A new hot air tool kit especially designed for applying heat shrinkable tubing and solder sleeves is being introduced by Heatgunkit.com, a division of Malcom Company.

The HGK102 Shrinking and Soldering

Kit features the Weldy Plus hot air tool which provides 7 programmable functions, a digital readout to monitor temperature and help users conform to ISO requirements, and a built-in stand. Supplied with tow specialty tubing, a selection of solder sleeves, a heat gun handbook and user manual, and a carrying case.

Ideal for contract manufacturing, assembly, and field service operations, the unit operates over a 175F to 1200F range and provides 21 CFM air flow. Applications for this kit include all types of heat shrinkable wire markers, shrink tapes, cable and connector boots, and related products.

Venmark International
Circle (21) on Reply Card

Pulse Generation

Global Specialists introduces a new 10MHz pulse generator.

Model 4010 offers low rise/fall time pulse signals at a high rep rate of up to 10MHz to meet today's higher frequency test and measurement applications.

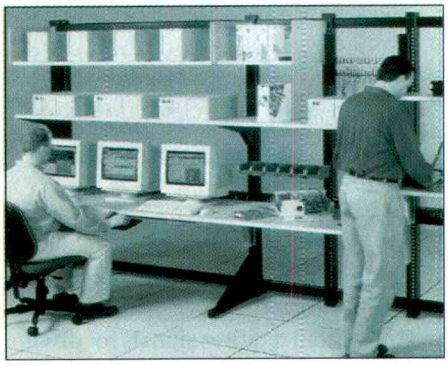
The unit features a wide pulse rate (1Hz to 10MHz) a fast pulse rate (up to

10MHz), 7 crystal derived spot frequencies, low rise and fall time (<10ns), A manual triggering facility and pulse width control in 5 decade ranges with variable adjust.

The generator also features a normal/inverted output polarity push button switch, special sync output, an easy to use front panel layout and is housed in a rugged material case with adjustable handle.

Global Specialists
Circle (22) on Reply Card

Technical Furniture



A new, open-architecture furniture systems for laboratory, assembly, and network applications that can be configured to exact user requirements, including power and cable management, and is fully adaptable to change is being introduced.

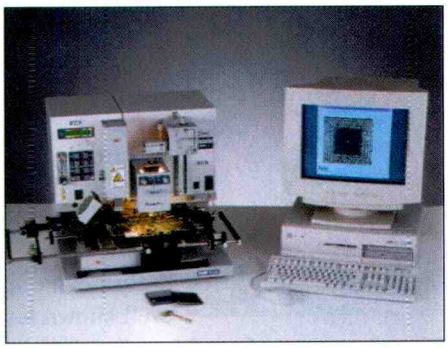
APW-Wright Line LMS Foundations is constructed from heavy-duty 12-gauge steel with an ESD-safe black epoxy powder-coated finish, and features over 1,00 components for custom configuring continuous work-surfaces: even around corners. Easily adapting to changes in personnel, technology, equipment, and space requirements, this open-architecture furniture system incorporates complete power and cable management ducts.

Providing a versatile solution to ever-changing technological environments, the furniture allows for the unlimited expansion and continuity of worksurfaces, shelves, and cable management without gaps. The open-frame design offers quick access to equipment while facilitating communications between workers and enhancing tam-sharing applications.

Venmark International
Circle (23) on Reply Card

BGA/CSP rework and repair equipment

Pace introduces the ThermoFlo 2000 BGA/CSP rework and repair equipment. The unit is use bus for post assembly rework and repair operations. Featuring an advanced vision overlay system, the product can accurately place area array devices with solder ball diameters as small a 4 mils. The microprocessor controlled reflow station ensures process repeatability. The 400W pre-heater and 1000W top heater coupled with the nozzle design ensures successful reflow and even heating. Thermo-sensor monitoring and the optionalPC software interface delivers full process control and allows



for highly accurate profile creation.

Unit is self-contained, eliminating the need for external air supply of vacuum connections. The TF 2000 can store and recall up to 40 profiles at the touch of a button, or an infinite number of profiles can be managed using the PC software.

For more information or a free demonstration, contact PACE by telephone at 888-535-PACE (7223), by fax at 301-604-8782, or contact your local authorized PACE distributor. For a closer look at PACE products, visit our website at www.paceworldwide.com.

PACE, Inc.
Circle (24) on Reply Card

New Products

Revised Repair and Rework Manual

Circuit Technology Center has extensively revised its popular circuit board repair and rework manual, CRC-20, "Printed Circuit Board Repair and Rework, Revision G." The procedures in this 227-page guidebook fully comply with IPC standards and have been used for years to repair circuit boards for thousands of companies around the world.

The new revision contains 8 new graphically illustrated, step-by-step procedures, bring the total to 89 procedures. Some of the new procedures include the following: profile development of BGA components, BGA pad and via repair, gull wing component modifications, chip component modifications, and a great deal more.

The new revision of the guidebook can be purchased for $79.00 or it can be free of charge at http://www.circuittechc-tr.com/guides/guides.htm.

Martel
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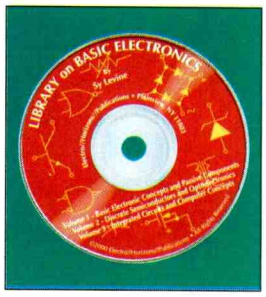
Basic electronics CD-ROM



Sy Levine's three-volume "A Library on Basic Electronics" is now available on one CD-ROM.

Sy Levine is well known for his many years of seminar presentations "From Ohm's Law to Microprocessors" which have been attended by electronic distribution, sales, marketing, advertising personnel, mechanical, chemical, and industrial engineers, and other members of the electronics community throughout the world.

"The CD-ROM Library strengthens your knowledge of basic electronic concepts and terminology, components, circuits, system, and much more" says Sy Levine.

The single CD-ROM Library includes:

Volume One - Basic Electronic Concepts and Passive Components,

Volume Two - Discrete Semiconductors and Optoelectronics, and Volume Three - Integrated Circuits and Computer Concepts.

The CD-ROM Library works with Windows 95, 98, 2000, and NT, and can be operated from the CD-ROM drive or from your hard drive. Its feature include: Hypertext capability, easy access to specific technical descriptions, definitions and related information, plus, "Highlight, Print, and Copy" capability, and Bookmarking.

Mainly Marketing Enterprises, Inc.
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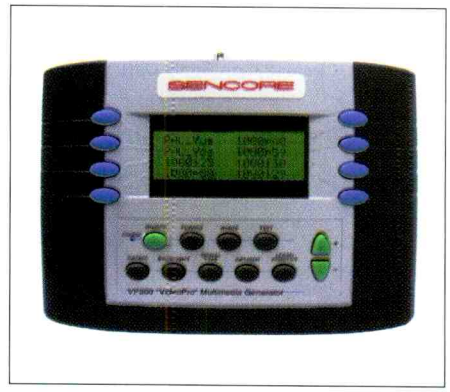
Video Pro Multimedia Generator

Until today finding signal sources for aligning a home theater display was a complicated task.



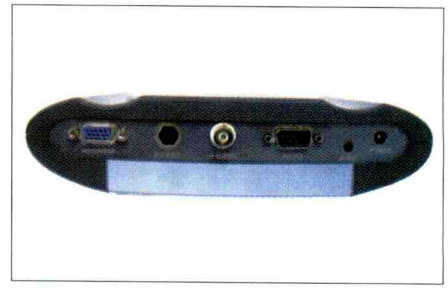
Each install requires signals for driving the display's HDTV, NTSC and Computer modes. But, until now, there wasn't one tool that provided everything you need for these required alignments. So you carried around a DVD player, tried to capture off air signals or just passed up the HD alignments because no signals existed.

Today your signal source dilemma is over. The VP300 'Video Pro' Multimedia Generator provides everything you need for fast and accurate alignment of each video mode.

The VP300 'Video Pro' is the only HDTV, NTSC and Computer Display video source you need for home theater installation, alignment and calibration. The 'Video Pro' provides the patterns you need for black level, white balance, focus and convergence alignment in all of the display's operating modes. The 'Video Pro' is portable, lightweight and battery operated (8 hours on one charge) so it goes wherever you go, ready whenever you need a reliable video signal source.

VP300 'Video Pro' Features:

- All ATSC HDTV and Standard Definition Formats (1080i, 720p, etc.)
- Component Video (YPbPr) and RGB Video Output



- Composite and S-Video NTSC/PAL Outputs
- Monitor Output (SVGA, XGA, etc.)
- Setup and Alignment Test Patterns
- Handheld, Portable, Battery Operated (8 hours on one charge)
- Tri-Level Sync (ATSC requirement)

Sencore Inc.
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ES&T Help Line

I am looking for help on a RCA CTC169 Chassis...ES&T ran the ProFax schematic but I need some troubleshooting help. Can anyone help?
Clay
614-476-0396
lilelectrnxsht@yahoo.com

I cannot find any information on contacting Garard. Can you help
ES&T:
ES&T Response: We found the organization that now handles questions on Bic-Garard. It is South Street Service at 516-922-0358.

We are looking for a MOV (Metal Oxide Varister) Index...The best way to troubleshoot a MOV. Can ES&T audience help?
Joseph Schmitt
Schmitt TV Service
812-985-2377

Literature

Tool and Toolkit Catalog

Jensen Tools, has released their all-new, 300-page Master Sourcebook for Fall 2000. This full color catalog contains thousands of products from leading manufacturers, including many items that are new to the industry.

The new sourcebook features an extensive selection of tool kits, cases and carts, test equipment, hand, power and specialty tools, wire and cable, soldering equipment, computer and LAN products, wire and cable, telecom test equipment,

soldering products, workstations, shop supplies, storage and handling equipment, lighting and optical products, field accessories, and more. Jensen offers a wide variety of JTK original tool kits for professional field service technicians. Custom kits and cases are also available.

Jensen Tools Inc.
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Installation, maintenance and repair catalog

Specialized Products, an international supplier of tools, tool kits, cases and test equipment, has added over two hunded new items to its comprehensive Fall 2000 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 and Medical Electronic industries. Also, peel-n-stick bookmark tabs have been included 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 a large selection of instrument/shipping cases. LAN test equipment choices include analyzers, Category 5 testers, and continuity testers. The telecom selection includes bit error rate testers, digit grabbers, digital butt sets and transmission test sets. For fiber optic installation, maintenance and test equipment, choose from cleavers, light sources, optical time domain reflectometers, power meters, strippers and more.

Any standard tool kit may be modified to suit a customer's specific application or budget. For more unique requirements, custom too kits can be built from scratch to exacting specifications.

Specialized Products Company
Circle (29) on Reply Card

NEW WEBSITE

Home wiring website

Jensen Tools, has just launched www.jensenhomewiring.com. This new site, designed to meet the needs of home wiring professionals, features tools, testers and accessories for the installation, maintenance and repair of LAN, telephone and CATV/satellite/audio systems.

Some of the many new products featured on the site include the 3001 Portable Audio Frequency Generator and the Handheld TV Pattern Generator from BK Precision, the UniHomeBox All-in-one Home Networking System, and the Satcom Digital Satellite Seeker. In addition to this, you'll find Jensen's own JTM handheld meters, our new Tone Generator/Tracer Kit, and plenty of great tools! The site also includes many other resources such as white papers, "how to" instructions, installation techniques and other information from products manufacturers.

Jensenhomewiring.com has all of the same attributes of the other Jensen Tools websites: free technical support; online technical documents; a 24 hour/7 day FaxBack Service; secure online ordering; and flexible shipping options - plus a UPS tracking feature that allows customers to check the status of shipments.

To learn more,
www.Jensenhomewiring.com.

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Literature

Pocket guide to Fiber Optic Testing

Fotec has just published a new pocket-sized Fiber Optic Testing Guide. This guide covers how to test fiber optic jumper cables, installed cable plants and fiber optic transceivers. It also includes conversion charts for dB to watts and dB to percent power lost, as well as hints on how to perform tests properly.

Fotec
Circle (32) on Reply Card

Workbench Systems Brochure

Anew brochure describing a wide range of stationary and mobile workbenches that can be custom configured from standard components for many applications is being offered by APW-Wright Line.

The TechOrganizer and TechBench Brochure describes this technical bench system and fully-welded frame storage system that can be configured from over 1,000 components to meet current and future workspace requirements. Featured are a line of stationary and mobile ergonomic workbenches that are designed to optimize individual workspaces and valuable floor space, while providing the flexibility necessary to adapt to change and growth. Developed for manufacturing-, assembly-, and test environments, workbench systems described in the 6-page full-color brochure are rugged and ergonomically correct. They incorporate shelves, drawers, adjustability, cable management, and other features designed to improve worker comfort, reduce fatigue, and increase productivity.

Venmark International
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Binder of information on power and high-frequency magnetics

Signal Transformer Co. has released a comprehensive and informative binder containing information on power and high- frequency magnetics. Included in the binder are application notes, technical articles, and brochures on standard off-the-shelf products, modified standard platforms, and custom designs to meet specific applications.

Signal has divided the binder into eight distinct tabbed sections. The Off-The-Shelf section contains specifications, outline drawings, and electrical schematics on more than 1,000 transformers. A section is also devoted to Custom Power, describing the company's custom design capabilities as well as containing a custom magnetic design data sheet. Signal's unique planar design for high frequency applications is explained in a series of application notes contained in another section.

For specific requirements, a section of the binder is devoted to Application Notes. The section has a series of informative tutorials on switch-mode power supplies, medical electronic systems, the safety of electronic systems, and international standards. Reprints of articles from leading electronic trade publications are also contained in the binder. A wall chart outlining the international single-phase and frequency standards is included in the binder as well.

Some material in the binder can be downloaded from Signal's website, as can updates and new literature when they become available. The website address is www.signaltransformer.com.

Signal Transformer
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Editorial Contact: Nils Conrad Persson, 913-492-4857, cpersedit@aol.com.

Books

The Technician's EMI Handbook

Clues and Solutions
by Joseph J. Carr
Newnes
An imprint of Butterworth-Heinemann

This book is a hands-on guide to finding the sources of electromagnetic interference and then fixing the problems. It includes basic theory of EMI as well as detailed explanations of why this problem is becoming more serious as the international scope of the communications and electronics industries grow. This book is not a textbook, but rather a handbook that will become a constant source of reference for anyone who runs into trouble with EMI.

Includes chapters on grounding, circuit shielding and filtering, preventing EMI in circuit design, as well as EMI sources such as power lines, transmitters, television, consumer electronics, telephones, automobiles, and the ever-frustrating mystery EMI.

Contents: Introduction; the EMI Problem; Electrical and Electromagnetic Fundamentals; Fundamentals of Electromagnetic Interference; Grounding Methods for RF Systems; Shielding Electronic Circuits; Filtering Electronic Circuits; AC Power Line and Electrical Device EMI; Controlling Transmitter Spurious Emissions; Telephones and EMI; Noise Cancellation Bridges ;Locating EMI Sources; EMI to Television, Cable TV and VCR Equipment; EMI to Consumer Electronics; EMI From Computers; Mystery EMI, Rusty Downspouts and All That; Radio Receiver Basics; Dealing with Radio Receiver System EMI; Electrostatic Discharge-(ESD);Regulatory Issues.

Readership: Technicians; anyone who works in the wireless communications market as well as people in the maintenance and installation of satellite, telecommunications, and electronics systems ISBN: 0 7506 7233 1 Paperback Line Illustrations: 222 line drawings

Measurements: 7 x 9.25 In.
Pages: 256pp
Price: $34.95
Butterworth-Heinemann
225 Wildwood Avenue
Woburn, MA 01801, USA
Phone: 800-366-2665
Fax: 800-446-6520

Multifunction Peripherals for PCs

Technology, Troubleshooting and Repair
By Marvin Hobbs
Newnes
An imprint of Butterworth Heinemann

Multifunction devices combine the essentials of a fax machine, printer, scanner, and copier into one peripheral for small and home offices. As the market for this equipment grows, the need for skilled repair and maintenance increases. Unfortunately the service documentation supplied by the manufacturers is completely inadequate making the repair jobs even harder and more expensive. Marvin Hobbs teaches you how multifunction peripherals work in theory and in practice with lots of hands-on examples and important troubleshooting and repair tips you don't want to miss.

This book fills a gap in the literature, and will be a welcome addition to the library of any technician or do-it-yourselfer.

Contents: Introduction; Diagnostics and Maintenance; Ink Jet Printers in MFD Machines; Laser and LED Printers in MFD Machines; Thermal Printers; Scanners; The Fax Function; PC Software for Printer Control; Standards and Protocol; Consumables; Glossary; Abbreviations; References Readership: Electronics technicians, students, home repair hobbyists ISBN: 0 7506 7125 4 Paperback Line Illustrations: 231 figures; Halftones: 4

Measurements: 7 x 10 In.
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Beginning Digital Electronics through Projects

by Andrew Singmin
Newnes
An imprint of Butterworth Heinemann

Beginning Digital Electronics Through Projects provides practical exercises, building techniques, and ideas for over thirty-five useful digital projects. Some digital logic knowledge is necessary, but the theory is limited to "need-to-know" information that will allow you to get started right away without complex math. Many components in this text are common to either analog or digital electronics, and beginners or hobbyists making their start here will find and overview of commonly used components and their functions described in everyday terms.

Each of the projects builds on the theory and component knowledge developed in earlier chapters, establishing progressively more ambitious goals.

Step-by-step learning instructions help you determine the best ways of working with such projects as Schmitt Trigger Circuits, Versatile ICs, Digital Support Circuits, and much more. Two interesting wireless projects (an FM receiver and an FM transmitter) bring the final chapters of this book to a close.

Contents: Quick review of analog circuit fundamentals; Value and application of analog circuits; Introduction to the basic philosophy of digital circuits; Value and application of digital circuits; Logic gates; Test equipment; TTL digital circuits; Power supply requirements; Truth tables for common building block gates; Digital sources and detectors; High-low state displays; Variable rate low speed pulser; Pulse speed reducer; Threshold level detector; Hi-low trip detector; Pulse stretcher; DC level shifter; Schmitt trigger circuits; Digital pulse train Schmitt oscillator; Power turn-off delay Schmitt; Power turn-on delay Schmitt; Triangle wave Schmitt generator; Schmitt switch debouncer; Digital IC build applications; LS 122 monostable for accurate pulse width generation; LS 75 quad latch for capturing pulse transient events; CD 4072 quad OR gate in a multi-input switching environment; TTL relay driver; Special power supply circuits; RF oscillator stable 6 volt supply; stable IC 5 volt source; IC bridge diode protector; Battery or adapter power supply; Jack socket tutorial; Meter overload protector; Simple 5 volt zener supply; Single chip FM receiver using the TDA 7000 IC; Low power

Books

FM transmitter; Plus much more.

Readership: beginning electronics hobbyists or students who want to gain a practical introduction to digital circuits.

ISBN: 0 7506 7269 2; Softcover
Measurements: 6 x 9.25 In.
Pages: 136pp
Approximate Publication Date: Friday, December 15, 2000
Price: $19.95
Butterworth-Heinemann
225 Wildwood Avenue
Woburn, MA 01801, USA
Phone: 800-366-2665
Fax: 800-446-6520

Microprocessors and Microcomputers: Hardware and Software

Ronald J. Tocci, Monroe Community College
Frank J. Ambrosio, Monroe Community College

Prentice Hall
Copyright 2000, 591 pp.
Cloth format
ISBN 0-13-010494-9

Summary

For introductory microprocessors and/or microcomputers courses that do not teach a specific chip, but instead teach generic concepts. The course may be found in departments of electronics technology, electrical engineering technology, computer engineering technology and computer science programs. Using the popular, powerful, and easy-to-understand 68HC11 microprocessor as a representative example, this text provides a comprehensive introduction to the concepts, principles, and techniques of microprocessors and microprocessor based systems.

Features

• NEW-Substantial, in-depth coverage of troubleshooting. o Equips students with the basic principles and techniques involved in troubleshooting digital systems- throughout the text, in case studies, and in end-of-chapter questions and problems.

• A comprehensive review of digital principles and circuits-Prior to discussion of microcomputers and microprocessors. Clarifies material for those with minimal background in digital electronics or those needing a refresher.

• Immediate practical application of the principles, ideas, and techniques presented. Includes over 400 chapter-end problems of varying complexity-many with answers in the back of the text.

• Extensive use of illustrative examples, uncluttered diagrams, and flowcharts. Helps to make difficult concepts more understandable for the beginning student.

• Chapter-end glossaries. Familiarizes students with the language of microprocessors to increase their levels of success in the course and on the job.

• A detailed description of each of the 68HC11's available instructions. This extensive appendix provides students with a convenient reference tool.

Table Of Contents

1. Number Systems and Codes.
2. Digital Circuits.
3. Memory Devices.

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781-433-1500
www.comdex.com

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January 6 through January 9, 2001 Las Vegas Convention and Las Vegas Hilton, Alexis Park and Riviera, Las Vegas, NV
Consumer Electronics Association
2500 Wilson Blvd, Arlington, VA 22201-3834
703-907-7605
www.ce.org

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Electronic Distribution Show Corp
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www.edsc.org

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www.nesda.com

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www.cedia.org

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4. Introduction to Computers.
5. Microcomputer Structure and Operation.
6. The Microprocessor: Heart of the Microcomputer.
7. Programming the 68HC11 MPU.
8. Input/Output Modes.
9. Input/Output Interfacing.

Appendixes.

Prentice Hall Publishing Company
One Lake Street
Upper Saddle River, NJ 07458
(973) 236-7825

Programmable Controllers Using the Allen Bradley SLC-500 Family,

David A. Geller, Oakton Community College
Prentice Hall
Copyright 2000, 336 pp.
Cloth format

ISBN 0-13-096208-2

Summary

For courses in Programmable Controllers and Microcontrollers. Using examples of real-world control system problems and sample programs, this text presents a comprehensive study of PLC use in the design of automation equipment. In addition to explanations of programmable controllers, hardware and software, it concentrates on the machine design process and the team approach used in most companies today.

Features

• Real-world control system problems and sample programs. Shows students how to design safe, reliable and efficient programs.

• In-depth explanation of the SLC 500 PLC controller system and its programming language-Assumes a basic background in Electricity but no prior experience in PLC systems. Familiarizes students with the popular Allen-Bradley SLC-500 PLC while providing a comprehensive study of programmable controllers.

• Practical applications. Bridges the gap between educational theory and the reality of the industrial workplace.

• Programming instruction-In-depth coverage of topics such as timers & counters is accompanied by examples of their use in a real-world application. Illustrates the relevance for the workplace and reinforces the concepts.

• Diagnostic programs and display systems-For monitoring the control program and help to reduce down time. Fits in with the immediate needs of the industrial sector for production efficiencies.

• Chapter-ending review questions. Reinforce the basic material presented in each chapter.

Prentice Hall Publishing Company
One Lake Street
Upper Saddle River, NJ 07458
(973) 236-7825

Guide to Webcams

By: Jason Byrne & John Breeden
ISBN #: 0-7906-1220-8
304 Pages
$29.95
Sams Technical Publishing

Want to talk face-to-face with your relatives in Rhode Island while sitting in front or your computer in California? How about checking in on your kids at the daycare center from your laptop? Or does your business need a new way to market its products and services on the Web? You can do all these things-and many more-with a webcam. Digital video cameras, or webcams, have become an increasingly popular method of communicating across the Internet, and encompass a growing number of useful applications. Guide to Webcams is written as a definitive introduction to this exciting technology.

Like computers, webcams are simply tools, and this book will ensure you use the right tools for the job. You'll learn how to recognize the different types of cams and the merits of each. You'll also learn how to choose the best computer to run your webcam application, set up the necessary software, connect to the Internet, and even design your webcam web site. Guide to Webcams covers it all. There are also sections on:

• Video e-mail
• Special cams
• Streaming video
• Internet video conferencing
• Setting up business web sites
• Security and legal issues

About the Authors: Authors John Breeden and Jason Byrne have worked together as technology reviewers at Government Computer News, a publication owned by The Washington Post. Their writings have been published widely, and they have also appeared on radio and television programs covering various technology issues

Sams Technical Publishing
5436 West 78th Street
Indianapolis, IN 46268
Phone:(800) 428-7267
Fax: (800) 552-3910

Home Automation Basics

By Tom Leonik

Home Automation Basics II

By James Van Laarhoven
Sams Technical Publishing

This new series addresses the increasing desire for the automated home. Home Automation Basics: Using Visual Basics 6 addresses the development of a home monitoring/home automation system using a typical home computer and Visual Basic 6 programming. With this book the reader is able to monitor HVAC systems, temperature, motion and a myriad of other functions within the home. Leonik's applications also extend well into industrial situations. Designed for electronics and computer engineers and hobbyists comfortable with a moderate level of programming skills.

Home Automation Basics II: Lite Touch Systems looks at the award-winning home automation system from LiteTouch (r), which can be found in homes across the country. Van Laarhoven goes into great detail about the system; addressing lighting, audio, installation and programming issues that allow electrical and electronics technicians the ability to get full use out of this system.

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Test Your Electronics Knowledge

Answers to the questions:

1. T = 500 seconds
2. This equation cannot be solved. The denominator is zero.
3. Ripple
4. Low pass filter, voltage controlled oscillator (VCO), and phase detector.
5. 1920's
6. False. To obtain the overall dB gain, add the individual dB gains.
7. True.
8. Brown, Black, Blue.
9. $1.45.
10. The voltage at point X is ñ35.667V.

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ES&T Readers Speakout

6 million% increase in quality over previous issues. Very readable. You want to maintain that readability factor. Some minor spelling/grammar errors, no big deal. I am a beginner and I found articles very helpful about the industry. I usually crave an understanding of how circuits work, not just repair checklists. I would add a very brief section like "How those Engineers get the electron to do those amazing things." J.U.

My ES&T issue of Sept. 2000 was mailed too late (Received on Sept. 18). To repair camcorder needs special tools: Tips for DMM for scopes, soldering irons. Tools for changes surface mount capacitors...Who supplies tools? A.L.

Could use more on proper make up of UTP, STP and fiber optic media. More in depth on PC, Server Systems, Routers, and Switches. And, how software and computer networks are affecting home and office. B.R.M.

Profax: The white background is just to "glaring" white! Please go back to the yellow background! (Increase coverage of) Switching power supplies, VCR servicing (heads). R.C.

Hello, Profax needs to be on heavier grade of paper, like before. Although, I liked the white background compared to the off yellowish brown. Excellent TV tech tips for RCA. Need more tips on TV/VCR combo's power supplies (Funai & Zenith). Thanks. T.E.

How about a "Tips and Tricks" section on servicing VCRs and TVs? Also, Fax machine servicing. R.C.

Sorry to see it change hands. The article on troubleshooting was good. We need more like it. Please keep the Readers' Exchange. We don't need but one issue per year on parts, sources, etc. Also, what happened to our Profax special issue?
Why not publish another magazine for the business part of this field? This has always been the best technical magazine-please don't drift away from it. Thank You. No Name

(Coverage on) Anything on computer monitors, all brands. N.E.D.

More on RCA TV CTC177 on UP. Problem explanation is very good. Thank you. H.T.S.

Good! D.T.A.S.

READER OPINION SURVEY SEPTEMBER 2000 ISSUE

The September issue Reader Opinion Card asked our readers to:

- **Indicate key business or technology topics ES&T should cover, or continue to cover.**
- **Share thoughts about market happenings, events, directions, difficulties and/or opportunities you believe we should address.**
- **And, make comments on this first issue published by Mainly Marketing.**

Here is a sampling of the comments received by press time.

Too many Profax from RCA. What about from Sanyo, Symphonic, Sony? I never see information. for camcorder: parts-tools-all types of supplies. Calendar of Expo. and calendar of events on electronics in Washington D.C. Metropolitan area? A.L.

Projection TV - More schematics, troubleshooting and features on Projection TV's. Bob Rose is a very good technical writer-less typo errors would be nice! This issue was skimpy on paper, it seems thinner. The profax change is for the worse, paper thickness wise. Even the sticky-peel name label is downgraded! You must be trying everything to save nickels. Overall a good value magazine! You've also combined the Reader Service card and the Reader Opinion Survey! T.F.

Please try to get my issue to me earlier in the month. J.A.S.

(Areas to Cover) At-home study courses (D.E.T.C. Accredited). Information on conventions/forums that are coming to the Midwest. More articles on digital TV. This is another excellent issue! D.M.W.

Well balanced. J.T.

I really liked the articles by Bob Rose, "21st Century TVs." The Profax on RCA203 is better than before, but still the print is a little small. I hope to see more current TV diagrams. At the current price of VCR's, I don't think anyone will service them. P.T.
The new graphics and typeface are eye-catching and easy to read. The Profax may require heavier stock to resist wear and yellowing. I'd like to see a series of articles on DVD's: Theory of operation, repair. J.C.M.

I like the new September issue. We need all the articles you can print on past TV problems and dope on new models coming out. We have always got a lot of service help from Bob Rose articles. We want all we can get from him!! Also any other technician writing for your magazine. P.N.

Would like to see this magazine cover some auto electronics, such as auto computers, sensors, scan tools, etc. More electronic equipment in autos every year. This magazine should have an auto electronics section; Theory/Testing etc. No magazine available now covering this. Thanks for listening. I remember PF Reporter very well. A.P.

Would like to see Profax back in heavier stock. No Name

Good articles on servicing TV's. Not much on VCR's though. Nothing on combo's. Combo sales continue to increase. Repairs at my shop on combo units are increasing in volume. As they are also increasingly more complicated, some articles on Syscon problems or an article on how TVs & VCRs interact would be very helpful. N.T.

I am very disappointed in the Profax and 21st Century TV schematics. They are impossible to read without a magnifying glass, especially if you use Bifocals. I am not interested in business or technology topics. Put more articles on actual electronic servicing of TV's , VCR's and consumer electronics. This is the reason I have taken this magazine for 25 to 30 years. Put more articles like Homer Davidson's TV. R.P.A.

The end of videotape is on the horizon and the shelves of the department stores. Technicians need to learn how hard drive, cameras and recorders work, and now. I have found the technicians from coast to coast starving for digital course, i.e., compress.(sic), Digital Signal Processors, Memory-Eproms-Drams and computer adjusting software (using & understanding). D.C.

Excellent. W.W.T.

None at this time! Keep up the good work! S.J.S.

Continue with systems. Updates on DTV and all new products. M.D.

More TV, VCR and computer articles!! More articles by Bob Rose and Homer Davidson. Best articles: Oscilloscopes for Video, Tools of the Trade and 21st Century TV Repair. S.R.C.

Excellent on RCA Servicing 21st Century TV's. H.J.C.

Detailed technical articles on television troubleshooting I enjoy. Please understand that if this magazine becomes 1/2 computer orientated as the others have done I will stop my subscription as I did with them. I like this one as it is. Thanks M.E.

(Topics to Cover) Microprocessors, Instrumentation step by step, Use (of) the personal computer in the Electronics lab. (Also) Job offers, and certification. Also can you put into every issue something like: " the good, the bad, and the worst in the electronics field." J.Z.

This magazine is perfect as it is. I would greatly appreciate it if you would leave it just like it is. D.L.R.

Additional Correspondence from ES&T Readers...

How about providing a list of training aids offered by the various Consumer OEMs? And...how to acquire them? Many times it is almost impossible to communicate with them for help. D.H.

From one who started reading PF Reporter 50 years ago-the Sept issue looks great-Cheers Keith Knos CET/EHF

Dear Marie and Dave,
I'm so pleased to see the September issue of ES&T! It's great! Congratulations on a wonderful start to a new era for this great old magazine. You're going to be just fine.
Sincerely, Dick Ross

Note and Thanks to DickRoss who is President of CQ Communications and previous owner of Electronic Servicing & Technology Magazine...and a good friend.

Send your comments, questions, suggestions, complaints and kudos to ES&T Readers SpeakOut, 403 Main Street, 2nd Floor, Port Washington, NY 11050. dallen@mainlymarketing.com. Fax: 516-883-2162.

THE MAGAZINE FOR PROFESSIONAL ELECTRONIC AND COMPUTER SERVICERS
ELECTRONIC
Servicing & Technology

What's Your Perspective??

The few short months since becoming involved with ES&T we have had the pleasure of meeting several hundred new friends: subscribers and advertisers. We were able to do this not because we had free plane tickets to travel the country, but as two industry events were held which NPSC, August 7-12, and CEDIA, September 6-10.

The differences in these two important events was striking and worth consideration.

NPSC sponsored by NESDA and ISCET in Sparks, Nevada, was well attended by many new and long time Electronic Servicing Professionals who devoted most of a week to long hours of seminar and training sessions. There was an active, two day exhibition of available products, services and opportunities. Total attendance was about 1000, with some 50 to 100 manufacturer participants.

NPSC was, according to many we talked with, a true family get together as well as a learning opportunity.

Discussions, exhibits, sessions and tutorials could certainly be described as focused on traditional Consumer Electronics Servicing and Repair. The most excitement was with regard to the new era of digital electronics, including home theater. Manufacturers were unanimous in voicing their commitment to the Consumer Electronics Servicing Industry. The feeling we observed could be described as cautiously optimistic.

ES&T's Editor, Conrad Persson and the two of us were warmly welcomed to the show and the market by the NPSC management, attendees, participants and exhibitors. You made us feel welcome and let us know your positive feelings towards ES&T...and, we really appreciated that welcome.

Four weeks later the three of us found ourselves in Indianapolis, Indiana at the CEDIA Expo. It was a wake up call! Here was the next level of Home Theater, the smart home, the cross fertilization of communications, electronics, computer, sound, entertainment and networking technology coming together to generate millions of dollars!

Everywhere we looked there were electronics products that required installation, servicing, 'tweaking' maintenance and more...and they were invariably tied in with ancillary, complementary technologies created with a level of cooperation between disciplines we may not have seen since the early days of the Apollo Program.

The people vying for the top billing came from each of these disciplines, yet we had the feeling that the person at the center of these developments had to be the Consumer Electronics Service Professional. You are, and should be the person who brings life to Home Theater and the Smart Home.

But the competition was fierce! More than 1000 exhibitors, and 17,000 people all thought they should be the center of attraction.

And ES&T?

It was ES&T's first venture to CEDIA, we learned a lot and we need to learn more about where ES&T and our readers will fit into this market and capitalize on the opportunities it offers.

"It's Big, Really Big."

Marie Marcellino Dave Allen

READERS' EXCHANGE

Readers' Exchange is a free service. The following restrictions apply to Readers' Exchange:

• Only individual readers may use Readers' Exchange, and items must be restricted to those that are ordinarily associated with consumer electronics as a business or hobby. If you're in business to sell the item(s) you want to offer for sale, the appropriate place for your message is in a paid advertisement, not Readers' Exchange.

• Readers' Exchange items must be restricted to no more than three items each for wanted and for sale.

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B&K 545 component analyzer. $1950 612-866-6183.

Wavetek Signal Analysis Sams 450-$250 and Sams Digital Model III at $350. Both in soft cases like new. Alex Minelli, 718 Michigan Street, Hubling, MN 55746, 218-263-3598.

Due to medical bills necessary to sell new-old stock radio tubes-No TV's no trash-100 large tubes or 200 small tubes $93 each. When sold all tubes gone, add shipping. Also must sell old radio books and catalogs. Maurer Television, 29 South 4th Street, Lebanon, PA 17042, 717-272-2481. Waiting for return call.

Sencore, New SC3100, Scope Meter, Frequency Counter $1,995; New Sencore, PRS570, Digital AC Isolation Transformer $595; Many other pieces of test equipment priced to sell. Email: sdcalal@att.net for complete list and prices. Contact Alex, 858-274-6935 (work) 9-5 Pacific Time.

Sencore equipment VG91, TVA92, PR570, less than 1 year old.
Sencore PA81 and SG80, stereo and power analyzer for sale.
Going out of business: parts, manuals, equipment for sales. Email: acmecw@aol.com

Service Literature for Sams 200-2242, & most manufacturers' subscription literature to current date. All parts and test equipment associated with operating a service center for the past 45 years. For information contact A Walter at email awalter@mnic.net. 507-354-4617, Fax 507-359-5556.

Sencore TC28 transis-tube checker, $175.00. Beltron system picture tube restorer w/ cricket univ. adapter, $531.00. B&K 1826 freq. counter, $72.00. Elenco S-1325 dual trace scope, $256.00. Sencore SCR250 SCR & triac test accessory, $89.00. S.W. technical products regulated DC power supply 0-35V, $145.00. 2-high voltage probes @$37.00 each. Computer monitor tester MT802, $137.00. B&K 1801 freq. counter, $183.00. Sencore LC102 auto Z cap.-inductor analyzer, $1,175.00. N.W. microfilm 514 double fische reader, $134.00. Sencore VC93 all format VCR analyzer, $1,049.00. Sencore TVA92 TV video analyzer, $1,292.00. Sencore VG91 univ. video generator, $1,454.00. Sencore PR 57 a/c variable isolation transformer & safety analyzer, $345.00. Tektronix 2235 100 MHz scope, $527.00. Heathkit ET-1000 circuit design trainer, $94.00. Fluke 77 multimeter, $102.00. All negotiable. *Contact: Dennis Hastings, 703-754-8790, E-mail: tvtech@megapipe.net.*

Optoelectronics M1 MicroCounter 10Hz - 2.8GHz with antenna pack (still in box), new condition. $250.00. *Contact: Aaron 918-456-2030 (evenings).*

TF46 Sencore transistor tester $200.00, like new, PR57 $200.00, microfishe cards $100.00, service manuals many models $500.00. Shipping not included. *Contact: Patrick R. Willie 520-871-2139.*

Digital Engine Analyzer $65, Charging System Tester $25, Electronic Ignition Tester $25. All above $100 plus shipping with manual. Contact: Leonard Duschenchuk 561-871-5831.

Sencore VC93 VCR Analyzer in excellent condition. Comes with all leads, manuals, and test tape. Also has output connector cable for VA62A or VG91. $550.00 plus shipping. *Call Gerald at 252-745-4493 or 252-745-5707.*

WANTED

CRT's for NEC GP6+ or 6PG+ Projectors PT# E8508A – RP, GP, BP and copy of service manual. Fax 562-924-9626.

Manual for EPROM programmer. Model DATA I/O 990-1902 system 19. jkmny@aol.com, tel 718-447-1385.

Sencor HA2500 sweep analyzer. Call Skip 631-363-6910.

SONY OBSOLETE PARTS: Part #1-809-120-21 (5 pin) Regulator module I.C. #DM 43. Part #1-808-979-11 (10 pin) High voltage protect module. I.C. #PM 501. Will accept good (used) or new part. Needed to complete repair job — HELP!!!! Contact: Appliance Service, 121 E. 5th Avenue, Tallahassee, FL 32303, phone and fax 850-224-4710.

Yoke: YS-53929K for 19" Spectricon TV M9C2-1K3, SAW filter for Wards 19" TV JSA-12646, Schematic for Toshiba 26" TV 289 X 4M. Worley, 305 Hickory Bend Rds., Enterprise, AL 36330, email: worley@snowhill.com, 334-347-5281.

Adapter Socket #CR-31 for B&K Picture Tube Tester Rejuvenator #470. Ed Herbert, 410 N. Third Street, Minersville, PA 17954.

Service manual and schematics for JVC-VCR Mod. HR-D960U. Will pay for copying or copy and return. BRS Electronics, 1329 Twining Road, Dresher, PA 19025, 215-659-2349.

95-4170 Zenith Fly or 9-848-02R Board. Write David Lehmann at R2 Box 104, Mansfield, MO 65704 or call 417-924-3350.

Sharp Camcorder VL-L250U, Philips O Scope PM 3212, Navy Impedance Bridge ZM 11 A/U Sidney 510 357 3788 working or not. S. Geldhor, 2147 Troubas, San Leandre, CA 94577.

Service manual for KOSS-model HG335-Cd, AM/FM Radio, Cassette Player. Will buy or copy and return. Also, still need ICDEC 00 15B or C. Murrays Repair Service 561-966-8862.

JVC, TV Model AV-3171S — service manual/schematic. Buy or rent, print is out of publication. Contact: Steve Bavis, 1144 Riverview Drive., Annapolis, MD 21401. 410-757-2592, esteve @flashcom.net

Hickok tube tester, Technics SP-10MK3 or MK2 turntables, SME or Technics tonearms, studio limiters and processors. 612-869-4963.

IC for a model 2700 dish receiver. I believe this to be a voltage regulator. It is a 5 pin device with the following markings, ST, (in a small square in the top left corner), then MRC, under that is VIP am 50, under that is C9829. Need cross reference for part, and schematic, or will copy and return. Any hints on lightening damage to this receiver would be appreciated. *Contact Marvin White's TV serv., 622 N. 5th St., Hollis, OK 73550, 580-688-2612. Circuit board designation for this part is: u5002.*

Output transformer for Crosley radio model 124. Must be original. *Contact: Paul Williams, 2364 Beaver Valley Pike, New Providence, PA 17560-9622, phone: 717-786-3803.*

Garrard Stereo Receiver Amp. Model# GRX665 Operator and Schematic Manuals buy or copy. T. Wilson 13123 Sevres Street, New Orleans, LA 70129, Phone: 504-254-0890

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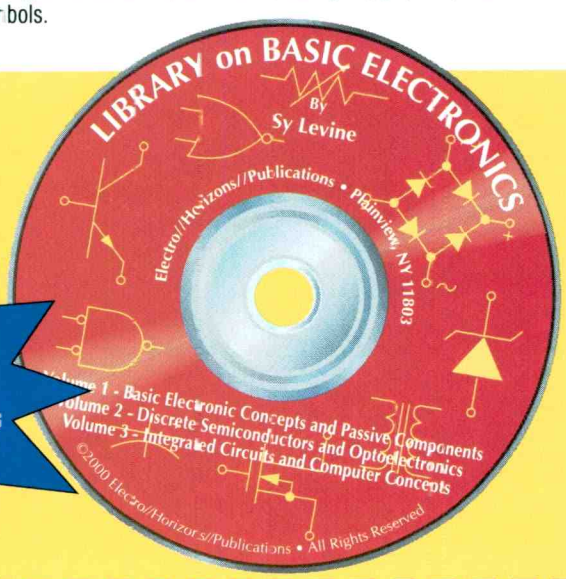

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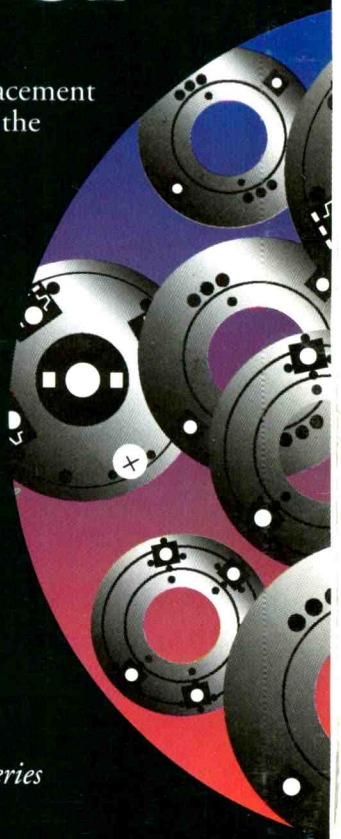

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