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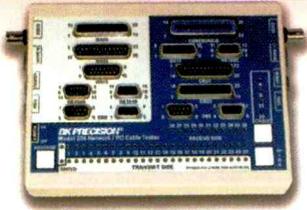
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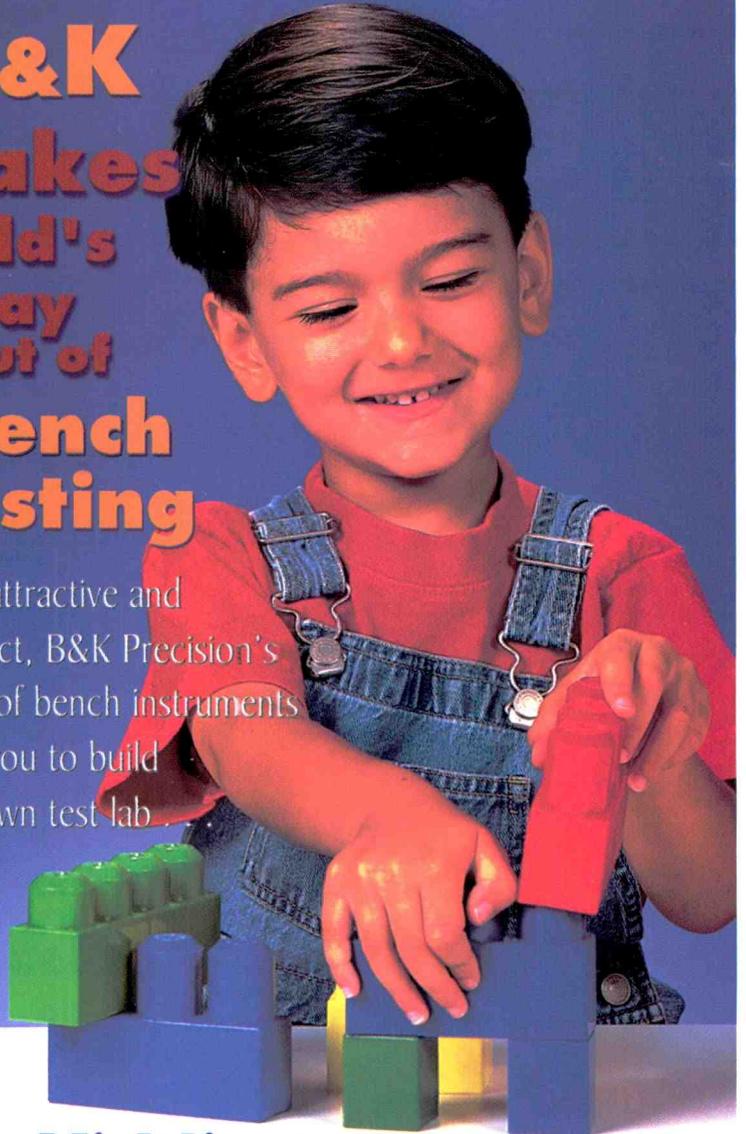
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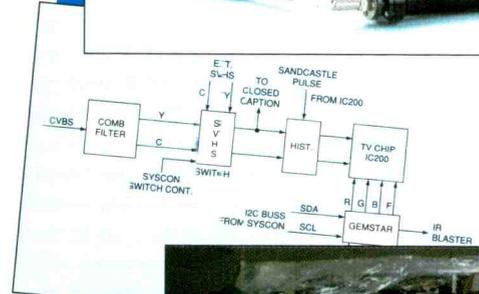
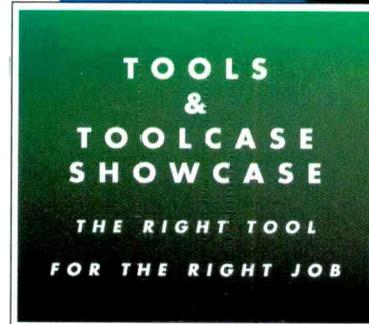
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HOME NETWORKING: ONLY A MATTER OF TIME?

Most homes of today contain a dazzling array of electrical and electronic (or electrically or electronically controlled) devices. Just think about the list: TV, VCR, DVD player, CD player, stereo, personal computer, microwave oven, telephone, furnace, air conditioner, refrigerator, dishwasher, stove, oven, lighting. In most homes, each of these functions is totally independent of each of the others. If forces at work in the laboratories, on the manufacturing floor, and in the marketplace, come together as some think they may, in the near future, it won't be long before all, or many, of these functions in the average home are interconnected.

Here are a few thoughts on the networking of the home, taken from the TechHome section of the CEA website at www.ce.org.

The Internet has long been a source of information on every conceivable topic, but entertainment content is a relative newcomer to the medium. Improved audio file formats like MP3 and RealAudio have opened the door to on-demand Internet content.

Why not use existing stereo equipment to play music from the Internet? A computer or a dedicated device can serve as Internet radio, giving you access to music, live broadcasts and news stories from around the world

Listening to music in any part of the house is another option. Linking the separate stereos in the house allows families to hear a single music source from several locations or select separate sources. You can play an MP3 on your PC in the study and listen to it in the family room.

Distributing video throughout the house is a popular feature of home networks. Home entertainment networks can enable family members to watch the same videotape, DVD, or digital satellite program from their own bedrooms. Let's say you have a DVD player in the family room and a television attached to a cable box in the bedroom. Using a remote control in the bedroom, you can turn on the DVD, select a movie and go to your favorite scene.

Home theater systems have become popular in the last few years; networking can enhance the performance of these systems as well. If a lighting control system is installed, it can usually be configured to respond to a home theater's remote control.

Windows and blinds can even be programmed to respond to a "movie" command.

Enjoying a movie from a bedroom or entertaining with music throughout the house can enhance leisure time, but whole-house audio and video distribution also offers many practical benefits. Cameras mounted inside and outside the house can be distributed to all the televisions in a home for added safety and security.

The family home has not been left out of the information age. With the proliferation of home offices and personal computers, people are demanding advanced communications capabilities in their homes. Computer networks, intercom and paging systems and multiline telephones are just a few examples of the communications equipment that have become common in today's homes. And as the popularity of the Internet continues to grow exponentially, high-speed connections within the home will remain high on the list of homeowners' communications needs.

Home computer networks allow the entire family to share documents, printers and high-speed Internet connections from computers in different rooms simultaneously.

If you are working at home and keeping an eye on small children, home networking allows you to listen or even watch the baby's room through the computer or television and answer the front door without getting up.

But why stay at the desk? Networking personal computers in a home can add mobility to the list of home-office worker's perks. Network connections in other areas of the house where you might want to work allow you to back up your laptop computer, receive e-mail and print from anywhere you like. Wireless networking solutions can even let you bring your work outside.

Multiline phone systems are also growing in popularity. As families add computer modems, fax machines and teen-age children to their lives, they quickly grow to need more phone lines. Multiline phone systems can reduce the number of lines needed by supporting several extensions on a few phone lines. Features like intercom, paging, auto attendant, voice mail and caller ID add power and flexibility to a phone system.

Intercoms have been available for many years as stand-alone systems. Some systems use the telephone as both a paging and intercom system. Using one of these systems, you can press a key on the phone and speak through the home's A/V speaker system. Pages are answered by picking up any phone in the house.

Integrating the communications systems within a home has two primary benefits. Electronic information for work or entertainment can be accessed from anywhere in the home, and an integrated communications system can be used to monitor and control various aspects of the home from any location. Many theorize that access to home control and electronic information from several places within a home will become as common as multiroom access to electricity is now.

Well, there's a lot more on that website, constituting compelling evidence that in the not terribly distant future, when a consumer electronics servicing technician is called to someone's home he or she may encounter not just a TV, or VCR, or DVD player that won't work, but some kind of problem on a network that won't allow a member of the family to access music or video from his own space in the house. Even worse, the problem might possibly be a complete network failure. Now what.

Complicating the potential that this might have for the technician is the possibility that the network might be designed to, or included portions or, any of a number of standards. Here's a list of standards listed on the CEA site that might affect a particular network or installation: EIA 775, EIA 775.1, VHN, OSGi, UpnP, Jini, IEEE-1394, HomePNA, Home Plug, IEEE-802.11, WECA, HomeRF, Shared Wireless Access Protocol, Bluetooth, IrDA, IrDA Control.

Consumer electronics service centers that want to stay around for a few more years might make an effort to become at least passingly familiar with what's going on in home networking. The likelihood that you'll encounter some of these systems in the future is increasing rapidly.

Conrad Persson

THE MAGAZINE FOR PROFESSIONAL ELECTRONIC AND COMPUTER SERVICERS

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DirectTV Responds to NRTC and Pegasus

EL SEGUNDO, Calif.-Jan. 31, 2001— In response to Pegasus Communications Corp.'s and the National Rural Telecommunications Cooperative's (NRTC) allegations that DIRECTV made misleading statements concerning the tentative order issued Monday by the United States District Court for the Central District of California regarding certain provisions of its distribution agreement with the NRTC, Odie Donald, president of DIRECTV Inc., stated:

"The allegations that DIRECTV made misleading statements concerning the Court's tentative order are baseless. Contrary to the NRTC's claim, DIRECTV's characterization of the tentative ruling is accurate. While we did not initiate public comment on the tentative order, we stand by the statements we made when asked to comment on a report that the motion had been denied; that the ruling was tentative and subject to change; and although the Court denied DIRECTV's motion, we are gratified that the tentative order substantially narrowed the legal issues regarding the scope of the NRTC's right of first refusal. DIRECTV is also pleased that the Court tentatively rejected NRTC's and Pegasus' attempt to avoid having the scope of the right of first refusal determined at all in this case. The tentative order made clear that DIRECTV will be permitted to have its claims proceed to trial in the near term."

The Court tentatively found that the right of first refusal as stated in the original 1992 Distribution Agreement was unambiguous and did not include rights to programming. The only remaining question will be

whether a 1994 amendment, which the Court acknowledged was silent on the subject of the right of first refusal, changed the right. The Court tentatively ruled that the NRTC may submit extrinsic evidence on this issue, but its tentative findings by no means signify victory for the NRTC. Donald continued, "While we understand Pegasus' concern that resolution of this issue at trial may affect its stock price, no action by DIRECTV was taken for the purpose of affecting the stock price of Pegasus or any other entity affiliated with the NRTC. It is difficult to understand how DIRECTV's effort to confirm the express terms of the distribution agreement, and to defend its business against the NRTC's overreaching claims, could even be remotely construed as an effort to manipulate the price of Pegasus' stock as insinuated in Pegasus' press release. "While we had hoped to obtain summary judgment, we are confident in our legal interpretation of the right and believe

ETA Schedules Annual Meeting for June 1,2

The 2001 Annual Meeting of the Electronics Technicians Association (ETA) has been scheduled for June 1 and 2 at the Putnam County Fairgrounds, Greencastle, Indiana.

Election of officers for the ETA and the Satellite Dealers Association (SDA) will be held.

For more information, members are invited to call 800-288-3824.

we will prevail on the narrow issues remaining for trial with regard to the scope of the NRTC's limited rights upon termination of its distribution agreement. We look forward to having DIRECTV's claim resolved in the near future."

DIRECTV is a unit of HUGHES Electronics Corp., a unit of General Motors Corp.

Open Services Gateway Initiative (OSGI) Releases Spec 1.0 CONNECTIONS 2000

On Wednesday, May 3, the (OSGI) formally unveiled Spec 1.0 at CONNECTIONS 2000: Advancing the Networked Home. This specification complements virtually all residential networking standards and defines an open standard that enables multiple software services for a services gateway.

"The deployment of gateways is fundamental in developing the infrastructure for future robust service environments," says Tricia Parks, president of Parks Associates. "We're delighted to see the strength behind OSGi's release of specification 1.0."

By tying such services as home monitoring, security, energy management, and control to any number of appliances, OSGI should witness early success in key markets, according to Dallas-based Parks Associates.

The fourth annual CONNECTIONS conference, the premier home networks and gateways conference co-hosted by the Continental Automated Buildings Association (CABA) and Parks Associates, played host to nearly 700 representatives. At the event, OSGi member Coactive Networks unveiled its Coactive Connector 3000 series, a full-service gateway that links an Internet connection to appliances, devices, and systems throughout the home.

Coactive's family of gateway products

is already the foundation of deployment plans for Sensel AB, an unregulated communications company formed by Swedish electric utility Vattenfall AB. Sensel plans to deploy multiple telemetry services to 400,000 customers via the Coactive Connector solution.

Coactive will also be a premier supplier for DTE Energy Technologies, an affiliate of Detroit Edison and a subsidiary of DTE Energy Company. As announced at CONNECTIONS, DTE Energy Technologies is using the Coactive Connector gateway to offer two Web-based service bundles, energylnow and safetylnow, that will create operating cost reductions through energy monitoring and data services as well as ensure food safety through temperature monitoring.

"Although much of the press touting the early market for home networks and gateways has largely focused on such capabilities as shared Internet access and distributed entertainment content, energy management features will be critical components of networked homes and businesses," said Kurt Scherf, Parks Associates' home networks analyst. "Our consumer research in Networks @ Home indicates that residential consumers will play a critical role in the diffusion of these intelligent management systems."

Jack Benz Resigns as RF Industries Board Chairman

San Diego: Howard Hill, President of RF Industries announced that RFI's Chairman, Jack Benz, has resigned from the board to pursue other interests. "We are grateful for his many years of dedicated service, guiding the company through financial difficulties and to improved sales and profitability. We wish Jack all the best in his new endeavors."

RF Industries includes both the RF Connector Division and the RF Neulink Division.

Government Mandates on DTV Products: Would Be Anti-Consumer and Anti-Free Market

Mandating the inclusion of a digital television (DTV) tuner in every television set as proposed by broadcasters will result in increased costs and severely limit consumer choice, the Consumer Electronics Association (CEA) reiterated today. The comments came in response to testimony delivered by representatives of the broadcast community during oversight hearings on DTV held by the U.S. Senate Commerce Committee. "This proposal, even if phased-in, will increase costs for American taxpayers," said CEA President and CEO Gary Shapiro. "We estimate that such a mandate could add hundreds of dollars to the cost of almost every television set, pricing many lower-income Americans out of the market and severely slowing the DTV transition."

Shapiro argued that the proposal also would inhibit the ability of consumers to choose how and when they will enter the digital television era.

"Consumers have demonstrated that they

want options when making the decision to upgrade to DTV," Shapiro noted. "Our own experience combined with sales figures and reports from retailers show that most consumers are choosing to upgrade to a high quality, DTV-upgradable monitor now - to enhance their DVD, DBS or analog experience - and purchase a digital tuner later when more broadcast programming becomes available."

"Already, manufacturers are providing consumers with a wide range of products that includes integrated television sets, DTV-upgradable monitors and stand-alone tuners. Throughout the transition, the free market will meet the needs of consumers as manufacturers provide DTV products at varying, affordable price points."

Shapiro further argued that manufacturers are more than doing their part to help drive the DTV transition.

"Sales of DTV products reached 625,000 in the year 2000, accounting for

1.4 billion dollars in consumer investment. We expect that 2001 sales of DTV sets and displays will grow 80 percent to 1.125 billion, with consumer investment climbing to 2.1 billion dollars," Shapiro stated. According to CEA, annual unit sales growth and dollar sales for DTV during its first four years on the market is projected to surpass that of computers, VCRs, CD players and color TVs.

Shapiro also noted that over the last two years, receiver and display prices have plummeted by nearly half.

"This decline in the price of DTV sets is in line with the initial 44 percent price decline seen for DVD players," he argued, "and much more rapid than the initial price declines of products like CD players, VCRs and large screen analog TVs."

"In addition, a wide variety of set-top boxes in the \$600 - \$1000 range have been introduced, including boxes that incorporate reception for satellite and over-the-air DTV signals as well as analog signals. We expect this year to bring a strong upsurge in sales of set-top box receivers now that the broadcasters have finally settled on an industry-wide transmission standard."

In addition to rejecting calls for costly and unnecessary mandates on digital television products, Shapiro said Congress should follow four key steps to speed the DTV transition:

- Insist that broadcasters transmit an ample supply of HDTV programming,
- Ensure that any copy protection solutions protect the noncommercial home recording and fair use rights of American consumers as well as the rights of content owners,
- Direct the FCC to ensure that cable providers carry broadcast DTV programs, and
- Ensure that there is a simple and consumer-friendly way to connect digital cable systems to DTV products.

"The United States stands as the worldwide leader in digital television," Shapiro concluded. "An expanding variety of DTV products are in the stores, and consumers are buying them in record numbers. Numerous providers are recognizing DTV's potential and producing DTV programming. CEA remains committed to working with broadcasters, cable providers and all other interested parties to ensure the fastest, most consumer-friendly transition to DTV."

Robust Broadband Internet and Home Networking Markets Point to Strong Residential Gateway Growth

Recent forecasts from Parks Associates predict robust growth in both home networking and broadband services, two markets that have a strong influence on the deployment of residential gateways. This relationship will help to create a strong market for the residential gateway, the subject of Parks Associates' Residential Gateway Report (Third Edition), because the need for a gateway solution increases in conjunction with the escalating number of devices and services in the home.

According to Parks Associates, revenues from broadband Internet services and home networking will be \$2.4 billion and \$1.4 billion, respectively, by the year 2000. By 2004, broadband Internet revenues will be approximately \$9.4 billion, an increase of almost 300%, and home networking revenues will be \$5.6 billion, an increase of exactly 300% from the expected revenues for the year 2000. These factors indicate a strong market for residential gateways in the near future.

"This projected growth in broadband Internet and home networking revenues is phenomenal," said Ian Bryant, research analyst for Parks Associates. "With such tremendous growth occurring over the next four years, broadband Internet and home networking will become fairly standard in

the home. This increased adoption will act as a driver for residential gateway development as technology management becomes a necessity for the average consumer. To take advantage of all the applications that broadband and home networking have to offer in the easiest and most user-friendly manner, consumers will have to integrate a residential gateway into the system."

The gateway solution, according to the Report, increases the overall value and functionality of the in-home network. This device can enable a number of services, including shared high-speed Internet access, digital entertainment (digital and interactive television, video-on-demand, MP3 streaming audio), interactive gaming, shared peripherals (printers, scanners, etc.), packet-switched voice (VoIP, VoDSL, VoCable), remote energy management, and home automation, to name but a few. Additionally, the RG has many of the features usually found on more sophisticated enterprise devices, such as firewall protection, static and dynamic routing, remote configuration and upgradability, and VPN. In its most developed form, a residential gateway has the ability to interface with any wide-area network, regardless of the media, and deliver services over any local area network in the home.

National Consumers League Survey Finds High Consumer Satisfaction With Digital Television Products

Digital television (DTV) owners are overwhelmingly satisfied with the performance of DTV products in their homes, although they are dissatisfied with lack of HDTV programming on the nation's airwaves, according to a nationwide survey sponsored by the National Consumers League (NCL).

"NCL commissioned this survey to assess consumer satisfaction among digital television owners," said NCL President Linda Golodner. "Opponents of the existing national digital broadcast standard have been suggesting that consumer response to DTV is unfavorable," Golodner said. "Our survey shows the assertions are groundless. We found that consumers were overwhelmingly satisfied with their HDTVs, a rather unusual response for such a new product."

The NCL survey, conducted by Opinion Research Corporation International, shows that about three quarters of those surveyed describe themselves as "very satisfied" with both the picture and the sound quality of their new sets. In fact, according to the survey, DTV picture quality received a 96 percent consumer satisfaction rating, with 77 percent being "very satisfied" and another 19 percent being "satisfied." Similarly, 89 percent of DTV owners are satisfied with their DTV set's audio quality.

While they are happy with their DTV sets, more than half of DTV owners are dissatisfied about the insufficient amount of digital programming being broadcast, with 35 percent being the "least satisfied." When asked what TV stations should do to improve digital TV, 42 percent stated, without prompting, that "more programming" is their top concern. Most-watched DTV programs, according to the survey, are movies (40 per-

cent), sports (23 percent) and primetime network programming, such as dramas, sitcoms, and talk shows (21 percent).

Seeking clarification about the FCC's transmission standard, NCL asked DTV owners if they had problems receiving DTV signals in their home. Four of five of those polled were satisfied with their signal reception, and only 4 percent said "better reception" was the one thing they would tell manufacturers to improve.

On the other hand, almost one-quarter of respondents hope manufacturers will lower prices for DTV products. "Some consumers are concerned about the initial high price of DTV equipment," said Golodner. Since they were first introduced in the fall of 1998, DTV prices have declined by 33 percent, according to the Consumer Electronics Association. The average prices for DTV products are about \$2,460 today, compared with about \$3,725, 18 months ago.

Golodner continued, "Though prices have dropped since DTVs were first introduced, further price reductions will depend on increased consumer demand. And to increase demand, broadcasters must address the issue consumers are most dissatisfied with - programming. It is American consumers who are the victims of some broadcasters' refusal to implement the HDTV standard and provide the digital programming this survey shows consumers want."

This NCL DTV owners survey was conducted by telephone May 31-June 14, 2000, among 200 digital television owners. The sample of 200 respondents was derived from a listing of approximately 1,100 DTV owners gathered by NCL from retailers and manufacturers and supplied to Opinion Research Corporation.

Five leading DTV brands representing significant nationwide market share, were represented. Results from a sample of 200 have a margin of +/- 7 percent.

Opinion Research Corporation, founded in 1938, is a global marketing research and teleservices company, with headquarters in Princeton, N.J. With offices in the United States, Europe, Asia, Latin America, and Africa, ORC provides integrated marketing services to businesses and governments in over 100 countries.

The National Consumers League, founded in 1899, is America's pioneer consumer organization. NCL's three-pronged approach of research, education, and advocacy has made it an effective representative and source of information for consumers and workers. NCL is a private, nonprofit membership organization dedicated to representing consumers on issues of concern.

Sams Names VP, Technical Services

Richard White has been named VP, Technical Services at Sams Technical Publishing. White is now responsible for Photofacts, Warehouse, Shipping, Receiving, Customer Care and Marketing. This is a new position at Sams and part of a recent reorganizations of responsibilities.

Former VP Operation, Jim Surface, has left the company. Reached at his home in Anderson, Indiana, Surface says he is considering a number of options to incorporate his thirty years of experience with Sams.

In Memoriam

Fellow Members,

William Murphy NESDA Region 5 Director passes away suddenly. On Sunday afternoon, January 7th, Bill Murphy passed away at his shop in Fairview, Ohio. He was a very active NESDA member and had served as Director for region 5 continuously since being elected to that office in August of 1997. He also held office in other local associations including the office of President of his Westlake Model Aircraft Club since 1996. Originally Bill and his late Father Elden opened two businesses to sell and service consumer electronics products in Cleveland and Westlake Ohio. He discontinued the sales operation sometime

around 1985 later completely closing his Cleveland location. He operated Normandy Electronics in Westlake Ohio from 1978 at its inception until last year when he moved his business to Fairview where he continued to provide service for many area consumer electronic products.

He will always be remembered for his compassion for others and his ability to listen to their thoughts and suggestions. He was never afraid to take a stand when representing those who sent him. I recall that compassion and dedication displayed at our last NESDA annual membership meeting in opposition to the proposed amount of dues increase with full support from his constituents. He always

displayed a gentle demeanor that hid a greater determination to succeed. He leaves a wife Laura, their family and many friends to lament his passing. His absence will become apparent to all and his efforts will continue to bless those he strived to serve.

Let me apologize for the time it took to notify the list as today is one month later, however regretful it was necessary to properly gather correct information. Thanks to all who helped and may God be with all his family and friends.

Sincerely,

John Eubanks

NESDA Vice President

fesa@fdn.com

High Definition, Are You Sick of it Yet?

By Alvie Rodgers

Rogers is Technical Trainer/Writer for Hitachi Home Electronics

With all the media attention, training preparation, lectures, and sales promotions, HDTV is obviously on everyone's mind. But you're probably asking yourself, "O.K., where is it?" Even though steady progress is, in fact, being made, it seems to be measured in painfully small steps.

There are basically three categories that the average service technician falls into in this new ATSC (Advanced Television System Committee) HD/SDTV (High Definition/Standard Definition TV) world:

1. I'm very comfortable with my current situation. I'm too old to learn anything new. This new technology will fade away anyway. I like NTSC and it is here to stay.

2. I'm just going to play it by ear. I'm going to pick up on this stuff little by little. If it comes, fine. But until then, I'll just keep going the way I'm going now.

3. This new Technology is cool. I'm going to learn all I can about it. I'm going to stay abreast of all the new products, terminologies and platforms. I'm excited about it.

What category do you fall in?

In the Beginning

In the late 90's, Congress advised the industry, "NTSC is outdated and way past its retirement age. It's time for something new and exciting. It's time to convert everything to a new format. The new format will be known as ATSC (DTV [Digital TV])."

With this new format, the lines of resolution can be increased to more than double what's now available through the conventional NTSC format. Not only that, but the signal will be available over the air, using conventional indoor or outdoor antennas. Of course, there will be some "tuning up" requirements for the older antennas presently in use but, in general, a standard NTSC antenna will work quite well with ATSC.

The Formation of the Alliance

Since this mandate from the Federal Government, the industry formed an alliance, bringing together the best ideas and technology from everyone, and ATSC was born. The first item on the agenda was the development of a compression scheme that would allow the transmission of the new, higher resolution signals in the same bandwidth used for NTSC broadcasts. The process agreed upon was the MPEG-2 (Moving Picture Expert's Group) compression technology. With this technology, up to four channels could be placed in the same 6MHz bandwidth currently used for one NTSC broadcast channel, provided that the video was very slow moving. Motion is the primary factor affecting compression ratio.

To illustrate, a conventional 2-line comb filter operates on the principle that adjacent lines of video are virtually identical. Subtract one line from the next and get chroma; add one line to the next and get luminance. The key factor here is that if each line looks pretty much the same, most of the information can be transmitted only once, eliminating the need to repeat the transmission on the next line. With that in mind, only the differences between adjacent lines have to be transmitted. The process is called redundancy reduction.

In addition, transmitting a carrier modulated with digital data significantly improves transmission efficiency, and there is no degradation of the signal. And unlike conventional RF signals, producing noise with a reduction in signal strength, there is no noise associated with digital signals. The viewer will have either a clean picture or no picture at all.



HITACHI

What Are You Afraid Of?

Having taught the principles of HDTV throughout the United States, I've listened to many comments related to this new technology, and it appears that the initial reaction of many in the service industry is one of fear, for two reasons:

First and foremost is the underlying fear of any new technology. Add a liberal dose of the nomenclature used to describe it, and a technician is faced with the prospect of learning not only the principles of operation, but a whole new vocabulary as well. The entire process is further complicated by the fact that the definition of some of the terms in this "new vocabulary" are not exactly fixed...there are considerable gray areas. So the confidence level of the technician

tends to suffer.

Secondly, a comfortable, familiar standard that has been around for many, many years is going to change dramatically, and there is an inherent tendency among many to resist change. Even though direct view and projection televisions have been changing for years, the fundamental standard remained unchanged. While ATSC has its own unique standards relating to how the signals are encoded, decoded and broadcast, a total of 18 different formats can be transmitted. NTSC supported two: color and B/W. signals can be 480P (480 lines, progressive), 24 frames per second, 30 frames per second, or 60 frames per second. Or the ATSC signal can be 720P or 1080i (1080 lines, interlaced) to mention just a few. Everything but 720P and 1080i fall into the SDTV category (Standard Digital Television), and 720P and 1080i fall into the HD category, (High Definition Television). For the purpose of this article, the focus will be placed on the two most common reception formats: 480P and 1080i. (P stands for progressive and I stands for interlaced.)

Comparison of NTSC and ATSC Signals

The chart below illustrates significant comparisons between NTSC and ATSC:

NTSC	ATSC	ATSC
	SDTV	HD
15,735 KHz	31.5 KHz	33.75 KHz
1H	2H	2.14H
480i	480P	1080i
Y Cr/Cb	Y Pr/Pb	Y Pr/Pb

The chart begins on the left side, indicating certain items that should be remembered about NTSC, along with new terms associated with the old format. The horizontal rate is 15,735KHz. The NTSC route within a schematic for an HD ready set is indicated by either 1H or 480i. When interlace is indicated, it must be divided by 2, since it takes two fields to make a

frame. NTSC, operating at 15,735 KHz, creates an image by interlacing two fields. Since 480i divided by 2 is 240, each field has approximately 240 visible lines.

The Interface

Another term that will be seen quite often is "interface;" i.e., how the signal from an external device is input into the television. RF (F59) connector inputs, and conventional RCA jacks for composite video are very familiar inputs (audio inputs will be ignored for the purposes of this article). An entirely new input is designated "component", and requires three RCA jacks . . . one for Y (Luminance), one for Component Red (Cr) and one for Component Blue (Cb). To help clarify, a little rhyme I use is "Y Cr/Cb is for NTSC don't you see". As a result, Y Cr/Cb inputs would not be able to accept Y Pr/Pb because the horizontal speeds are different. The Television would be out of Horizontal sync if this were tried.

ATSC supports both SDTV and HD (usually referred to as Progressive and HD modes). Hitachi manufactures both an HD ready Projection Television (requiring a set-top box for receiving ATSC broadcasts); and a self contained HD/SDTV set with a built in ATSC tuner,

an NTSC tuner, and a satellite Receiver.

The Progressive sets support two deflection speeds: 33.75KHz for HD; and 31.5KHz for everything else and the self contained sets operate at only one deflection speed: 33.75KHz. In the progressive sets, NTSC is up-converted through a device called a Flex Converter, responsible for taking any input signal, in any for-

mat, and modifying it as required for use by the deflection circuit.

The self-contained HD/SDTV products use a device called a DM-1 module to up-convert the input signal to 540, where it will be interlaced for 1080i HD signals; and progressive for everything else. These sets operate at 33.75KHz at all times.

Test Equipment for HDTV

Obviously, a new generation of test equipment has been developed to support these products. Special ATSC generators produce either still images (expensive), moving video (very expensive), or both (even more expensive). Regardless of expense, however, it is mandatory to have a generator capable of operating the television at the higher deflection speed. It's interesting to note that all the alignments on the more complex, self contained projection sets can be performed with only NTSC signals, whereas the HD Ready sets require a Progressive input as well as an HD signal to do a complete alignment.

The various formats can create difficulties with respect to digital convergence. Any operating mode that alters the frequency of the deflection circuit requires its own digital convergence alignment (DCA), and memory. Therefore, it's possible to satisfactorily perform a complete DCA performed on a set operating in progressive mode, while the same set would be misconverged with a 1080i signal. In effect, the DCA must be performed twice.

A Technical Note: If the customer has a set-top box with a selector switch for output format, the set-top box can be placed in the 1080i output mode and the menu of the box can be used to place the set into the higher deflection speed of 33.75KHz even if an HD signals is not available. At that point, digital convergence alignments can be made.

Interface

It seems the area of most insecurity is that of Interface. It has already been established that the Y Cr/Cb is used exclusively for NTSC signals, and Y Pr/Pb is used exclusively for ATSC signals (Hitachi

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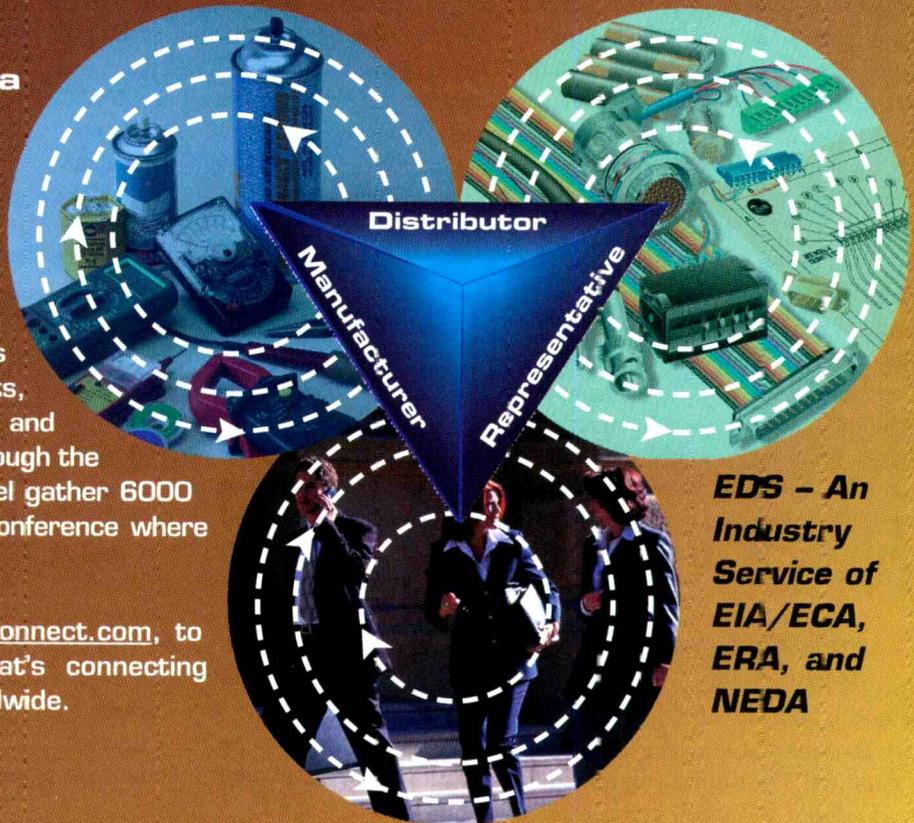
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Circle (14) on Reply Card

HD ready sets do not care what input you use, since the Flex converter will detect and manipulate any input). However, there are many "off-board", or external signal sources that require some familiarization. Such off-board sources include Satellite, Cable and ATSC Tuners. Each will be discussed separately.

Cable

At some point in time, it will no longer be possible to connect a cable directly into the set. Already, the term "Digital Cable" is being confused with high definition television. Digital cable requires a set-top converter provided by the cable company, that outputs conventional NTSC signals. At present, cable companies do not provide SDTV/HD signals, but when they do, a set-top converter will still be required. The ATSC tuner will not be able to decode SDTV/HD signals generated by the cable companies, since they will be using the QUAM format, as opposed to ATSC. It is unclear at this time how the set-top converters will interface with the television. At the present time, cable companies seem to be leaning toward an RGB interface instead of Component. If that happens, there must be yet another required conversion of signals between the cable set-top box and the television (RGB to Component adapter). Or, hopefully, they may decide to provide an ATSC output on the set-top-box.

Satellite Television

Since the beginning of Satellite TV transmissions, it is well known that the signal is remarkable; very clear and very detailed. The limiting factor, however, is similar to that of certain cable systems; it requires a decoder for each television in order to provide independent channel selection. The initial inability of Satellite systems to receive local channels has also limited its popularity for many consumers. SD/HD signals adds more consumer confusion to the mix. In order to receive the new channels, customers who already have a dish installed for regular reception must install a) additional dishes; or b) a

completely new dish, oblong in design, with two LNBs (a third LNB will soon be required). At that point, the output from multiple dishes (or the new oblong dish) must be routed, through a combiner/switch, to a new decoder and then to the set. How this decoder interfaces with the set is still unclear at this time: RGB, Component, USB, Firewire, RF, etc.

ATSC Set-Top-Boxes

At this time there are no clearly defined standards for the interface between these devices and the Television set.

Hitachi currently manufactures two self-contained HD models: 61HDX98B, and 61HDX01B. In the very near future, additional models will be available. These sets have built in ATSC Tuners and satellite receivers, as well as NTSC tuners.

The customer simply connects a terrestrial antenna to the F-59 RF IN on the NTSC/ATSC connectors; and the Satellite RG-6 cable into the satellite TV input. Through the satellite or ATSC terrestrial transmission, the set is capable of displaying the 1080i signals on a wide-screen format of 16X9, with superior picture quality.

Any shortcomings of these products relate directly to interface. Until interface standards are established, there will still be a great amount of confusion on the part of the consumer. Even seasoned sales representatives tend to have problems, with interface characteristics, as well as the new terminology related to high definition systems. Some items purchased by the consumer will not properly interface with their products, and in some cases might not work at all.

Aspect Ratios

Another area of confusion relates to Aspect Ratio. Aspect ratio defines the fundamental shape of the viewing screen, and is, essentially, the ratio of screen height to screen width. Two aspect ratios are now in use: 4X3 (1.333 to 1), the original aspect ratio in use for many, many years; and 16X9 (1.777 to 1), typically in use to support the new SD/HD formats.

Although a gradual transition from a 4X3 NTSC world into a 16X9 ATSC world will certainly occur, a majority of the entertainment software currently available is formatted for the 4X3 world. Therefore, the existing 4X3 format material must be up-converted to fit a 16X9 environment. When such material is broadcast over the ATSC airways, the quality does not begin to approach that of HDTV, and generally will not meet the expectations of the consumer.

At present, the equipment required to produce HD signals is very expensive. So, while many broadcast stations might be meeting the letter of the federally mandated ATSC laws, they often don't meet the spirit, citing falling revenues and the burdens imposed by considerable capital expenditures.

ATSC Versus NTSC

Because much of the broadcast materials available today is still NTSC, many of the newer Progressive HD ready sets are being produced using the standard 4X3 aspect ratio screen. These sets require a set-top box to receive any of the ATSC signals and because the set displays in a 4X3 format, some compatibility issues are noted.

If an ATSC broadcast, in a 16X9 format, is displayed on 4X3 screen, dark bars would be produced at the top and bottom of the screen. The television control systems prevent uneven aging of the CRTs by producing an OSD image that makes the bars gray. However, because the ATSC channel is up-converting NTSC materials, the signal isn't a true 16X9 format, so the signal also produces black bars on the sides. There is a general rule of thumb that can be used to differentiate between the two...if the bars are gray, they can be manipulated; if they are black, they cannot.

Because the progressive sets have a built-in Flex Converter, some manipulation of the screen display can be performed. Although the display can be placed into either a 4X3 or a 16X9 mode, there are some limitations. Using the rule of thumb previously described, it can be determined the extent of the limitations

set by the broadcast signal.

DVD: NTSC Mode

DVD produces high-resolution signals, with a clean and dynamic image. A very popular DVD format for movies is the "letterbox", centering a wide screen image onto a 4X3 screen. However, the "letterbox" movie may or may not be a true 16X9 format. Consider the following scenario, for example. Assuming the set is placed into the 16X9 mode, there appears a gray bar on the top and bottom and a small black bar on the top and bottom of the picture. Remember the rule of thumb. If it's black there's nothing that can be done. If the label on the DVD is consulted, it probably indicates that the movie is not a true 1.777 to 1 aspect ratio, but instead some derivative; something like 1.834 to 1, perhaps. This situation becomes more prevalent on a

16X9 screen, since the customer naturally assumes that, when wide screen format is selected, (Smooth Wide in Hitachi PTVs) the image will fill the screen. However, because it's not a true 16X9 (1.777 to 1 aspect) it will not completely fill the screen and some black will still be visible on the top and bottom of the image.

Anamorphic DVD

Another confusing area of DVD is the Anamorphic mode, whereby the movie is recorded using a much higher screen width and resolution. However, in theory, when displayed on a 16X9 format it should fill the screen and be pretty much linear in appearance. Again, if the aspect isn't appropriate to fit on a 16X9 screen, bars will appear.

The anamorphic DVD is the wave of the future. It takes advantage of the fact that more pixel information is available

from the stored image than a 1.333 image. But it does require a 16X9 high definition set to benefit from the increased resolution, even though increased resolution helps the 4X3 world image as well.

Conclusion

Until the software is available to the consumer in true high definition format the average consumer will likely sit back and wait, not only for software availability but for prices to drop, as they historically do. So where do you stand on the matter? Are you ready for the new 16X9 world? Are you comfortable with all the new terminologies? Are you making plans and preparation or are you comfortable in your current world?

Remember, "It's been mandated." So it is coming. Lets get ready. ■



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Circle (12) on Reply Card

Printer Servicing

By the ES&T Staff

Personal computers have penetrated just about every area of our lives: the office, industry, restaurants, theaters, homes. The results of the processes performed by personal computers: whether words, numbers, graphics, or some combination of them, are usually output in hard copy form by some kind of printer. As with every electro-mechanical device, printers fail and need to be serviced. Many consumer electronics service centers have found that servicing of computers, and their peripherals, including printers, can be a good source of income.

Some printer problems are difficult to diagnose and solve. But many printer problems require only a modicum of knowledge about printers and a great deal of troubleshooting ability, a quality most consumer electronics service technicians have in abundance.

This article will discuss solution of a common problem, demonstrate the value of technical support, then alert service centers to a problem that exists with the printer parts supply.

Printer Problem Symptoms

We've all seen computer printouts that don't look good: streaks, splashes, random spots on the page. These defects can be caused by a number of malfunctions in the printer. Just as a consumer electronics servicing technician can

learn a great deal about what malfunction in a VCR or TV set is causing a problem by examining the image on the screen, he can learn a great deal about what malfunction in the printer is causing a defect in the image on the printed page.

To continue the analogy of the TV or VCR, in many cases you can determine a great deal about problems by quizzing the owners about how they use the product. The same is true when you're trying to determine why a printer is putting out flawed pages. Some of the factors that bear on printer problems include the type of output that is being printed, the type of paper in use.

Here's a list of three common types of printing defects:

- Pages that are completely black or completely white
- Poor quality prints
- Spots and lines that repeat.

Printout is Completely Black, or Completely White

If the printed page comes out completely black, direct your attention toward the high-voltage power supply and the high-voltage power supply connection.

If the pages are coming out just as white as when they went in, the most likely cause is a faulty toner cartridge, a malfunctioning controller board, problems with the high-voltage power supply, or an improperly seated transfer roller/wire. Another possibility in the case of printing of blank pages is a defective scanner.

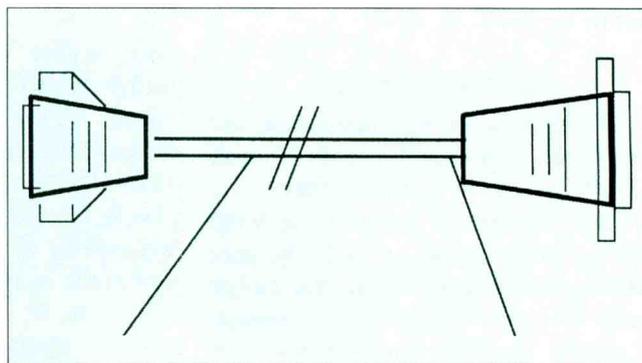


Figure 1 IEEE-1284 compliant cables can communicate 100 to 200 times faster than the older Centronics parallel printer cables. Each wire pair is twisted up to 36 turns per meter to match the impedance of the IEEE-1284 interface. Shielding is also better.

If the scanner is the cause of the problem, it should be obvious. Most printers display an error message when the scanner in this case.

Bad Image Quality

An image that looks bad may be caused by one of the following:

- A faulty toner cartridge,
- A dirty mirror,
- A faulty scanner,
- A malfunctioning controller board,
- A poor connection from the high voltage power supply or transfer roller/wire.
- Perform a printer self-test.
- Check the cartridge to see if it has been refurbished? Some toner cartridges depart significantly from the manufacturer's specifications. The photosensitive drum may be inferior in quality. Even the toner may be lower in quality, or it may not have the same consistency as the toner that the cartridge originally contained.

• Check to see if there is a defect on the photosensitive drum. The defect may be caused by the scanner or the drum itself. Carefully rotate the photosensitive drum to see if there is a defect on it. Don't touch the surface of the drum. You could cause more defects.

• If the defect is one that makes marks on the paper in several places spaced evenly and vertically aligned it may be caused by a roller that has a defect in it. When a defect such as this occurs, roll the bad printed page in the shape of a cylinder. Look for a roller with a similar diameter in the printer. That is most likely the cause of the problem.



Figure 2 Some parts vendors purchase used and defective whole unit printers like this pallet-load, then disassemble, test, package, and sell these components. Some companies even warrant and market these parts under the refurbished category. Worn parts like these can cause early failure of a repair and costly callbacks.

Making the Most of Printer Customer Support

by Jim Van Laarhoven

It is often heard that two heads are better than one. Getting a fresh viewpoint from a technical support center might eliminate some of the mental gear-grinding that can accompany many troubleshooting cases. In most instances, a lot of hard work has already gone into the project prior to call placement, so you probably have quite a bit of information to share with technical support. Before making that call, it might be helpful to construct a troubleshooting list of what problems you have already eliminated and what problems are still questionable.

Using a computer printer problem as an example, we will explore some common steps that may be helpful when dealing with a basic technical support call.

Soon after the install of an inkjet printer was completed, the computer showed a communication fault when the print command was sent from LPT1. The printer displayed a green light, which meant it was ready for the computer to send commands. This made it seem unlikely that the printer itself was at fault. The cable had worked before on the previous printer and the computer was recognizing that it was looking for the correct printer on the correct port. A list of these observations was then made on a sheet of paper along with the model and serial number of the printer. In addition, the error codes that the computer displayed were also added to this list.

The next point is to ask yourself what you think the problem is. You may think you have no idea, but you most likely do. This suspicion is how you will steer the conversation while talking to technical support. About this time, you may feel like dumping the whole problem on technical support. It would be easier on you to let them figure it out by themselves, however, you have the advantage of seeing the problem first hand. Any input you have will be important and will initiate a two-sided problem-solving attitude. Good support personnel will welcome friendly input and this is when a problem really starts to get solved.

In this situation, it seemed that the printer cable should be suspected. It had worked on the old printer, but the new printer had many new features, such as bi-directional

communication.

A call was then placed to support. The technician listened and then came to the same conclusion: the cable was probably at fault. He explained that the cable was apparently an older one that was not IEEE-1284 compliant, meaning it could not handle the high-speeds or status indicators of bi-directional communication (Figure S1). Either the cable needed replacing or a change needed to be implemented in the software configuration. In the configuration area of the printer software, a box was checked for bi-directional communication. Mouse clicking that box would allow the standard compatibility mode (one-way) to be enabled, thus allowing the old cable to function with the new printer. One of the features that would be eliminated by using the old cable were certain on-screen status alerts (such as; paper out, printer cover open, etc.). Technical support also mentioned that if the cable was ever upgraded, to make sure that the printer port BIOS was set back to BiDi. BiDi or bi-directional is also referred to as Nibble Mode. In this mode, the printer will send two nibbles (4 bits each) of information to the computer (this will display the paper out, cover open, etc.).

This conversation with support was quick, friendly and covered a lot of ground. The next step was to make the decision. In this case the owner was impatient to use the printer and did not want to buy another cable. The configuration was changed to suit the customer's immediate needs.

The preceding example was simple; however, it makes a good point. Organizing ahead of time cuts down on the time you spend on the phone with support. This is important, especially if you use the same support people all of the time. They will appreciate this consideration and will tend to share more of their knowledge with you in the future.

There are many other ways to use technical support, one of which is component information. Frequently, discreet components are proprietary and lack any identifiable marks. Sometimes an unmarked package that looks like a standard transistor could be something else. In most cases, it

would be a simple task for technical support to find out for you. Another area they can help with is corporation information. Now and then corporate phone numbers are a little hard to locate. Generally, support has these telephone numbers at their disposal and will usually give them to you if you ask.

There are instances when you find it necessary to place a second call to technical support because a troubleshooting problem is not getting solved. At this time, it would be helpful to let them know everything you have tried up to that point, particularly if the product you are working on is under warranty. Technical support commonly has the authority to issue a replacement unit and will do so if they think every troubleshooting angle has been exhausted.

It is interesting to find out that a technical support group has so many different uses. They have a tendency to spend a significant amount of time talking with their engineering department, so they do know a lot of cutting-edge technology. In addition, they work with such a large variety of technicians and their unique troubleshooting problems, that their storehouse of knowledge is normally quite extensive.

The internet is another excellent source for technical support. Interactive data bases that use key words can answer many of the questions you may have. In some ways, using these data bases can be easier than calling a regular support center. You don't have to wait as long to get information and you can browse many different sources at your convenience to find exactly what you are looking for. E-mail addresses are generally available on the website in case you need a specific response from support personnel. This gives support ample time to gather information before they send you an e-mail response. This response may be more accurate and detailed than a telephone conversation simply because the pressure to perform immediately is reduced.

In summary: isolate the general problem area and then organize that information on paper before you call technical support. This will give both you and support the confidence to deal with the problem and bring it to a successful conclusion.

Pulled Parts, A Plague on Our Industry

Pulled or Remanufactured? Know the Difference

by Will DeMuth and Paul McGovern, Depot America

There is an alarming practice growing in the service industry today - the practice of selling used or "pulled parts" under the title "refurbished."

The process starts out with the parts vendor purchasing used and defective whole unit printers in large lots (Figure S2). Next they will disassemble, test, package, and sell these components. Some companies even warranty and market these parts under the "refurbished" title.

Of course, with the better part of their life cycle already spent, these parts cost much more in the long run. When a part fails prematurely, the cost is not to the company that supplied the part. It's to the service company that has to pay labor for the service technician to replace the warranty item. Even a warranty plus payment for return shipping hardly offsets the cost to the service company for labor.

The indirect risk - and potentially the most damaging - is the customer dissatisfaction that this practice creates. The service provider's most important attribute is the confidence the customer has in their ability. The erosion in confidence has an immeasurable price tag.

And for the parts vendor, the lure is the windfall profit. It can be as much as 500 percent. With such margins to be made, it's obvious to see why this problem is growing at an epidemic rate. When a company can buy bulk used printers for under \$50, the potential margins are extremely high without a guarantee on the part itself.

How to Avoid Buying "Pulled Parts" When You Want the Real Thing

Service organizations need to be on guard for this rising problem. Here are some tips to help you avoid becoming a victim:

- Ask Questions. Know your vendor. Ask for DOA, NTF and warranty rates. A company that knows itself will monitor and measure its quality.

- Define refurbished. There are degrees, since "refurbished" has various definitions. Is the part partially or completely refurbished? What does the vendor do beyond "fluff and dust" If the claim is that the part is tested, how is that done? What parts have been replaced? For a fuser, 100 percent refurbished means gears, rollers, lamps and

picker fingers. Refurbished means "like new," both cosmetically and functionally.

- Inspect the parts received. Check the part and see if it is clean and is a near match to OEM quality. Is there toner buildup, paper dust or general wear and tear on the components? Do they chemically clean or use an abrasive method? Cosmetic appearance could be a good indicator as to the origin.

- Monitor to determine if it's a good vendor. Monitor the overall product quality throughout the life of the business relationship.

Use a reputable depot repair facility. Most of all, check your future partners out - from your own basic instinct to their reputation. For a service company, it's goal is to establish a relationship with a vendor. As one service professional says: "Price is nice., but a reliable partner is priceless."

If you make the decision to purchase pulled parts, certainly that option is available. Just make sure you are paying the pull part price, and your customer is informed as to what is going into his printer. Typically, you will pay 80 to 90 percent less than the 100 percent refurbished exchange price. ■

Photofact Index

JVC	SP2722UA.....4387	G5D-3689C04393	SONY
AV-271154388	RCA	G5D-3689C14393	KV-13FM124394
AV-27115 Suffix A4388	CTC197CJ3.....4389	G5D-3689G04393	KV-13FM134394
AV-271204388	CTC197CK4389	G5D-3689G14393	KV-13FM144394
AV-27120 Suffix A4388	PS32600YX14389	G5R-3259C14385	SCC-S40H-A4394
PANASONIC	PS32700YX14389	G5R-3259G14385	SCC-S40J-A4394
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CT-20D20B4392	PS36700YX14389	G6D-2058G04417	
CT-20D20DB4392	SANSUI	SHARP	ZENITH
CT-20G5B4395	TVM1915A Version D..4390	CN13M104386	B27A30ZC54391
CT-20G5CB4395	SANYO	CN13-M1004386	B27A30ZC64391
CT-2014SB4395	AVM-3259C4385	CN13-M1504386	B27A30ZC654391
PP3264395	AVM-3259G4385	VN-61TVCR-329	B27A30ZCF4391
SP3274395	AVM-3259S4385	25VT-H60TVCR-329	B27A30ZCF54391
QUASAR	AVM-3689C4393	25VT-H80TVCR-329	B27A34Z4396
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Tools For Efficient Servicing

One of the things that has characterized humans as distinct from other species is humans' use of tools. Not that some other intelligent animals don't use rudimentary tools, but humans alone have devised such a wealth of tools of all kinds. In fact, the ages of humanity are reckoned by the types of tools (weapons are a kind of tool, too) used by humans: the stone age, the bronze age, the iron age. Look at any profession, and you see tools. Masons have tools to cut bricks, trowels, mortar pointing tools. Carpenters have hammers, saws, measuring tools, levels, squares and more. A surgeon has scalpels, retractors, clamps, scissors, and many other tools.

Consumer electronics service technicians are no exception to the truth that every profession has its own complement of tools. Actually, it's easy to forget how many tools are required in order to perform service on consumer electronics products. Moreover, there are many other tools that may not be essential, but under the right circumstances, can make the work more efficient: so much so that they eventually pay for themselves in time saved.

Consider this list of tools and test equipment that a consumer electronics servicing technician uses in a given day: screwdrivers, wrenches, pliers, wire cutters, wire strippers, soldering iron, vacuum solder remover, magnifying glass, task lighting, jigs, fixtures, vises, snap ring pliers. A technician's work includes disassembling the product to be repaired, testing the circuitry to determine which components are faulty, replacing the faulty components, testing the repair, and reassembling the product. If the technician has the needed tool, of good quality, for each step in the process, the work will go smoothly. If the needed tool isn't at hand, or if the tool is not of the required quality, the job might take more time than it should, or the technician might even damage the unit.

More advanced tools can help the technician get the job done more quickly and efficiently. For example, a tool such as a power screwdriver can zip fasteners off during disassembly and back on when reassembling. And they save more than time: they can spare the technician debilitating repetitive stress injuries.

Another time saving tool is the soldering station. A soldering station can be left idling constantly so that it's ready whenever the technician might need to desolder a joint. If it happens to be a station equipped with an integral vacuum desoldering system and fume removal system, it can whisk away the solder as soon as it melts it, and remove noxious fumes at the same time.

The Computer As Tool

As technology advances, tools for all professions become more sophisticated and improve the efficiency of the practitioner. As a specific example in the service profession, as consumer electronics are increasingly based on digital electronics technology, the personal computer increasingly becomes a necessary tool to diagnose and adjust those products.

With every passing year, more and more consumer electronics products today, such as camcorders and TV's contain a great deal of computer-like circuitry: a microprocessor is used to control some of the functions of the product, and data stored in EEPROM (electrically erasable programmable read-only memory) directs the processor in carrying out those functions. The ROM data performs a function similar to the function of adjustment controls in earlier products.

As the product ages, or otherwise ceases to function properly because of failure of adjustments, the technician can connect the computer to the product, check the operation of the unit, and change the EEPROM data, restoring the unit to proper operation. In this case, the computer has served the function of both a piece of test equipment in observing the product's operation, and the

function of a tool that is the modern equivalent of a screwdriver or alignment tool.

Selecting a Vendor

You can buy most tools just about anywhere. Every hardware store, department store or discount store has a tool department where you could probably obtain many of your tools. But then the tool needs of a consumer electronics servicing technician are pretty demanding and many of the tools needed to service a TV, VCR, camcorder or personal computer are special-purpose tools. It might, therefore, be more effective to select tools from vendors who know the special needs of the technician.

The Showcase

This Tool and Toolcase Showcase is designed to provide readers with a little more information than is ordinarily available about tool vendors. Each advertiser in this showcase has been given an additional amount of space to tell readers about their company in the hope that it will help in the process of

determining who is most likely to carry the kinds of tools most targeted to consumer electronics service.

As you read the descriptions of these companies, written in their own words, you might want to keep these questions in mind:

- How long have they been in business?
- How often are they able to fill orders from stock?
- What payment options do they offer: open order account, credit card?
- How soon after receipt of an order to they ship?
- Do they add a shipping surcharge?
- Do they have a toll free number?
- What ordering options do they offer?
- What is their return policy?
- Do they offer a warranty?
- Is there a minimum order amount?
- What shipping options do they offer?
- What special services do they offer?

Electronic Design Specialists

makes test equipment designed to help servicing electronic technicians troubleshoot problems as quickly and accurately as possible. All test equipment is designed by David T. Miga, CET, who is an electronic engineer and a certified electronic technician.

The EDS corporation was started in 1986 when Dave designed a digital capacitor meter and a semiconductor analyzer to increase his own productivity as a contract technician. When other technicians saw what the EDS-52 capacitor meter and the EDS-59 semiconductor analyzer could do, Dave found himself being asked to build more of these prototypes for them. The production version of the semiconductor analyzer, the SemiAnalyzer 59C, was very successful and was sold from 1987 until 1997. Other unique test equipment followed, such as the Bus Line Tracer, the Micro-Analyzer, the Leak Seeker, and the very popular CapAnalyzer. Although designed for independent service technicians, regular users are the US military, most of the fortune 500 companies, NASA, the TV networks and cable companies, Panasonic, Pioneer and many trade schools and colleges.

Dave designs his test equipment with an entirely different perspective than most test equipment companies. All ideas start with interviewing thousands of

independent service technicians for their opinions and special needs. This approach is different from conventional test equipment manufactures, where equipment is designed by engineers that may have never picked up a soldering iron, who wouldn't be able to repair their own television, even with their own test instruments. Their idea of test equipment is to bombard the technician with numbers, to be expensive and to be difficult to use. This is overkill for a servicing technician; check out the "used test equipment" section in the classifieds of this magazine for these products.

For this reason, all EDS equipment is designed to give the technician the tools to tell whether a component is good, poor, or bad, in a circuit, as accurately as possible. A technician doesn't need to know what a capacitor's dissipation factor or dielectric constant is; just is it bad, can I move on? EDS test equipment is designed by technicians, is guaranteed accurate for in circuit tests, and is designed for easy use. Determining the quality of a component in questions done by the test instrument, not the technician.

To design a test instrument to decide whether a component is good or bad, EDS analyzes actual defective components sent in by technicians. Calibrating the test equipment is done by comparing new, old but still working, and known defective components, then pro-

gramming the test equipment to make the decision, with Dave's 30-year experience as helpful input. Every CapAnalyzer 88A is still tested with the same actual good, poor, and bad electrolytics and tantalums used to design the original prototype, before releasing it to the customer.

EDS was the first on the World Wide Web with animated demonstrations of test equipment products, and has one of the best technical assistance programs on the internet. You can even download replacement owner's manuals and review tech tips, and get self-maintenance help for each product.

As the electronic repair industry moves into the twenty first century, more and more technicians will discover that to be productive, less time must be spent looking at schematics of increasingly complicated circuits. Simply checking components in the circuit with the problem, with the right instruments, is how profitable repairs will be done by surviving technicians in the next millennium.

EDS products are available from your distributor. For international sales contact EDS directly. Check out www.eds-inc.com for a current list of distributors. All products come with a 60 day satisfaction guarantee or money-back policy.

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Test Equipment Update

Standards and Measurements

by Alvin G. Sydnor

In the early 1800's it was Lord Kelvin (Sir William Thompson) who said; "When you can measure what you are speaking about and express it in numbers, you know something about it. But when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and Unsatisfactory kind."

Consumer electronics technicians use multimeters and other pieces of test equipment every day while rarely giving a thought to how that test equipment was calibrated. For example, when the technician touches the leads to the points in the circuit to be tested and the meter displays 15.7V, how does he know that there is actually 15.7V at that point within some reasonable margin of error? The answer is that the manufacturer has used some standard value of voltage to calibrate that meter. Moreover, the standard that the manufacturer used can be traced back to the NIST (formerly NBS).

Everywhere you look standards and the need to measure accurately surrounds us. It can be said that society as we know it got its start with the setting of standards. Standards and measurements have become a full-fledged science whose stature and importance are fully recognized by governments the world over. The transition in which the technique of measuring has grown from an art into a science came just in time for the modern industrial age.

The search for developing more accurate ways to measure length, mass, time and temperature will never end. These are the four master measures on which all other measurements depend. Each of the four establishes the excellence with which we can examine the physical universe and they provide the basis for all technologies. The goal in establishing standards of measurements is to provide a unit that can be reproduced with accuracy anywhere in the world by anyone. Therefore, the units of length, mass, time and temperature should be referred to basic constants of nature, preferably at the level of atomic behavior. Three of the four units: length, time and temperature are now defined in terms of natural constants.

What's a Cubit?

There is no doubt that Noah was a good carpenter. The Ark he built stayed afloat for more than 120 days during one of the heaviest rainstorms and worst floods ever recorded in history. But Noah doesn't deserve all the credit. He was given the specifications to build the boat: 300 cubits long, 50 cubits wide and 30 cubits high. Even today we would consider this to be a good-sized ship. In Noah's time a cubit was roughly 18 inches, which meant that

Noah's 300 cubit, floating menagerie was about 450 feet from stem to stern.

In Noah's day a cubit was the length of a man's forearm, which was the distance from the tip of his elbow to the end of his middle finger. Obviously the cubit was not a positive fixed dimension and it was not a standard by any means, but since Noah was the only one doing the measuring he could be fairly certain that both sides of the Ark would be the same length and meet at the bow at the stern. For thousands of years a man's foot, hand and arm were the standard measuring tools.

It was Columbus's voyage to the New World that made the civilized world bigger and it helped broaden men's imaginations. Science and the industrial revolution soon were to make the old rule-of-thumb techniques of measuring inadequate.

Newton's Rings

Sir Isaac Newton in 1672 presented the world with some new ideas on the nature of light and color. He had noticed that when two flat pieces of glass were pressed together he could see circular bands of rainbow-like colors, these circular bands became known as Newton's Rings.

What Newton had discovered was an incredibly precise method of measuring, but he didn't recognize it as such at that time. Later many other scientists began to

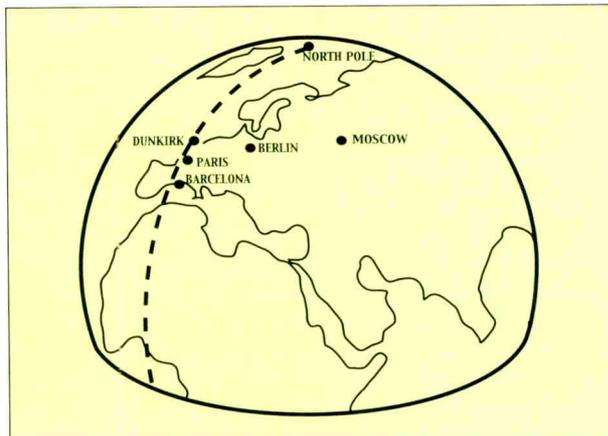


Figure 1 The basis of the meter was the quadrant of the earth's meridian passing through Dunkirk, France, and Barcelona. The Dunkirk-Barcelona distance was measured using astronomical determinations of latitudes. The meter was defined as one-tenth-millionth of the Equator-to-pole quadrant.

build on Newton's groundwork, and soon a new branch of science came into being known as interferometry. Today this method of using a ray of light as a yardstick enables us to measure distances within closer than millionths of an inch.

During the 16th century only astronomers were concerned with accurate standards and measurements. During that time there were a variety of different units of measurements even within each country for the same quantity. It was Galileo who made it clear that physical measurements were an integral part of studying natural phenomena. Natural philosophers began to realize that common well-defined units of measurement were necessary in order to exchange and compare experimental results. By the second half of the 18th century at the time of the French Revolution a concerted drive developed among investigators from several nations to establish a truly international system of measurement that was to be based on a sound scientific method.

Development of standards

Several standards of length were proposed for the new measuring system. More than 100 years earlier the astronomer Jean Picard had suggested that the unit of length be defined as the length of a pendulum with a natural period of one

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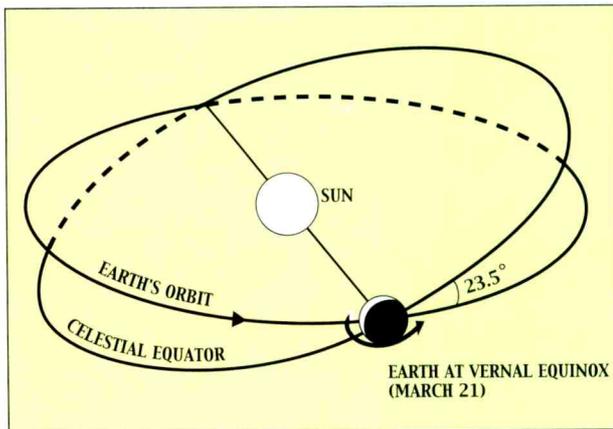


Figure 2 The basis of the second, generally accepted before adoption of the metric system, was the mean solar day, of which the second was 1/86,400th part. The mean solar day, in turn, is 1/365,2422th of the tropical year, measured from vernal equinox to vernal equinox.

second at sea level and at a latitude of 45 degrees. Many agreed with Picard's proposal. However, a committee established by the French National Assembly finally rejected the idea in 1790 as insufficiently precise. Soon after, there was another suggestion that was given a considerable amount of attention, which was to define the standard of length as some fraction of the equator; this idea was also rejected.

The proposal that was finally agreed upon was that the unit of length be the meter which was to be defined as one-tenth-millionth of a quadrant of the earth's meridian as carefully measured over that fraction of the quadrant lying between Dunkirk in France and a point close to Barcelona. See Figure 1.

Between 1792 and 1799 the measurements between Dunkirk and Barcelona were painstakingly carried out by a surveying crew under the direction of astronomer Jean Baptiste Delambre. The astronomical measurements obtained established that the distance between Dunkirk and Barcelona represented a little more than a tenth of the entire quadrant from the North Pole to the Equator. The measured distance from Dunkirk to Barcelona turned out to be 1,075,039 of the units subsequently defined as the meter.

The Metric System

From this data the French government adopted an entirely new system of standards called the metric system that was

based on what they called the meter. The new standard was supposed to be one ten-millionth part of the distance from the North Pole to the Equator when measured on a straight line running along the surface of the earth through Paris. Those heavily involved in establishing the metric system was astronomer Jean Baptiste Delambre, a French diplomat Charles Maurice de Talley and the discoverer of oxygen, Antoine Laurent Lavoisier.

The progress in adopting the metric system was slow

but continued at a steady pace. It was a major disappointment within the U.S. because the Dunkirk-Barcelona distance supposedly put France and Spain in a favored position within the scientific community. Finally the metric system was accepted by many countries except Italy, Belgium and the Netherlands who didn't accept it until the first quarter of the 19th century, and in the mid 1860's it became legal to use the metric system in Great Britain and the United States.

The unit of mass, the kilogram, was taken as the mass of a cubic decimeter (one tenth of a cubic meter) of water at the temperature of its maximum density, this volume was to be called a liter. In this way the unit of mass and volume were derived from the standard of length by using the most available of all liquids as the medium for the conversion.

Problems With the Standards

As time went on there became a growing dissatisfaction with the new adopted system as it was originally conceived. The major and only reason for selecting the earth's meridian as a basis for a standard length was that the meridian or some specified fraction of it would always be available as a reference. Experience had demonstrated that two-meter bars could be compared to the earth's meridian. Also it was difficult to reproduce the kilogram in different countries simply by weighing the mass of a liter of water at maximum density.

In 1870 the French Government made arrangements for a conference to discuss the dissatisfaction and concerns and to work out a more unified standard of the measuring system. The results of this conference led to the signing of the Treaty of the Meter in Paris in 1875. The treaty established an International Bureau of Weights and Measures, which was to be the custodian of the standards for an international system of measurements and a General Conference on Weights and Measures were to meet periodically to handle any additional problems and also to adopt new definitions as the need arose.

The treaty also provided for a special commission to begin designing prototype standards of the meter and the kilogram so that the system could be based on two independent standards. In 1889 the meter was officially defined as the distance between two engraved lines on a bar of platinum-iridium alloy at zero degrees centigrade (now called Celsius). This new international meter bar was to be kept in a vault at Sevres, near Paris in the custody of the newly formed International Bureau, and it was to be made available for comparison with the length standards of all nations.

Copies of the meter bar were furnished to all nations adhering to the treaty. Also during the same time period the kilogram was defined as the mass of a particular platinum-iridium cylinder and copies of the cylinders were supplied to the treaty nations.

Soon after the new prototypes were received in the United States, the Office of Standard Weights and Measures within the Treasury Department were given custody of the standards and the responsibility to redefine the yard and the pound as appropriate fractions of the meter and the kilogram. Since then the yard, pound, and gallon in the U.S. have been based on the metric system.

Definition of the Second

The unit of time, the second had been specified much earlier in terms of the relative position of the earth and the sun. See Figure 2. The second had been defined as 1/86,400th part of a day and later as 1/31,556,925,9747th part of the tropical year 1900. The need to refine the second

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was necessary because it was found that the rotation of the earth is more erratic than had been thought. The irregularity is probably caused by tides, winds, earthquakes and magnetic fields.

Refinement of the Standard for the Meter

In 1960 the General Conference on Weights and Measures meeting in Paris again refined the meter in terms of a particular wavelength of 1,650,763.73 radiation from the isotope krypton 86. In 1970 the conference again refined the second as 9,192,631,770 cycles of the frequency associated with the transition between two energy levels of the isotope cesium 133.

Since the meter had been defined in terms of a second, a unit of time automatically involved clocks. This definition of the meter was quoted to an accuracy of nine significant digits: "the length of a path traversed in vacuum by light in 1/299792458 seconds. Recently the Commerce Department's National Institute Standards and Technology (NIST) recently placed a new atomic clock into operation that will neither gain nor lose a second in approximately 20 million years.

More than a hundred and fifty years ago standards were important for only five different kinds of measuring units: length, volume, weight, time and angle. Today, we must have standards for the accurate measurements of temperature, light intensity, color, sound intensity, electric current, X-ray dosage, nuclear radiation, time and many other phenomena's. Virtually all can be derived from four and only four independent units, which are, the meter for length, the kilogram for mass, the second for time and the leivin for temperature.

These four quantities together with two derived quantities (the ampere and candela) are the building blocks of the International System of Units. The International System of Units, universally abbreviated SI (taken from the French Le Syst'eme International d'Unites) has been the dominant measuring system used in science and international commerce.

There are some measurements that do not depend on the four basic standards, they

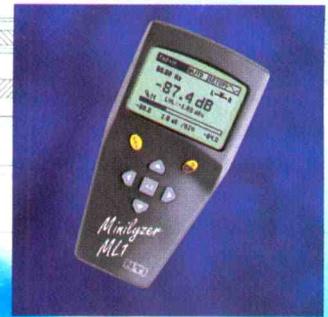
include angle measurements, which are basically ratios of two lengths and therefore are independent of particular units of length and color measurements which are really schemes of classification related primarily to the properties of the human eye.

Establishing other Standards

In the last half of the 19th century there were tremendous advances in the theories of heat, light, electricity and magnetism. Major industries being to exploit these developments and it became necessary to invent and build instruments that could measure a completely new set of properties. In addition standards had to be developed for many of the new units of measurement. These needs led to the establishment in many countries of a central organization for setting and developing standards. Thus the National Physical Laboratory was created in England in 1889 and in the United States the National Bureau of Standards (NBS) was established by an act of Congress on March 3, 1901 to strengthen U.S. industry's competitiveness; advance science and engineering; and improve public health, safety, and the environment.

One of NBS's basic function was to develop, maintain, and retain custody of the national standards of measurement, and provide the means and methods for comparing standards used in science, engineering, manufacturing, and education with the standards adopted or recognized by the Federal Government. The Omnibus Trade and Competitive Act of August 1988 changed the name of the National Bureau of Standards (NBS) to the National Institute of Standards and Technology (NIST), which gave NIST the added task and responsibilities of conducting basic and applied research in the physical sciences and engineering. Also NIST is to assist U.S. industry in the development of measuring technology to improve product quality and to facilitate rapid commercialization of products based on new scientific discoveries, thus increasing the ability of U.S. industries to be competitive in the global marketplace.

In recognizing the rapid expanding use of the SI it became necessary to amend the Metric Conversion Act of 1975. In one particular section titled "Metric Usage"



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the amendment designates the metric system of measurement as the preferred system of weights and measures for United States trade and commerce.....and requires that each Federal Agency, by the end of fiscal year 1989 as economically feasible to start using the metric system of measurement in all procurements, grants and other business related activities except to the extent when such use is impractical or is likely to cause significant inefficiencies or loss of markets for U.S. firms.

In January 1991, the Department of Commerce issued an addition to the code of Federal Regulations entitled "Metric Conversion Policy for Federal Agencies" which removes the voluntary aspect of the conversion to the SI for Federal agencies. Executive Order 12770 issued July 1991 reinforces that policy by providing presidential authority and direction for the use of the metric system of measurement by Federal agencies and departments.

The advent of the space age and the

Internet has intensified the search for more accurate measurements, which in turn help gain the objective of reliability and quality. This new challenge to American Industry has forced natural adoption of rigorous standards and precision measurements. As an example, our space vehicles must operate successfully millions of miles from earth; the physical, electrical and mechanical properties of thousands of individual components must be carefully controlled by reference to accurate standards.

The Standard Volt

The following discussion of the standard for the electrical parameter, the volt, was derived from the NIST website. It's obvious from this discussion that the agency responsible for maintaining electrical standards is constantly seeking to develop more effective ways to define the standard and to make calibration standards available to science and industry.

All voltage measurements performed in the U.S., whether for the purpose of direct voltage reading or for the determination of another parameter (such as temperature) through the use of a transducer that converts that parameter into a voltage signal, rely for consistency on traceability to international standards through the U.S. legal volt. Because of the length of the calibration chain that connects measurements by an end user with the U.S. legal volt, it is common for the measurement uncertainty of the end user to exceed the NIST primary uncertainty by a factor of 100 or more. The continued development and deployment by the U.S. electronics instrumentation industries of increasingly sophisticated and accurate instrumentation places ever-increasing demands for higher accuracy voltage metrology both in calibration and testing laboratories and on production lines and factory floors. Consequently, NIST is continuously pressed to reduce measurement uncertainty at the beginning of this chain and to develop improved mechanisms for dissemination to the end user. Through maintenance, development, and dissemination of the U.S. legal volt, this project provides the robust base for voltage metrology that enables the U.S. electronics instrumentation industries to compete successfully in the global market.

Technical Strategy

A representation of the SI unit of voltage has been established via the Josephson

effect, to maintain and disseminate the U.S. legal volt. The measurement systems required to measure and transfer that voltage to other electronic systems and chemical or electronic standards have been developed. To continually achieve the lowest possible uncertainty, project members 1) perform regular checks for subtle systematic errors in both the Josephson voltage standard systems and the subsequent transfer systems, 2) perform regular comparison checks between our systems, 3) maintain long-term observations of well-characterized check standards, and 4) periodically verify our consistency with the international community through very careful international comparisons. Research continues on the physical and statistical limitations of metrology equipment and protocols both presently in use and under development in order to support future technological advances.

There has been an increasing demand in recent years, by industrial users of Josephson voltage standards, for NIST to provide voltage calibrations with higher accuracy than is presently available through our standard volt calibration services. To provide that increased accuracy in the voltage dissemination we are developing a measurement assurance program (MAP), based on 10 V Zener reference standards, which will reduce the uncertainty delivered to our customers by approximately a factor of four.

By 2001, complete the documentation for the 10 V Zener MAP so it can be offered as a regular service to NIST customers.

In recent years, an increasing number of Josephson voltage standards have been deployed both around the world and throughout the U.S. It has proven very difficult to verify in the field the performance of voltage metrology systems based upon Josephson standards because the accuracy of these measurements is limited by the performance

of the Zener voltage references used as transfer standards. Because the ultimate performance of Josephson voltage systems should be much better than can be verified using these standards, a traveling compact Josephson voltage standard (JVS) is being developed along with measurement protocols appropriate for its use in the intercomparison of Josephson systems. The elimination of problems associated with traveling Zener standards will substantially reduce the uncertainty of Josephson voltage intercomparisons.

Editor's note (based on an article at www.britannica.com)

The Josephson junction, and the Josephson voltage mentioned in the above discussion are based on the Josephson effect, which is named for the British physicist Brian D. Josephson. Josephson predicted the phenomenon, and then discovered it in 1962. The Josephson effect has to do with the passage of current from one superconducting metal to another through a very thin insulating film (the Josephson junction) and the effects of small magnetic fields on this current.

The electrical state of Josephson-junction devices changes to a different electrical state very quickly. This phenomenon raises the possibility of producing superconducting microcircuits that operate faster than any other known kind. People have tried to develop computers using this effect, but technical problems have led to discontinuance or scaling back of these projects.

More to the point of this discussion, the voltage across a Josephson junction is known theoretically to depend only on the values of certain basic physical constants. Since these constants are known to great accuracy, Josephson junctions are now used to provide the absolute standard of direct-current voltage. ■

Circuit Board Rework Solutions

By Jerry Howard

Howard is owner of Howard Electronics in Kechi KS, a company that has been in the consumer electronics servicing business for 55 years, and is now also a distributor of soldering/desoldering equipment, test equipment, and other related products (www.howardelectronics.com).

There is probably not a consumer electronics product made today that doesn't contain SMD's (Surface Mount Devices). For a consumer electronics service center, this means that it is important to make sure that the service center has the proper tools to do the job, and that the technicians have the knowledge to use those tools in order to survive in the electronics repair business.

Surface mount technology has been around for a long time, but the tools for R&R (removal and replacement) have been slow to be accepted by many service and repair organizations, most likely because it is hard to justify the price of the better tools when weighed against the price of the average repair. Reluctance to upgrade to modern, more expensive, rework tools forces some of the more conservative service centers to look for innovative ways to use the tools at hand to do the work. The biggest problem with this is that it is possible to ruin the whole board by not having the right tools, thereby ruining the whole device that you are working on.

This is not a catastrophic problem when the cost to replace the product wouldn't be significantly higher than the cost to repair the unit. Damage by a technician to a product being serviced becomes a serious problem when the unit being serviced is a higher priced equipment as opposed to what we call throwaway equipment.

Service centers that plan on staying in the electronics repair business have to be servicing at least some higher priced products. That also requires an investment in top quality soldering and desoldering equipment to perform a job worthy of the reputation of the service center.

The Cost of a Complete Solder/Desolder Station

Fortunately, the investment in a good solder/desolder station does not require you to mortgage the business. It is possible to purchase a complete system for less than \$1200.00, which gives you the ability to replace almost any thru-hole, chip, SOT, SOP, QFP, PLCC components, and more. I said almost because there is a type of component used in some equipment that is called a BGA (ball grid array). Circuit boards that contain BGA devices are only repaired by a select few service centers because the equipment required to repair BGAs can cost several tens of thousands of dollars, which puts servicing of those devices beyond the scope of this article.

Thru-Hole Desoldering

Perhaps the best way to help technicians understand how a modern, versatile, desoldering station can make PC board rework easier and more efficient is to describe the process of replacing some typical components using a desoldering station. When a service center begins using a desoldering station, they experience an increase in productivity. It becomes possible to remove an IC from a single layer board at a rate of about 2 seconds per pin. A 100-pin microprocessor will take about 200 seconds, or about three and one-third minutes. It will take slightly longer if the IC is soldered to a multi-layer board because of the slower heat transfer to the other side of the board. It is important to make sure that the solder is thoroughly melted before pressing the trigger on the desoldering pencil. When all the leads have been desoldered, the IC should just fall out and all of the pads will be perfectly clean and ready to accept a new IC. Resoldering the new IC should be just as fast with the temperature-controlled soldering iron on the station. On some units, there is a K-Type thermocouple built right into the tip of the ceramic heater, thereby holding the idle temperature within 3 degrees Celsius.

Eliminate Costly Repairs

A modern desoldering station helps service centers eliminate costly board repairs caused by using inferior tools. Most technicians have at one time or another damaged a pc board. It might have been possible to repair the damage, but you were sure hoping that if anybody in the future saw your work, they would not be able to trace it back to you. Moreover, repairing a board you have damaged takes up valuable service time. I know...we have all been there. This scenario can all but be eliminated by using quality tools. Remember, the tools make the technician, just like the business suit makes the businessman.

Cost of Doing Business

The efficiency of using a desoldering iron will help to lower the cost of doing business, thereby making the business more profitable, and more competitive in the marketplace. Whether you have 200 technicians working for you, or you are a one-man service center, you still have to be productive, competitive and perform quality work to remain in business in this economy.

Hot Tweezers

Technicians who work on camcorders and other equipment with surface mount electrolytic capacitors will be relieved to see how easy they are to remove and replace. With the hot tweezers, it is possible to remove one about every three to five seconds. With a little practice, you can easily replace them with the hot tweezers too. Also removing chip resistors, chip capacitors, and SOIC's are a snap. The tweezers have blades up to 30mm wide. The tips come in sizes of 2mm, 3mm, 5mm, 10mm, 15mm, 20mm, and 30mm.

Hot Air Pencil

The hot air pencil, a part of many soldering stations is also useful for removal and replacement of small chip compo-

nents. Resoldering can be accomplished using solder paste and, if properly done, it should look as though it has never been removed when you're finished. Then you know that you have done a job to be proud of. When you get into larger components, you will then use the larger hot air machine. One of these machines has a 310W ceramic heating element that is temperature adjustable, with a sensor built into the tip to keep the temperature constant regardless of air flow. The air flow is also adjustable so you can use high air flow for removal and low air flow for replacement with solder paste. Several focus hoods are also available to cover the many different types of IC's including PLCC's (the J leads). The unit comes with a focus hood that has a port that is 5mm in diameter, which will be perfect for many jobs. There are many different sizes of focus hoods available for this unit. There are also focus hoods from other manufacturers that will fit the heater perfectly, so you can share focus hoods if you already have some in your service center.

SMD Removal

With a soldering/desoldering station you should be able to, very easily and without much expertise, remove and replace most any component. Some of the harder components would be the fine pitch QFP's (quad flat packs). Removal of one of these components is done by simply applying a good quality paste flux and applying heat from the hot air station; preferably with the correct focus hood or tip to match the job. If the optimum size focus hood is not available, the technician can still use the 5mm focus hood that comes with the unit. It is just necessary to move it around a lot more and will probably take longer for removal. With a device that causes the IC to separate from the PC board surface when the solder has melted sufficiently (one of these devices is called the IC Popper), you never have to worry about getting the IC too hot because the unit will pop up the IC just as soon as you have solder melt on all leads. You also do not have to worry about pulling any pads, as the device does not put enough pressure on the IC to pull up

a pad because of trying to remove prematurely.

Clean-Up and Site Preparation

Once the IC has been removed, it is time to clean the area with the desoldering tool. This does a fine job of cleaning the pads. Just turn the temperature up a little, touch the pad and wait a couple of seconds for solder melt. Then start in a circular motion with the desoldering tool perpendicular to the pads and work your way around the pads until all of the solder is removed. Next I would take an alcohol pad or flux remover and clean up the flux residue. Then take your syringe of solder paste with a blunt tip stainless steel needle or plastic taper tip needle and apply a small bead of solder paste around the outer perimeter of the pads. Next take a vacuum pickup tool and locate the proper positioning for the IC to the pads. The solder paste is tacky and should hold the IC in place during re-flow of the solder paste. Positioning of the IC at this point is not extremely critical. If you have at least 50% of the lead on the pad it will correct itself during re-flow. The solder has a terrific surface tension and will align the IC automatically during re-flow.

SMD Replacement

Next take the hot air handle that is part of the soldering station and adjust the air flow to a point where it will not blow the solder paste during re-flow. This can be achieved by trial and error and then can be set the same way each time you re-flow with that particular tip. What you are really trying to achieve with the solder paste is exactly what has been done during the production of the component or unit that you are working on. The secret to proper re-flow with the solder paste is to bring the temperature up to approximately 130 degrees Celsius. (This is called the pre-heat time). Then slowly (about 2C/second) bring it on up to about 170 degrees Celsius. (This is called the Soak Time). Then more rapidly bring it up to 220 degrees Celsius (this is called the dwell time), and remove all heat and let it cool on it's own without any external cooling. (Of course, this is called the cool time).

Solder Paste Type

There are three well know types of solder paste in use today which are all determined by the type of flux used to hold the solder balls together. The most common type used to be the RMA type, which stands for Rosin Mildly Activated. It washes off with denatured alcohol or a common flux remover. The second type is Water Soluble, which washes off with DI (De-ionized) water. The third type (which is now the most common) is No Clean, which means that you can leave it on without any detrimental effects.

PC Board Pre-Heater

One other practical addition to soldering and desoldering tools is a PC board pre-heater. Use of a PC board pre-heater can virtually eliminate thermal stress and thermal shock on the component and potential delamination of the printed circuit board. Pre-heating of the PC board is now the accepted process when reworking large components and is an absolute must when reworking BGA's (Ball Grid Arrays). One pre-heater has a ceramic heater with a K-Type Thermocouple and closed loop for temperature stability. It also has digital readout of the set temperature and the actual temperature.

The Right Tool for the Job

For years the trusty soldering iron was all any competent technician required in order to remove a faulty component from the circuit and to install the replacement. Times have changed. The technician servicing today's sophisticated, densely populated, PC boards requires sophisticated soldering tools to get the job done efficiently, effectively, and without causing damage to the very product he has been entrusted to service.

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ProService

Review

First Quarter 2001

A trade publication for professionals in the business of repairing consumer electronic equipment, appliances or computers.

An official journal of NESDA (National Electronics Service Dealers Association), and IS CET (International Society of Certified Electronics Technicians).

— Business Management —

Going Beyond the “Cost of Doing Business” Analysis

Too many service dealers don't know their actual costs of doing business, but of those who do know, many are using the information in the wrong way.

by Fred Longworth, M.B.A.

PURPOSE
ProService Review, included quarterly in **Electronic Servicing & Technology**, is produced by NESDA, the National Electronics Service Dealers Association, 3608 Pershing Ave., Fort Worth, TX 76107. It is intended for the enlightenment, education and entertainment of the members of NESDA, IS CET, and other ethical professionals engaged in or connected with the appliance, computer, and electronics service industries.

With the exception of official announcements, the statements and opinions expressed herein are those of the authors and not necessarily those of the associations.

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Sam came back from the cost-of-doing-business (CODB) seminar eager to revamp his prices. After a few calculations, it became clear that his flat rate of \$79 labor plus parts to fix a VCR or TV was grossly inadequate. He really needed to charge \$140 labor — just to break even!

Since he'd just opened his business, and the new phone book wouldn't be coming out until Spring, he was getting in only about 20 repairs a month. These were taking approximately 40 hours to complete.

His total monthly overhead came to \$2,000. If he divided the \$2,000 by the 40 hours which he had to sell, he got \$50/hour — or \$100 per 2-hour repair. To this he needed to add the direct cost of his own labor (treating himself as his own employee.) Since, at a bare minimum, he would have to spend \$20/hour, including taxes, workers comp, etc., to replace himself, he figured his own cost at \$40 per job. This upped the “breakeven point” to \$140. Now, as a capitalist, he was entitled to a “businessman's profit,” so he added another 10% for good measure (\$14). The grand total came to a whopping \$154 per repair.

He knew that a typical VCR or TV billed out at \$25 or less in parts, so he put a big sign in his window: “VCR/TV Repair — Fast 3-Day Service — Most Repairs Under \$179 Including Parts and Labor.”

From that day on, except for an occasional big-screen TV, customer input dropped to zero.

When I met Sam at a trade association meeting, and he told me how slow things were, I said, “Why don't you lower your prices?”

He looked at me like I was crazy. “I can't do that,” he protested. “I'd lose money.”

The problem is obvious: Sam has priced himself out of the market.

His customers won't pay \$179 — or even \$150 — for an ordinary VCR or TV repair. In Sam's town, you can get lots of business if you can profitably service garden-variety VCR's and TV's for \$90 to \$100. But, with the exception of high-end units, customers will go elsewhere — or just buy new equipment — when the repair price approaches \$125.

In economic terms, the upper price limit for a repair is established by the marketplace. And the marketplace couldn't care less about Sam's arithmetic.

So, we need to ask: if CODB analysis doesn't define for us where, precisely, to set our price, just what does the analysis tell us? The answer is: it sets the lower price limit, the least amount we can charge and not go in the hole. But, we can't use this “breakeven” number to set our prices. We use it to compare against what we do charge, and thus, to calculate our margin, or our profit.

But, be careful. As we can surmise from Sam's example, CODB analysis gives us inflated numbers if the facility is operating below capacity.

In most cases, the highest profits are made when a product or service is sold at “what the market will bear.” Luckily, there's a standard method for finding this out that provides us with real prices. And, curiously, to get a rigorous number and optimize your profits, you need to plug your CODB values into the formula.

Let me show you by example.

Assume that you currently charge \$50 labor, plus an average of \$10 in retail parts to fix a right-reverse whazzit. You call around in your town, pretend you are a consumer, and find

(Beyond CODB, continued on PS- 4)

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NESDA continues the legacy of service to its members, including education, technical and management training, and discounted business services. The website introduces consumers, as well as servicers, to some very specialized information.

by Mary Margaret Merrill

The original, and primary purpose of NESDA.com is to bring useful information to NESDA's membership. To that end, the site has been very successful in the wealth of information presented. This includes links to other useful sites when NESDA doesn't have the final answer. NESDA's Internet Committee, and its Webmaster, work continuously to increase its usefulness to members. Have you visited NESDA's web site lately?

Non-members who are curious about NESDA are invited to visit the "What is NESDA?" section. Here, you can read about NESDA's mission to aid independent servicers in their business survival. Visitors are walked through a comprehensive explanation of NESDA's major benefits and programs. Additional information is available through the NESDA office.

BEYOND THE ORDINARY

Special sections are devoted to two of the better programs. One of these is NESDAnet, the servicers' e-mail network. This includes participating NESDA members, NESDA officers, manufacturers, and parts distributors. Also featured is NWSN, the NESDA World Service Network. NWSN is a marketing initiative for qualifying businesses utilizing the Internet as a marketing tool. Both programs are optional at an extra cost so that non-participating companies do not have to pay for programs they do not support. Most questions about either program are answered in the FAQs (Frequently Asksed Questions) of each section. §

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Contact the NESDA/ISCET office at 800-797-9197 ext. 16, to order your personal copy of the 2001 ProService Yearbook and Directory. §

ISCET – Preparing Technicians for Today and Tomorrow

There is a place for technicians who have proven their abilities through certification. There is a place for proven-professional technicians to continue their training, and help elevate their industry to new levels.

One place with two goals: a professional/fraternal society for concerned and caring technicians.

by William S. Warren CET/CSM

When you were studying to become a technician, you imagined that you would become one of the *best* technicians. After you became a professional, and after you worked on-the-job at restoring the operation of hi-tech equipment, you *knew* you were among the best.



But who else knows? If your skills haven't been measured against others in the

industry, how do your customers know that you're not just a parts-swapper? How do you position yourself among the elite in your profession?

The answer to those questions is: certification. As in ISCET-Certified Electronics Technician.

And if you are, or become an ISCET-Certified electronics Technician, how do you continually enhance your professionalism, while promoting the betterment of your industry?

The answer to *that* question is the International Society of Certified Electronic Technicians (ISCET). That may be a long name, but it has a very short meaning: **The Best.**

ISCET's mission is simple: to promote technical certification worldwide, and to provide a place for certified technicians to come together to advance their profession. Technicians wishing to tell the world they are the best can, through ISCET certifications, demonstrate they *are* the best.

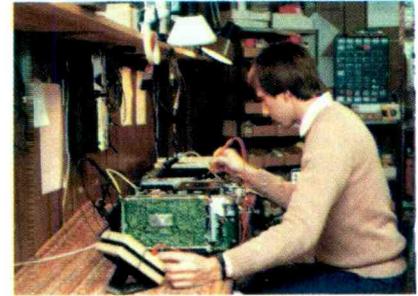
Since our beginning, ISCET has taken this simple mandate, and forged ahead to become one of the preeminent technical certification organizations in the world. To date, we have certified over 47,000 technicians

in various technical disciplines. While ISCET's roots are in consumer electronics, it has diversified into *all* segments of electronics servicing. ISCET is now a leader in certifications in fields as diverse as advanced audio and bio-medical electronics, to industrial and video. We have an extensive Associate program for students and apprentices with less than 4 years experience, to an unequalled Journeyman program for experienced technicians. In addition, we offer a number of journeyman endorsements in specialties such as camcorder, computer networking, and motor control. We are also a major contractor to the Federal Communications Commission (FCC) for implementation of the FCC Radiotelegraph certificates, licenses, and endorsements.

Not all programs are equal. ISCET is rightly proud that its certifications carry college credit recommendations by the American Council on Education's (ACE) College Credit Recommendation Service (CREDIT).

ACE is not a self-serving trade group. It is the leader in its field, and the service most major colleges and universities turn to for credit recommendations. An official ACE transcript is a permanent, lifetime, computerized record of all exams and courses evaluated by ACE, and the ACE transcript is designed to facilitate the acceptance of ACE credit recommendations by colleges and universities.

Quick and easy access. That is ISCET's goal. While we offer access to many of our certifications through the national testing firm of LaserGrade, the backbone of our efforts remains our



volunteer corps of over 400 members that have agreed to work as certification administrators. We are a professional society — of our members, by our members, and for our members. Our efforts emanate at the grass roots level and carry forward.

It's not just electronics either.

While electronics is in our name, we also administer the Certified Appliance Technician (CAT) program for the National Appliance Service Technician Certification (NASTeC) program. This program, developed by the Association of Home Appliance Manufacturers (AHAM) and controlled by the Appliance Technician Certification Association is ISCET's latest addition to its stable of certification programs.

Did someone say training? The leader in certifications is a leader in technical training as well. ISCET is a source for extensive training for the electronics professional, from sample tests to detailed books; from computerized quizzes to interactive CD-ROM based training utilizing Electronics WorkBench. In addition, our members receive mailings on everything from job opportunities to

technical papers by industry leaders.

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§

Editor's Note: William S. Warren CET/CSM is a Past Chairman of ISCET and owner of Warren Electronic Services in Knoxville, TN.

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(Beyond CODB, continued)

that the competition has a spread of \$55 to \$75 labor, and an average of \$10-20 in retail parts. Okay, now you know that you are the lowest price in a marketplace that generally runs \$65 to \$95 to provide the same service.

Since you keep accurate records of the important categories of items you repair, you note that, typically, you service 25 right-reverse whazzits per month. That's a total of $\$60 \times 25 = \$1,500$ revenue.

To earn this \$1,500 revenue, your CODB analysis tells you that (forgetting the extra capitalist's kicker) you would need to charge an average of \$45 (\$40 labor, plus \$5 wholesale cost of parts) to break even. This comes to $\$45 \times 25 = \$1,125$. Subtract this from \$1,500 and you get \$375, which is your profit.

Now, you raise your retail price, say, to \$60 labor and \$10 in parts. You carefully note how this affects customer demand, and you find that demand drops to 24 units a month. That's okay, because your revenues are now $\$70 \times 24 = \$1,680$. Your cost equals $\$45 \times 24 = \$1,080$, and your profit is \$600.

Flushed with success, you raise your retail price again, to \$80. Now, you lose another couple of repairs — down to 22. But your revenues increase to $\$80 \times 22 = \$1,760$. This generates a cost of $\$45 \times 22 = \990 , and a profit of \$770.

Now, you up the retail price another \$10 to \$90. Input decreases to 18 units. Revenues go to $\$90 \times 18 = \$1,620$. Cost drops to \$810. Profit increases to \$810.

Finally, you raise the retail price to \$100. Input decreases to 13 machines. Revenues go to \$1,300. Costs go to \$585. Profit drops to \$715.

Empirically, you have discovered a "maximum" (about \$90) on the price/profit curve, a sweet spot above and below which profits decline. Generally, this price will be within the "spread" or range of other dealers' prices in your market, but occasionally it will be higher or lower. Regardless, you have discovered the point of highest return for a given category of set.

But, don't rest on your laurels. You should continue to monitor price vs. aggregate profit, category by category, always on the lookout for trends or sudden changes.

Now, some manufacturers still

require you to provide a cost-of-doing-business analysis to justify your warranty rates. It is, after all, in their self-interest to pay you no more than they have to. And, unless you doctor the numbers — and many do — the analysis forces you to tip your hand. In some states, such as California, a manufacturer cannot, technically, pay you less than the CODB. (However, most will try, if you let them get away with it.)

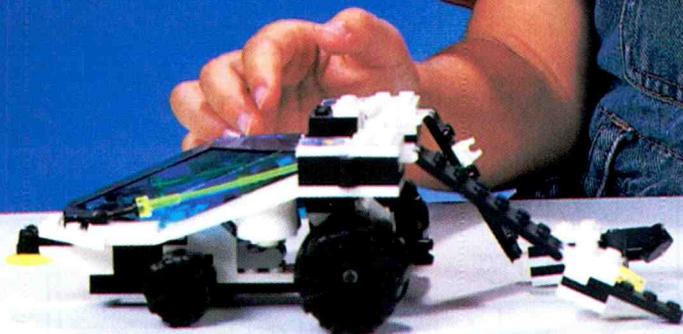
This connection to warranty rate negotiations was, I believe, how the whole CODB obsession got going in the first place. But, you should know: in business school, a simple CODB pricing model is not encouraged. That's because it is assumed that you are trying to maximize your profits, rather than playing a pleasant little numbers game on paper.

In short: know what your costs of doing business are; don't be a slave to your findings. Use the information intelligently to ensure continued business — and profits. §

Editor's Note: Fred Longworth CET, M.B.A. is owner of Longworth Consulting and StereoTech in San Diego, CA. §

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March 2001 *Electronic Servicing & Technology* 37

Gemstar, Histogram, Comb Filters, and More

By Steven J. Babbert

We recently wrapped up a series in which we took an in-depth look at state-of-the-art television. The example used in this series was a Magnavox #25P506-OAAA. We will now follow up with a look at a Magnavox chassis #27W508-OAAA. The basic system used in both of these chassis is very similar. The latter, however, has some additional features that many technicians may not be familiar with.

Figure 1 is a block diagram depicting a portion of the video processing circuit. The CVBS (composite video baseband signal) from the video source switch enters the comb filter where it is separated into luminance and chrominance signals, designated Y and C respectively. These signals then pass through a second

switch that selects either the main signals or SVHS. The selected signals then pass through the histogram board and finally into a section of the main signal processor for chroma demodulation and formation of the R, B, and G signals. These signals

are then applied to the OSD (on-screen display) switch block along with the external R, G, B, and Fast Blanking signals from the Gemstar (Guide Plus) module. These blocks will

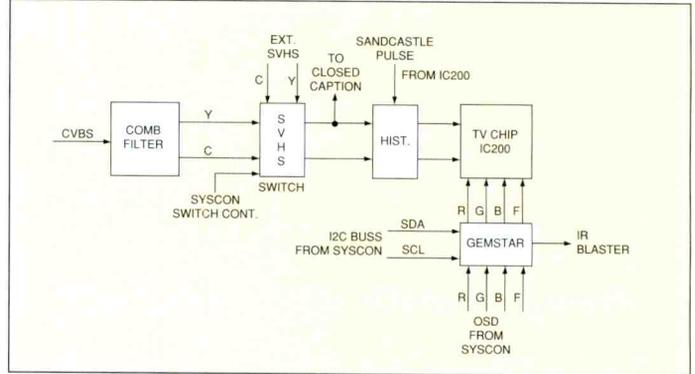


Figure 1. This figure will be helpful in seeing how the various blocks are situated with respect to the TV-chip.

be dealt with one at a time. For a refresher on OSD and RGB signals, see Magnavox Signal Processor Part II in August '99 ES&T.

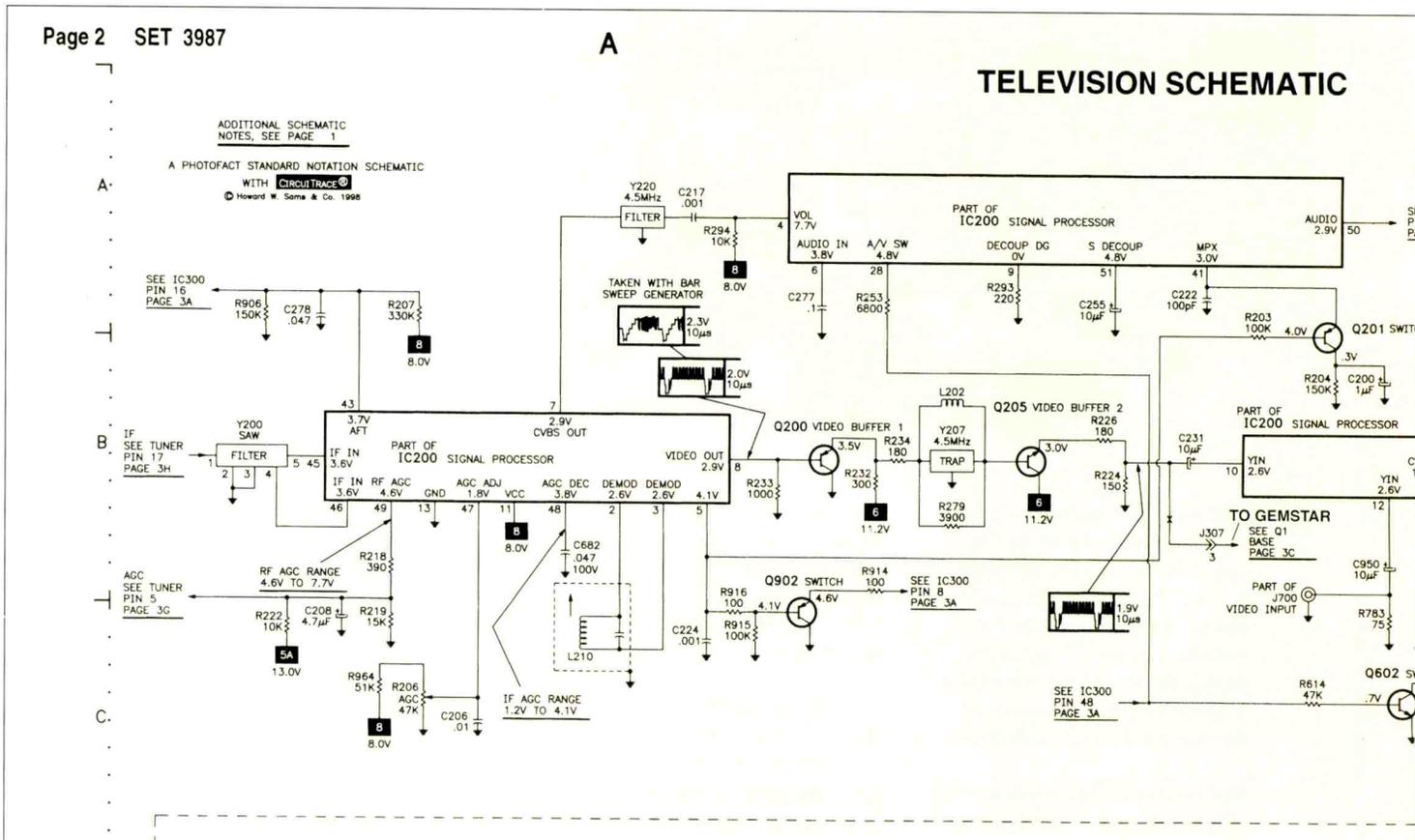


Figure 2. This section of the schematic shows the luma/chroma signal path ahead of the comb filter as well as the tie-in points for the SVHS switch, histogram board and Gemstar board.

TV in a Chip

The video source switch is part of the main signal processor, IC200 (Figure 2). This IC will be referred to simply as the TV-chip in this article since it is essentially a TV in a chip; Phillips often refers to these as "one-chip-TV" solutions in their technical literature.

Note that pins 10 and 12 are labeled YIN whereas pin 14 is labeled CVBS. Do not be confused by this inconsistency. In all three cases this is the CVBS signal, which contains both Y and C components. The signal exiting pin 14 is identical to that of the selected source. Pin 10 is the internal source from the video detector via the video buffer and pin 12 is external.

The CVBS signal from pin 14 is buffered by Q601 and then enters the comb filter module at pin 2. For more information on comb filters see ES&T January 1997. This particular filter employs a glass type delay line as

opposed to the CCD (charge coupled device), which is often used in this type of circuit. The comb filter separates the luma and chroma signals for an overall improvement in picture quality. The Y and C signals exit the comb filter at pins 5 and 3 respectively.

SVHS Switch

The luma and chroma signals are routed to IC601, the SVHS switch (refer again to Figure 1). Before entering IC601 the luma signal is amplified by transistors Q604 and Q611 (not shown) respectively. When in the SVHS mode, IC601 selects signals from the SVHS input.

Source selection is controlled by the syscon, IC300 (not shown). Luma and chroma signals exiting IC601 are applied to the histogram board. Note that the luma signal is also routed to the syscon's on-board data slicer for removal of closed captioning information.

Histogram Board

The heart of the histogram board is ICI, a Phillips TDA9171 (Figure 3). Basically, this IC uses real-time analysis of the luma signal to make continuous adjustments of the contrast ratio. The theory of operation is very involved and will be omitted here for brevity: simply think of it as a circuit that dynamically adjusts the contrast to compensate for imperfections resulting from brightness changes of a given scene, etc.

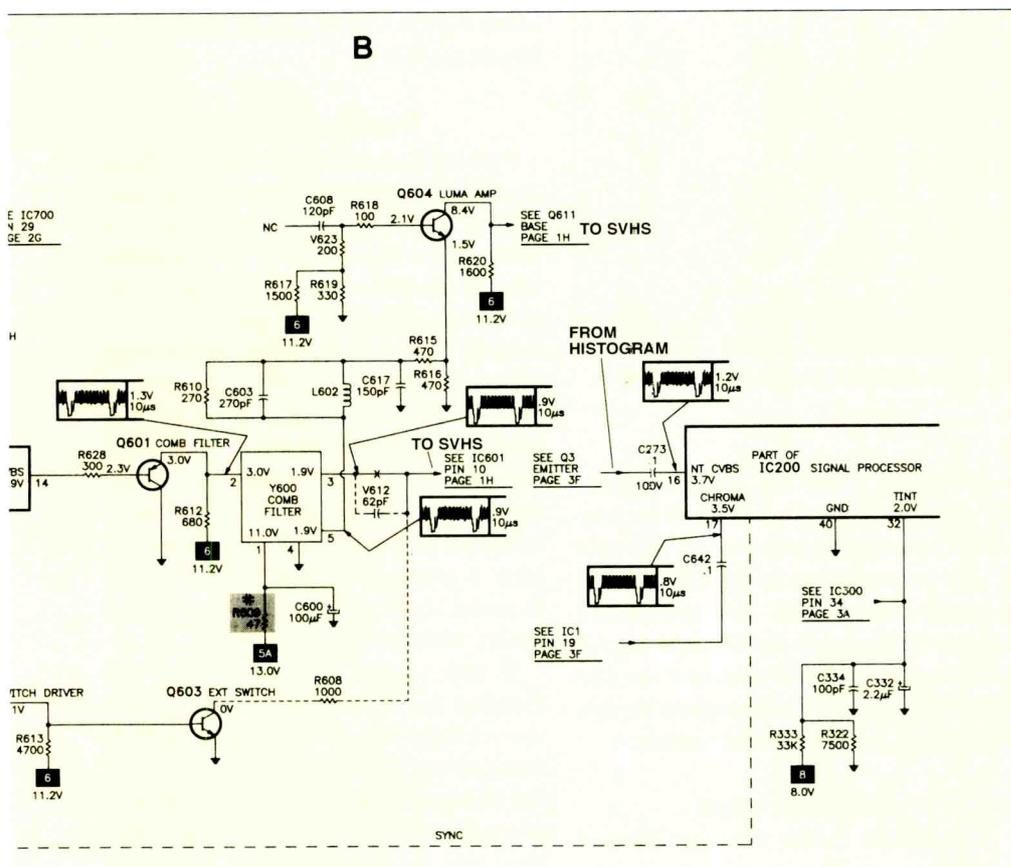
Luma and chroma signals from the SVHS switch enter IC1 at pins 7 and 2 respectively and exit pins 14 and 19. A sandcastle pulse from the TV chip, IC 270, enters at pin 5. This is in keeping with the concept of synchronizing all video processing to a common sandcastle pulse.

Since the histogram board is in the luma/chroma signal path, it must be considered as a possible source of trouble anytime there is a loss of video or any evidence of a degraded luma or chroma signal. Scoping the inputs and outputs for a normal signal should enable you to isolate any problems. Be sure that the proper sandcastle pulse is present at pin 5 if you suspect that the histogram circuit is not operating normally.

Histogram-corrected luma and chroma signals are applied to pins 16 and 17 of IC200. Referring again to Figure 1, you will see that the TV-chip also receives red, blue, green, and Fast Blanking OSD signals. In this case, however, the OSD signals come from the Gemstar (Guide Plus) board instead of the syscon.

Gemstar (Guide Plus)

The Gemstar system is an electronic Program Guide that appears on the TV screen much like the printed TV listing grids found in daily newspapers. The screen includes a "video window" displaying the current on-air broadcast from the selected channel. An IR interface between the TV and the VCR allows the user to record an upcoming program simply by highlighting any listing and then pressing the record button on the remote.



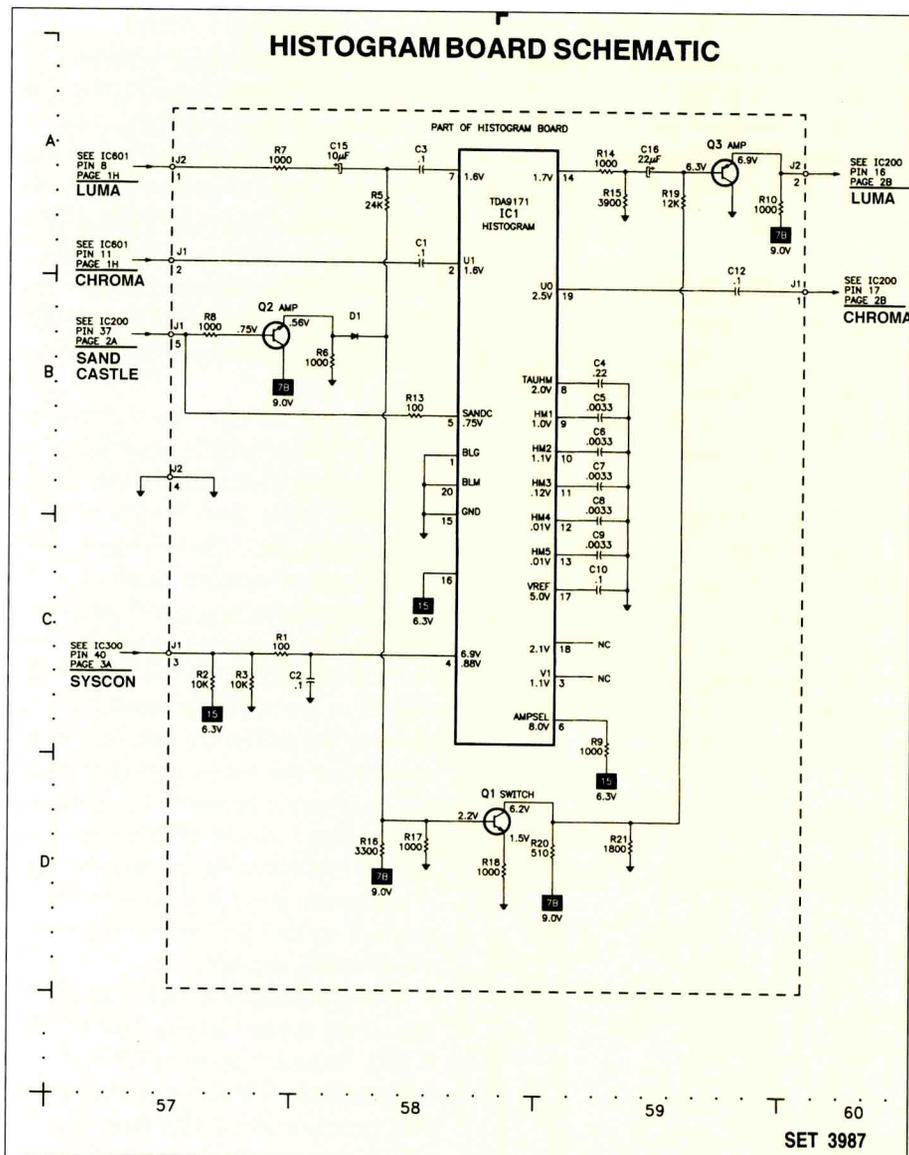


Figure 3. This figure shows the actual histogram board schematic. Note that the histogram chip is synchronized to the common sandcastle pulse.

The Gemstar board is shown in Figure 4.

Like the histogram IC, the Gemstar circuit is highly complex and therefore a detailed description of its operation will not be given here. In most cases the entire board will be replaced as a unit if it is found to be faulty. Isolating a problem to the board will not be too difficult once you are familiar with the various input and output signals.

Amplifier Q1 receives a CVBS signal which is taken from a point just ahead of the INT/EXT video switch. From this point the signal is passed through additional amps and comparator IC7 prior to being applied to the Gemstar IC. Note that

the Gemstar board has its own microprocessor, which coordinates all activity on the board. Note also that the Gemstar IC has a connection to the I2C bus for communication with the television's syscon. This allows the Gemstar circuit to turn on the TV and tune to a specific channel when a selected program begins, an optional feature in some models.

Some TTL Logic

In addition to the Gemstar IC and microprocessor the Gemstar board utilizes several digital ICs from the TTL logic family. The discussion here will

focus on IC1, a quad 2-input multiplexer since it handles the R, G, B, and Fast Blanking signals. IC1 is a 4-bit wide A/B switch. Note that there are four A inputs and four B outputs labeled Y. It works the same as the OSD switch block, which is an integral part of any common TV chip.

The A inputs are connected to the Gemstar microprocessor which provides all of the program guide information that has been decoded by the Gemstar circuit. The B inputs are connected to the television's syscon. These inputs are used for regular OSD and closed-captioning. Switch selection is controlled by the Fast Blanking signal from the syscon, which is applied to pins 13 and 1 (select). This means that the OSD information from the syscon has priority and will override any simultaneous Gemstar information.

The selected signals are output from IC1 and routed to the regular OSD inputs TV chip IC200. When both A and B inputs are inactive the Fast Blanking pin at IC200 will be held low and regular video signals will be passed to the video output amplifiers.

Troubleshooting

Problems associated with the Gemstar board will most likely only affect the operation of the Electronic Program Guide. In some cases regular OSD may also be affected since the OSD information passes through IC1. In rare cases a problem with the Gemstar board may cause a black screen. If, for example, the Fast Blanking pin of IC1 should become stuck high, all regular video will be blocked. Other combinations of outputs stuck high could result in a raster of any color including white (all pins stuck high). If you suspect such a problem simply disconnect the Gemstar board and normal video should return, without OSD of course.

If you suspect a problem with the Gemstar board, be sure to check for the correct input signals (CVBS, horizontal, vertical) and I2C bus connections. Check the IR blaster output when the VCR will not respond to programmed commands. Note that the Gemstar board obtains its power from 5V source #16. This source utilizes its own rectifier and regulator in the switching power supply. Failure of

this source will only affect Gemstar and OSD operation.

Features such as histogram correction and Gemstar are becoming common in

monitors and TVs using CRT, LCD and projection displays. There are, of course, many variations, some offering more features than those outlined here. This infor-

mation will give you an edge in understanding and troubleshooting any system you encounter in the future. ■

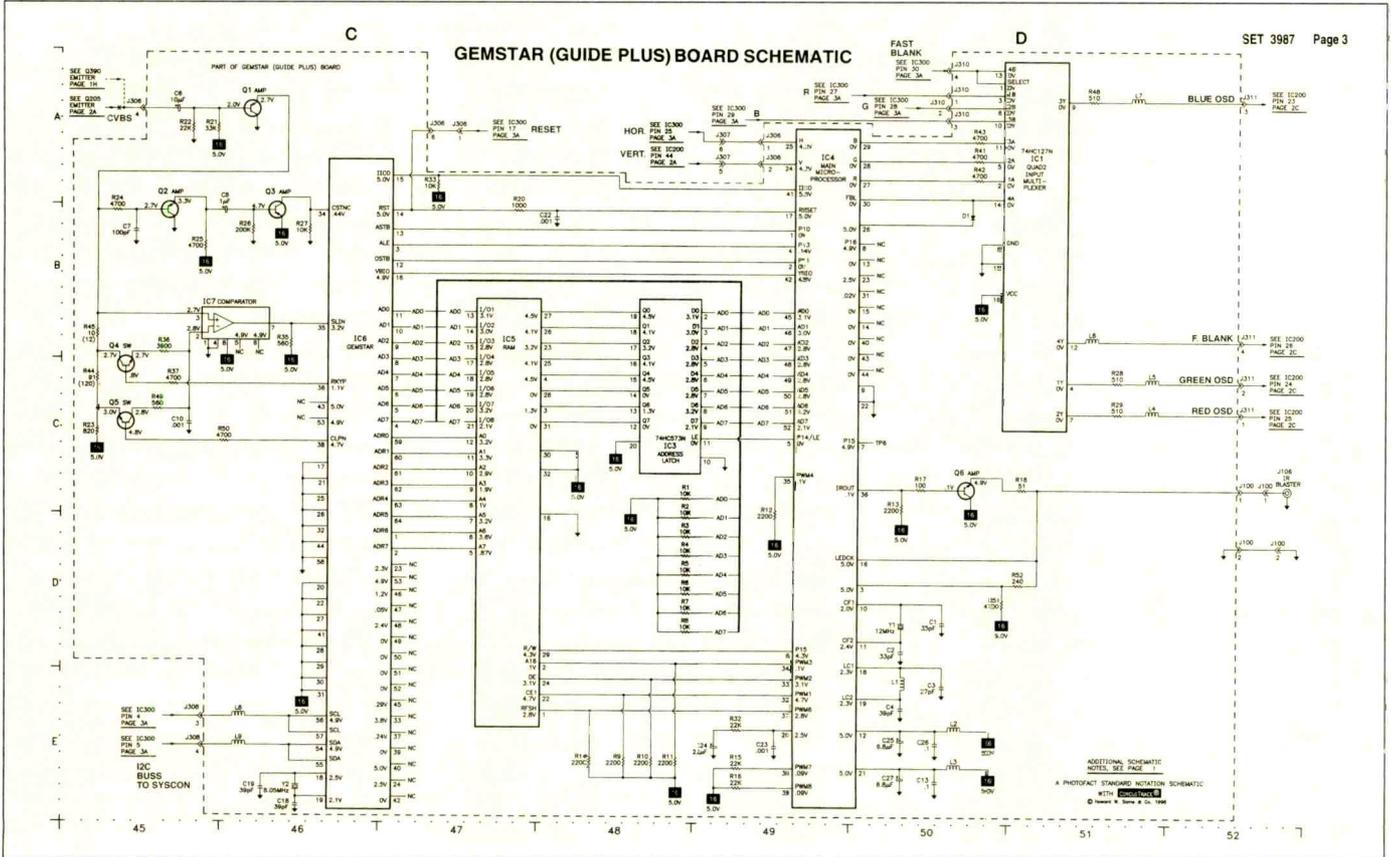


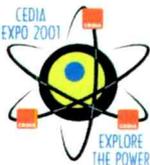
Figure 4. The Gemstar board comprises mostly digital ICs and may present a challenge to some technicians. If you suspect one of the logic ICs is defective you may want to try replacing it since they are not expensive.

Calendar of Industry Events



NPSC 2001

National Professional Service Convention and Professional Service Trade Show



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(Formerly COMDEX/Spring)
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Key Media
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Needham, MA 02494-2722
781-433-1500
www.comdex.com

CABLE-TEC EXPO 2001
MAY 8 — 11, 2001
Orlando, FL
Society of Cable
Telecommunications Eng.
140 Philips Road
Exton, PA 19341
610-363-6888
www.EXPO2001info@scte.org

ELECTRONIC DISTRIBUTION SHOW & CONFERENCE (EDS)
MAY 15 — 17, 2001
Educational Programs
May 14
Las Vegas Hilton
Las Vegas, NV
Electronic Distribution Show Corp.
222 South Riverside Plaza
Suite 2160
Chicago, IL 60606
312-648-1140
www.edsc.org

NATIONAL PROFESSIONAL SERVICE CONFERENCE (NPSC)
JULY 30 — AUGUST 4, 2001
Riviera Hotel
Las Vegas, NV
National Electronics Service Dealers Association (NESDA)
2708 Berry Street
Fort Worth, TX 76109
817-921-9061
www.nesda.com

CUSTOM ELECTRONICS DESIGN AND INSTALLATION ASSOCIATION (CEDIA)
SEPTEMBER 5 — 9, 2001
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CEDIA Headquarters
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VCR Servicing: More About TV/VCR Combination Units

By Bob Rose

No long ago, the editor of ES&T asked me to do an article on a TV/VCR combination. While looking over my material, I discovered that I had quite a few notes on various combi models manufactured by Funai and sold by Philips and notes on a few models by other manufacturers. I didn't pay much attention to the material at the time, but after the article had been written, I began to think that you might be interested in those notes. So, here they are, a miscellany of information, largely applicable to VCR servicing, on units that I have seen over the last few years. I present the information in as useable a form as possible in a "if you have this symptom, then this may be the fix" format.

Before getting to the notes, I want to let you know that I have decided not to include schematics for the first two-thirds of this article for three reasons. First, if I did the schematics would take up at least as much room as the written material. Second, I will use a problem-solution approach instead of my usual analytical methodology. Third, my instructions should lead you to the faulty component with a minimum of effort. The exception will be the last third of the article. Since these combis are relatively unfamiliar to many techs, I decided to beef it up with additional information.

Philips-Funai TV/VCR Combinations

Here are a few notes pertaining to repair of Philips combis that were manufactured by Funai. This information is also applicable to most units manufactured by Funai regardless of the brand under which they were sold.

Shutdown After Playing Ten to Fifteen Seconds

The symptom may take a different turn and show up as soon as the unit is plugged into an ac outlet if it attempts to load a tape when no tape has been inserted. After an unsuccessful attempt to load the non-

existing tape, the unit shuts down.

The problem is almost always related to the center LED. It seems that the LED gradually loses its ability to emit enough light to keep the tape end sensors turned on. When they turn off, the end sensors permit their inputs to the system control microprocessor to go high. The microprocessor interprets the high as a command to start the tape loading sequence. After attempting to load a tape when no tape is present, one of the shutdown circuits activates, shutting down the unit.

How, you may wonder, does a weak and failing center LED cause the unit to stop playing a tape? Isn't that symptom more than likely related to a defective reel sensor? You are correct. Here's how the situation develops. In an effort to save money, engineers came up with a way to use the light emitted from the center LED to detect supply reel rotation. When it gets weak, the LED's emission is high enough to keep the tape end sensors turned on but not high enough to permit detection of reel rotation. Therefore, the unit shuts down just a few seconds after it begins to play or record.

Other factors may contribute to the problem. Dust and grease on the light prism cause the same failures, as do cracks and bad connections and weak tape start and end sensors. To that end, some parts supplies sold a kit of parts that included the prism, center LED, and start and end sensors.

The kit included instructions to inspect the printed circuit board for cracks and defective solder connections. I have been able to repair almost 90 percent of these problems by replacing just the prism and/or the LED.

I used to order a complete kit of parts from a company that has since gone out of business, and still have several kits on hand. I don't know if another supplier has picked up the ball. If you do know where such a kit can be purchased, I would appreciate your letting me know, and I'll pass the information along. In the mean-

time, you might find the OEM part numbers useful:

- the prism OVM302723
- the end sensors ST-316R2-B
- the center LED QPQSSLR938CV

The Philips part number for the center LED is 4835 130 87139. I don't have at my fingertips the Philips numbers for the other items. I think, however, that you can get them from Philips just by using the OEM number.

By the way, Zenith VCRs have the same problem. Zenith puts out a kit of part consisting of a center LED and three resistors that corrects the problem, which I always use for warranty work. But I used the MCM LED for non-warranty repairs. The MCM LED is considerably larger than the LED it replaces, but it works like a champ. If you use it to fix a Zenith VCR, be sure to put a piece of heat shrink tubing around the body of the LED to contain the light. You know, of course, to leave the top uncovered. I have also used the MCM LED to fix certain Sharp and Emerson products.

The CCX Series

I have a note from Philips' technical service about certain units in the CCX series that develop a hum in the speaker after the unit has played for about two hours. The note says that IC601 ought to be changed using part number 4835 130 87078. Before you change the part, I suggest you check the speaker because I have had to replace several defective speakers in these units.

Other units may on occasion fail to record linear audio or record audio that is distorted. The problem has been traced to corroded contacts on the full erase head. Cure the problem by removing the connector and soldering the wires directly to the FE head or by replacing the connector with part number 4835 263 97018. Incidentally, you may find this problem in other model numbers.

Some CCX series combis (and VCR's) displayed the wrong information on the

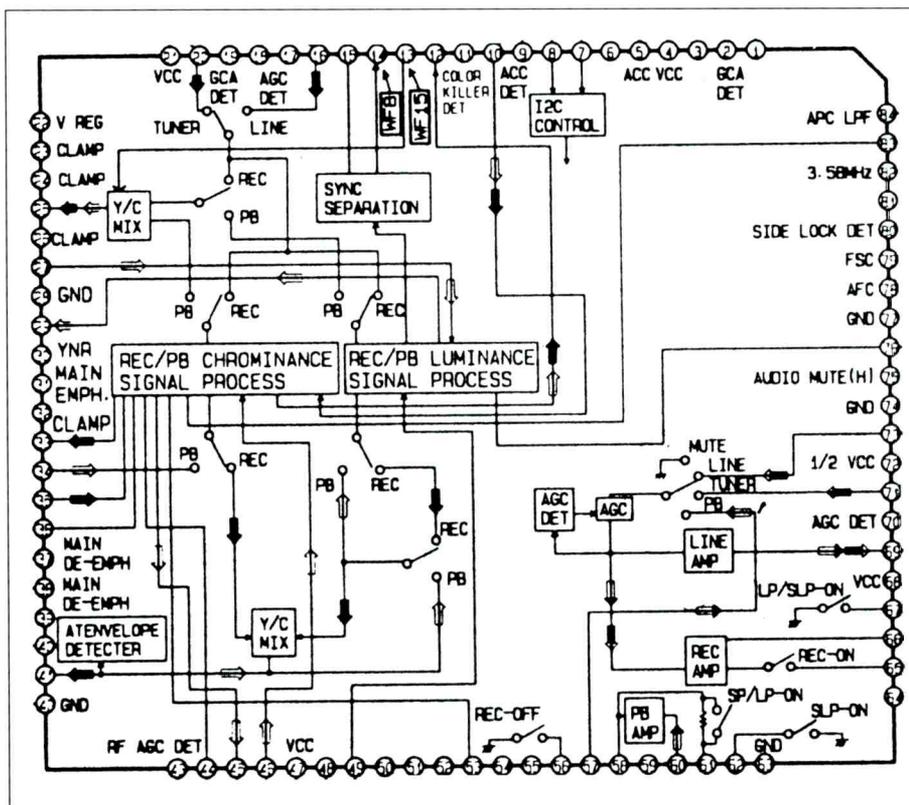


Figure 2. In a number of units I encountered, the symptom was as follows: The picture is great, but I don't have sound when I use the TV or play a tape. In all but one instance, I traced the problem to IC3001 (AN3476FBP), the video and audio processor. This diagram shows the pinout for this IC.

been close to +10V. Diode 6334 had developed leakage.

By the way, make a note of the fact that most of the dead set symptoms in the Philips-Funai combis are caused by faulty voltage regulators in the power supply, particularly the +6V regulator (7806). I keep a handful of them in stock at all times.

My notes point out another cause for a dead set, namely D6212, a 5.6V zener connected to the reset pin of IC6201. If it becomes leaky, the voltage across it won't read the requisite 5.6V, keeping IC6201 from resetting. The result is a dead set.

Another note reminded me of a no vertical deflection situation, with a reminder that the problem might be intermittent. It was caused by a broken circuit board trace at capacitor C160. C160 stands upright on the circuit board (near connector CN101). Because it stands upright, the guide molded into the cabinet may jar

C160 and cause the connection to break when the chassis is installed into the unit or when the unit is moved from one location to another. If you encounter this problem, be sure to bend C160 in the direction of IC301 before you put the deck into the cabinet.

RCA TV/VCR Combinations

My first notes concern the 13TVR60, 13TVR70, 19TVR60 T13060, T13065, T13070, and T19060. The complaint may be: the VCR works fine, but the TV part won't come on. Begin by checking the voltage at the collector of the horizontal driver transistor. If the voltage is 0.0V, check for poor solder connections at RL01. This resistor connects to pin 3 of the horizontal driver transformer (LL01). The problem may be intermittent. If you haven't seen it, you will see it!

If you find a voltage of about 20Vdc when you check the horizontal driver transistor, you need to be prepared to dig

deeper into the horizontal deflection circuit because that's where you will find your problem.

The second note concerns a GE 19TVR60.

In the case of a dead set, check DP20 for a short. If it is shorted, replace it with an ECG577. Oh, by the way, if DP20 is shorted, you might think that the horizontal output transistor is shorted. But when you remove the diode from circuit, the output transistor will check normal.

I have on two occasions had to replace RL06 (680ohm, 2W) and CL05 (0.47uF, 250V) on the deflection board. In both instances, the components were burned beyond recognition. Having an experimental bent, I tried to sub the capacitor with one of a different value. Because my experiment failed, I advise you to use the correct value.

Speaking of problems with diodes, I have a note about a leaky DP31 on the power circuit board. If DP31 becomes leaky, the combi may turn on intermittently, or it may not turn on at all. If it turns on, every feature of the combi will work as it should, and it will perform basically flawlessly. The green power on LED will, however, always come on, even when the TV won't. Replace DP31 with a 1N4148.

Another note reminds me of a situation in which the combi had no picture, no sound, and no OSD. The problem was no +33V to the tuner because of an open 180ohm, 1/2W resistor. Check the associated diode if you find the resistor open.

And now a final but very important note. Let me illustrate it like this. I got one in the other day from another shop with a note that it wasn't worth fixing. I plugged the unit in and immediately noticed that the green power on LED blinked six times and went out. This is always an indication that the unit is in parental lock. Take the remote control and hold the power on button down for at least ten seconds. The unit unlatches, permitting you to turn it on and use it normally.

The Newer Panasonic-Quasar TV-VCR Combinations

These combis were produced under one of several model numbers and come in the

traditional sizes of thirteen- inch and twenty-inch. I am not sure that I have seen a twenty-five inch model, but I'm not sure that I haven't. Anyway, I'm referring to the mechanism that came out in 1997 and is labeled the UZ mechanism. As far as I can tell, the UZ deck mechanism is still in production. I am using manual number MKS9801M321 as my reference. It covers the PC-M1348, PV-M1358W, VV1308, VV1318W, PV-M1368, PV-M1378W, PV-M2038, PV-M2048, VV2008, VV2018W, and PV-M2058.

Electrical Problems

The first thing I want to touch on is an electrical problem that is terribly easy to overlook. Someone brought a twenty-inch combi for service. She said it had been in another shop, and they said it wasn't worth fixing. Would I take a look at it? When I applied ac and pushed the power button, I noted that the unit was

completely dead. The newer units are built onto a single circuit board, making troubleshooting a real chore. But the average technician can check a thing or two without getting involved in a major disassembly. I found a convenient cold ground and checked a couple of secondary voltages coming out of the VCR power supply and was gratified to see that the power supply was up and running. The presence of these voltages led me to suspect that one or more of the IC protectors, small fuses located in at least two of the B+ lines coming out of the power supply, had opened. I checked them and found the fuses in the +5V and +12V lines open. The combi needed two small fuses to put it in good working order. The IC protectors are located on the front of the circuit board just to the right of the deck.

You will find a schematic of the switching power supply in Figure 1. This power

supply has just one IC protector, which is located in the +5V line. The schematic does, however, serve as a good illustration of my point. By the way, these power supplies are among the easiest to fix that I have ever worked on. In most instances, replacing Q1001, Q1002, F1001, and maybe the bridge rectifier(s) puts the power supply back on line. However, I always take a few minutes to check the diodes in the secondary circuits, especially the zener diodes, because they too fail. It's also a good policy to use your ESR meter to check the capacitors, especially if the unit has been in service for a few years. Should I mention the need to use good quality parts for the defective ones you replace?

The second electrical problem is a bit more difficult to fix because it involves replacing a multi-pin, surface mount IC. The symptom is as follows: the picture is great, but I don't have sound when I use

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the TV or play a tape. In all but one instance, I traced the problem to IC3001 (AN3476FBP), the video and audio processor. The pinout for this IC is shown in Figure 2.

If you encounter these symptoms, may I state the obvious? Do a bit of checking before you order and replace this naughty IC. I usually check to make certain it has the necessary operating voltages and then inject an audio tone on the audio output pin 59. If I hear audio in the speaker, I know that the rest of the circuit is working. If I don't hear the audio tone, I concentrate my efforts on the audio output IC (IC4151), an AN5265. Remember the single exception I mentioned in the last paragraph? It was a defective IC4151. So look before you leap. Every time I just know what the problem is, well, that's the time I don't!

Other than the problems I mentioned, I have found these units to be relatively trouble free.

Mechanical Problems

Now let's shift attention from electronic problems to mechanical problems. I want to deal with three.

First, there is the problem of the unit not taking a tape. Of all the units I have serviced, two things stand at the head of this list. First is the matter of a foreign object finding its way into the deck. We all have had our share of humorous articles

that have been crammed into VCR's and combis. The worst mess I ever encountered was a peanut butter and jelly sandwich! I almost had to total the unit, but I finally did manage to get it clean.

The number two cause for a failure of the loading mechanism is in my experience a bent tension arm (item 29 in the manufacturer's literature for this unit). Perhaps I ought to let you know that we do lots of work for rental companies, which explains the abuse we have seen. I am able to fix most of the UZ tension arms by straightening them with a pair of pliers, but I have had to replace a few because these new ones don't seem to be as well constructed as the older ones. The part number for the item is VXLS1074.

The other item that keeps the VCR from accepting a tape is the carriage or cassette up unit. Most of the time, the problem is due to the defective part labeled item 69 in the manufacturer's drawing of the unit. You may purchase each component of the cassette up unit separately, but since it is inexpensive, I usually purchase a new one if I don't have a used one on hand. Well, there is one exception. Item 70, the wiper arm unit, is also easily broken (part number VXLS1665). The part number for the complete cassette up unit is VXYS1172.

Second, there is the problem of the tape refusing to load. As you certainly know, there are lots of deck malfunctions that may keep a tape from loading. However, one stands out for the UZ mechanism. Locate the main lever, making a note of where it attaches to the main lever drive arm. The main lever really isn't securely attached to the deck. When the retainer that holds it in place on the deck gives way - and it will - the main lever disengages from the main lever drive arm and effectively disables the deck.

Third, you may need to know how to remove a jammed tape from the UZ mechanism deck, and you have a choice of removing it manually or electrically. Refer to the manufacturer's service literature as you read further. The manual method of tape removal depends on the state of the mechanism. Begin by asking, "Is the pinch roller up against the capstan shaft?" If it is ask "Can I rotate the main cam gear?" If you are able to rotate the main cam gear, choose method two. If you can't, choose method one. If the pinch roller isn't against the capstan shaft, use method three.

Use the electrical method only if you are able to move the mechanism by rotating the main cam gear. The literature says that if the unloading doesn't being within two seconds after you have connected a dc power supply to the test points, abort the electrical method and try to remove the jammed tape manually. ■

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Circle (11) on Reply Card

Comdex Preview NASC Review

By ES&T Staff

COMDEX, taking place at McCormick Place in Chicago April 3 through April 6, is the forum at which computer hardware and software vendors, and related organizations, display their wares to the people and companies that use those products, people such as Corporate Management, Senior Executives, Sales Managers, Marketing Managers, Operations Managers, Human Resources Managers, Customer Service Managers, E-Commerce Strategists, General Managers and Finance Managers.

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keep up in this constantly battling world of innovation and obsolescence? And, more importantly, how do you get ahead? ASPs are promising to get enterprise and consumer customers up and running with e-business and productivity applications in record time - creating high-powered corporations of all sizes and empowering end users.

Fundamentals of Wireless Communications Level 200

You'll need a background in basic communications terminology and technology (LANs, modems, etc.), but you don't need to be an engineer to understand the huge amount of information presented in this day-long tutorial. It will start with a look at the opportunities, motivations and constraints of wireless communications, and then explore how radio works (and why it sometimes doesn't). It will then proceed to limited-range wire-

less systems (wireless LANs, PANs [including Bluetooth], and related systems and products), and metropolitan-area wireless networks including wireless local loop, wireless bridges and consumer wireless MANs. After that, the conference will cover wide-area wireless systems, including paging and messaging, packet radio, cellular and PCS/PCN, data on wide-area networks and satellite-based networks. This conference will also examine the world of wireless middleware, portals and gateways, and how to use wireless to connect mobile users to network-based applications. It will end with a look at today's subscriber units and terminals, and provide a glimpse of the broadband future.

The Broadband Future - Advanced Technologies and Networks

A basic understanding of contemporary data communications and networking

(modems, LANs, etc.) is suggested as a prerequisite.

And a Whole Lot More

COMDEX is a trade show where attendees can learn a great deal about what is happening in the world of computers: hardware, software, the internet. It's not possible to capture it all in a few pages in a magazine. If you think Comdex might be for you, you can find more information at www.comdex.com, or write to them at:

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781-433-1500 ■

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Name _____

Address _____

City _____

State _____ ZIP _____

Send material about IS CET and becoming certified

Send one "Study Guide for the Associate Level CET Test." Enclosed is \$14.95 (includes postage/handling). **TX residents — include 8.25% sales tax.**

ES&T

Circle (13) on Reply Card

Hitachi's Herrin and EPA Highlight NASC Meeting in Orlando

The National All Service Convention held in Orlando, February 8-10, was highlighted by two very different messages to the Service Industry.

Hitachi's Walt Herrin, long considered an advocate of the independent service professional called upon the audience to do more homework on the cost of doing business with each manufacturer you support and then to stand up together and do something about it.

The convention sponsored by the Florida and New Jersey Electronic Service Groups, the Electronic Technicians Association and the Professional Service Association had several hundred attendees for sessions on technology and management, an exhibits area, and a major training program by Philips.

One of the most controversial sessions of the conference was a presentation by the Florida Department of Environmental Protection (EPA). Raoul Clarke, Environmental

Administrator presented a comprehensive analysis of the environmental concerns he and other have with the pollution problems of discarded consumer electronics products, particularly televisions and computer monitors which contain 2 to 8 pounds of lead each.

The Florida EPA is using the current environmental laws to push large users of TVs and computers to dispose of old units through 'demanufacturers' who charge a fee for their service. Independent servicers are included in his effort as they often have a significant number of units ready for disposal. The net result would be for the servicer to insist on a "disposal fee deposit" on all televisions brought in for service—in case the customer did not pick up the unit and the servicer was forced to dispose of it.

As the Florida EPA had no educational or enforcement plans at the consumer level several viewed the effort transferring an unfair educational obligation to the independent servicer. ■

Servicing Tips/Aids Reference

Servicing consumer electronics products is a challenging profession. Just keeping up with the technological innovations in consumer electronics products is a full-time occupation. And every time you think you have become aware of the new electronics products found in people's homes, someone comes along and introduces several more.

Given that it's just nearly impossible to know everything about today's wonderful world of magical consumer electron-

ics devices, any tips, hints, symptom cure information that a service technician can gain access to become invaluable resources. With that in mind, the following is a list of companies that publish service tips available in the form of books, computer disks or on line, that might make servicing those products a little easier. Some of them are free, others are not. And we make no representation about the usefulness of any of them.

ORGANIZATIONS, SOFTWARE PRODUCTS

Andromeda Research
PO Box 222
Milford, OH 45150
513-831-9708
Fax: 513-831-7562

Electronic Software Developers Inc.
826 South Main St.
Farmingdale, NY 11735
516-221-6403
800-621-8477
Fax: 516-293-0721
esd@bocom.com
www.servicetips.com
www.tvtechtips.com

Electronix Corp
1 Herald Sq.
Fairborn, OH 45324
937-878-9878
Fax: 937-878-1972
www.repairworld.com

Euras Technologies Inc.
PO Box 2036
Waterloo, IA 50704
319-236-2000
Fax: 319-236-2020
kline@euras.com
www.euras.com

Glendale Software Co.
5322 North 59 Ave.
Glendale, AZ 85301
623-939-6522
Fax: 623-939-6522
glensoft@aol.com
www.glensoft.com

Good-Lyddon Data Systems
6879 Sard St.
Rancho Cucamonga CA 91701
909-980-4563
joseph_lyddon@eee.org

Intrepid Video & Electronics
501 Luther Rd
Harrisburg, PA 17111-2055
sales@intrepid-video.com
www.intrepid-video.com

KDT-V TV Repair
514 3rd St
Aurora, IN 47001
812-926-4321
888-537-8477
Fax: 812-926-1014
earl@servicesoftware.com
www.servicesoftware.com

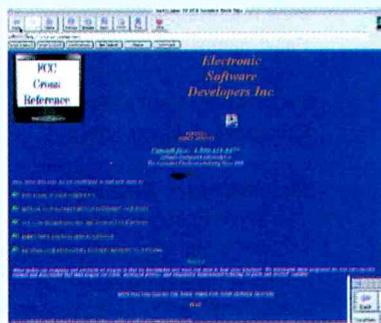
Mike's Repair Service
PO Box 217
Abderdeen Proving Ground, MD
21005
410-272-4984
800-2-FIX-TV5

Pioneer Hill Software
24460 Mason Rd.
Poulsbo, WA 98370
360-697-3472
Fax: 360-697-7717
pioneer@telebyte.com

T.I.P.S. (Technical Information Procurement System)
PO Box 1681
Forest Park, GA 30051
770-968-3715
Fax: 770-9683715

TV Man Tech Tips, Inc.
1112 Weston Rd., #181
Weston, FL 33326
954-349-2455

Warwick TV Service
2279 W. Shore Rd.
Warwick, RI 02886
401-737-1980
Fax: 401-732-9363
tvtek@aol.com



A Gaggle of Web Sites

The internet is a treasure trove of information. Unfortunately, as with a real treasure trove, the treasure is frequently not easy to find. The sidebar contains a listing of assorted web sites that contain information that is purported to be tips that will help service technicians in servicing various products: some are pay sites, some free sites, and some are a mixture of free and pay. Don't worry about going to a web site

and having to pay for the visit. They warn you when you're about to enter a pay area, and, of course, they can't charge you unless you send them a credit card number.

Some of the sites are better than others, but at this point, given the volume of sites available, it wasn't possible for the editors to rate them on their usefulness.

We would like to expand and improve this feature in future issues. So if you visit

any of these sites and find it particularly useful, or particularly useless, please let us know. And if you find a site on your own that you think is especially good, please contact us about that.

Moreover, keep in mind that the internet is a volatile place. In the blink of an eye, websites begin operation while others cease operation. It's entirely possible that some of the sites listed here will not be available when you try to log on.

SOME USEFUL WEBSITES FOR CONSUMER ELECTRONICS SERVICE TECHNICIANS

TV Repair List

<http://groups.yahoo.com/group/tv-repair/>

The TV Repair List consist of a group of Electronic Repair Professionals dedicated to the sharing of knowledge and information concerning the repair and operation of Video products. To alleviate spamming of the list, all prospective members will be screened to verify that they are a repair professional (you will receive an email from the webmaster asking you what company you work for and what you do there that qualifies you as a professional). Please be aware that only professionals are allowed to join the list.

www.shophelper.net

Pay. Visit site for rates.

ShopHelper is a web site designed specifically for television repair. According to the webmaster, "It contains the most complete and accurate tips available anywhere." Includes over 30,000 tips.

www.repairfaq.org

Free. Aimed primarily at the hobbyist Sci.Electronics.Repair Frequently Asked Question(s) (or S.E.R FAQ for short) Home Page. This site features Samuel M. Goldwasser's latest

and greatest "Notes on the Troubleshooting and Repair of..." series of comprehensive repair guides for consumer electronics equipment and other household devices. There is also a great deal of other information of interest to the electronics hobbyist, experimenter, technician, engineer, and possibly even the dentist and poet. Included are the now quite comprehensive and massive "Sam's Laser FAQ", many new schematics, and links to over 1,000 technology related sites. In addition, there are a variety of documents from other sources on electronics troubleshooting, repair, and other related topics.

Notes On The Troubleshooting And Repair Of Television Sets

www.repairfaq.org/sam/tvfaq.htm

This is another free site. As with the above mentioned site, it is primarily aimed at hobbyists, but there may be information here that is of value to technicians at all skill levels.

<http://elmswood.guernsey.net>

(this site is in England)

This was a free site, dedicated to repair of British made TVs. When I logged on on March 5, I found the message "This site is now closed, I

would like to thank everyone for your support over the years. This site should be back very soon please look back often

<http://regie.topcities.com/>

Free. Repair tips, schematics, service literature, etc. for technicians computer web sites for parts, configuration, and repair help; links for tips for: monitors, tv, vcr, and for television & vcr parts.

<http://www.balancedliving.to/tech>

Free. Joe's Tech Support. This page consists of links to manufacturer home pages and links to useful software.

<http://wa6ati.webjump.com>

Free. Technical Assistance Web Page. The T.S.S. pages are dedicated to technicians that repair all types of television products. The T.S.S. pages are a collection of detailed symptoms and cures collected over a four year period in the webmaster's recent role as a Tech Support Specialist for a major service and retail sales company in Southern California.

Site includes tech tips for a variety of consumer electronics products, links to manufacturers and distributors and more. ■

Replacement Parts Directory Corrections

The January 2001 issue of Electronic Servicing & Technology contained our Annual Replacement Parts Directory. Please make the following corrections to your directory.

Thomson Consumer Electronics

Should be:

Thomson multimedia
2000 Clements Bridge Road
Deptford, NJ 08096

Servicers should call:

856-853-2525 for Authorized Distributor List

Samsung Electronics America, Inc.

Ledgewood, NJ

Should be:

Parts Replacement Center
18600 Broadwick Street
Rancho Dominguez, Ca 90220
310-537-7000

Sears Replacement Parts

3412 Demtropolis Road

Mobile, AL 36693

Percy Hawthorne, Mgr.

Becky Bennett, Customer Relations

800-225-2864

Fax: 800-755-1346

Spdcommercial.com

New Products

Tone/Probe Kit

The new JTK-100 is a combination of Jensen's feature-rich TT-100 tone tracer and TG-100 tone generator housed in a rugged leather-trimmed Cordura Plus belt holster with top flap. The case has



gusseted seams and offers a strengthened rib to stand up to constant wear from the probe tip as it is in use.

Jensen Tools Inc
Circle (18) on Reply Card

Socket SuperSet

SK Hand Tools has expanded its metric socket line with a new 39-Piece 1/4" Drive Metric Socket SuperSet (#91839). The set includes standard, deep, and flex metric sockets — 36 sockets in all. The



set also includes a spinner handle, an extension, and professional ratchet featuring a completely-enclosed, re-buildable ratchet mechanism and diamond knurled grip for no-slip handling. Set comes packaged in a convenient, molded plastic carrying case.

Tools in the 1/4" Drive Metric Socket SuperSet include:

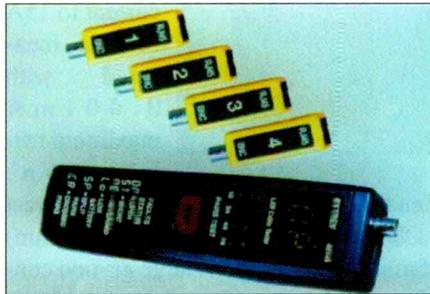
- Professional 1/4" drive ratchet - 4.5" long
- 2" Extension

- 6" Spinner Handle
- 12 Six-point standard sockets (5 - 15 mm, including 5.5 mm)
- 12 Six-point deep sockets (5 - 15 mm, including 5.5 mm)
- 12 Six-point flex sockets (5 - 15 mm, including 5.5 mm)
- Molded carrying case

SK Hand Tool Corporation
Circle (19) on Reply Card

LAN Cable Tester

Extech's NEW LAN Cable Tester, Model 40145, is designed to meet Ethernet and Token Ring LAN standards. The tester accepts a variety of

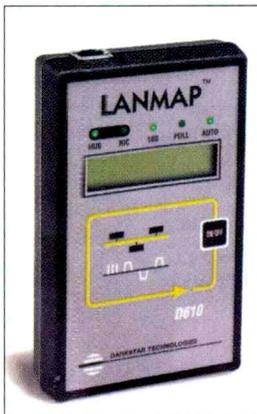


BNC and RJ45 terminated cables and checks for open, short, reversed, crossed, split pair, and faults. The type of fault is displayed on a 2-digit, 14-segment LED. Red/green LEDs indicate the pairs and pass/fail status. The Cable Tester accommodates up to 4 remote units for cable identification and routing.

Extech Instruments
Circle (20) on Reply Card

Port Verifier

With the touch of a button, the LanMap 610 Port Verifier from Jensen scans UTP or STP cables for an Ethernet link partner at the far end of the cable. When connected to any 10/100 hub, switch or NIC, the tester will auto-negotiate and get link at the



highest common capability.

The unit fully supports IEEE 802.3u standards and resolves network compatibility problems by clearly telling the user what speed and duplex settings a device is capable of handling. Five LEDs indicate Hub or NIC, speed, duplex, and whether or not an auto-negotiation actually took place. All advertised capabilities in the FLP burst are displayed to the user as well as frame and link errors. Traffic is displayed as a bar graph and permits the user to monitor the percent utilization and peak load for the LAN segment. The product will also identify the service that is present on active RJ45 jack. In addition to 10/100 Ethernet, it will identify 100BASE-T4, Token Ring and telephone service. When plugged into an open cable, the tester defaults to its toner mode and can be used with any standard probe/amplifier to trace the cable.

Jensen Tools Inc
Circle (21) on Reply Card

Multifunction Telephone Cable Tester

The Model 1039 from AEMC is a multifunction telephone cable tester which is useful for testing insulation



resistance, line resistance, resistive imbalance, capacitance and capacitive imbalance of copper telephone cable. It is also capable of measuring overall capacitance (to 4000nF) and cable

length (to 80.0 kilometers). Users can select test voltages of 50 or 100V for the insulation testing to ensure no harm to telephone equipment. As an added feature this instrument also measures AC and DC voltages and can detect off-hook current via direct connection to the telephone line.

AEMC Instruments
Circle (22) on Reply Card

Prelco Offers Pre-Programmed EEPROM Cross Reference on Web

On their website, www.prelcoparts.com Prelco offers a free pre-programmed eeprom cross reference guide that crosses OEM part number with Prelco's pre-programmed units.

Prelco Electronics offers over 155 different pre-programmed eeproms for use in: TV's, VCR's, and TV/VCR Combination Units for manufacturer replacements including: Fisher, JVC, RCA, Magnavox, NAP, Panasonic, Sanyo, Sharp, Sylvania, Toshiba, and Zenith.

Their eeproms are pre-programmed for user and factory preset values and the company claims this will save most service technicians at least 45 minutes of labor.

In addition to their pre-programmed eeproms, Prelco Electronics is a is the innovator of pre-programmed eeproms and all of their parts go through an extensive seven level parametric and life cycle testing procedure. Their pre-programmed eeproms will retain factory and user preset values for over 12,000 hours.

In addition to their innovative line of pre-programmed eeproms Prelco Electronics is a stocking distributor of original Japanese, European and American type Integrated circuits, Transistors and Tuner Assemblies...including obsolete and discontinued types. Prelco features a minimum order requirement of \$15.00.

Prelco Electronics
Circle (23) on Reply Card

Clamp-On Ground Resistance Tester

Extech's New Clamp-On Ground Resistance Tester, Model 382356, provides



autoranging mA and resistance measurements. Ground Resistance measurements range up to 1500W with 0.01W resolution. Leakage current to 15A can be measured with 0.001mA maximum resolution.

Readings are displayed on a high contrast LCD with Data Hold. The 0.9" (23mm) clamp jaw opening fits large ground conductors and provides high sensitivity. Features includes automatic detection of electrical noise on the ground rod, continuity test beeper, and automatic self-calibration when powered on. The tester meets IEC-1010 (Cat. III - 300V and Cat. II - 600V) requirements. Complete with 9V battery, calibration plate, and carrying case.

Extech Instruments
Circle (24) on Reply Card

Annual Schematics Index

Sams Technical Publishing has just released the 2001 Annual Index.

Each year, Sams adds hundreds of new models to their library of service manuals through PHOTOFACT production and out-of-print manuals from electronics manufactures.

The 2001 Annual Index contains over 185,000 entries, covering everything from antique TXs to CB radios to the newest flat screen TVs on the market today. The Index provides a quick reference to repair schematics available from.

The Index is available in paper and CD-ROM formats. The paper formats is available at www.samswebsite.com for just \$5, while the CD-ROM is available for \$12. A \$5 coupon will be included with the 2001 Index redeemable on the purchaser's next order.

Sams Technical Publishing
Circle (25) on Reply Card

SORRY

The last several issues of ES&T have not been delivered in as timely manner as any of us would like. We are working to solve these problems and will be back on a timely schedule with the April Issue.

For our international subscribers we have contracted with a postal expediting service that should help our delivery. Thanks to all of you for your patience. The folks at SE&T/Mainly Marketing.

THE MAGAZINE FOR PROFESSIONAL ELECTRONIC AND COMPUTER SERVICERS

ELECTRONIC

Servicing & Technology



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Distribution Showcase and Review
Rewritable Disk Systems
CCTV
Test Probes/Accessories Update
Antennas/Top Boxes for HDTV
50th Anniversary — History Part 2

MAY, 2001

Ad Space Closing: April 16, 2001
Materials Due: April 18, 2001

COMDEX Review
Cable-Tec Show Issue
EDS Show Issue
Networld+Interop Show Issue
15th Annual Web and Buyer's Guide
Monitors
Marine Electronics
Electronic Servicing Supplies
Audio/Sound Installation and Maintenance
Cost of Service Today

For Advertising Information Rates and Reservations: Contact Joni Jones at 516-944-8068, jmjones@ix.netcom.com or Dave Allen at 516-883-3382, dallen@mainlymarketing.com **Editorial Contact:** Nils Conrad Persson at 913-492-4857, cpersedit@aol.com.

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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.
- All submissions must be typed or printed clearly!

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Tel: 516-883-3382 Fax: 516-883-2162

FOR SALE

Duplicate Sams photofacts, and other duplicate service manuals. Send sase for list. Also other duplicate service test instruments. N. Young, 214 E. Robertson St., Brandon, FL 33511.

Sencore CVA94 Camcorder analyzer with Sencore VR940 Video reference in mint condition, Sencore CM2125 Monitor Analyzer, Sencore HA2500 Horizontal Output Analyzer. All equipment includes original manuals, schematics, and accessories. Will sell together all separately for best offer. Call Rich at 636-561-8413 or email at abori@ninenet.com.

Sencore SC-61 wave form analyzer, 60 MH Band width, and VA-62 Video analyzer. \$495 each. B&K 467 3-meter CRT tester. \$160. Call 1-870-246-7234.

H.W. Sams manuals for sale. TSM (24-151) \$100 for all. AR (19-308) \$250 for all. Photofacts (1-2000) a very few missing between 1 and 100. \$750 for all. A few cabinets included. Dave at 218-643-6904, e-mail djnls@702com.net.

Sencore (ALL FORMAT VCR ANALYZER) VC93 VCR Analyzer, like new, all probes, manual, video tapes, \$550.00 {includes shipping}. Contact James at 845-831-5981 or fax 845-831-6865.

Sencore VC93 VCR analyzer in excellent condition, used very little. Includes all manuals, test tapes and leads. \$500.00 OBO. Call Darrell @ (814) 448-2881 or (814) 669-4916 or Fax: (814) 669-4260.

Sencore TVA92, \$600. Sencore VG91, \$600. Sencore CR70 Beambuilder, \$600. Excellent condition. Manuals and Cables. Call Sam, 916-655-3365.

Training Tapes and Courses: TV-Satellite-Audio Repair Course 6 video's 40 lessons \$50; VCR Repair course 2 video's 15 lessons 1 Advanced Troubleshooting Manual \$50; VCR G-Series Chassis Repair Video \$17; TV Repair CTC 170/190 Chassis video \$17; VCANDOTV Part 1 Video \$17. Call Frank for availability and details 757-523-8946.

Sencore test equipment: SC61 waveform analyzer, SG165 Stereo Analyzer, VC93 VCR analyzer, VA62A Univ. video analyzer, TF26 transistor checker, PR57 isolation transformer. All in excel-

lent condition with original manuals. Selling all together only. Many extras included not mentioned here. Great price! For more information e-mail: jotech@excite.com

Oscilloscope, B&K Model 1460, solid state, triggered sweep, \$100, 1970. Horz. pulse, can test coils & transformers, w/ringing pulse. Solid State Sweep/Marker Generator, B&K Model 415, \$100, 1970. Microfiche Reader, Bell & Howell, Model ABR917, 14" x 18" screen, \$100, 1983. Slide & storage boxes, Zenith slides 1983 to 1990, extra lamp, 4" x 6" plastic slides, parts lists, schematic, etc. Will sell all of the above for \$100 each, Plus UPS charge. All manuals, accessories and original boxes included for all the above. All are in working order. Wallace W. Huffman (219) 453-4811.

Retired senior electronic technician will sell listed Sencore Equipment in perfect condition for the sum of \$1800 plus shipping. SC61. Waveform Analyzer Scope, VC93. VCR Analyzer, VA48. Video Analyzer and PR57. Isolation Transformer. For copy of full list write to Jose Navarro 6101 N.W. 5st. Miami Fl. 33126.

VC 93 Hardly used with Probes. Phone# (514)-421-0517, \$800.

Sencore TF46 Super Cricket Transistor Tester \$300 and B&K model 470 picture tube tester rejuvenator \$400. Both items like new. Jims TV, 14751 E24 Ave Aurora, CO 80011. (303) 366-5592.

WANTED

Toshiba t6400dx2/200 model# pal604u unit or screen. Contact: Jim Stults (770) 489-1175, stults-jims@aol.com.

Sams CB photofacts #CB-222, CB-251 and CB-263. Will buy either of those or some of the other duplicate copies you have. Please write: Tony Hudson #263236, MCRC H.U.4, P.O. Box 2000, Wartburg, TN 37887.

Service manual/schematic for Pioneer TV SD-P4044. Carver service manual CS5. 1 sub woofer. N. Young, 214 E. Robertson St., Brandon, FL 33511.

Schematic for Macintosh computer color display family NO. M1212. Contact G. Fakhreddin, #272914 168 Frontage Road Newark, NJ 07114

Sencore TVA 92 or HA 2500 at a good reason-

able price. Bob Autry 10 Roling Acres Weaverville NC 28787. 828-645-7909.

Manual for EMC, Electronic Measurements Corp. Tube Tester Model 213/215. Will buy or copy/return. Victor Meeldijk, v.meeldijk@diagnostic.com, 973-967-6412.

Seamatic/service manual for a symphonic color TV model #SV19M. Ray's TV Box 70, LaCombe, LA 90445. e-mail: www3334@yahoo.com

Schematic for NEC color tv model #CT-2750S Will Pay For Copy And Postage. Jims TV 14751 E24 Ave Aurora, CO 80011 (303) 366-5592.

EICO HF-32 mono tube amplifier from the 60's, any condition. Have one, need a second for stereo. Or as parts, at minimum, need its power and output transformers- will build the rest. John Agugliaro, CET. phone: (845) 947-2748. e-mail: JAGUGL4546@aol.com

Service manual, schematic, etc. (original or copy) for Zenith TV model SMS1935S. Terry Rohler, 18 Joyce St., Stafford, VA 22554-3737, (540) 659-0263, e-mail: rohler@erols.com.

Panasonic Power Transformer #SLT5K22-V for stereo model SE-2510. Mackenzie TV Service. (480) 946-7270, Fax (480) 946-2549, E-mail: marjmac@home.com.

Yoke, YS-53929K for 19" spectricon TV model 9C2-1K3 or equiv.; Hitachi Flyback 2432091 or equiv.; Manual (or copy) for Toshiba 26" TV 289X4M. W. Worley, 305 Hickory Bend Rd, Enterprise, AL 36330. worley@snowhill.com (334) 347-5281

Reward! Mitsubishi 35" TV model #CS-3504R-need front door part #702C757030. Contact Todd in Felton, PA at 717-993-5164.

COMING IN MAY 2001 ISSUE THE 15TH ANNUAL BUYERS GUIDE AND WEBSITE DIRECTORY

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

ES&T Readers Speakout

READER OPINION SURVEY/COMMENTS

I am always anxiously looking forward to the next ES&T magazine!!! You always deal with availability and source for prices but isn't it time to write about the inflated prices of parts?!!

Why do manufactures maintain ridiculous inflated prices? Discourage you from repairing and keep on buying new stuff?

When you buy a (expensive) brand as Sony, indeed you may expect higher than average parts prices. But, for instance, if you buy a relatively cheap brand such as Sharp you do not expect Sony prices!

I bought the following Sharp IC's and state their prices RH1X2701CEZZ (\$38.67), RH1X1712CE (\$31.61), RH1X242GCEZZ (\$42.30). Their fly-back F005YPE (\$83.00) No wonder techs are dying! In my opinion, original parts last much longer, but have to consider generic. Manufactures are making good money selling consumer products. So let them lower their prices on parts, enabling tech to make a living.

When techs are "dying" who is going to fix their more & more complicated stuff? Do they realize this??

Thanks for reading this.

C.C. - Coral Springs, FL

Dear ES&T Magazine:

Your magazine is getting better & better. Instead of the silly "how to clean VCR" type articles I've seen in the past, I now find worthwhile and current information that causes me to actually sit down spend time reading it. Now if you can only get the "January" issue to me in January...

I loved the informative product evaluation of the LeakSeeker and CapAnalyzer and encourage you to have articles like this as often as possible. In a world filled with test equipment, it is refreshing to see honest evaluations on testing equipment that will help all techs troubleshoot faster and try to stay ahead of the bill collector. Help us decide what to buy and what to avoid.....

(In the article)...Bob Rose commented that his CapAnalyzer didn't find the bad caps in his Funai TV/VCR. I have found that this problem is unique to the Funai. My understanding of electrolytic caps is that their capacity changes drastically with heat, and so the cap manufactures intentionally list tolerance as high as +/-25%! Engineers are supposed to design with knowledge of

these extremes in tolerance so that the device should work with capacity cut in half.... I hope other users write to ES&T about their experiences with these and other test equipment devices. If we all share worthwhile information, this will help all technicians everywhere in the long run.

Sincerely, David Miga, CET
Service dept. of Electronic Specialists,
Boca Raton, FL

NOVEMBER, 2000

Issue Comments: With reference to ES&T's 2001 editorial calendar, "What products, topics, or coverage should we add, delete, expand or consider?"

Add car stereo repairs and installation.
Add switching power supplies.

L.G. - National Broadcasting -
Port of Spain, Trinidad

Digital Audio. A series on servicing Sony TVs.

F.R. - Christ Church, Barbados

DECEMBER, 2000

ES&T asked readers for the names of vendors and products they felt should be advertised in ES&T. The results of that part of the questionnaire will be printed upon completion. Following are additional comments on the issue or other topics.

Keep up the good work. All excellent articles.

A.S. - Boothwyn, PA

As an ITT Tech student and pilot and USCG Licensed Sea Captain I say "BRAVO" I read, I learn, I prosper.

L.A. - Malden, MA

Did not receive this magazine until Jan. 3, 2001. Is it the postal service or magazine publisher?

K.S. - Essexville, MI

Informative intermittent TV shutdown problems. I learned a lot.

L.G. - National Broadcasting -
Port of Spain, WI

Nov. article on electrical repairs to cell phones, ridiculous for small repair shop. DEC. article on troubleshooting, techniques very good need more of same.

Bob's TV Repair Shop -
New Baltimore, MI

Add more service tips on TV's, VCR's and computers. Need more information on Digital TV's and HDTV.

G.H. - Bayamon, PR

2000 issue: Hitachi TV, Profax 3192; is its schematic a joke? In the past ES&T's schematic was good completed. Lately is very poor. I'm not happy with you people.

Alex Video - A.L. - Dale City, VT

I liked your soldering and de-soldering update and troubleshooting SMD components.

D.H. - Dagsboro, DE

There should be one standard that all IR remotes adhere to for basic foundation. A cross for Philips/Sanyo other numbers on tuners to Philips/Sanyo other would be helpful NIL5: PTV = Projection TV. Three letters to describe a new device is no longer adequate too many duplications.

H.R. - Kansas City

I like the way "Profax" was printed. It is easy to read black & white good contrast.

J.R.D. - St Paul, MN

What happened to Profax Pullouts the replacement is illegible (Jan 2001). I have to admit the old style was much better and easier to use.

F.F. - Patchogue, NY

Your magazine continues to improve with Technology advancement. Many interesting articles every issue.

H.O.W. - Newark, DE

Readable Profaxes on white glossy paper; Excellent! Now you are "Cooking with Petroleum!"

V.R.M. - Aguadilla, PR

Great Issue. Thanks so much.

Economy Electronics - Cookeville, TN

JANUARY, 2001

The ES&T Survey card asked which manufacturers have the best support, brands you would recommend, etc. The statistical tabulation will be published upon completion. Here are additional comments on this question, and the overall issue.

Mitsubishi can keep you on hold for hours. Sarcastic answers, problem they knew with no service warning.

Sony uses only Sony dedicated components, very slow order response.

W.J.K. - Montague, MA

I am an Independent servicer, and my experience in the above are based on

being an Independent! The Best Yet!
E.W. - Bedford, OH

Pleased About Profax paper quality & legibility.

Are there ever any big service conventions northeast? Thank You.

J.C. Electronics -

Great magazine. Keep up the good work. I need to find a CRT for a Philips scope (10MHZ) can ES&T audience help?
R.J. - Rapid City, SD

Need better proof reading of articles. Many mistakes one example, December page 7 troubleshooting shutdown problems. Text reads R4175 & R4116, 41.2 figure 3 schematic shows R3117 twice at 200kn. It makes articles hard to follow and understand.

J.T. - Avoca, PA

Quality and workmanship and service-ability are on the wane - Mfg. Sell parts and service information for high prices to make up for losses in new product low prices.

B.C. - TV-Services - Otis Orchards, WA

Emerson is the worst for support. I have been trying to get a processor IC chip #M52039SP for the last six months, would you have any idea where I can get this chip?

RF Radio Electronics - Honaker, VA

Good issue. 10 year Profax directory AOK.

M.C. - Des Plaines, IL

The Profax no. 3193 in most cases is completely unusable. Most inter connecting lines are missing, poor quality.

J.G.S. - Sharp Images -
Winston Salem, NC

No service manuals available from main distributor in New Jersey.

D.H.B. - Bayamon, PR

Zenith is the hardest to get parts past 5 years old.

C.N.G. - Florence, SC

ES&T Readers are invited to respond to any of the above or make additional comments. Wherever possible, we will put interested parties together.

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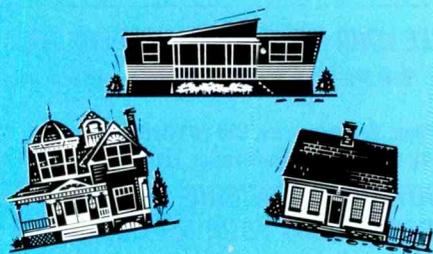
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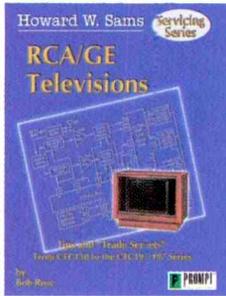
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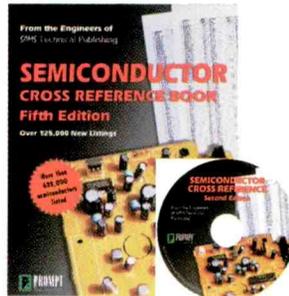
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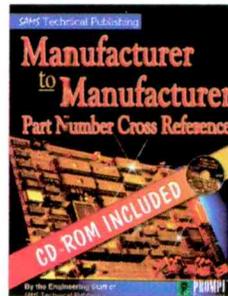
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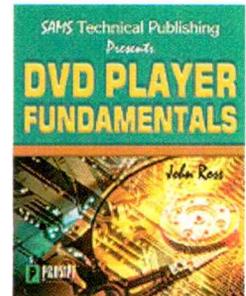
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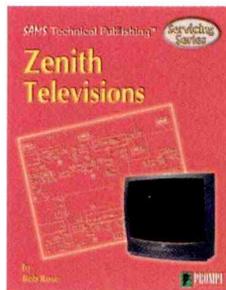
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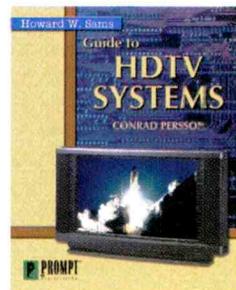
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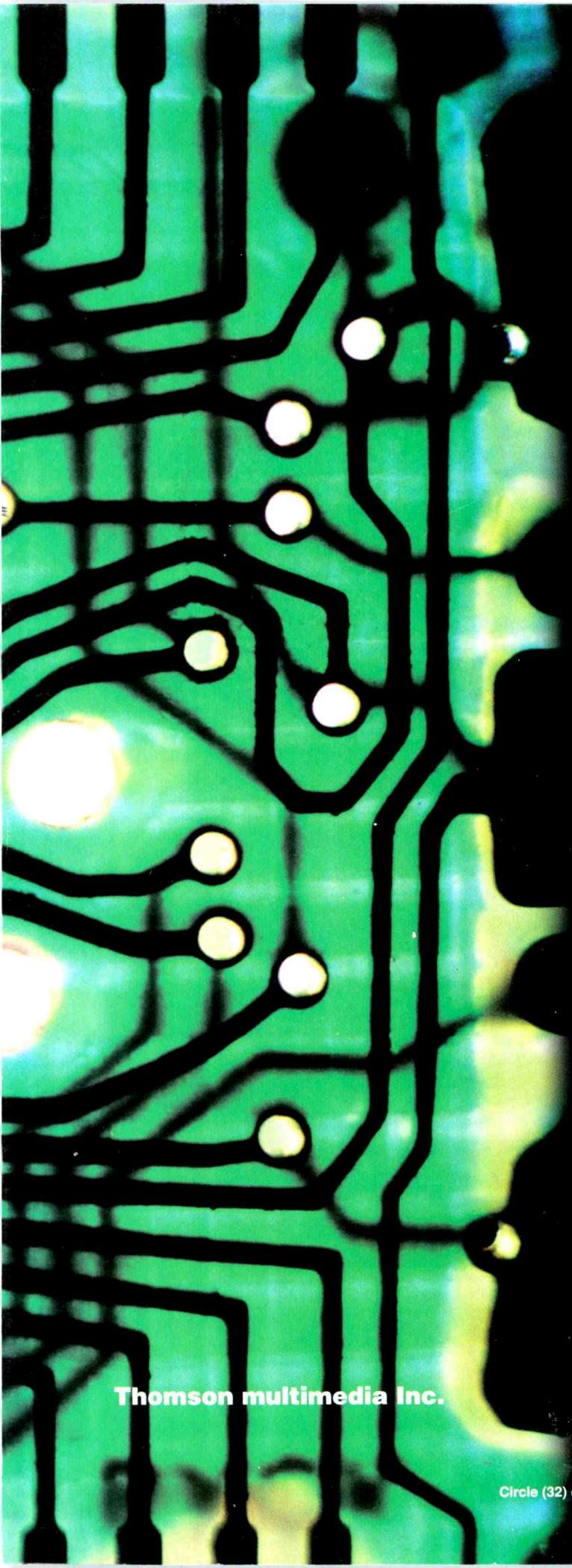
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