

THE MAGAZINE FOR PROFESSIONAL ELECTRONIC AND COMPUTER SERVICERS

ELECTRONICTM

Servicing & Technology

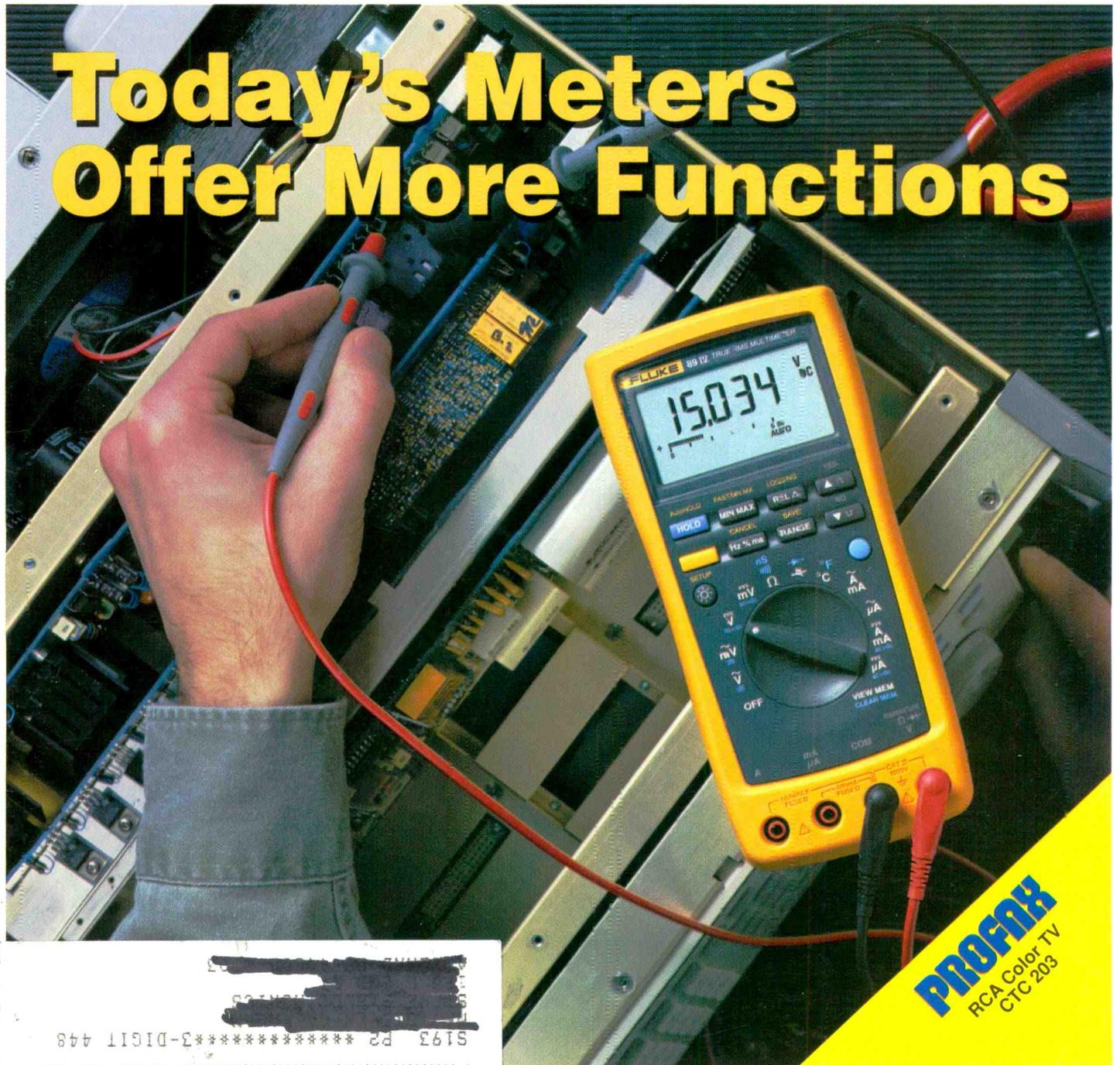
September 2000

TOOLS OF THE TRADE: DMMs, Oscilloscopes, Accessories

NPSC Report, CEDIA Preview

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by Bob Rose

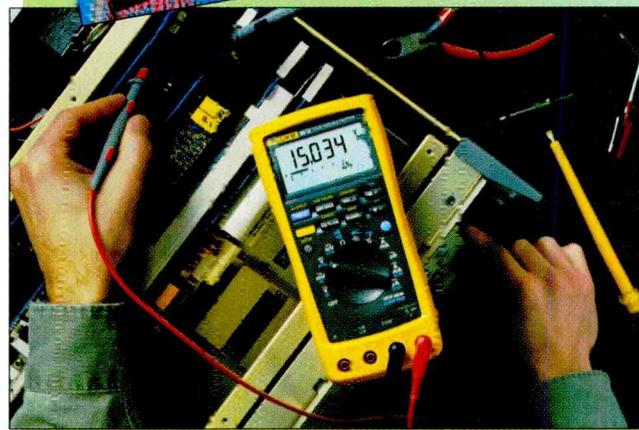
Microprocessors, ROM, software: this is the stuff of which modern television sets are made. This article describes several TV faults that seem more computer related than TV related, and provides some sage advice on diagnosing and correcting them.

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Everyone knows transformers provide electrical isolation between the input and output. Isolation transformers are often used for increased safety and to meet domestic and international safety standards.

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ON THE COVER

A far cry from the single function meters of the early days of electronics, today's multimeters offer not only accurate readings, but a broad range of functions: volts, ohms, milliamperes, diode test, capacitance, and much more. (Photo courtesy Fluke Corp.)

Viewpoint

THE MAGAZINE FOR PROFESSIONAL ELECTRONIC AND COMPUTER SERVICERS™

ELECTRONIC

Servicing & Technology

In July *Electronic Servicing & Technology* Magazine was purchased from CQ Communications by Mainly Marketing Enterprises Inc.

For the old timers among the ES&T readership, a "new publisher" may have an "old" ring. ES&T has been "owned" by a number of people and/or firms since Howard Sams began the publication as *The PF Reporter* some 50 years ago.

Yet, we know that 'owning' a good publication is a little like 'owning' cats...you don't really ... you are just responsible for their care and feeding. This 'knowledge' comes from first hand experience... we have a total of five cats in our household and both of us have spent many years in business-to-business publishing.

The fact of the matter is that Dick Ross, Jon Kummer and the inside staff of CQ Communications interviewed us carefully before agreeing to sell ES&T. It was a little like interviewing to adopt one of our cats from the North Shore Animal League here in Port Washington. The good folks at CQ wanted to be certain that we intended to seriously work towards making ES&T the best it could be. We intend to do that.

WHAT HAS CHANGED AND WHAT HASN'T...

From a business standpoint, advertisers will see changes in our sales staff and publishing offices on the mast (page 5) and in various 'house' ads throughout this issue.

For ES&T's long-term readers and advertisers you should know that Nils Conrad Persson has agreed to continue as Editor. We are delighted! Conrad has done a magnificent job and has a tremendous following throughout the industry.

During the past month we changed printers. With new capacity, we expect to upgrade the graphics, color, and readability of each issue.

We have also added Mr. Jay Febrer as our Webmaster. Watch for our new web site under construction at www.estmag.com.

Last month, we attended the NPSC-NESDA show and conference in Reno. We received many comments, inputs and suggestions for enhancing the basic editorial product. A key issue was the need for information critical to business operations and survival. (At the Conference, many of the consumer electronics manufacturers made heavy commitments designed to insure the continuation of the Professional Service Provider.)

So, you will soon see additional information on the opportunities and difficulties facing the Professional Service Provider. We will be adding more new products, more information on distributor offerings, and more information on the policy, warranty, personnel and business developments from the consumer electronics manufacturers.

WE ASK FOR YOUR HELP...

If we are to provide the Professional Service Provider with this information we need your input. Call, write, fax or Email any of us when you learn information that should be shared with your colleagues. We will make every effort to substantiate and/or clarify your information and share it with our readers.

Many manufacturers are not set up to send out press releases on warranty changes, policy changes, regional and/or national field sales movement, or other developments of importance to the service provider. These issues are not part of these mega firms' overall press activity. You can help us develop this dialogue with your service partners.

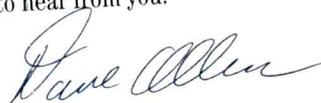
FINALLY, THANK YOU.

Whether we heard from you at NPSC, on the phone or whatever, we both say "Thank You" to all the readers, vendors, advertisers and friends who have given us words of encouragement and warmth during this hectic first month.

Thanks again, and do not forget, we want to hear from you.



Marie Marcellino
Publisher
mmarcellino@mainlymarketing.com



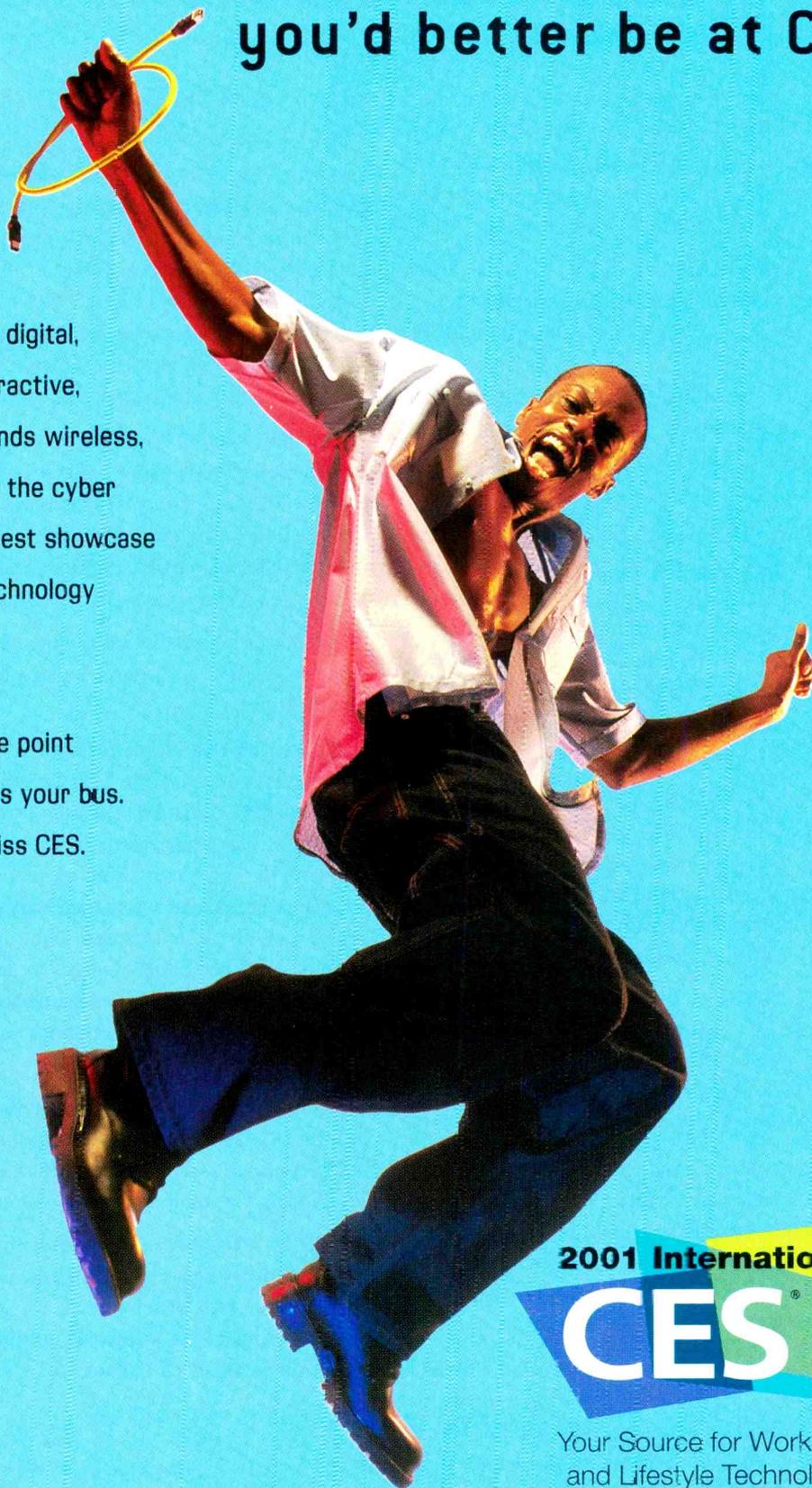
Dave Allen
President.
dallen@mainlymarketing.com

Electronic Servicing & Technology Magazine, A Mainly Marketing Media
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Editorial

by Nils Conrad Persson

UNDER NEW MANAGEMENT

Here we go again. As you will see on page two of this issue in the page entitled "Viewpoint," ES&T is now under new ownership. It's not the first time that this magazine has changed hands. There have been a lot of changes of ownership of either the parent company of ES&T, or ES&T itself, over the years.

In 1982, I became editor of ES&T, and at around the same time, Intertec and a company called Harcourt Brace Jovanovich agreed to a swap of magazines. In that transaction, Intertec relinquished control of a magazine whose identity I can't recall, and took over a magazine that many of you are familiar with "Electronic Technician/Dealer." At that time, ET/D was incorporated into ES&T rather than being published as a separate entity.

There was a fair amount of consternation among the readers who had previously been receiving ET/D and now began receiving ES&T. One of the features of ET/D was a department called TekFax, schematic diagrams of television sets. ES&T, which was now being sent to them instead of ET/D did not carry schematic diagrams. Intertec was inundated with complaints from the new readers, and it wasn't long before ES&T began including schematics under the designation "ProFax."

Intertec was bought and sold several times after that, but we won't go into any detail about that. However a pivotal change was made in early 1990. The publisher of ES&T decided that it didn't fit in with the other magazines in that division of the company, so he put it up for sale. CQ Communications, a publisher based in Hicksville, NY bought ES&T and published the April 1990 issue as a CQ magazine.

CQ published ES&T for a little over 10 years. Recently, the owner of that company decided for a number of reasons that he wished to sell it. On August 1, 2000, Mainly Marketing Enterprises Inc., a company in Port Washington, NY, bought it.

One thing that has characterized ES&T through all these changes is that it has never wavered from its mission: to provide consumer electronics service centers with information that helps them do their jobs. And, as you can see from the Viewpoint of the new owners, Dave Allen, President and Marie Marcellino, Publisher, that will continue to be the aim of ES&T.

The only changes that are planned are changes that will make ES&T a better magazine, one that will serve its readers in a greater variety of ways, and offer information that will be useful in operating a service business beyond just the technical and troubleshooting aspects of service. These changes are summed

up nicely in the Viewpoint page.

It's exciting to be editor of ES&T at this juncture. As you can see from the coverage of the National Professional Service Convention (NPSC) in this issue, the manufacturers of consumer electronics products have reaffirmed their commitment to support independent service. Many of them are making their service literature widely available free of charge via their internet sites. Some manufacturers are limiting availability to members of NESDA, but at least one, Hitachi, is making service literature at their web site available to all industry service centers.

But there's more. For example, some manufacturers who have for a period of time had a policy of exchanging faulty products under warranty will be returning to a policy of supporting service of those products in the field by independent service centers. And, in general, many manufacturers have voiced the intention to make it easier for service centers to do business with them.

All of this means that independent consumer electronics service is alive and well, and is being supported in many ways by manufacturers.

In keeping with the revitalization of the consumer electronics service industry, ES&T plans revitalization as well. Watch for changes to come. For example, we have already contacted a number of manufacturers, and will contact the rest of them in the coming months, to obtain access to their service literature so we can expand and update our ProFax department. Moreover, we have invited manufacturers to provide us with relevant information about personnel changes in their service divisions that will assist readers of this magazine so we can keep you posted as to whom to contact within those companies.

Another feature that we plan to revitalize is our Successful Servicing article series. There are many service centers throughout the U.S. that have managed to not only remain successful but become even stronger in spite of adversity in the business. We'll bring you their stories to let you know how they did it.

The world has just entered a new millennium, consumer electronics service is entering a new era, and now ES&T has entered a new phase in its development. It's going to be fun and interesting to watch how things all unfold as we work together to make independent service thrive.

Conrad Persson

THE MAGAZINE FOR PROFESSIONAL ELECTRONIC AND COMPUTER SERVICERS

ELECTRONIC

Servicing & Technology

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

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403 Main Street, 2nd Floor
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EDITORIAL

Editor: NILS CONRAD PERSSON
P.O. Box 12487, Overland Park, KS 66212
913-492-4857
cperseedit@aol.com

CONSULTING EDITORS

TV Servicing Consultant: BOB ROSE
TV Servicing Consultant: HOMER L. DAVIDSON
Components Consultant: VICTOR MEELDIJK
Audio Consultant: ALVIN G. SYDNOR
Electronics Theory Consultant: SAM WILSON

BUSINESS

Publisher: MARIE MARCELLINO
mmarcellino@mainlymarketing.com

President: DAVID L. ALLEN
dallen@mainlymarketing.com

CIRCULATION

Circulation Coordinator: MARY TALI
admin@mainlymarketing.com

PRODUCTION

Production Manager: MARIANNE MEADOWS
mmeadows@mainlymarketing.com

SALES STAFF

Sales Director & West Coast: DAVID L. ALLEN
dallen@mainlymarketing.com

East/Midwest: JONI JONES
P.O. Box 346, Port Washington, NY 11050
Tel: 516-944-8068 Fax: 516-944-2739
jmjones@ix.netcom.com

International: JAY FEBRER
jfebrer@mail.com

Classified/Display Classified: LYNDIANE PAOLETTI
admin@mainlymarketing.com

Sales Coordinator: LYNDIANE PAOLETTI
admin@mainlymarketing.com

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Cisco unveils internet home

Teams with major home developers to enable internet connected community.

Building on the vision to provide consumers anywhere, anytime Internet access in the home, Cisco Systems, Inc., has unveiled its Internet Home. Cisco's 1,700 square foot Internet Home showcases the benefits of a high-speed, always-on Internet connection that enables an array of consumer devices and appliances in the home. Cisco also announced it is teaming with developer Playa Vista, to build Internet-equipped "smart homes" in a major new residential and commercial community development in West Los Angeles. The Cisco Internet Home, developed in conjunction with leading consumer companies Digital Interiors, The Great Indoors, Hewlett-Packard Company, Sears, Roebuck and Co, and Whirlpool, demonstrates the power of the Internet in enhancing daily living for consumers, as well for the developers creating the homes and communities of the future. High-speed Internet connectivity throughout the home allows consumers to conveniently conduct everyday activities online such as shopping for groceries, listening to music or sending family photos to grandparents.

"The Internet Home drives home the message that always-on, high speed Internet connections are available in today's home, whether it's an older home or brand-new development. It also demonstrates how an always-on, high-speed Internet connection is as easy to use as turning on a light or a water faucet," said Mike Moone, group vice president and general manager, Cisco's Consumer Line of Business. "We are pleased to be working with leading consumer companies and community developers to help make Internet Homes a reality for consumers."

In the Cisco Internet Home, the refrigerator knows when the door is left ajar and can notify the homeowner via a web pad device, enables a child to receive homework help from a parent at work or traveling, or control the lights, music and security system with the touch of a button.

These conveniences are all possible with a high-speed Internet link such as Digital Subscriber Line (DSL) and a Cisco Internet Home Gateway, which will be available next year.

DTV Product Sales to Date Surpass All of 1999

Arlington, VA, July, 2000 - According to figures released by the Consumer Electronics Association (CEA), factory sales to dealers for digital television (DTV) displays for the month of June were 26,750, the biggest sales month to date for DTV. June figures brought DTV display sales for 2000 to 129,438, surpassing total display sales in 1999 (121,226). These figures include DTV and HDTV display monitors that require the addition of a set-top box to receive digital broadcasts as well as DTV and HDTV sets that include a DTV tuner. In addition, 17,671 stand alone set-top receivers have been sold to dealers since January 2000.

"These numbers demonstrate that despite limited broadcast programming and some who advocate delays in the broadcast community, consumers are buying DTV," said CEA President and CEO

Gary Shapiro. "Non-broadcast digital and high-definition content is available to consumers via satellite and, in some markets, via cable. And many consumers are simply opting to buy DTV and HDTV displays now - to enhance their analog TV and DVD experience." To date, the majority of DTV factory sales have been DTV and HDTV displays that require the addition of a set-top box to receive digital broadcasts. In 1999, 17 percent of the total DTV products sold (including monitors, integrated sets and digital set-top receivers) were capable of receiving digital broadcasts. CEA expects this trend to continue as long as some broadcasters question the DTV standard or insist on using DTV primarily as a subscription data service.

"Even as consumers enjoy non-broadcast digital and high-definition content from a variety of sources, some vocal broadcasters are dragging their feet, confusing consumers, and stalling the broadcast transition to DTV," said Shapiro. "Broadcasters made a commitment to deliver DTV in return for the loan of valuable public spectrum. Further delays are a denial of the public trust. Lingering debates over the digital broadcast standard and efforts to accommodate new broadcast business models cannot be allowed to trump consumer interest in DTV."

Earlier this year, CEA released revised DTV sales projections to account for delays in the broadcast rollout and limited programming. According to the new projections, if broadcasters choose the "fast lane" to DTV and demonstrate 100 percent compliance with the Federal Communications Commission (FCC) rollout schedule while providing a high percentage of digitally-originated content to consumers, DTV product penetration will reach 50 percent by 2006. If broadcasters take a "middle of the road" approach and have continued station conversation delays while providing a high percentage of up-converted analog content, DTV product penetration will be no more than 30 percent by 2006. Finally, if broadcasters choose the "off-ramp" on the road to DTV - characterized by non-HDTV business models and delays related to reopening the DTV standard, DTV product penetration will only be 15 percent by 2006. 2006 is the target date for return of the analog spectrum.

The Consumer Electronics Association (CEA), a sector of the Electronic Industries Alliance (EIA), represents more than 600 U.S. companies involved in the development, manufacturing and distribution of audio, video, mobile electronics, communications, information technology, multimedia and accessory products, as well as related services, that are sold through consumer channels. Combined, these companies account for more than \$60 billion in annual sales.

Dolby Announces Pro Logic II Decoding

San Francisco, - Dolby Laboratories announces the introduction of Pro Logic II, its next generation of Dolby Surround Pro Logic decoding technology. Pro Logic II brings exciting new features and advanced performance for decoding the many thousands of existing Dolby Surround programs, making them sound more like a discrete Dolby Digital 5.1-channel version than ever before.

The world is rapidly transitioning to digital delivery formats like DVD, and digital television (DTV), satellite and cable, all of which offer Dolby Digital 5.1 audio capability. The music industry is on the verge of transitioning from stereo to 5.1-channel sound with the new DVD-Audio format. Consumers enthusiastically demand 5.1-channel sound in new programs of all kinds. But vast numbers of programs already exist in stereo and Dolby Surround, and many more will continue to arrive in years to come. Pro Logic II lets consumers enjoy these programs with a convincing "5.1-like" presentation.

Pro Logic II is able to decode the thousands of existing Dolby Surround movies and TV shows already on the shelf, compatibly, and with enhanced image stability. The improvements in decoding techniques mean that the discreteness of the sound field elements are better-preserved in the decoding process than was possible with the now universally standard Pro Logic technology, developed in the mid 80s.

"The technology in Pro Logic II is the first fundamentally new approach in matrix decoder design since the basic design which is still at the core of every other active matrix surround decoder," said Roger Dressler, Director of Technology Strategy for Dolby Laboratories. "Pro Logic II was designed from the outset to convert conventional stereo music recordings, which will be with us for some time to come, to a natural, believable surround experience. The result is a decoder that can handle a wide range of movie and music program material with equal skill. Dolby is proud to be handling the licensing and technical support of this exciting new technology." This new system was invented by Jim Fosgate, one of the most prolific developers of surround decoding technologies since the quadraphonic era of the late 1960s. Mr. Fosgate said, "I have spent the past 25 years figuring out how to expose the hidden information in standard two-channel stereo recordings, both new and old. This breakthrough in matrix decoding technology allows users to enjoy all their existing two-channel programs, whether Dolby Surround encoded or not, with an enhanced level of spatiality and directionality."

Pro Logic II also incorporates special features for controlling the overall spatial dimensionality and frontal sound field imaging that are particularly suited for autosound applications. A standard four-channel Pro Logic decoding mode is also included in the technology package. Dolby Surround Pro Logic II decoding can be implemented economically in either analog and digital circuitry, making it ideal for use in all traditional home theater products and in a range of new "music surround" products.

CEA Supports Chairman Tauzin's Demand for High-Definition Television Content from Broadcasters

Arlington, VA, July 25, 2000 - The Consumer Electronics Association (CEA) expressed its full support for comments made by Congressman Billy Tauzin (R-LA), chairman of the U.S. House Commerce Committee's Subcommittee on Telecommunications, Trade and Consumer Protection, demanding broadcasters provide high-definition television (HDTV). The Chairman made his comments during a hearing on the U.S. digital television (DTV) transition held today by the Telecommunications Subcommittee.

As he closed the hearing, Tauzin sternly told broadcasters that

any attempt to lease or sell for subscription data or other services the digital spectrum provided to them for the DTV transition would be a "deal breaker." He said that the spectrum must be used to broadcast HDTV and warned that it will be a "very big mistake" if broadcasters do not provide HDTV to consumers.

"Congressman Tauzin's comments echo our sentiments exactly," said CEA President and CEO Gary Shapiro, who testified at the hearing. "We believe that having received public spectrum, all broadcasters now have the obligation of keeping their end of the bargain. Broadcaster decisions to use the spectrum primarily for services other than delivering free over the air television abrogates the agreement with Congress and denies the public trust."

CEA also applauded Chairman Tauzin's call to ensure that all consumers can receive a DTV signal. Tauzin argued that cable companies must carry high definition signals on their systems as part of the HDTV "deal." "Consumers are entitled to have a HDTV signal," he said. "For our part, our industry has every incentive to make sure that all Americans have access to the wonders of DTV," said Shapiro. "That is why we are offering an ever-increasing array of products at various price points. And that is why we oppose any change in the existing, approved DTV broadcast standard, 8-VSB."

During the hearing, consumer electronics manufacturers conclusively ended the debate over the DTV transmission standard by demonstrating 8-VSB reception within the congressional hearing room using a simple indoor antenna. A representative of Zenith Electronics "surfing" local DTV channels and showed the marked superiority of DTV picture quality over analog picture quality as received within the hearing room. NxtWave Communications, a manufacturer of DTV chips, used an indoor antenna to showcase DTV reception on a PC via a card designed by the company. "Some may conclude that I am biased in favor of the current standard," testified NxtWave Chairman and CEO Matt Miller. "I am, because I understand its superior capabilities and what they can mean for bringing new and better services to the American public in both urban and rural areas. Pausing now for years while we debate the intricacies of this or that standard is the equivalent to 'fiddling while Rome burns.' Our DTV standard is fine, it does the job and will accommodate future requirements. Let's get on with it."

In his testimony, Shapiro described a successful consumer transition to digital television (DTV) characterized by board product offering, increased programming from alternative media sources, steady sales, and high consumer satisfaction with DTV products. "TV manufacturers have introduced approximately 200 different products and DTV is available at hundreds of retail locations across the country. Already, more than 300,000 DTV products have been sold to dealers (including DTV and HDTV monitors, integrated sets and stand-alone set-top boxes), representing a consumer investment of nearly \$800 million. As we have heard from retailers, DTV is meeting and even exceeding consumer expectations," said Shapiro.

"Broadcasters must now meet their end of the bargain by providing high quality, true high definition programming," Shapiro added. "We look forward to working with Chairman Tauzin and others to ensure that the DTV transition continues to move forward."

Agilent confirms X-Ray inspection test capability for Lead-free solder

Agilent Technologies Inc. has announced confirmation of the ability of its automated X-Ray Inspection system to test a variety of the new lead-free solders destined to appear in consumer electronics in the coming years.

"We are seeing strong market pressures regarding the toxicity of lead and other materials found in today's consumer electronics products," said Kamran Firooz, general manager of Agilent's Manufacturing Test Division. "Consumers want more environmentally friendly products, thus manufacturers worldwide are exploring new solder alternatives such as tin, copper and silver."

Both Japan and Europe are accelerating the elimination of lead from printed circuit boards. With lead-free deadlines of 2001 and 2004 respectively, manufacturers must address the solder issue and work to incorporate newer, more environmentally friendly solder in existing products.

Manufacturing with lead-free solder alloys poses new challenges to the manufacturing process, including increased material costs and higher melting points. Higher melting point solders may create new challenges for service centers as well.

CEA Creates R-7.5 Engineering Subcommittee to Establish Standards for A/V Home Networking

Arlington, VA - The Consumer Electronics Association (CEA) R-7 committee on home networking standards has created subcommittee R-7.5 to better facilitate the interoperation of cluster networks. The goal of the R-7.5 Audio/Visual subcommittee is to define a set of common services for networked audio/visual devices so they can interact with other devices via the home network.

Launched and managed by CEA's Technology and Standards Department, R-7.5 will first seek to adopt or modify an existing home networking standard. If the creation of an entirely new standard is set, R-7.5 will use a network framework that is architecturally neutral (A/V cluster protocol neutral) and independent of the run-time environments (operating system and platform neutral).

To foster broad compatibility, R-7.5 will work with the R-4 Video Systems Committee on Audio/Visual intra-cluster issues, the R-7 Home Networking committee on cable compatibility issues. Bill Rose, Leviton vice president of electric engineering and R-7 Chairman explains, "The problem is the numerous standards involved from the protocols used on each network to the methods used to control all of the products. R-7.5 has been created to look at just such scenarios and help define the system needs so this and other applications can be simplified to the point that the homeowner can handle the job without the use of an integrator and equipment."

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New EIA Standard Specifies Tests for Node Data Link Layer's Conformance to CEBus

The Consumer Electronics Association (CEA) has published the EIA-633.42 standard that specifies the test methods and procedures used to determine the level to which a node data link layer conforms with the CEBus set of home networking standards. The CEBus standards are a series of specifications for a network that provides a standardized communication facility for devices and services to exchange information and control signals throughout a home.

EIA-633.42 describes how to measure a node data link layer's conformance to EIA-600.42, the node data link layer standard. The new standard determines node data link layer compatibility using test cases, test steps and test case dynamic behavior. The test cases outline the test steps and feature descriptions of each test to be run on the unit under test (UUT). The standard's test case dynamic behavior section is a formal expansion of each test case, written in the form of a series of test steps with a pass or fail outcome.

The standard was created by R-7.2, the CEBus subcommittee of CEA's R-7 Home Networking Committee. R-7.2, chaired by Bernadino Camba of Domosys, is responsible for the recently completed CEBus standards series (EIA-600 series) as well as CEBus conformance series (EIA-633 series). R-7.2 is now working on a specification that puts common application language (CAL) on top of eXtensible markup language (XML).

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New Products

Audio analyzer

Today's audio listeners expect concert-quality sound from their home and car audio installations with sparkling highs and thundering lows. But simple installation errors can make the best system sound cheap and hollow. Speaker placement, sound reinforcement techniques, and system calibration are little more than a trial and error guessing game without the right tools. Sencore's new SoundPro Audio Analyzer enables you to set up audio systems quickly and accurately,



to near concert hall quality, says the manufacturer. The product is a professional quality audio analyzer with features custom-designed for home theater and consumer audio installations. Key features include:

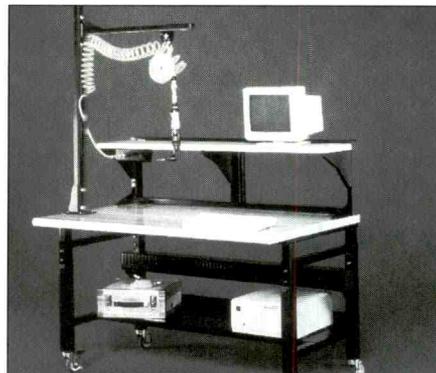
- A built-in Real Time Analyzer to properly tune and balance any audio system in minutes.
- A convenient Energy Time Graph to identify and correct uneven sound dispersion in the room.
- A Sound Pressure Level meter to ensure proper level balancing of each speaker.
- A Noise Criteria (NC) Test to analyze background noise.
- All the output Test Generator signals you need, in one portable package including white & pink noise, and sine & square waves - all fully adjustable. Standard RCA phone, 1/4" mono, 1/4" stereo, and XLR output connectors.
- A Signal Level Meter that accurately measures any audio input.
- A Built-in Distortion Meter for checking speaker distortion.
- Polarity Tester checks speaker and system polarity.
- Quick, dynamic Cable Tester finds opens, shorts, or crossed cables.

- Built-in audio bandwidth digital Sample Scope for signal monitoring.

Sencore Inc.
Circle (5) on Reply Card

Mobile workbench

A heavy-duty mobile workbench that can be equipped to handle changing requirements in manufacturing, assembly, test, and laboratory environments is being introduced by APW-Wright Line. The Mobile TechBench features 12 gauge



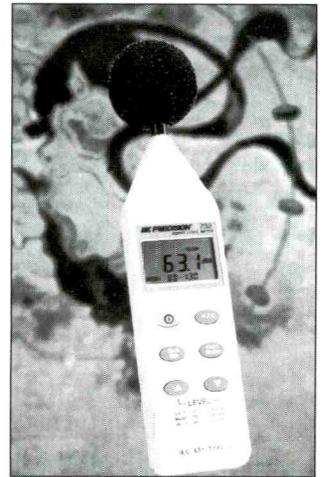
all-welded steel construction, heavy-duty lockable casters, and an ESD-safe work surface with fully integrated cable management. Adapting to changing needs, this modular workstation can be easily customized for multipurpose applications with various shelving and an ergonomic swinging jib and balancer. Designed to perform a wide variety of in-plant and laboratory functions, the bench is 60"W x 36"D x 35"H and includes a fully supported 16"H organizer shelf. Primary applications include expanding fixed assembly lines, movable electronic workstations for ESD waxing and cleanup, and roll-up troubleshooting test stations.

APW-Wright Line
Circle (6) on Reply Card

Digital sound level meter

BK Precision introduces the Model 732 Digital sound meter. The new lightweight, battery powered, hand-held unit meets IEC 651 Type II specifications. The meter provides three convenient measurement ranges: low - 30dB to 80dB, medium - 50dB to 100dB, and high - 80dB to 130dB, with an accuracy of +/- 1.5dB. The meter meets

the IEC 651 Type II and includes frequency weighting A and C and fast and slow time weighting. Two auxiliary ports provide ac output, IVrms full scale, or dc Output,



10mV/dB. The unit also offers the following features: a 4-digit LCD with 0.1dB resolution and 0.5 second update cycle, MAX MIN function, low battery indication, electric condenser microphone with wind-screen, and auto power off. Specifications include a dynamic range of 50dB, a frequency range of 31.5Hz to 8kHz, 0C to 40C (32F - 104F) operating temperature, and 10-80% RH.

BK Precision Corporation
Circle (7) on Reply Card

Multimeter

Extech's new MultiPro models MP510, MP520, and MP530 provide basic voltage accuracy of 0.08%. The optically isolated RS-232 PC interface with Windows95/98 compatible software (optional)



allow the user to collect, display, plot, save, or export data or graphs. Measurements are displayed on a backlit 5000 count LCD with high resolution: 0.01mV, 0.1µA, 0.10ohms, 0.01nF, 0.001Hz. Features also include a wide (voltage bandwidth of 40Hz to 20kHz, smart Auto Power Off which is disabled if

New Products Continued

a signal is present at the test leads, high and low resistance auto-lead zero, and water resistant housing. All models measure voltage and current, resistance, frequency, capacitance, diode, and continuity. Models MP520 and MP530 provide True RMS for ac voltage and current. In addition, Model MP530 measures selectable degrees F/degrees C temperatures and features Relative, Min, Max, Max-Min, and 5ms Peak Hold. An analog zoom provides 5 times resolution to detect small signals

(updates 60 times/sec). All models are UL listed and meet IEC 1010 CAT III- 600V, CAT II - 100V.

Extech Instruments Corporation
Circle (8) on Reply Card

Rework station

PACE announces a new look and new features for the all-new MBT 250-SDPT multifunction rework station. New front panel graphics make the units easier to set-up and operate. The SDPT acronym



reflects the type of hand tools packed out with the system; Solder, Desolder, ThermoPik and ThermoTweez. For soldering, the PS-80 iron is both rugged and versatile. To handle desoldering tasks the MBT line now features the SX-80 SODR-X-TRACTOR, which is an innovative new desoldering handpiece with a disposable solder chamber. The ThermoTweez is a flexible handpiece that can remove anything from the smallest two sided components to the largest four sided quad flat packs. Finally, the Thermo-Pik is designed for medium and large four sided components and features an integral vacuum pick up.

PACE
Circle (9) on Reply Card

Contact cleaner

Sprayon S02020 is a versatile cleaning and degreasing agents available for elec-



tronic contacts. It is a non-flammable, non-corrosive, non-staining cleaner that is safe on virtually all plastics. Its non-ozone-depleting formulation is an alternative to TFI13. The cleaner removes light contaminants without leaving a residue and without causing temperature control problems. According to the manufacturer, it can be applied while equipment is operating because it instantly evaporates.

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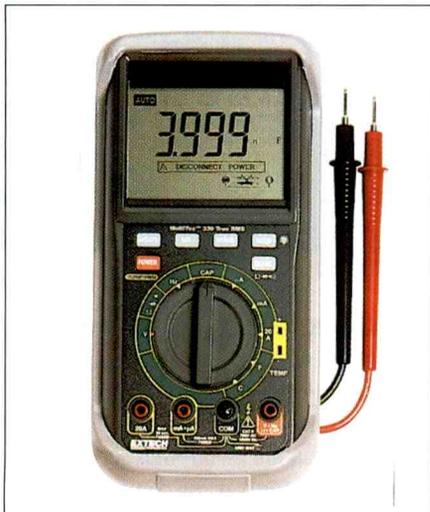
New Products Continued

Its dielectric strength is 19,000V The solvent comes with an extension tube for fast, precise cleaning of electronics equipment. It cleans printed circuits, relays, switches, precision instruments, clocks, vacuum tube parts, cameras, coin counters and chutes.

Sherwin-Williams Consumer Group
Circle (10) on Reply Card

DMMs

Extech's NEW MultiTec Series of MultiMeters (Models MT310, MT320, and MT330) measure ac/dc voltage, ac/dc current, resistance, frequency, duty cycle, and capacitance. The basic dcV accuracy of Model MT310 is 0.5%.



Model MT320 features a basic dcV accuracy of 0.3% and a temperature function with switchable F/C units. Additional features of Model MT330 include a basic dcV accuracy of 0.1%, temperature function with switchable F/C units, True RMS measurements for ac voltage and current, and a backlit display. Measurements are displayed on an oversize, high contrast, 4000 count LCD. Display prompts indicate correct test probe connections, blown fuses, and to disconnect power for passive functions. The optically isolated RS-232 PC interface with optional RS-232 cable and Windows 95/98 compatible software allow the user to collect, display, plot, and save data. Added functions include diode and continuity tests, Data Hold and Relative functions, and Auto power off. UL listed. Meets CAT II - 1000VDC, 700VAC.

Extech Instruments Corporation
Circle (11) on Reply Card

Desoldering handpiece

PACE announces the new SX-80 Sodr-X-Tractor handpiece. At the heart of the system is a disposable cardboard

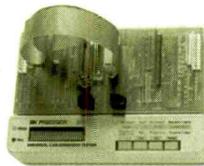


solder and flux trap that reduces hand-piece cleaning time and provides an environmentally friendly means of reclaiming the solder. Additionally, the SX-80 utilizes a modular plug-in heater which decreases maintenance downtime. The SX-80 Sodr-X-Tractor exclusively uses the new clog-resistant Endura Desoldering Tips.

PACE
Circle (12) on Reply Card

Universal Cable Tester

Test just about any cable or harness in fractions of a second.



PC Cable Tester

Tests most PC data cables and network cables, such as printer, monitor, modem, mouse.



IC Tester

Tests hot chips like TTL, CMOS, & LSI



Universal Device Programmer

Programs EPROM chips for HDTB, CDMA or GSM.



Arb Generator

Creates waves point by point like nobody else.

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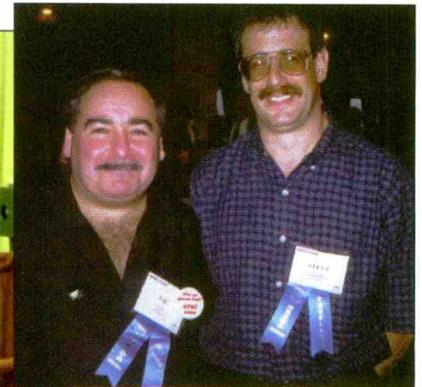
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Meet the BK Kid at WESCON, Booth #2456

Circle (31) on Reply Card



NPSC Show Report



The first National Professional Service Convention (NPSC) of the new millennium (or, if you happen to be a purist, the last NPSC of the present millennium) featured an interesting mix of seminars and show exhibits. In a time when the computer has come to predominate not only as a business tool and a communications and information-gathering device for homes, but as a device at the hearts of many consumer electronics products, much of the concern of the service community revolves around diagnosing problems in computer-related circuitry and dealing with the software that operates it.

Because of the small size of many of the components that are used in constructing these circuits, service technicians are also concerned with removing and replacing tiny components without damaging the surrounding circuitry.

Yet another perpetual concern of service centers is gaining access to manufacturers for filing of warranty claims, ordering of replacement parts, accessing of service literature, and more.

Many of these concerns were addressed by seminars and trade show exhibits at the 2000 NPSC, held August 7 through 12, 2000, at John Ascuaga's Nugget in Reno NV.

The seminars

The broad array of seminars at this convention was aimed at providing service technicians with information designed to help them in a number of areas: servicing the increasingly complex products, understanding the finances of servicing, dealing with customers. Following is a selection of the seminars that were available to attendees.

- PTV Digital convergence training, presented by Hitachi.
- CET review course, presented by the International Society of Certified Electronics Technicians (IS CET).
- Service Diagnostics on CTV and DVD products including Force, presented by Philips.
- Digital PTV convergence training, presented by Panasonic.
- Lab course on alignment of Sony's flat-screen WEGA TV line, and Convergence procedures for the RA-3 Projection TV, presented by Sony.
- Basic facsimile service techniques, presented by Sharp
- Digital PTV convergence training, presented by Pioneer.
- Customer relations for technicians, presented by Hitachi.
- Using service materials on CD-ROM, presented by Mitsubishi.

Computer media and the Internet

The trade show exhibits made it clear that manufacturers, distributors, and other entities that either depend on, or sell to independent consumer electronics service centers are increasingly using computer media and the Internet to exchange information with service centers. Various exhibits made it clear that service centers can now use the Internet to do the following:

- File warranty claims,
- Check on the status of warranty claims,
- Research parts,
- Order parts,
- Download service literature
- Access the manufacturers' service support system.

Moreover, many manufacturers are offering service literature in the form of CD-ROMs. Different manufacturers are using different software systems to operate their CD-ROM-based service literature, although there is some commonality of approach. For example, a service technician can use the operating system for Thomson Consumer Electronics to view and print service literature for Mitsubishi products and vice versa.

But it's not just the manufacturers who are offering information exchange via the Internet and via computer media. Other exhibits made it clear that distributors,

Heard At NPSC

NPSC provided 6 days of face-to-face dialogue on all aspects of succeeding in the electronic servicing business. ES&T jotted down these random comments heard during sessions, presentations, the exhibition and table talk.

"If we do a good job servicing, we make the retailer and the manufacturer look good."

"Our best technicians will have to be in the field, not on the bench"

HDTV comment... "you have higher educated clients... you must have above average people out there".

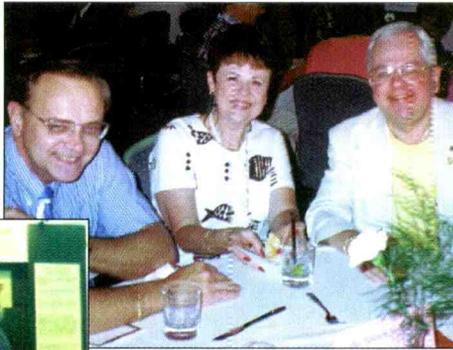
"If manufacturers give top quality pre assistance we can send lower level technicians on service calls."

"90% of the time service center professionals sign warranty price schedule agreements without negotiating anything... even though many printed schedules offer that option."

"One formula for successful servicing: diversify... and when an area is no longer profitable, cut it out."

"When the marketing people at the consumer electronic companies are sold on the value of good service, the Field problems will diminish."

"If you are going to sell a \$30,000 home theater setup, upgrade your shop's appearance."



extended warranty companies, tech tips software providers and others are also doing business via the Internet.

ClickFix

One of the more interesting announcements made at the convention was a website by a company called ClickFix. It's designed to allow the user of the site to more quickly service a faulty product. And while it does provide such things as service "tips," it also provides the user with a suggested step-by-step troubleshooting path, possibly similar to a troubleshooting "tree."

Before we get anyone too excited about this, the site provides solutions for a number of types of product at the present moment, but the consumer electronics portion is still under construction. It should, however, be available soon. Interested parties can visit the website at www.clicksoftware.com. ClickFix provides:

- Predictive maintenance: Equipment problems are anticipated before they occur.
- Web-based customer self-help: Customers can access help online, which may let them fix the problem themselves.
- Remote diagnosis: Problems are identi-

fied before a technician is ever sent out.

- Help desk support: Call center personnel know each problem's history and the most likely fix.
- On-site support: Each technician arrives fully knowledgeable, fully briefed, and fully equipped.

Each of these layers learns from the others - customers don't waste time repeating themselves if the problem escalates to the next layer. ClickFix also learns from the previous episodes of similar problems - accumulating knowledge for maximum benefit - but giving the user only the right information so the problem can be resolved quickly.

SatisFusion

Many service centers are familiar with a company named Wood Technologies International (WTI). This company offers services to consumer electronics service centers such as full service claims processing, claim validation service, and claims payment service. At NPSC 2000, the company announced that it has undergone some changes and improvements, and is now called SatisFusion. Following are that company's words on its new direction.

"With the growth in the Internet industry, WTI will be part of a new vision,

SatisFusion. Rest assured that the same great service that you have received from WTI will continue; in fact, service will be enhanced. In the meantime you can still process all of your needs through www.woodtek.com."

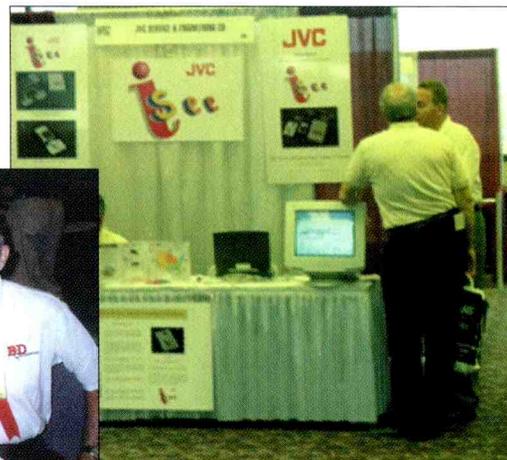
The company helps businesses to generate more revenue and enhance their profits by raising their customer satisfaction and overall customer lifetime value, resulting in higher customer retention.

By fusing the company's established fulfillment and service programs with the speed of the Internet, the company provides quick, easy and reliable service plans for customers, as well as a comprehensive package of post-sale services - all of which help manufacturers, retailers, and service centers build great customer experiences.

This system seamlessly integrates with retailers' branding on their Web sites to lay the foundation for an ongoing relationship of trust with the customer. The system offers transparent and seamless execution and operation by branding the platform to partners, not this company.

The company expects that customers will prefer to use a transparent SatisFusion powered site for their online shopping needs and will return again and again to track the life cycle of their purchases. By combining the

NPSC Report



power, speed, networking and data processing capabilities of the Internet with dependable warranty and post-sales expertise, the system enhances the commerce experience of retailers' web business and helps increase lifetime customer values.

Find more information at www.satisfusion.com.

An opportunity to service electrically powered toys

You've no doubt seen those battery-powered toys such as cars, trucks, etc. People continue to buy those products in increasing numbers and they do break down. That means that companies that make those toys are constantly recruiting service centers to service their toys when they fail.

One such company, Peg-Perego, exhibited at NPSC looking for qualified servicers to repair their little cars, trucks, fire engines, motorcycles. Here's some information about that company.

For more than 50 years, Peg Pérégo has been taking children on outings: first in their baby carriages and strollers, and later in pedal and battery-powered riding vehicles. Operating on an international level, with facilities in the United States, Canada and Europe, Peg Pérégo carries on its reputation of fashionable, quality products and service for juvenile products and children's riding vehicles.

Peg Pérégo started in Italy in 1949 with the creation of a baby carriage for Giuseppe Pérégo's son. Mr. Pérégo hand-built the frame while his wife created the fabric coverings. Other parents liked the carriage and in response to these parents'

requests for their own carriages, Peg Pérégo was born. Within a few years, this craftsman became an industrialist.

In the early 1960's Peg Pérégo introduced pedal-operated and rechargeable battery-powered children's vehicles.

Peg Pérégo employs almost 1,500 people worldwide and operates in nearly 1.2 million square feet of factory and office space in Italy, Germany, Canada and the United States. These facilities undergo frequent updating and enlargement, including the recent 125,000 square foot expansion of the Fort Wayne, Indiana, facility that now totals 325,000 square feet.

In addition to keeping facilities up-to-date, Peg Pérégo research focuses on and continually cultivates original and innovative ideas for high-quality baby carriages, strollers, juvenile products and children's riding vehicles.

At the moment, Peg Pérégo is recruiting service centers to service their products. If you're interested, you can find more information and/or contact them at www.perego.com, or 800-782-2108.

Service center management

Another type of product/service represented at the NPSC trade show was service center management software. One of the newer products exhibited at the show was Miracle Service Electronic and Appliance Edition by Nexent Corporation. This software, according to the company, allows electronic and appliance repair companies around the globe to have the same powerful features that were once only available to large repair centers.

This software, says the manufacturer can take you from the Customer, Equipment and Work Order to the Warranty Claim or Invoice in one simple smooth process

For work order management, the software provides

- Work Order Number and Dealer/Third Party Work Order Number
- General and Progress Notes
- Symptom/Repair Notes and Codes
- In, Due and Completed Date/Time
- Details of Work Performed
- Parts Used and Parts Charges
- Assign to Technician
- In Shop Location
- Accessories List
- Job and Bill Code
- Priority, Status and Call Type
- Labor Hours and Labor Charges
- Shipping and Travel Charges
- In Warranty, Extended Warranty, In-Shop Warranty and Non Warranty Status
- Prints Task/Claim Tickets

The software also allows the service center to use virtually any claims submission format, such as:

- In-Shop Warranties
- User Definable warranty and extended warranty claims companies
- Electronically submits warranty claims in a variety of formats, including XML, CPX, KPI and Sony ServNet, and many others
- Transmits claims via e-mail, FTP or BBS
- Prints warranty claim forms for NESDA, NARDA, CEASA, ABCD and more. ■

MANUFACTURERS PROMISE SUPPORT AT NPSC

Several of the manufacturers made announcements that brought smiles to the NPSC audience, and in some cases brought them to their feet with applause. In effect they were renewing their commitment to independent service by providing service literature at low or no cost, by being easier to do business with, and in at least one case, by providing expensive and seldom used test jigs, etc. without charge.

THOMSON

***"Think digital, think service, think profit:
A partnership opportunity."***

Following is a condensed outline of remarks made by Steve Zell, Director, Consumer & Product Services, Thomson Consumer Electronics. The theme was "We know that the number one issue is profitability. For 2000, here are our 20 key initiatives to help our service network become more profitable, more efficient, and easier to do business with."

- Increasing Service Contract Labor Rates to 20% Vs 10% premium over standard warranty rates.
- A major emphasis on paying fairer in-home negotiated warranty labor rates by encouraging servicers to share their Cost of Doing Business. It is critical that each servicer performs In-Home Service.
- Thomson Service Network (TSN): Thomson's goal is to offer the best web enabled service network site in the industry.
- Tech-Line assistance on NESDANET is a big hit and we hope to improve even more with interactive technical assistance on TSN.
- The Quality of Service (QOS) Program is alive and well resulting in more financial rewards for the servicer.
- Paying In-Home Rates for first dealer stock claim when the servicer is required to go to the dealer's floor to repair an in-home warranted product.
- All new audio systems are returning to a field repair warranty vs customer exchange.
- VCR will remain field serviceable for the near future.
- Thomson's strategic partnership with Radio Shack (The RCA Digital Entertainment Center) means more service for the independent authorized service center. I encourage you to contact your local store. Contact your local FSM if you need assistance.
- Our HDTV Systems Servicing Plan pays to troubleshoot the complete system and to help execute the exchange of the set top box when required. In addition, Thomson is developing a program that will allow select Authorized Service Centers to become exchange points for shippable UPS type digital products. Our goal: offer a Total Digital Service Solution for our customers.
- Our preapproval program simplifies claim processing.
- We are testing a program to allow Authorized Service Centers to sell RCA Service Contracts with a good margin opportunity.
- In June, we launched our Business-to-Business Support Line to assist Authorized Dealers and Service Centers in resolving customer service issues. We now offer one number to contact for Tech-Line, Field Service Manager, and Consumer Relations.
- Last year's Get-Connected Program was designed to drive customers to you for hook-up and assistance that you get paid for when offering on-site hook-up assistance.
- As a part of TSN, FixFinder is now FREE.
- With every new training course we develop, a free copy of the information will be provided to each state and local association.
- Thomson continues to hold its annual Service Advisory Council meeting in Indianapolis where we listen to you, and respond.
- We will launch our initial effort surrounding Internet Based Training later this year. Our goal is to offer the best Internet Based Training in the industry.
- We have reached an agreement that will allow the server version of our AutoMan service data runtime engine to our Authorized Service Centers-free of charge: no passwords, no lock-down and greater freedom in accessing the data you need to get the job done.
- We are actively reviewing all internal processes, policies, and procedures to see how we can better streamline our operation and make the job of dealing with Thomson easier.

HITACHI

"We cannot survive without each other"



Here are several points made by Walt Herrin, General Manager, National Service Division, Hitachi America Limited, Home Electronics Division:

- Provide electronic Service Manuals (to both Authorized and non-Authorized Service Facilities via our Service Division Website, free of charge. Subscription fees have been eliminated.
- Seldom used and expensive Convergence Overlays and Alignment Jigs will be available to both Authorized and non-Authorized Service Facilities on loan, free of charge. They will be shipped overnight, with our compliments.
- Access to Service Division website (electronic Service Manuals, Symptom-Cause data, Technical Bulletins, Training Programs, etc.) is available upon request to any established Service Center in the United States and Canada, free of charge.
- Electronic "Critical Customer Complaint Backordered Parts Expedite" service is available to all Authorized and non-Authorized Service Centers via the Service Division website.
- Telephone technical assistance is available free to all Authorized and non-Authorized Service Centers.
- Support to Local, State, and National Electronics Associations.
- Suggested that Service Centers "sell" their service to end-users and manufacturers, justifying pricing structure with superior service and customer support.

Other manufacturers pledged renewed support to independent service to a greater or lesser degree. The conclusion that can be drawn is that independent service is important to manufacturers, that they will support independent service, and that, therefore, independent service will be a viable business for the foreseeable future.

***Hitachi... "Give my customers
the same level of service
you give out-of-warranty
customers...and fix it!"***

NOT YOUR FATHER'S DMM

Based on material provided by Fluke Corporation

There was a time when the tool of choice for a servicing technician was the VOM, the volt/ohm/millimeter. It was a very useful tool, but it only performed those three functions. Moreover, the analog scale required a great deal of interpretation and interpolation. Gradually, the general-purpose meter evolved, adding at various times a digital readout (then a bar graph display to show trends that a digital readout cannot), continuity measurement, semiconductor junctions, capacitance, frequency measurement and more. Some meters of today even have an oscilloscope type of readout. All of this functionality has been a boon to technicians.

Troubleshooting in the field/on site

Working out in the field and taking measurement readings can be a grueling task for electronic and electrical technicians and engineers because of varied working conditions. The DMMs that today's technicians and engineers use not only provide accurate measurements and perform consistently under harsh conditions, but they also allow for quick and easy documentation of those measurements. More important, technicians and specialists working in the field are using a new universe of specific applications available with the new wave of digital multimeters to help assess the service needs for a wide range of systems in many different industries.

One US company that designs, produces, and markets control system integration products and services that provide factory automation solutions to the worldwide control industry uses new versatile DMMs to perform wherever and whenever needed.

One of several project engineers for the company recently had an opportunity to work with a highly functional DMM. He found its many options and functions useful, including the multiple readout display, the improved accuracy percentage and the rugged case. He also liked the meter's abil-

ity to log data and store large amounts of information over a long period of time.

This particular meter can store up to 1000 measurements in a stand-alone operation. Moreover the unit offers a 250 microsecond Min/Max for capturing peak transients. When the engineer was finished taking his measurement they

The bright display also includes a real-time clock for enhanced troubleshooting that powers-up and settles on measurement readings. The display can be used, for example, to correlate the time of day with measurement events. The meter also provides temperature measurement and



time stamping features with a real-time clock. Expanded capacitance ranges to 50mF provide a wide range of measurement reading for technicians and engineers working on power supplies and other equipment.

A factory automation application

One factory automation application opportunity where the data logging feature of the new meter would be particularly appreciated is in an aircraft hanger that serves as the West Coast manufacturer's

painting facility. The curing room must be heated to a constant 82 degrees C in order for the special paint to properly adhere to the aluminum skin of the aircraft. Obviously these are challenging working conditions for employees who need to conduct long-term meter readings. However, by using a data-logging meter, maintenance personnel can now set up and secure the meter inside the electronics cabinet and log the meter reading over a prescribed amount of time. This eliminates the need to post someone at the electronics cabinet for an extended period in order to take the reading.

With a meter that can log and save up to 1,000 measurements users can set up the unit to log the minimum, maximum and average readings while at the same time monitoring a signal that spans seconds to days. The logging feature will also classify a measurement within a specific time period as either "stable" or "unstable."

Determining signal stability

Stable is commonly defined as a period of time during which the measured signal stays within a narrow range, whereas unstable is a period of time during which the signal varies outside of that narrow range. Coupled with the time-stamp feature, the user can determine when a voltage or current drops out and comes back as well as how far out of range the parameter of interest strayed. Obviously this is useful when the technician is trying to find intermittents or when monitoring signals over time.

Readings can also be manually saved and entered into a maintenance log that even can be used to create a very low-cost maintenance management system.

Time of day clock

The logging feature with time-of-day clock has been found useful at another Midwestern company — a manufacturer of power inverters. There at their main manufacturing plant, an engineering

TOOLS OF THE TRADE

technician has used the logging feature to clearly identify a software bug that caused an engineering development model to fail after several hours. The voltage logged by the meter showed a failure at precisely 17 hours, and a retest repeated the failure and the timing exactly. Although this problem had eluded the technicians previously, now armed with this new information, the technician consulted with the onsite programmer and quickly found the error in the program.

Audible signals

While recording data, the meter emits an audible tone to signal that a new minimum or maximum reading has been sensed and stored. Users can select response times between 100 milliseconds and 1 second. The meter also has a 250-microseconds response time setting for capturing fast transients. The 250-microsecond Fast Min\Max mode can be used to isolate the peak of an ac signal.

Forms

This meter can be provided with forms software that enables the user to use ready-made templates to create custom reports. The software also gives the user the ability to further analyze measurements by zeroing in on measurements with much finer detail. It's also possible to log many more than 1000 measurements when a PC is connected directly to the instrument. Under this arrangement, the meter downloads each measurement directly to the PC through the meter's built-in-infrared communications port instead of saving it in the meter's memory. The software is useful for documenting test procedures for new equipment installations, meeting the demands on a regulatory agency or tracking maintenance history.

Another useful feature is a built-in frequency counter. It measures ac signals up to 1 MHz. A "slope trigger selector" allows the user to measure duty cycle and pulse width. With the slope trigger set to positive, the meter will display the percent of cycle for the positive portion of the signal in pulse width mode. Switch to negative slope for the opposite effect.

Reading hold

Another useful feature of some modern DMM is feature that captures the measurement, automatically beeps and locks it on the digital display for later viewing. Auto Hold is a useful safety feature that allows the user to focus his full attention on the location of the probe while making a measurement and is automatically updated with each new measurement. The meter's "Relative mode" remembers a reading and shows the difference between the first reading and subsequent readings.

Safety

As distribution systems and loads become more complex, the possibility of transient overvoltages increases. Motors, capacitors and power convention equipment such as variable speed drives can be prime generators of dangerous spikes. Lighting strikes on outdoor transmission lines also cause extremely hazardous high-energy transients. When a technician is taking measurements on electrical systems, these transients are "invisible" and largely unavoidable hazards. They occur regularly on low-voltage power circuits, and can reach peak values in the many thousands of volts. In these cases, the user's protection depends on the safety margin already built into the meter. The voltage rating alone, unfortunately, will not indicate how well that specific meter was designed to survive these high-voltage transients.

Modern DMMs are designed for IEC-61010, Category III 1000 V environments. Moreover, all inputs are protected from overvoltage transients to 8 kV.

More like a Swiss Army Meter?

With all of the features available, modern DMMs take the place of many different test and measurement devices that technicians have had to take with them into the field in the past. Moreover, since all the functions are contained in a single instrument, there's a minimum of swapping of leads to capture all of the readings that are needed.

Check 'em out

Today's test instruments, whether oscilloscopes, DMMs or other devices are constantly being made to be more rugged, more functional, easier to use, smaller and lighter. An instrument that was designed just a few years ago may just not do the job demanded by today's more sophisticated electronics products. Technicians are well-advised to shop carefully and compare features and prices before buying a meter they may be living with for years to come. ■



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OSCILLOSCOPES FOR VIDEO

Adapted with permission from the LeCroy L.A.B. Brief V "Using Analog Scopes In Video Applications."

“Video” is a broad term that encompasses many applications. These include, but are not limited to, commercial broadcast, medical imaging, military chemical detection and targeting, surveillance, industrial imaging, consumer/commercial service, and training simulators. Many video formats are currently in use. The most common formats are NTSC, PAL, and SECAM. HDTV is an emerging technology.

Each of these general formats has sub-categories of specifications. But all video formats share general characteristics in composite form. And therefore the recommended test procedures, which exploit the benefits of analog oscilloscopes, have much in common. The analog scope is a versatile and cost-effective tool. Over the years, analog scopes have been used as general-purpose test equipment in a variety of applications. The analog scope's ability to display mixed-signal, relative-frequency content is especially useful when viewing complex video waveforms. In addition to a crisp and familiar analog display, features possessed by some analog scopes are useful for viewing complex signals:

- Composite video: TV triggering (line or TV horizontal), channel output for another test instrument (e.g., vector scope or waveform monitor), calibrated variable time increment to optimize the display's vertical and horizontal size, and pedestal clamp to lock the back porch to ground.
- RF head switch-point adjustments: dual-delayed trace “zoom,” bright display, 2+2 channels for trigger source.
- Transmitter intermodulation distortion: X-Y mode real-time update, Z-Axis input.
- Data transfer constellation patterns: DC offset bias, allows the scope to remain DC-coupled and maintain dynamic range.
- Serial data video: Skew compensa-

tion adjustment, front-panel active probe connections, 50 Ohm/1M Ohm inputs, and percent display control.

- Video Camera Setup: Fast retrigger rate, real-time display, composite video triggers, bright display with grey scaling and persistence.

- Post-production Subcarrier to Horizontal Sync Phase Adjustment: Delayed trace, bright display, stable trigger, fast display update rate.

A brief video overview

Video is designed so the human eye and brain can perceive individual frames as seamless motion. Though visual acuity may vary from person to person, the biological peculiarities of the human eye and brain are exploited to create the illusions of motion and color in video. Frame rates, resolution, color levels and gamut, hue, persistence of vision are essential to all visual display technologies. The basic idea is quite simple - single still frames are presented at a high enough rate so that the eye integrates these into motion.

Interlaced lines

In a fashion analogous to movie film, video creates the illusion of motion by successively overwriting a sequence of complete pictures for one entire screen image. Each individual “still picture” screen image (commonly referred to as a FRAME) is composed of interlaced raster scan lines.

Slow frame refresh rates cause “flicker” in moving images. This is because the time between frames is longer than the duration of persistence of vision. Human vision persistence decreases with increasing brightness, and as a result, bright pictures require faster update rates~

Movie film is typically presented at the rate of 24 frames per second. The rate is slow enough to cause flicker. Theater projectors avoid the flicker problem by placing rotating shutters in front of the image

in order to increase the repetition rate by a factor of 2 (to 48 frames per second) or 3 (to 72 frames per second) without increasing the actual number of images.

Television electronically accomplishes the same effect by presenting each frame in two interlaced fields. The first scan includes only the odd lines; the next scan includes only the even lines. This doubles the number of “flashes” per frame, because the field rate is double the frame rate. NTSC systems have a field rate of 59.94 Hz, and PAL/SECAM systems a field rate of 50 Hz. The line values were chosen to ensure that the picture does not flicker under normal lighting conditions. Historically, the synchronizing rates were selected by relating them to power-line frequency (e.g., 50 Hz or 60 Hz), but today they are derived from a stable oscillator.

Each video frame consists of an odd number of lines (e.g., PAL=625 or NTSC=525). The number of pictures per second is directly related to the line rate.

For each frame, the number of displayed raster lines is less than the total number of transmitted raster lines. Some of the raster lines are typically used to ensure vertical blanking interval and others are for test or special purposes. The electron beam writing to the screen makes two trips per frame. The first trip down the beam “draws” all the odd-numbered lines of the frame. The second time down, the even-numbered lines are drawn.

For example, an NTSC frame consists of 525 interlaced raster lines. Only 485 of them are active lines in the frame. The remaining 40 lines represent the vertical blanking interval, containing the pre-equalizing serration pulses.

Interlaced means 2 sets of raster scans (commonly referred to as Fields) are drawn for each frame. The fields are alternately drawn on the screen - Field 1 first, then Field 2. The first half (Field 1) of the frame is composed of raster scan lines 1 through 264 sequentially drawn on the

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screen. The second half (Field 2) of the frame is fit between the first set of lines (interlaced) and is composed of lines 265 through 525. In Field 1, lines 21 through 263.5 (242.5 lines) are active video. In field 2, lines 282.5 through 525 (242.5 lines) are active. The total number of active lines in a frame raster scan is $242.5 + 242.5 = 485$.

Some background

To clearly understand video, consider how the NTSC times and frequencies were derived. The Line Frequency (f_{line}) and Field Frequencies (f_{field}) for NTSC were defined in the original monochrome systems with respect to power line frequency. Historically, 525 lines were displayed at a 30 Hz rate (or one half the ac line frequency), and therefore the horizontal line frequency was 15.7 kHz.

Each TV frequency band is mandated as 6MHz wide to conserve the spectrum. The monochrome picture carrier is 1.25MHz. The audio carrier is separated from the monochrome carrier by 4.5MHz and is 5.75MHz. The introduction of color required a monochrome-compatible system while both preventing interference between audio and video carriers and maintaining a 6MHz bandwidth. To accomplish this and maintain 4.5MHz audio separation and 525 lines, the frequency was changed to an odd multiple of the half-line rate to ensure: a) a color burst phase reversal between alternate lines, and b) that the beat frequency between color subcarrier and average audio level is approximately 920 kHz.

To accomplish this, the following definitions were adopted:

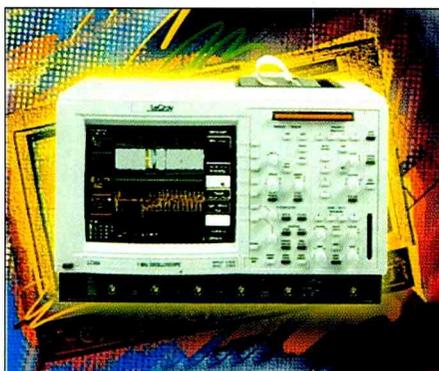
- 1) Line frequency is defined as:
 $f_{line} = 4.5\text{MHz}/286$
 $= 15.73426\text{kHz}$
- 2) Field frequency is defined as:
 $f_{field} = f_{line} + (525/2)$
 $= 59.94\text{Hz}$
- 3) Color burst frequency (f_{sc}) is defined as:
 $f_{sc} = (455/2) \times (4.5\text{MHz}/286)$
 $= 3.579545\text{MHz}$

Color overview

The field lines are always displayed from left to right. After each line is writ-

ten, while the beam returns back to the left, the signal is blanked (retrace blanking). When the beam reaches the bottom of the screen, it is blanked until it returns to the top to write the next line (vertical blanking).

The electron beam is analog-modulated while drawing the horizontal line. In



black and white, the modulation signal, called luminance, translates into intensity changes in the electron beam and, therefore, gray-scale levels on the picture screen.

Color television was developed to be compatible with existing black and white television receivers. Color TV added the color information on the monochrome signal. For color signals, a color synchronization signal, called the color burst, is inserted into the horizontal blanking signal back porch. Additionally, chroma modulation carries color level information.

Analog advantage

The analog oscilloscope has inherent advantages in viewing the complex signals discussed above. These include fast update rates and rearm times that allow viewing waveform changes in real time. Effects of adjustments on the device under test are immediately visible on the bright analog display. The ease of use and "alias-free" display afforded by analog scopes make them the ideal choice when making critical measurements, especially when setup time is limited.

Video triggers, pedestal clamping, delayed traces

Three major TV standards are present in use:

- National Television Systems

Committee (NTSC)

- Phase Alternation Line (PAL), and
- Sequential Couleur avec Memoire (SECAM).
- The differences between PAL, SECAM, and NTSC video systems are defined in their respective standards. Each system has a set of recommended test practices, which exploit the advantages of an analog scope equipped with TV trigger.

PAL SECAM and NTSC

All three systems use the same definition for luminance, but not for primary R, G, and B colors. The major differences between the systems are the number and frequency of horizontal lines.

NTSC is mainly used in the United States and Japan. NTSC 525/60 refers to 525 lines at a 60 Hz rate (30 frames per second).

PAL is used in parts of Europe. PAL 625/50 refers to 625 lines at a 50 Hz rate (25 frames per second).

SECAM is used in France and many parts of the former Soviet Union. SECAM 625/50 refers to 625 lines at a 50 Hz rate (25 frames per second). PAL and SECAM differ in chroma modulation.

Measurements

Composite video is typically monitored while triggering in line rate or horizontal sync rate. The line rate allows selection of Field 1 (ODD), Field 2 (EVEN), or Fields 1 and 2 sequentially (BOTH).

NTSC example measurements

In making video measurements, the TV line trigger (TV-BOTH, ODD, EVEN) can be selected to view the signal with respect to line rate. Setting the timebase to 3.24 ms/div, the scope will display one full frame (two fields) of video. The delay function allows examination of one line while displaying the entire frame. This useful feature lets a user view one "pixel" while monitoring the full video frame.

The horizontal sync trigger (TV-H) is used to display two adjacent horizontal (2H Display) lines.

Some scopes have a rear panel output that lets the user measure video while out-

putting the same signal to a specialized device such as a vector scope, video monitor, or lower-impedance device that loads the device under test.

The variable timebase is calibrated so that valid time/div and frequency measurements can be made while in variable mode. Amplitude can be adjusted in the same way. The amount of display compression is displayed on the screen when variable amplitude is invoked or changed. Some high performance analog scopes even have the added feature of an IRE unit scale when in CCIR or ETA scales.

Using the TV trigger

These descriptions describe a typical sequence for triggering on video signals.

1. Input composite video signal of any format to CH 1 or CH 2.
2. Select TV Trigger.
3. Select the appropriate TV Trigger type triggering at the TV horizontal (TV-H) rate.

Selecting TV trigger

Using the appropriate controls on the scope allows the technician to select from among the following

- a) TV-H (Horizontal Sync): The sweep is triggered by the horizontal synchronization pulse.
- b) ODD (Odd Field Lines): The sweep is triggered by the selected horizontal synchronization signal in the odd-numbered field.
- c) EVEN (Even Field Lines): The sweep is triggered by the selected horizontal synchronization signal in the even-numbered field.
- d) BOTH (Odd or Even Lines): The sweep is triggered by the selected line number of a horizontal synchronization signal in the odd-numbered and even-numbered fields.
- e) OFF (Non-TV Trigger)

Using dual timebases in video

Some analog scopes let you use delayed traces to show two timebases on a signal. This lets the user examine a large section of the waveform in one timebase, while zooming on details in a faster timebase. Delay timebase provides more resolution on long duration signals. An oscilloscope with dual delay lets the user examine two sections of a larger waveform. These features are useful when measuring VTR head switch points on an RF envelope, or Subcarrier to Horizontal Sync Phase for Gen-Lock.

Use the oscilloscope

Many technicians shy away from using the oscilloscope. Sometimes it just seems to be complicated. But there are many malfunctions, such as problems in the video circuits, that can be diagnosed most readily by viewing waveforms on the oscilloscope. The more a technician practices with the 'scope, the more familiar with it he'll be, and the more ready to fire it up and apply it to the problem. ■

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TEST ACCESSORIES SPEED TROUBLESHOOTING

When a television set, or some other piece of consumer electronics equipment has malfunctioned and been brought in to the service center for service, the information and materials needed to restore it to operation vary, depending on the nature of the unit and the skills and experience of the technician. Some problems are relatively simple and yield readily to the attentions of the service technician, and others are very difficult and require that the technician resort to every tool available.

For example, some problems require little more than a visual inspection. The technician removes the covers from the inert, or improperly operating, product, inspects carefully and finds that one or more component(s) are discolored or burned. Those obviously must be replaced. Then the technician makes some measurements with the multimeter to be sure that resistances are within spec, and if they are, he applies power to the product. If it works, problem is solved.

In other cases, careful inspection of the product, extensive testing with the multimeter, and other troubleshooting procedures yield no results. In these cases, the technician must evaluate the symptoms, and possibly bring to bear some other items in his inventory.

Test accessories

When inspection, resistance measurements, and other basic steps don't reveal the cause of the malfunction, the service technician may have no option but to apply some test accessories to the project. For example, if the technician deems it necessary to use a line-powered oscilloscope to observe waveforms in a modern TV set that will be checked while also connected to the power line, he will need to connect the set through an isolation transformer. If the technician connects both the set and the oscilloscope to the power line, as soon as he attaches the oscilloscope ground lead to the TV, he

will almost certainly damage components in the power supply of the set, and could damage the oscilloscope as well.

But that's only one of the procedures for which the technician will require a test accessory. If he wants to limit the current to the set in case it has a short circuit in it, or start the set up at reduced voltage to avoid damage to the circuits in case of a voltage-sensitive problem, or perform any of a number of operations, he will have to rely on some kind of accessories. These accessories may be as simple as an ordinary 100W light bulb, or as complicated as a personal computer.

A list of test accessories

As manufacturers continue to alter the designs of existing products, introduce new consumer electronics products, and incorporate new technology into their products, the list of test accessories continues to grow. For example, back in the days before TV sets were powered via a full-wave bridge rectifier, it wasn't necessary to have an isolation transformer available to connect the TV to the power line in order for it to be probed using an oscilloscope. Today it is. Before the days of infrared remote control, it wasn't necessary to have a method to test remote control transistors. Today it is. Or at least it's a good idea.

Following is a partial list of helpful test accessories. If there are any of these here that you don't have available, you might give some thought to obtaining them. Of course, not all of these test accessories apply to all service centers.

- Test leads
- Test Probes
- IC test clips

- Variac
- Isolation transformer
- DC power supply
- Waveform generator
- Decade boxes
- Dummy loads
- Sweep/marker generator
- NTSC color bar generator
- Test jigs and fixtures
- 100W light bulb

The above are some of the old standbys. The following list includes some that have become requirements, or at least are useful in some situations, more recently:

- Personal computer
- Remote control tester

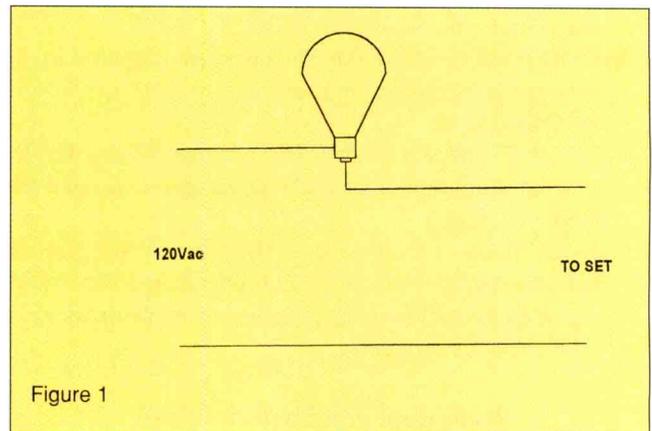


Figure 1

- Universal remote control (for testing IR remote control receivers)
- Camcorder
- VCR

Following are some applications for some of these test accessories

The 100W bulb

Interestingly, some of the simplest of these devices can be the most helpful. Take the 100W light bulb. It hardly seems to qualify as a test accessory, yet it's amazingly useful when the problem is a dead set, or one that comes on when power is applied then immediately shuts down. The cause of the problem might be a number of things, including a problem in the shutdown circuitry,

TOOLS OF THE TRADE

or a problem that's triggering the shut-down circuitry, but it could be a short circuit or overload somewhere.

In such a case, if you connect a light bulb in the hot leg of the power line connection (Figure 1), if the problem is some kind of overload, the resistance of the light bulb may limit the current sufficiently to allow the technician to make some voltage or waveform checks to at least isolate the problem to a segment of the circuitry. Moreover, the light bulb provides a rough guide to the severity of the overload. If the light glows brightly, the overload is heavy. If it glows more dimly, the overload may be only slight.

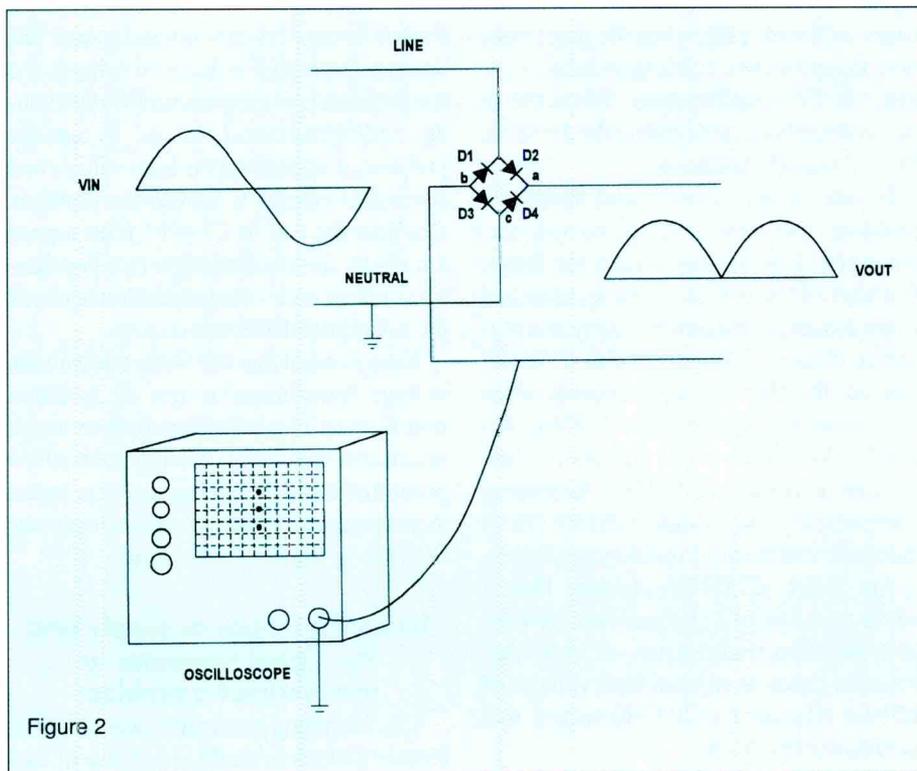
The isolation transformer

We covered the use of the isolation transformer in depth in the June article on test equipment, but it bears repeating here. If you attempt to connect a modern-day TV with a power supply that's based on a full-wave bridge rectifier, you're going to cause problems. The reason for this is that by connecting the grounds of both instruments together through the power line ground connection, you place the full power-line voltage across one of the diodes in the bridge (Figure 2). This has a tendency to produce if not infinite current through the diode when it is forward biased, then at least the full current that the power line can produce. The diode is quickly destroyed.

Because of this problem, every service center should have an isolation transformer at every position where products with full-wave bridge rectifiers will be tested. Isolation transformers are relatively inexpensive and using one on every product to be tested can save a great of money in bridge rectifiers and time to repair the self-inflicted problem.

The variable transformer

The variable transformer is another device that can help the service center troubleshoot products that would otherwise be nearly impossible to troubleshoot, and to avoid destroying replacement components that have just been installed. For example, if a TV set shuts down immediately when it is turned on, sometimes it is possible to get it to operate with reduced line voltage. Once the



set is operating, the technician can observe waveforms and make other tests with the set on in order to troubleshoot it.

In other cases, the set may not operate at line voltage because it is not correctly adjusted, but it will operate at above normal line voltage. In this case, the technician can take advantage of operation of the set at above line voltage in order to observe the operation and to adjust it so it works at normal line voltage.

Another use of a variable transformer is to operate the set at reduced voltage after a repair has been completed. Here's something that a number of technicians have reported that has happened to them. The technician troubleshoots a dead set using visual observation and resistance measurements only, and finds one or more components that are damaged or destroyed, then replaces them. Satisfied that the repair has been made adequately, the technician applies power to the set only to find that the set shuts down immediately to the accompaniment of a cloud of smoke, and the replacement component is damaged or destroyed.

Now the technician again replaces the faulty components, and attempts to determine, through resistance checks again, if there are any other bad components.

There are no other obvious faults, but this time, the technician, having already spent quite a bit of time and money on the repair doesn't want a repeat of the catastrophic failure he witnessed last time, so decides to connect the set to the power line via a variable transformer. He starts at much reduced voltage and gradually brings the voltage up and sees that the set comes on.

Now the technician can feel the replaced components, and connected components, to see if they are running hot, perform voltage tests and observe waveforms. All of these power-on tests will allow him to locate any other faulty components, or circuit wiring, without destroying the replacement components he already installed.

An actual experience

The following describes an experience that Homer Davidson, a frequent contributor to ES&T, had when troubleshooting a set that had improperly adjusted B+ voltage, and the actions he took in correcting the problem.

Improper adjustment of the B+ control in the older sets can cause intermittent shutdown symptoms. Most of these symptoms occurred with power lines that were poorly regulated. In some of these

cases, in the evening when the power line was loaded down, causing reduced voltage, the TV would operate. When the ac line voltage became higher in the daytime, the TV would shutdown.

If you observe intermittent shutdown problems that seem to be caused by incorrect power line voltages, check for defective start and run diodes, both rectifier and zener diodes, in the power supply and regulator circuits. In one RCA CTC125 chassis, the chassis would operate when the power line voltage was 118Vac, but would shut down when the power line voltage increased to 125Vac. Replacing intermittent zener diode CR110 (75V) cured the intermittent shutdown problem.

An RCA CTC159 chassis that I encountered would operate with the variable isolation transformer set at 95Vac, but shut down at normal line voltage of 120Vac. Replacing CR4160 solved this intermittent problem.

In one unusual case, intermittent shutdown symptom in an RCA TX82 13-inch set was followed by a motorboating sound in the audio. Replacing leaky DP01 solved this problem

Another use of the variable transformer

If this TV will not operate, the first step for the service technician to take is to determine if the cause is excessive high voltage, or if this is simply chassis shutdown. In this set, the high voltage is monitored by diode CR4901, which rectifies the pulses from the flyback (T4401). If the high voltage should increase, the rectified voltage at the cathode of CR4901 will also increase. This voltage increase triggers zener diode CR4409 and the chassis shuts down.

To troubleshoot this symptom, start by disconnecting power to the set and disconnecting one end of CR4901 from the circuit. Now connect the set through a variable voltage transformer (often called by a brand name of one brand of variable voltage transformer, "Variac"). Start with voltage output of the transformer near 0V, and slowly increase the voltage to the set. Make a note of the ac voltage at which the chassis shuts down.

If the chassis shuts down before the trans-

former voltage reaches normal power line voltage, this is high-voltage shut-down, and the problem is somewhere in the high voltage and/or horizontal circuits. To cure the problem, troubleshoot the high voltage and horizontal circuits to isolate the problem. Resolder the end of CR4901 after repairs are made. If you determine that the chassis is not in high voltage shutdown, check the horizontal deflection circuits.

Keep in mind that the Variac, or variable voltage transformer is not an isolation transformer, it is an autotransformer, which means that the output winding is actually a portion of the input winding, and this device therefore provides no isolation whatsoever between its input and its output.

Using the dc power supply and the signal generator to troubleshoot a problem

The following is another case in which Homer Davidson made clever use of two test accessories to troubleshoot a difficult problem. In this case the subject was an RCA set. Here's how Homer described the procedure.

In the RCA CTC166 and 167 chassis, the 9Vdc supply for the deflection processor IC (U1001) is scan-derived from the flyback circuits and fed to pin 16. With this type of arrangement, the low voltage power source, the horizontal circuits, and the flyback power source must all function to operate the entire TV chassis. If any of the above circuits are defective, the chassis might not fire up and remain shut down.

To determine if the horizontal circuits are operating, disconnect the set from the ac line and inject a +9Vdc source at pin 16 of U1001. With the 9V source feeding pin 16, scope pin 64 of U1001 to see if there is a square waveform at that point. If you find a square waveform at pin 64, you know that the deflection circuits are okay. Next, check for a vertical waveform at pin 55. If there is no waveform at the vertical or horizontal output pins, the horizontal IC (U1001) and related circuits must be repaired before servicing the low voltage power supply circuits.

Inject a horizontal drive signal at the base of the horizontal output transistor

(Q4401) to determine if the horizontal output circuits are normal. If horizontal deflection is now present, check the waveforms and components associated with pins 57 through 64 of U1001. If by chance there is no horizontal deflection, check Q4401, and the voltage and waveforms connected to the horizontal output transformer (T4401). Determine if the raw 165V and 129V sources are functioning.

A few other test accessories

We listed them above, the personal computer, remote control tester, universal remote control (for testing IR remote control receivers), camcorder, VCR. All of these can be useful as test accessories. A few are obvious: the remote control tester will tell you if the hand-held sending unit is operating. It can be as simple as a card that glows when illuminated by infrared light, or as involved as a circuit that uses a photodiode to sense the presence of IR. The VCR can be used to generate program material to help to determine if a TV is operating properly.

And here's a clever idea that was found on the internet at <http://www.repairfaq.org/>. If you have an intermittent problem, and would like to make a record of, say a TV, when an intermittent failure occurs, you can set up the set, with the oscilloscope attached to the point of interest, set both TV and oscilloscope so that the camcorder can record both units on tape, then start recording.

When the failure occurs, the videotape will record what happened on the TV screen, and what happened to the waveform on the oscilloscope screen. With both of those bits of evidence you'll be well on your way to solving the problem.

Test accessories can save time, money

There are a lot of test accessories available, and certainly not everyone is worth having by every service center. But in some cases, the correct accessory can save minutes, or sometimes hours, of head scratching and valuable service time. We hope this article has provided readers with some ideas on how test accessories can be useful to them. ■

CEDIA EXPO PREVIEW

"who is better qualified to select and connect a home theater system than a consumer electronics service center?"

Home theater is a mushrooming segment of the consumer electronics market. Consumers, especially those who go to movies regularly, and are aware of the spectacular sensations that a large-screen moving picture combined with hi-fi surround sound can generate, are increasingly aware of the sophistication of consumer electronics products in their homes.

Home theater represents a significant opportunity for consumer electronics service centers. Many service centers have shied away from home theater because they see home theater installations that require the skills of carpenters, masons, sheet rock specialists, and the like, to install.

Many consumers are just looking for an expert who can help...

But the definition of "home theater" is broad. It means anything from a large-screen TV in a cabinet or on the floor connected to a sophisticated audio surround sound system, all the way up to a full-blown theater arrangement. While service centers may not want to become involved in a huge construction project, many consumers are just looking for an expert who can help them select the components that best suit their living room or family and can hook up the cable and the satellite dish to the TV and connect the whole thing to a 5.1 channel surround sound system and do it correctly so it looks and sounds great.

And who is better qualified to select and connect a home theater system than a consumer electronics service center. Service managers and technicians are intimately familiar with the operation of television systems, and audio is easy by comparison. And they can certainly quickly learn what one of these gee-whiz home theater systems is all about.

CEDIA

There's an entire organization of people devoted to the design and installation



CEDIA EXHIBITION HOURS

Friday, Sept. 8: 11:00AM - 6:00PM

Saturday, Sept. 9: 9:00 AM - 5:00PM

Sunday, Sept. 10: 10:00 AM - 3:00PM

of home theater and related systems. They call themselves the Custom Electronics Design and Installation Association (CEDIA). CEDIA's annual Expo for the year 2000 is in Indianapolis (Wednesday, September 6 through Sunday, September 10). ES&T is attending, and will be preparing a report for our October issue.

In the meantime, just to give readers an idea of the concerns of CEDIA, and the education opportunities for attendees, we present this schedule of events for the 2000 CEDIA Expo.

Boot camp

As if that weren't enough in the way of educational courses, CEDIA also puts on a "Boot Camp" for newly hired custom installation employees. Here's a synopsis of what it's all about.

The number one issue facing the industry is bringing in new installation personnel to cope with the spectacular growth of the industry. Three years ago, CEDIA introduced the first industry Boot Camp.

CEDIA Boot Camp brings a progressive blend of short lectures followed by hands-on workshops, followed by review, followed by test. Key concepts, definitions, techniques and procedures are drilled repeatedly. The Boot Camp facul-

ty will feature some of CEDIA's most popular instructors and some of the industry's most experienced installers. Each of the modules is complemented by hands-on workshops.

Every attendee will receive a reference manual that gives further exercises and explanation of key installation procedures and techniques.

Boot camp course hours are: Thursday 7:45 am until 6:00 pm; Friday 8:00 am until 12:30 pm, followed by Friday Graduation and Instructor Guided Tour of Show Floor 1:30 pm to 2:30 pm

Courses presented during boot camp include:

- Introduction to installation fundamentals
- Wire, cable and connector overview
- Basic installation techniques: framing structure
- Drilling plans and drilling technique
- Basic installation techniques: Pulling wire, squaring boxes and brackets
- Basic installation techniques: J-box trim, device and speaker installation
- Basic system installation and operation

Special events

In addition to the courses mentioned above, the CEDIA Expo offers several special events and features, including:

- The Garden of High Definition Delight II
- Opening Reception on the Show Floor
- The Jam Session
- Live Broadcasts from the "At Home with CEDIA" television program
- The Home of Electronic Lifestyles(tm)
- The EXPO Awards Banquet
- The Electronic Lifestyles(tm) Awards
- CEDIA's Sixth Annual Golf Tournament
- The Opening Keynote Breakfast
- The Annual Meeting and Keynote Luncheon
- 24-hour broadcast of EXPO programs into your hotel room

Educational courses at CEDIA Expo

According to the CEDIA material, the CEDIA EXPO offers attendees a high return on their investment.

CEDIA EXPO 2000 PROGRAM



CEDIA 2000
Sept. 6-10

ESSENTIAL TECHNOLOGIES

- **Illuminating the custom home - Level: 300**
Sessions: Wednesday, 9:30 am - 11:00 am; Saturday, 2:00 pm - 3:30 pm
- **RF troubleshooting - Level: 300**
Sessions: Thursday, 1:00 pm - 2:30 pm; Sunday, 2:30 pm - 4:00 pm
- **Audio/video system grounding and interfacing - Level: 200**
Sessions: Wednesday, 1:30 pm - 3:00 pm; Saturday, 2:00 pm - 3:30 pm
- **NEC/OSHA - Level: 200**
Sessions: Thursday, 11:00 am - 12:30 pm; Saturday, 4:00 pm - 5:30 pm
- **Fundamentals of electrical circuits - Level: 200**
Sessions: Wednesday, 3:30 pm - 5:00 pm; Sunday, 10:30 am - 12:00 pm
- **Media center and head end engineering - Level: 200**
Sessions: Thursday, 3:00 pm - 4:30 pm; Sunday, 12:30 pm - 2:00 pm
- **Residential infrastructure wiring - Level: 200**
Sessions: Thursday, 3:00 pm - 6:00 pm; Friday, 10:00 am - 1:00 pm
- **Power management - Eliminating electrical artifacts and noise from audio/video installations - Level: 300**
Sessions: Thursday, 9:00 am - 10:30 am; Sunday, 2:30 pm - 4:00 pm
- **Antenna installation and theory - Level: 200**
Sessions: Wednesday, 1:30 pm - 3:00 pm; Friday, 3:00 pm - 4:30 pm
- **Blueprints and basic drafting techniques - Level: 200**
Sessions: Wednesday, 9:30 am - 11:00 am; Friday, 5:00 pm - 6:30 pm
- **Category 5 installation processes - Level: 100**
Sessions: Wednesday, 11:30 am - 1:00 pm; Saturday, 8:00 am - 9:30 am
- **Installation Tips and Techniques - Level: 200**
Sessions: Friday 10:00 am - 1:00 pm; Sunday, 8:30 am - 11:30 am

WHOLE HOUSE TECHNOLOGIES

- **Multi-room audio - Level: 100**
Sessions: Thursday, 3:00 pm - 4:30 pm; Sunday, 8:30 am - 10:00 am
- **Multi-source/multi-zone audio/video - Level: 200**
Sessions: Thursday, 9:00 am - 10:30 am; Sunday, 12:30 pm - 2:00 pm
- **IR control of A/V components 200 - Level: 200**
Sessions: Thursday, 11:00 am - 12:30 pm; Sunday, 10:30 am - 12:00 pm
- **Whole house technologies overview - Level: 100**
Sessions: Thursday, 1:00 pm - 2:30 pm; Sunday, 8:30 am - 10:00 am
- **Advanced whole house systems - Level: 300**
Sessions: Thursday, 7:00 pm - 8:30 pm; Sunday, 2:30 pm - 4:00 pm
- **Touch screen interface design and testing - Level: 300**
Session: Thursday, 5:00 pm - 8:00 pm
- **"Mind-melding" with your customers - Matching the technologies to deliver their desired experience - Level: 200**
Session: Friday, 3:00 pm - 4:30 pm
- **Fundamentals of HVAC systems - Level: 100**
Sessions: Wednesday, 1:30 pm - 3:00 pm; Friday, 3:00 pm - 4:30 pm
- **Interfacing with HVAC systems - Level: 300**
Sessions: Wednesday, 3:30 pm - 5:00 pm
- **Automating wired lighting systems - Level: 200**
Sessions: Wednesday, 9:30 am - 11:00 am; Saturday, 8:00 am - 9:30 am
- **Powerline carrier control - Level: 300**
Sessions: Wednesday, 11:30 am - 1:00 pm; Saturday, 4:00 pm - 5:30 pm
- **Fundamentals of security systems - Level: 100**
Sessions: Thursday 5:00 pm - 6:30 pm; Saturday, 2:00 pm - 3:30 pm
- **Fundamentals of access control - Level: 100**
Sessions: Friday, 5:00 pm - 6:30 pm
- **Telephone installation - Level: 200**
Sessions: Wednesday, 3:30 pm - 6:30 pm; Thursday, 3:00 pm - 6:00 pm

HOME THEATER

- **Multi-channel systems in real world rooms- Level 100**
Sessions: Wednesday, 9:30 am - 11:00 am; Saturday 2:00 pm - 3:30 pm
- **Technical considerations of high end screening & music rooms- Level 300**
Session: Wednesday, 11:30 am - 1:00 pm
- **Projection screen technologies- Level 300**
Sessions: Saturday, 8:00 am - 11:00 am
- **Video display technologies- Level 200**
Sessions: Thursday, 5:00 pm - 6:30 pm, Sunday, 8:30 am - 10:00 am
- **CRT projection calibration- Theory and practice- level 300**
Sessions: Thursday, 1:00 pm - 4:00 pm, Friday, 5:00 pm - 8:00 pm
- **Video display essentials - "Digital widescreen televisions rewrite the rulebooks!" - Level 100**
Sessions: Saturday 4:00 pm - 5:30 pm; Sunday, 2:30 pm - 4:00 pm
- **Room equalization and system measurement - Level: 200**
Classroom Sessions: Thursday, 9:00 am - 10:30 am; Friday, 10:00 am - 1:00 pm
Lab sessions: Friday, 7:00 pm - 8:30 pm; Saturday, 8:00 am - 9:30 am
- **Multi channel audio formats - Level: 200**
Sessions: Thursday, 9:00 am - 10:30 am; Sunday, 10:30 am - 12:00 pm
- **Applications of digital equalization - Level: 400**
Session: Wednesday, 3:30 pm - 5:00 pm

- **Basic home theatre acoustics - Level: 100**
Session: Thursday, 11:30 am - 12:30 pm
- **The home theatre space/Ergonomics & layout - Level: 300**
Sessions: Friday, 5:00 pm - 6:30 pm; Sunday, 12:30 pm - 2:00 pm
- **The home theatre space/Creating the envelope - Level: 300**
Sessions: Friday 3:00 pm - 4:30 pm; Sunday, 10:30 am - 12:00 pm
- **Minimizing acoustic distortion in home theatres - Level: 300**
Sessions: Friday, 3:00 pm - 4:30 pm; Sunday, 2:30 pm - 4:00 pm

HOME NETWORKING

- **Home networking in a wireless world - Level: 200**
Sessions: Thursday, 1:00 pm - 2:30 pm; Saturday, 4:00 pm - 5:30 pm
- **Home networking will change the custom business - Level: 100**
Sessions: Thursday, 11:00 am - 12:30 pm; Friday, 10:00 am - 11:30 am
- **Installing residential high speed data networks - Level: 200**
Sessions: Thursday, 11:00 am - 12:30 pm; Saturday, 8:00 am - 9:30 am
- **Home networking technologies and standards - Level: 100**
Sessions: Thursday, 7:00 pm - 8:30 pm; Saturday, 8:00 am - 9:30 am
- **Home networking in multi-dwelling units - Level: 200**
Sessions: Wednesday, 11:30 am - 1:00 pm; Friday, 7:00 pm - 8:30 pm
- **Networking microsoft windows for SOHO - Small Office/Home Office - Level: 200**
Sessions: Thursday, 3:00 pm - 4:30 pm; Sunday, 8:30 am - 10:00 am
- **System integration "The real world" - Level: 300**
Sessions: Thursday, 9:00 am - 10:30 am, Sunday, 10:30 am - 12:00 pm
- **Serial communications - Level: 300**
Sessions: Wednesday, 1:30 pm - 3:00 pm; Sunday, 12:30 pm - 2:00 pm
- **A/V networking with 1394/HAVI - Level: 200**
Sessions: Wednesday, 3:30 pm - 5:00 pm; Sunday, 12:30 pm - 2:00 pm
- **Universal plug and play (UPnP) system design & device integration - Level: 200**
Sessions: Friday, 5:00 pm - 6:30 pm; Sunday, 2:30 pm - 4:00 pm

PREREQUISITE KNOWLEDGE:

- **Networking multiple sources - Level: 300**
Sessions: Friday, 3:00 pm - 4:30 pm; Saturday, 2:00 pm - 3:30 pm

NEW AND EMERGING TECHNOLOGIES

- **1394 UPDATE - Level: 100**
Sessions: Wednesday, 9:30 am - 11:00 am; Friday, 7:00 pm - 8:30 pm
- **New technologies updaTE - Level: 100**
Sessions: Thursday, 9:00 am - 10:30 am; Friday, 5:00 pm - 6:30 pm
- **Future technologies-The inside scoop from silicon valley - Level: 200**

CEDIA EXPO 2000 PROGRAM

Sessions: Wednesday, 11:30 am - 1:00 pm; Friday, 3:00 pm - 4:30 pm

- **Digital audio formats - Level: 200**
Sessions: Thursday, 11:00 am - 12:30 pm; Saturday, 2:00 pm - 3:30 pm
- **The future of home networking in the custom installation business - Level: 200**
Sessions: Wednesday 1:30 pm - 3:00 pm; Saturday, 4:00 pm - 5:30 pm
- **Connecting home control systems to the internet**
Sessions: Wednesday, 3:30 pm - 5:00 pm; Sunday, 8:30 am - 10:00 am
- **PVR's & TiVo - Level: 100**
Sessions: Thursday, 3:00 pm - 4:30 pm; Sunday, 10:30 am - 12:00 pm
- **MP3: How will downloadable digital audio affect the custom industry? - Level: 100**
Sessions: Friday, 10:00 am - 11:30 am; Sunday, 12:30 pm - 2:00 pm

BUSINESS MANAGEMENT

- **Basic company operations documentation - Level: 100**
Sessions: Thursday, 7:00 pm - 8:30 pm; Friday, 5:00 pm - 6:30 pm
- **Advanced company operations documentation - Level: 200**
Sessions: Friday, 7:00 pm - 8:30 pm; Sunday, 2:30 pm - 4:00 pm
- **The secrets to developing & selling service agreements; Creating the perfect cash flow machine! - Level: 300**
Sessions: Wednesday, 11:30 am - 1:00 pm; Friday, 10:00 am - 11:30 pm
- **The business of doing business-How to make money in the custom installation business - Level: 200**
Sessions: Wednesday, 11:30 am - 1:00 pm; Friday, 3:00 pm - 4:30 pm
- **Strategic management - Level: 200**
Sessions: Thursday 9:00 am - 10:30 am; Saturday, 4:00 pm - 5:30 pm
- **Custom installation operations management - Level: 200**
Sessions: Wednesday, 3:30 pm - 5:00 pm; Saturday, 8:00 am - 9:30 am
- **Financial management demystified - Level: 300**
Sessions: Thursday, 11:00 am - 12:30 pm; Sunday, 8:30 am - 10:00 am
- **Managing and motivating your custom installation employees - Level: 100**
Sessions: Thursday, 5:00 pm - 6:00 pm; Saturday, 2:00 pm - 3:30 pm
- **"The life of Fred"- How to make money selling labor! Level: 200**
Sessions: Wednesday, 9:30 am - 11:00 am; Thursday, 5:00 pm - 6:30 pm
- **How I learned to stop worrying and love the bomb - Level: 100**
Sessions: Wednesday, 11:30 am - 1:00 pm; Saturday, 4:00 pm - 5:30 pm business.
- **How to run a successful small custom installation business - Level: 100**
Sessions: Wednesday, 1:30 pm - 3:00 pm; Friday, 3:00 pm - 4:30 pm

- **The essentials of project management & profitability - Level: 200**
Sessions: Thursday, 1:00 pm - 2:30 pm; Sunday 10:30 am - 12:00 pm

BUSINESS EXCELLENCE

- **PRESENTATION 101 - Level: 100**
Sessions: Wednesday, 9:30 am - 11:00 am; Friday, 5:00 pm - 6:30 pm
- **Creating satisfied customers - Level: 100**
Sessions: Thursday, 3:00 pm - 4:30 pm; Saturday, 4:00 pm - 5:30 pm
- **I'm spread so thin you can see right through me**
Sessions: Thursday, 9:00 am - 10:30 am; Friday, 3:00 pm - 4:30 pm
- **The installer / customer interface**
Sessions: Wednesday, 9:30 am - 11:00 am; Sunday, 8:30 am - 10:00 am
- **The art of coaching employees - Level: 300**
Sessions: Wednesday, 11:30 am - 1:00 pm; Saturday, 8:00 am - 9:30 am
- **Thinking through effective business - Level: 100**
Sessions: Thursday, 11:00 am - 12:30 pm; Friday, 10:00 am - 11:30 am
- **Organizing your company to handle the emerging business of advanced integration - Level: 400**
Sessions: Wednesday, 3:30 pm - 5:00 pm; Saturday, 2:00 pm - 3:30 pm
- **Public speaking for the petrified - Level: 300**
Sessions: Thursday, 9:00 am - 10:30 am; Sunday, 12:30 pm - 2:00 pm
- **Brain technology - Level: 100**
Sessions: Thursday, 5:00 pm - 6:30 pm; Sunday, 2:30 pm - 4:00 pm
- **Effective leadership styles - Level: 100**
Session: Sunday 12:30 pm - 3:30 pm
- **Managing change - Level : 100**
Sessions: Wednesday, 1:30 pm - 3:00 pm;
- **There's no substance without structure (Why & how to organize your business for growth) - Level:100**
Sessions: Wednesday, 1:30 pm - 3:00 pm - Sunday, 10:30 am - 12:00 pm
- **Entrepreneurial excellence in your business, and your life (Custom designing your business to meet your life goals) - Level: 100**
Sessions: Thursday, 1:00 pm - 2:30 pm

MARKETING STRATEGIES

- **Making the move into public relations & marketing - Level: 100**
Sessions: Wednesday, 1:30 pm - 3:00 pm; Thursday, 3:00 pm - 4:30 pm
- **Advanced public relations & marketing - Level: 400**
Sessions: Wednesday, 3:30 pm - 5:00 pm; Friday, 7:00 pm - 8:30 pm
- **Dinosaurs fuel cars, sales & marketing fuel the web - Level: 300**
Sessions: Thursday, 1:00 pm - 2:30 pm; Friday, 10:00 am - 11:30 am
- **Basics of designing a profitable web site - Level: 100**
Sessions: Saturday, 8:00 am - 9:30 am; Sunday, 8:30 am - 10:00 am

- **Taking your web site to the next level - Level: 300**
Sessions: Saturday, 2:00 pm - 3:30 pm; Sunday, 2:30 pm - 4:00 pm
- **Merchandising differentiated systems for results - Level: 200**
Sessions: Wednesday, 9:30 am - 11:00 am; Sunday, 12:30 pm - 2:00 pm
- **Get famous in four steps - Level: 300**
Sessions: Thursday, 1:00 pm - 2:30 pm; Friday, 5:00 - 6:30 pm
- **Advanced getting famous in four steps - Level: 400**
Sessions: Thursday, 3:00 pm - 4:30 pm; Saturday, 4:00 - 5:30 pm
- **Marketing your business...How to tell the world what you do - Level: 300**
Sessions: Thursday, 7:00 pm - 8:30 pm; Sunday, 8:30 am - 10:00 am
- **DTV - Be the expert in your area - Level: 200**
Sessions: Thursday, 1:00 pm - 2:30 pm; Sunday, 10:30 am - 12:00 pm

SALES RELATIONSHIPS

- **The big picture through the eyes of Sam Runco & digital TV - Level: 100**
Session: Thursday, 11:00 am - 12:30 pm

A SPECIAL PRESENTATION BY SAM RUNCO, RUNCO INTERNATIONAL

- **When only a palace theater will do - Level: 100**
Session: Friday, 10:00 am - 11:30 am
- **A decade of selling "best practices" - Level: 200**
Sessions: Wednesday, 9:30 am - 11:00 am; Thursday, 7:00 pm - 8:30 pm
- **Home theater custom cabinetry design; Make it work for your business - Level: 100**
Sessions: Thursday, 1:00 pm - 2:30 pm; Friday, 7 pm - 8:30 pm
- **How to keep your clients smiling - Level: 300**
Sessions: Wednesday, 9:30 am - 11:00 am; Friday 10:00 am - 11:30 am
- **Custom sales - A real world approach - Level: 300**
Sessions: Thursday, 9:00 am - 10:30 am; Saturday, 2:00 pm - 3:30 pm
- **Selling lighting control systems "Best practices" - Level: 100**
Session: Friday, 3:00 pm - 4:30 pm
- **Elite sales & marketing skills - Level: 400**
Sessions: Wednesday, 3:30 pm - 5:00 pm; Saturday, 4:00 pm - 5:30 pm
- **How to sell to women in the custom installation world - Level: 100**
Session: Thursday, 3:00 pm - 4:30 pm
- **Sales to builders for the next decade - Level: 300**
Sessions: Friday, 5:00 pm - 6:30 pm; Sunday, 10:30 am - 12:00 pm
- **The art of managing home cinema projects - Level: 400**
Session: Thursday, 11:00 am - 12:30 pm
- **Selling upscale products - Closing the big ticket sale - Level: 200**
Session: Wednesday, 3:30 pm - 5:00 pm; Thursday, 5:00 pm - 6:30 pm
- **How to generate a winning proposal - Level: 200**
Sessions: Saturday, 8:00 am - 9:30 am; Sunday, 8:30 am - 10:00 am

REPAIRING 21st CENTURY TVs

by Bob Rose

... Change is the order of the day.
It doesn't come just once or twice in five years any more.
It now comes about every six months ...

I confess to a certain difficulty introducing this subject. It is as if I know what I want to say but can't get at it. So, I guess the best way to begin is to state the obvious, that you and I are in a profession that is changing at such a rate that keeping current is close to impossible. I have been around in some capacity since the mid-1950's, meaning I have lived through the transition from tubes to transistors, to integrated circuits, to microprocessors, to surface mount devices, and to the current flux in consumer based electronics.

There was a time when we technicians

could expect major changes once or twice in, let us say, five years. Beyond those major changes, very little happened. For example, Zenith has used the same basic power supply design in its middle-of-the-road products since about 1988 and is in fact still using it though their engineers have come up with a new design that will probably dominate the current "C" line products. If you search through Zenith products—all of them—you will find just a very few basic power supplies in the TV's they have put on the market in the last ten years. Thomson, on the other hand, seems

to have set the pace for the industry. I have counted at least nine, different power supplies that their engineers have used in the same time span in their middle-of-the-line products.

I say all of that to say this: change is the order of the day. It doesn't come just once or twice in five years any more. It now comes about every six months, and it is so radical that we technicians must constantly read, watch videos, and peruse CD's just to keep up it.

Having said that, let me move on to illustrate the kinds of problems you and I

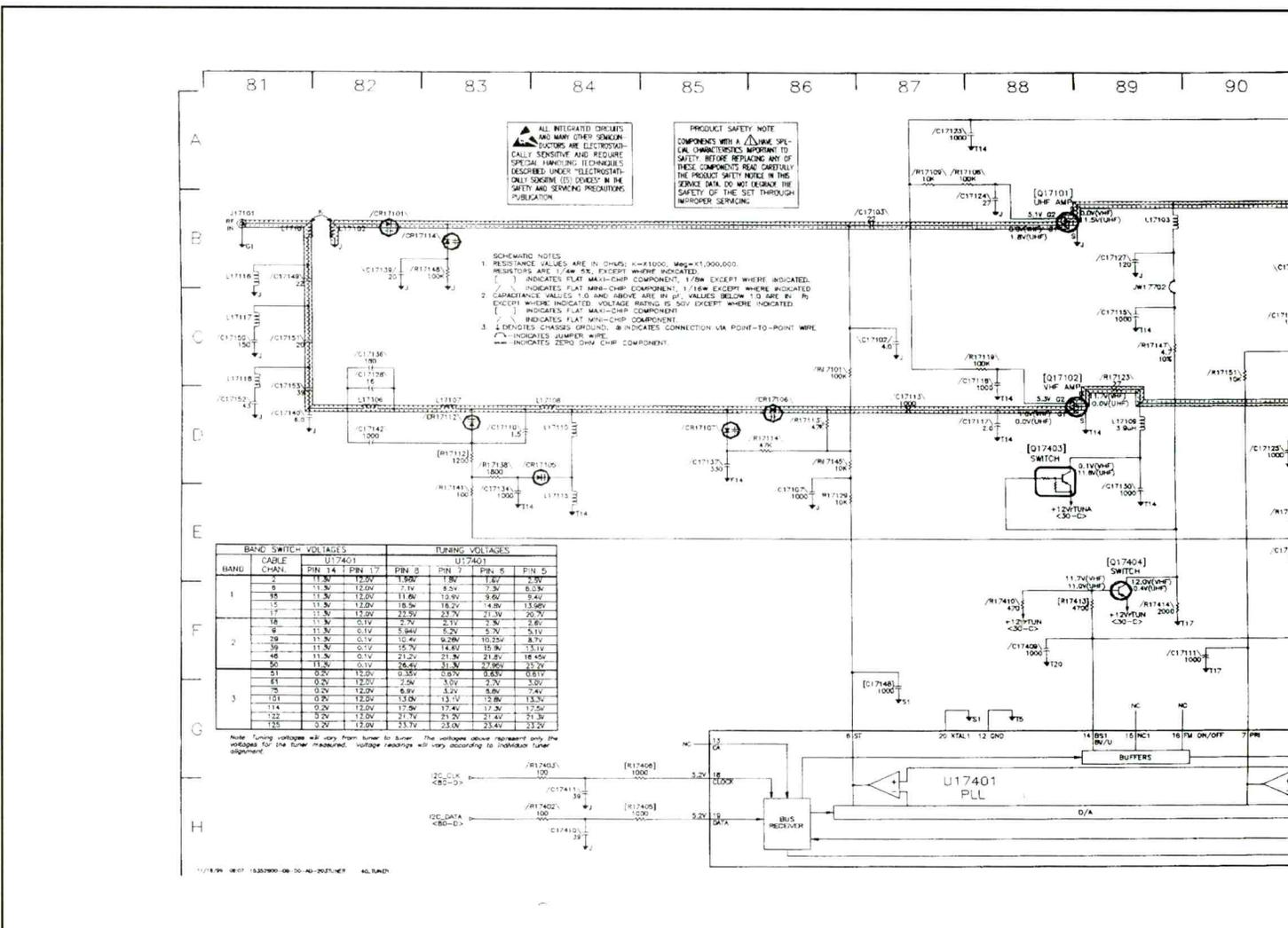


Figure 1. In the CTC195, under certain conditions, the glue used to hold crystal Y17401 in place while it was being soldered becomes conductive and keeps the crystal from oscillating. If you encounter a situation such as this, take the crystal off the circuit board, carefully remove the glue, and install a new crystal.

face when we open our shops on a given Monday morning and say a frosty "hello" to the twenty-first century televisions waiting to be fixed.

Software versus hardware

Did you ever think that when you looked at a broken television you would have to decide whether the problem is caused by software, hardware, or a combination of the two? We who work a bit with computers have had to think in those terms for many years, and the time has come when we who work with televisions

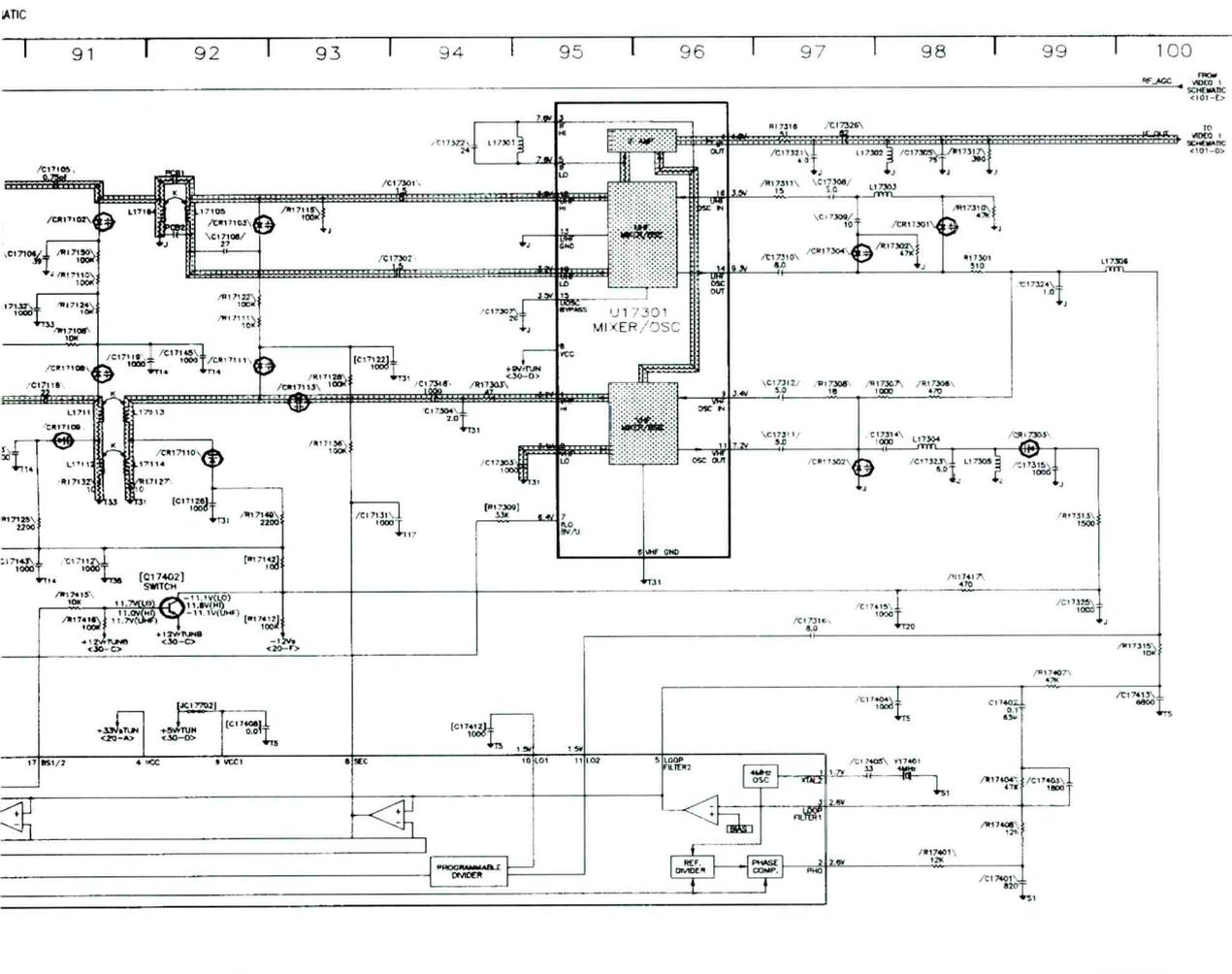
must also think in those terms. I'm not saying anything new. If you have worked on RCA televisions for the last five years, you worked with software problems every time you either replaced or programmed an EEPROM in a CTC175/76/77 or CTC187 chassis.

As a matter of fact, every manufacturer of televisions now employs a version of the technology Thomson more-or-less pioneered. EEPROM's have been around for quite a while, but Thomson was the first as far I know to rely on them as the sole repository of the chassis' working parameters.

Since chassis parameters are now set electronically and stored in electronic memory, software problems have become about as common as hardware problems.

A CTC195 that loses picture and sound

I have serviced many CTC195/197 sets that came into the shop with the complaint, "It loses picture and sound." The unit might lose picture and sound once a week or several times a day. Based on your previous experience with RCA products, you might be thinking, "Oh, another



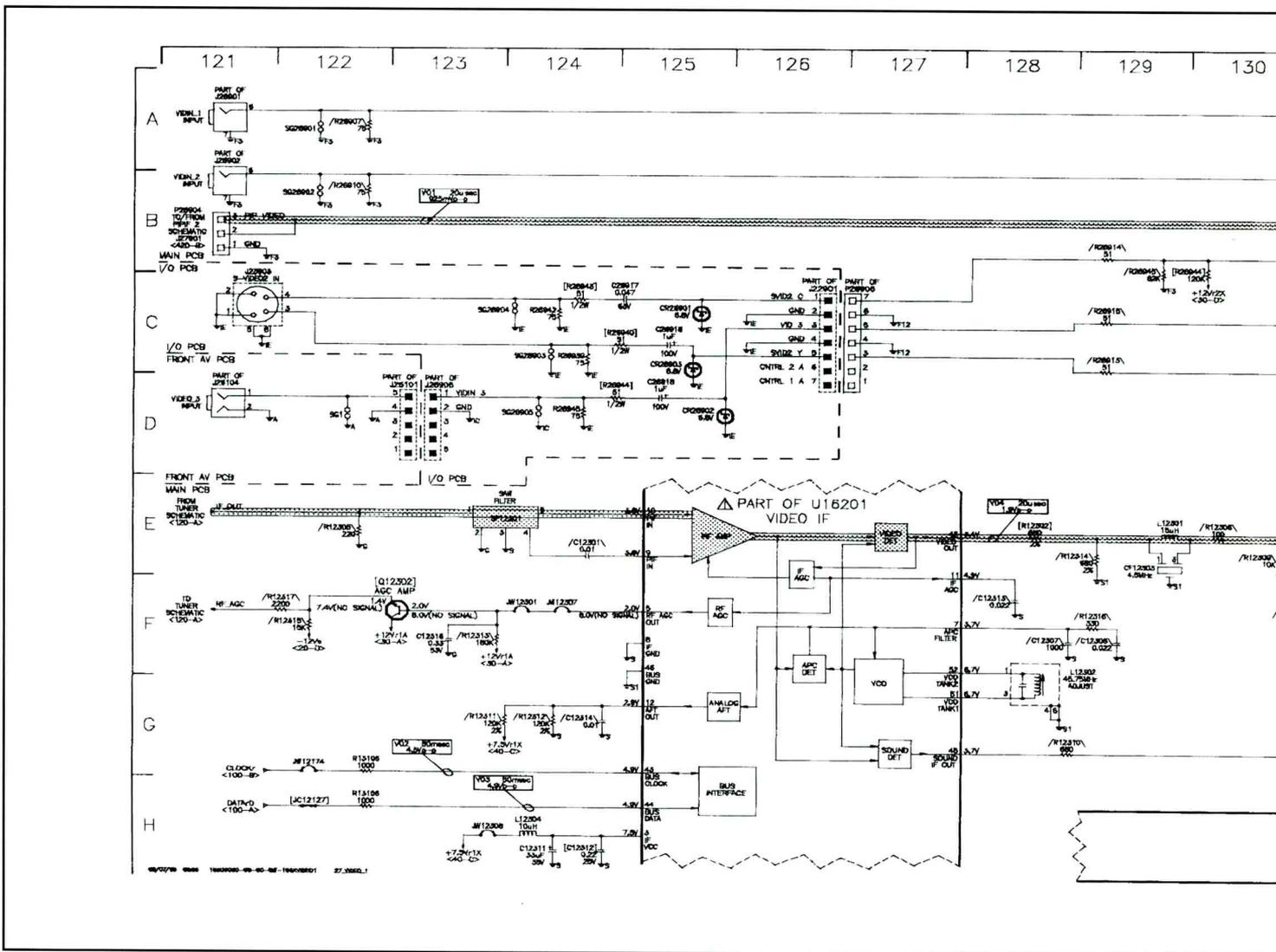


Figure 2. If you encounter a CTC195 that loses picture and sound, check pin 12 of U12601 (Figure 2) for 3.8V. If the voltage is higher than 3.8V (and it probably will be), use Chipper Check to adjust the IFvco for as close to 3.8V as you can get. You might also want to check the APC setting while you are monitoring pin 12, which should also be at 3.8V.

er tuner shield problem.” If you are, you are incorrect. This problem is cut from a different cloth because it concerns the setting for the voltage-controlled oscillator (VCO) that controls the demodulation of the IF signal. Thomson calls it the IFvco setting.

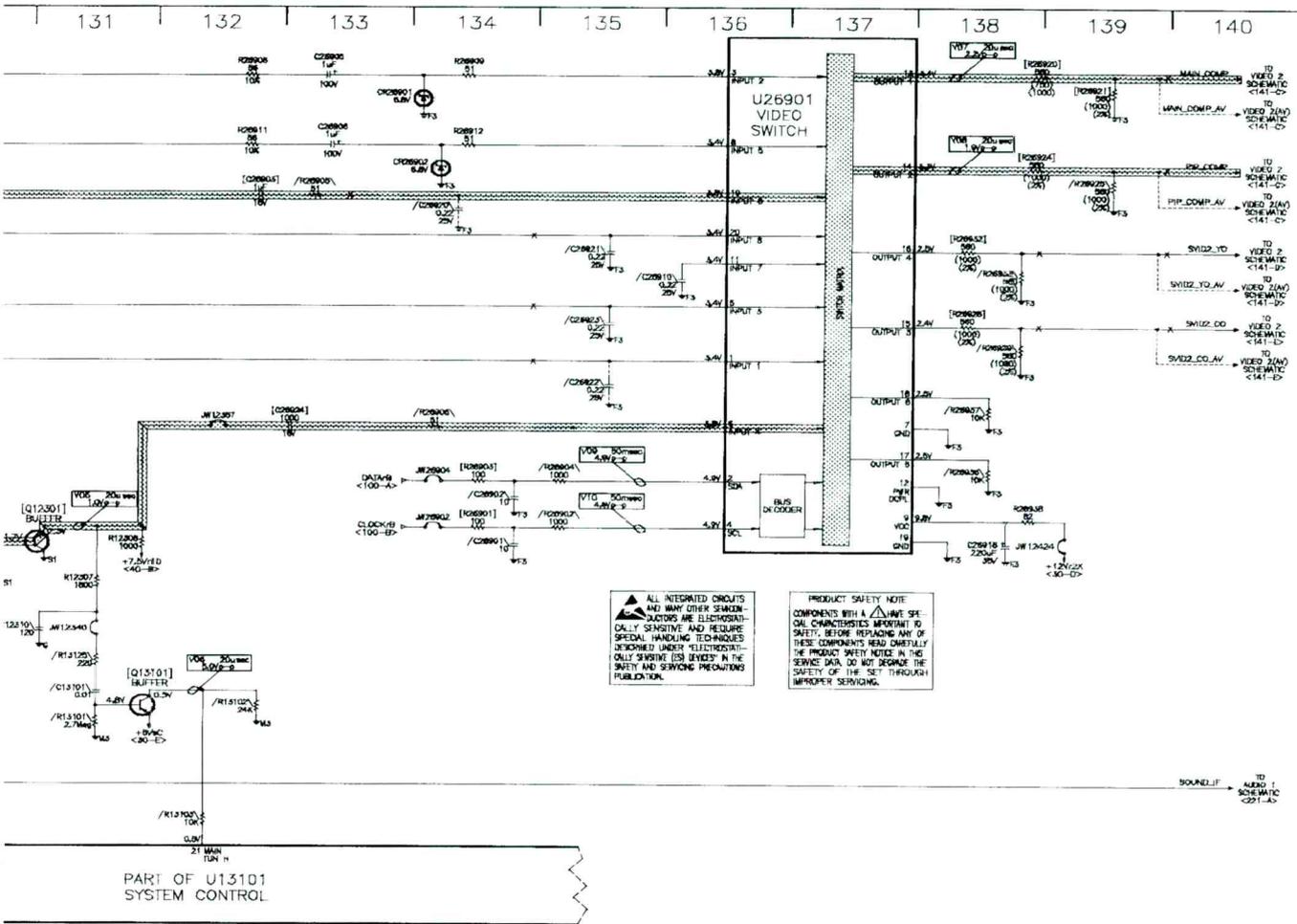
Before getting to the IFvco problem, you ought to know that some production runs have a similar problem that is caused by oscillations within the tuner. Thomson issued a service bulletin detailing the changes that should be made to cure the problem (TV 98-001A). The service bulletin does not apply to those tuners that attach to the bottom cover by means of two solder points. This type of bottom

tuner cover indicates that the resistor and I-bar upgrades have been installed. If the tuner on which you are working does not meet the “two solder points” criterion, change R17106 from a 10Ω resistor to a 39Ω resistor using part number 205322. Then, if a zinc liner is present, remove it and toss it into the garbage. Clean off excess solder and install the new tuner I-Bar (part number 242605) in place of the discarded zinc wrapper. Install the bottom shield and realign channels 35, 41, 45, 58, and 50 using the Chipper Check alignment software.

When the CTC 95/197 first came out, there was a tendency for a channel to drop out for a few seconds and then return.

Thomson issued a service bulletin (TV 97-021) instructing the technician to check R17520 and replace it if it isn't a 100Ω resistor, using part number 218508 and then to replace C17503 with a 22 pf capacitor (part number 194903). If the TV on which you are working was manufactured after December 1997, you shouldn't have to perform this update, but you ought to be aware of it in case you do.

We have encountered one other condition that causes the tuner to malfunction. It seems that a type of glue was used to hold crystal Y17401 (Figure 1) in place while it was being soldered. Under certain conditions, the glue becomes conductive and keeps the crystal from oscillating. If you



encounter a situation such as this, take the crystal off the circuit board, carefully remove the glue, and install a new crystal. I know it's a lot of trouble, but my philosophy is, "better safe than sorry." Besides, the crystal isn't expensive, and the procedure takes very little time.

Back to the IFvco alignment

Begin by checking pin 12 of U16201 (Figure 2) for 3.8V, and do use a high impedance DMM. If the voltage is higher than 3.8V (and it probably will be), use Chipper Check to adjust the IFvco for as close to 3.8V as you can get. You might also want to check the APC setting while you are monitoring pin 12, which should

also be at 3.8V. If it isn't, tweak the setting till it is. I won't give you instructions about how to use Chipper Check to make these adjustments because the instructions are contained within Chipper Check itself.

I have since learned there is an easier way to align the IFvco than getting out Chipper Check and your computer. Attach a DMM to pin 12 of U16201, and monitor it while you adjust L12302 (Figure 2) for a reading of 3.8V on the meter. Let me caution you to be extremely careful when you adjust this coil because even a slight turn makes a significant difference in the voltage reading at pin 12. I frequently need to turn the coil something like an eighth of a turn to get

the correct voltage reading.

A misaligned IFvco leads to symptoms other than total loss of video and audio. For example, I worked on a CTC197 today that got wide noise bands in the picture and something that sounded like static crashes in the audio after it had played for a while. The voltage at pin 12 of U16201 read 6.8V. Adjusting L12302 for 3.8V put the television in good working order.

A Sharp TV that had no audio

My second illustration concerns a Sharp TV that had no audio. I searched my records to find which model gave this particular problem but couldn't find it. For the illustration, assume that it was a

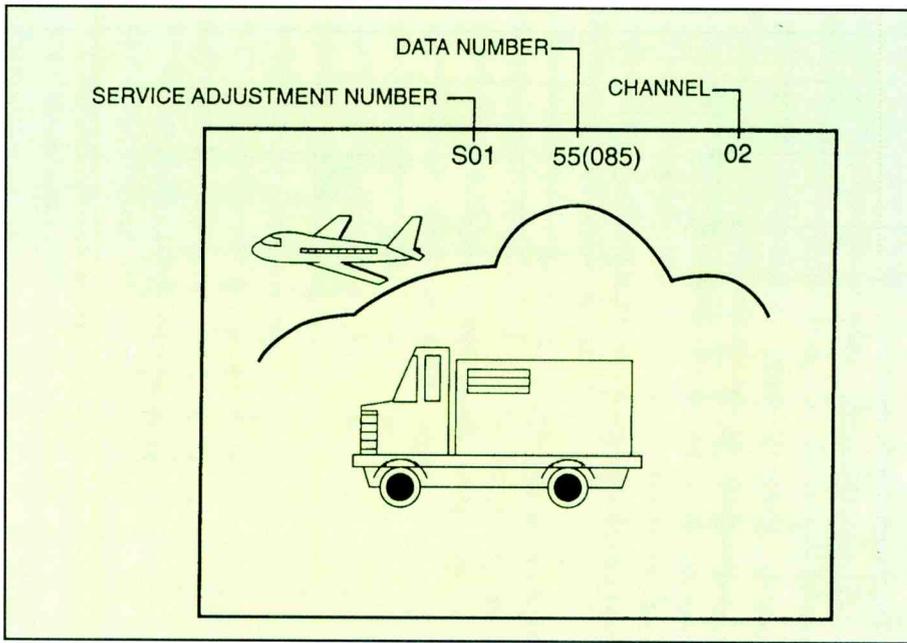


Figure 3. In some Sharp sets, you call up the service menu by pressing the volume up and channel up buttons while applying ac power to the chassis. Three numbers appear at the top of the screen when the service menu comes up. The first number is the "service adjustment number," the second is the "data number," and the third is the channel number.

25K-M100. Let me repeat. The model in question was not a 25K-M100. I am using it solely as an illustration.

I made the usual checks around the audio output chip and found nothing amiss. I also found nothing out of the ordinary when I checked the circuits in and around the "rainforest IC." Having learned a thing or two in the past, I called up the service menu by pressing the volume up and channel up buttons while applying ac power to the chassis. (In some chassis, Sharp tells you to short two test points together.) Three numbers appear at the top of the screen (Figure 3) when the service menu comes up.

The first number is the "service adjustment number," the second is the "data number," and the third is the channel number. I used the data in Figure 4 to check the settings for the chassis on my bench.

(Continued on page 42)

SERVICE NUMBER	ADJUSTMENT ITEM	DATA		ADJUSTMENT CONTENTS
		INITIAL VALUE	RANGE	
S01	PICTURE	55	00-7F	
S02	TINT	46	00-7F	
S03	COLOR	32	00-7F	
S04	BRIGHTNESS	40	00-7F	
S05	SHARPNESS	24	00-3F	MUST BE SET TO "28"
S06	VERTICAL PHASE	00	00-3F	MUST BE SET TO "00"
S07	HORIZONTAL PHASE	12	00-1F	
S08	RF-AGC	23	00-3F	
S09	VERTICAL AMP	20	00-3F	
S10	VC0	2C	00-7F	
S11	R CUT-OFF	00	00-FF	
S12	G CUT-OFF	00	00-FF	
S13	B CUT-OFF	00	00-FF	
S14	G GAIN	7F	00-FF	
S15	B GAIN	7F	00-FF	
S16	TRAP (3.58MHz)	00	00 OR 01	MUST BE SET TO "00"
S17	BALANCE	20	00-3F	MUST BE SET TO "20"
S18	C.C. POSITION	17	00-7F	
S19	Y-MUTE	00	00,10,03	00= NORMAL, 01=NoY, 03 = No VERTICAL
OP	OPTION (set to each mode)	80	00-FF	"40"=25K-M180, "30"=25K-S100, "70"= 25K-S180, CK25S18
M01	MTS LEVEL	0A	00-0F	Only for Models 25K-S100/180, CK25S18
M02	STEREO-VCO	20	00-3F	
M03	FILTER	1C	00-3F	
M04	LOW SEPARATION	20	00-3F	
M05	HIGH SEPARATION	1B	00-3F	

Figure 4. I used these data to check the settings for the Sharp chassis on my bench. All of the data numbers were correct except the "options" (OP) setting. When I set the options data correctly, the audio popped in.

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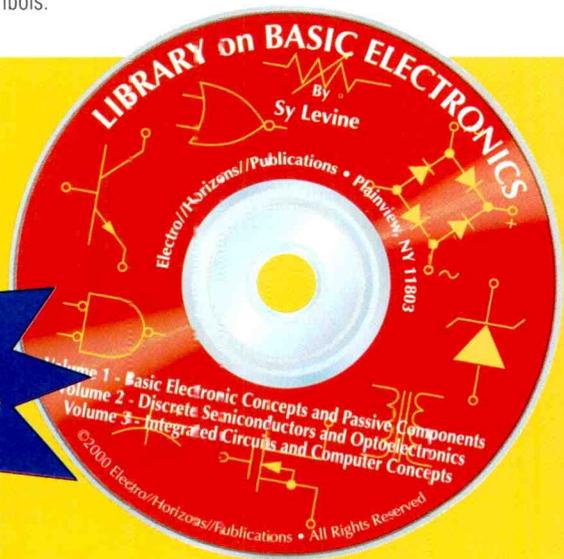
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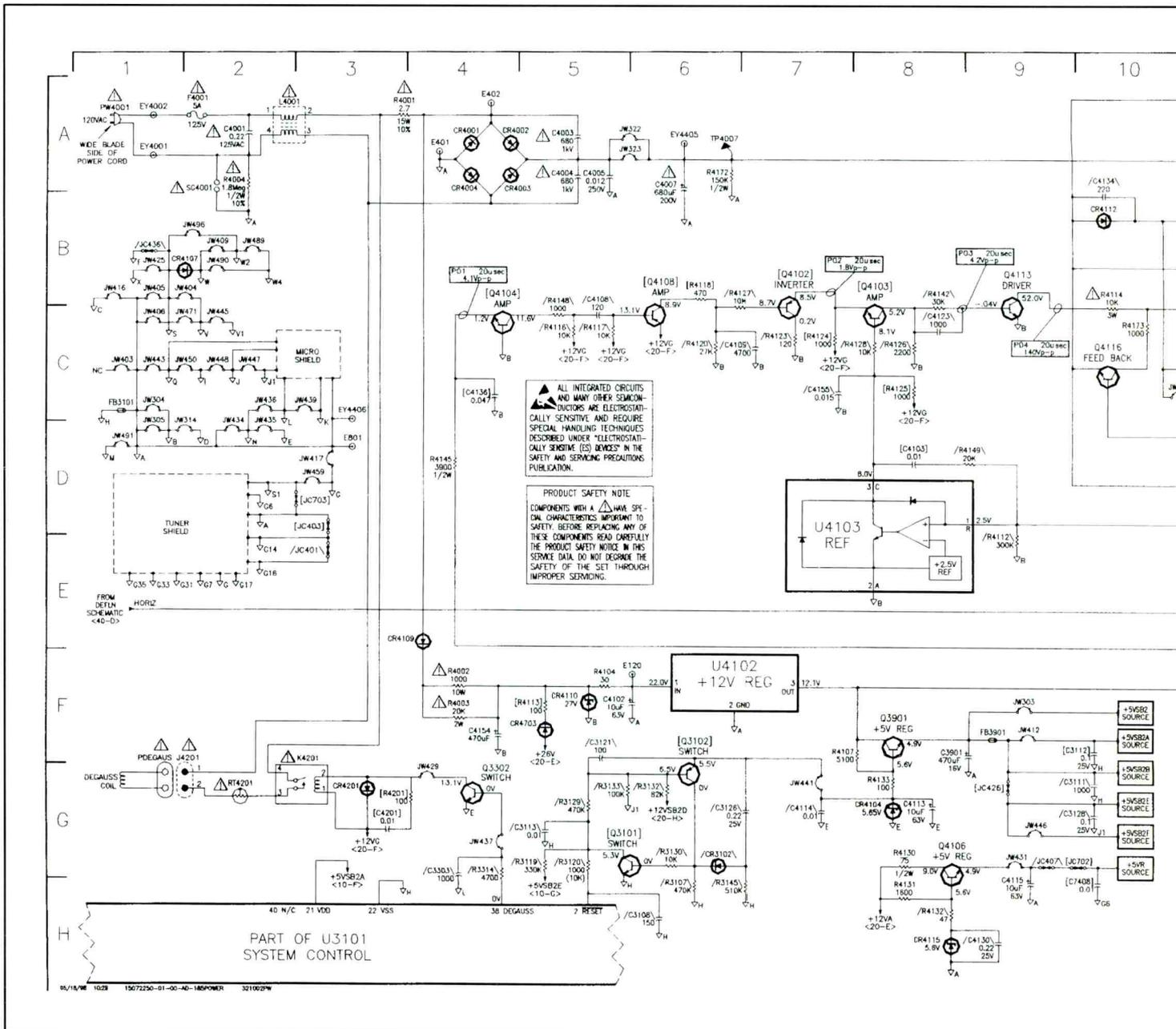


Figure 5. If a CTC185 set loses reset voltage, which is a low followed by a high on pin 2 of U3101, system control goes into a power saving routine to permit it to store pertinent data before it shuts down.

(Continued from page 40)

All of the data numbers were correct except the “options” (OP) setting. When I set the options data correctly, the audio popped in.

There is no need to belabor the point that software—we talk about a “corrupted” EEPROM—has a profound effect on the operation of twenty-first century televisions. Having begun the conversation about software problems, I am certain you can finish it based on your experience, can’t you?

Microprocessor problems

The problems I am about to discuss aren’t caused by a failure of the system microprocessor, but by incorrect information getting to it. Microprocessors are highly reliable, among the most reliable components in twenty-first century TV’s. They won’t work, however, if they don’t get correct information. Well, that’s not quite true. In some instances, they won’t work. In other instances, they won’t permit the TV to work. I’ll give you an illustration of each of these conditions.

A dead set CTC185

This CTC185 came in as a dealer stock repair with the complaint, “Plays for a few minutes and turns itself off.” The first order of business is always to confirm the complaint. Sure enough, the TV worked fine for about five minutes and then shut down. It would come back on when I issued a power on command, play for about a minute, and shut down. However, it wouldn’t come back on a third time.

As you know, several things can cause a chassis shutdown. I began by checking

Error code:		Chassis:	Error:
HEX	DEC	POWER CONTROL ERRORS	
00	0	ALL	No Errors
01	1	ALL	16V_STBY fault
03	3	ALL	12V_RUN fault
08	8	ALL	T4-Chip XRP (X-ray protection)
09	9	ALL	T4-Chip POR (power on reset)
0A	10	w/F2PIP	F2PIP POR
0B	11	ALL	Stereo Decoder POR
10	16	ALL	Run IIC bus latched
12	18	ALL	Standby IIC buss latched
HEX	DEC	IIC ACKNOWLEDGE ERRORS	
22	34	w/Gemstar	Gemstar bus fault
2C	44	w/F2PIP	F2PIP fault
80	128	ALL	Stereo Decoder Fault
BA	186	ALL	T4 chip fault
C4	196	ALL	Main Tuner PLL bus fault
C6	198	ALL	Main Tuner DAC bus fault

Figure 6. In the CTC203 the set stores in memory the three most recent faults that the microprocessor detects, the most recent error stored in memory location 03. The error codes are listed here.

tions include a Gemstar Program Guide (Guide Plus +), V-Chip, on-board tuner (though some come equipped with a traditional modular tuner!), and a sophisticated system control. Most of these circuits have been around for a few years. For example, the TOB is similar to the one used in the CTC175/76/77, and the system control looks and operates like the CTC195/97 chassis. However, the power supply is brand new.

The set in question had a peculiar set of symptoms. It had great audio and video

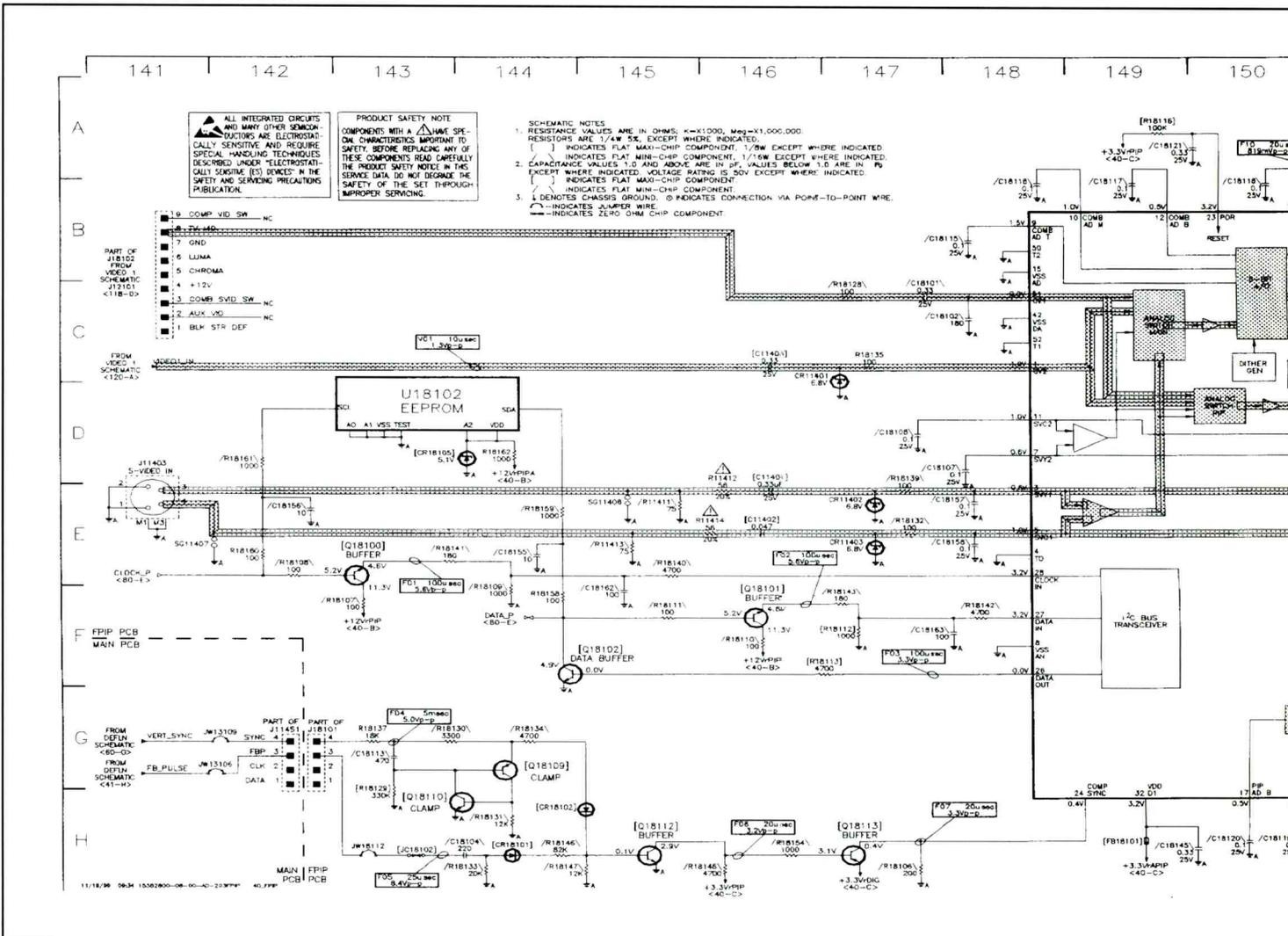


Figure 7. The tech to whom I talked regarding a problem in a CTC203 said, "Yes, you are going to have to make three changes on the F2PIP module because the PIP processor isn't resetting fast enough." I followed his instructions, and the set worked exactly as it should.

and worked like a champ until it was tuned to an inactive channel, at which time it shut down, tried to restart three times, and finally turned itself off. You know this software-based routine as “three strikes, and you’re out.”

“Oh, my!” I thought as I looked at this 32-inch monster, “what have I gotten myself into?” Where does one begin? Just to have something to do, I checked the XRP circuit and found it normal. I also checked the regulated B+ and the retrace pulse and found nothing amiss.

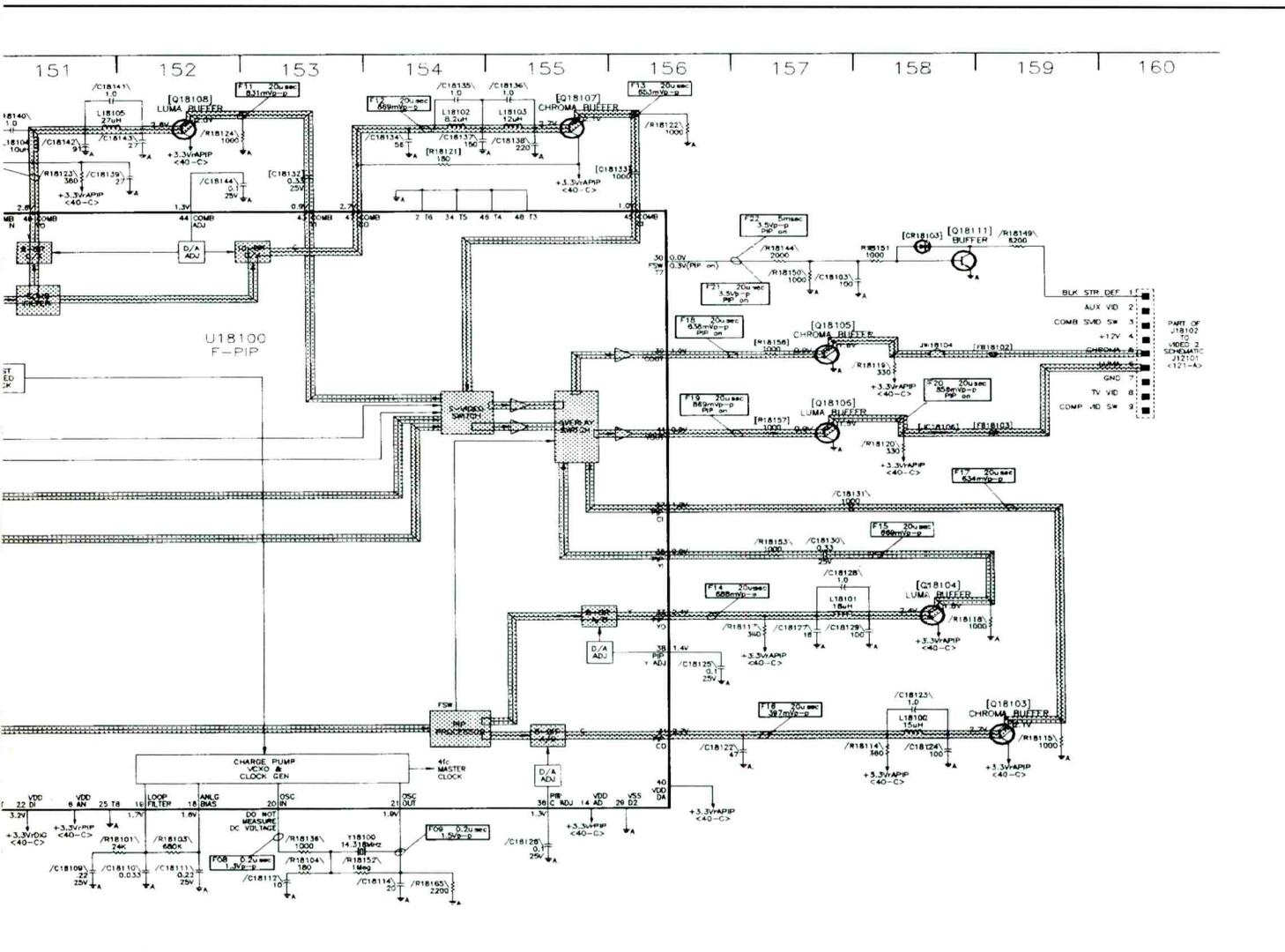
A little voice inside my head said, “Why not check the error codes?” Well, I did and found three: 16, 16, and F2PIP. The set stores in memory the three most recent faults that the microprocessor

detects, the most recent error stored in memory location 03. The error codes are listed in Figure 6. If I read the codes correctly, the F2PIP had caused the run bus to latch. By the way, “F2PIP” is Thomson’s way of saying, “comb filter plus picture-in-picture.” This little module is contained on a single, vertically mounted circuit board located just to the left of the tuner if you look at the chassis from the rear. It does duty as comb filter, video switch, and PIP processor.

Okay, the time had come to make a phone call. I fought my way through to technical assistance. The tech to whom I talked said, “Yes, you are going to have to make three changes on the F2PIP module because the PIP processor isn’t

resetting fast enough.” I followed his instructions, and the set worked exactly as it should.

Here is the cure for this truly esoteric problem. Remove the F2PIP module. Don’t worry because it plugs onto the motherboard. No soldering necessary. Now use Figure 7 as your guide and make the following changes to the circuit of U18100. First, replace R18116 (a 47k smd) with a 100k smd using part number 192084. Second, replace C18121 (a 0.33 smd capacitor) using part number 220132. Third, add smd part number 192096 from pin 21 to ground. Simply piggy back it onto an existing component and solder it into place.



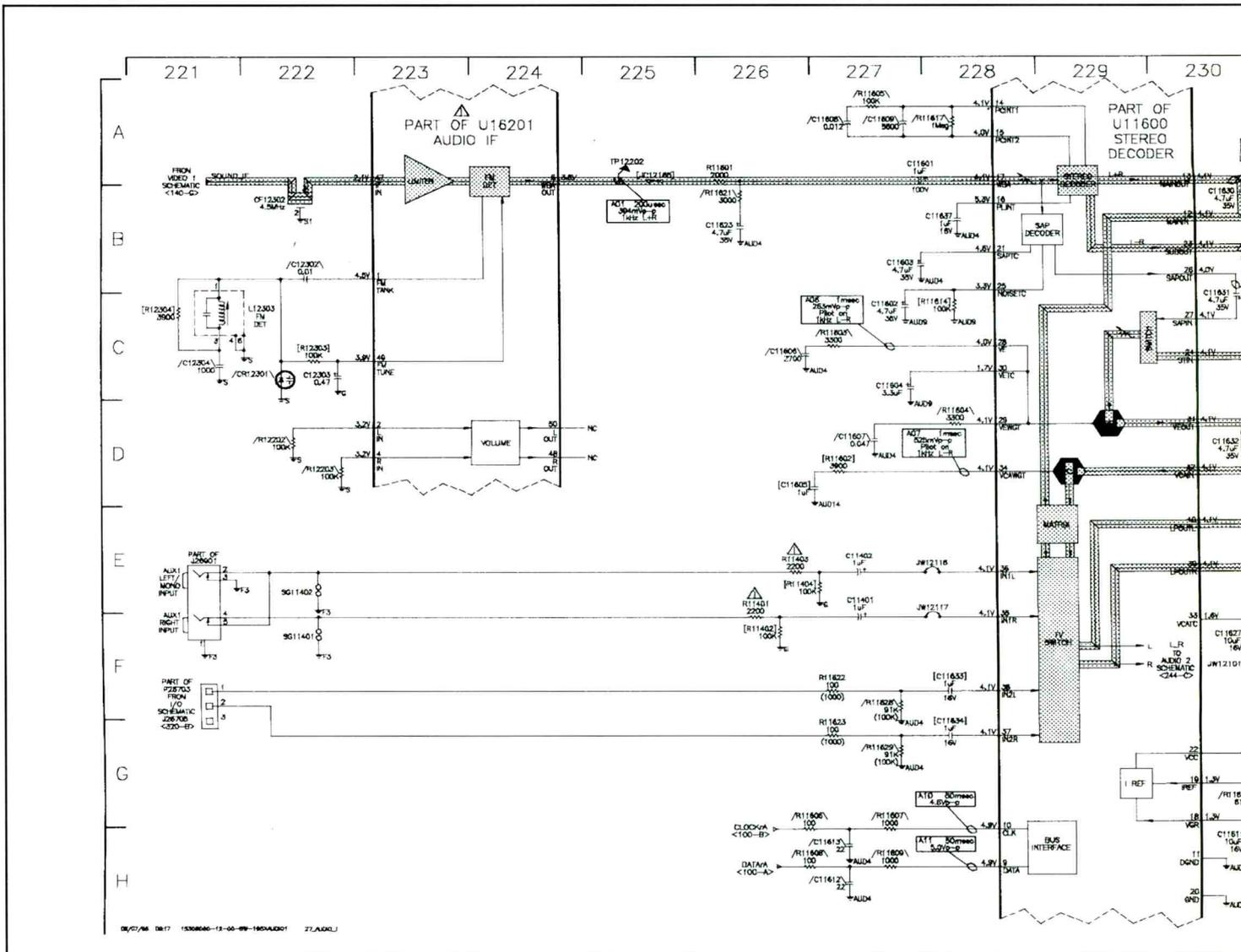


Figure 8. Audio circuitry of a CTC195/97203.

I guess I ought to say that you should check R18116 at pin 23 of U18100 first. If it is indeed a 47k resistor, then make these changes. The newer F2PIP modules have already been modified.

See what I mean when I say the micro-processor will shut down a TV if it doesn't get correct information? System control in the CTC203 constantly polls the major circuits via the data bus. If it detects a fault, it will promptly turn the television off. In this instance, it did not receive an acknowledgment from the PIP processor, "assumed" the F2PIP was inoperative, and did what its software mandated which is turn the set off! Welcome to the world of twenty-first century televisions.

A CTC195/97203 without audio

Now, let's change pace a bit and look at an audio problem these new marvels have. The no audio condition shows up in one of two ways. First (and our shop has seen lots of these) the customer may say, "I turned my TV on this morning, and I have no sound." My partner responds by saying, "Unplug it and reapply ac after it has been unplugged for about twenty minutes. Call us back, and let us know if you have sound then." The customer usually calls back to say, "It's perfect now." This scenario might repeat itself in something like a week or a month. Or the customer might say, "I still don't have any sound."

Let's take the second condition first. Begin by checking the dc voltage on pin 49

of U16201 for approximately 3.9V (Figure 8). If the set happens to be a CTC203, check pin 49 of U12101 for approximately 3.4V (not shown). You are measuring the voltage on the FM tune pin of the FM detect circuit. If the circuit isn't working properly, the dc voltage will measure high, often in the neighborhood of 7V.

To fix, look for an open C12304 in the CTC195 or C12309 in CTC203. The capacitor is located just off pin 3 of L12303. Use part number 197600 to replace it. Next, check CR12301 located just off pin 1 of L12303. If it is defective, replace it using part number 227051. Or better yet, just replace them as a matter of course if the dc voltage is ramping high.

Now, go back to the first condition, the

1 msec
-40V -R
-40V -L-R

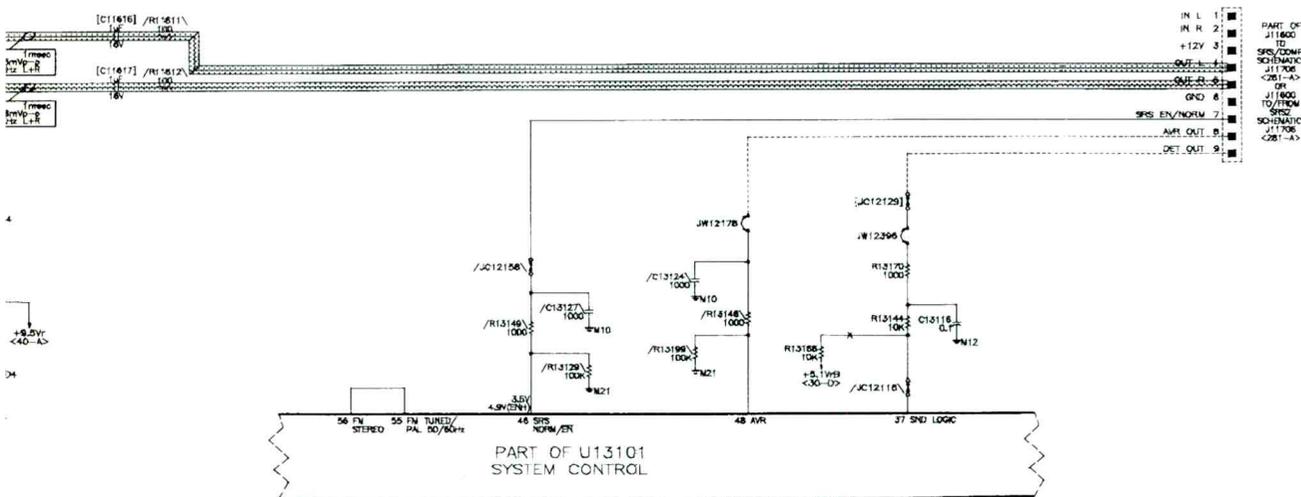
5 msec
22mVp-p
size L only

AC
20mVp-p
size L only

AC
10mVp-p
size L only

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“on again” and “off again” audio situation. Thomas, the technician who does the bulk of our in-home service, has fixed in the neighborhood of ten sets by replacing C12304, CR12301, and U1600 (using part number 237930). Be aware that the new IC comes as a kit of parts. Do read the instructions carefully because you might need just the IC and not the parts that accompany it. We were told that this fix was just “a shot in the dark” and asked to report our success or failure. We have not had a single failure to date.

A defective tuner in a CTC203

I will wrap up this discussion of twenty-first century repair problems by recounting a CTC203 that sometimes

would display a fine picture with excellent audio and sometimes wouldn't. Most of the time, the tuner just wouldn't work.

The literature suggests that for a “no tune” situation, you begin by verifying channel number changes on the screen. If the OSD doesn't respond to a channel change command, forget the tuner and go to work on the system control circuit. In this instance, the OSD responded to all commands. Second, check all of the supply voltage to the tuner, specifically +5V, +12V, -12V, and +33V. They were okay. Third, check for the correct band switching voltages on pins 14 and 17 of U17401, pin 7 of U17301, and the collector of Q17402. Those voltages were also okay.

Next, check the tuning voltage on pin 5 U17401. It should change as the channels increment or decrement. It didn't change. The literature also says if this voltage is stuck high or low, suspect a problem in the PLL loop, like Y17401. Use a X10 probe and check for a 4MHz signal at a value of about 1VPP. The waveform I saw was not only low in amplitude but also distorted. It is easier to change the crystal than the IC, but a new crystal didn't fix the problem. I had to change U17401 using part number 231529 to fix the set.

Enough for now. I hope these cameos give you a taste of the kinds of problems we technicians are called upon to deal with in the beginning years of the new millennium. ■

ISOLATION TRANSFORMERS INCREASE SAFETY OF ELECTRONIC SYSTEMS

Every consumer electronics service technician knows what an isolation transformer is. Or should know. It's a transformer that provides electrical isolation between the input and the output. Isolation transformers used while servicing products that derive their power via a full-bridge rectifier are 1:1, that is, the voltage at the output is the same as the voltage at the input. The products with which isolation transformers are used have a "hot" ground, and thus the only way to test them safely is to connect them to the power line via an isolation transformer.

But isolation transformers are used in some electronics equipment to make them safer to use. These transformers may have any turns ratio depending on the desired output voltage. Technicians who might service such products should be aware of the reasons that they contain isolation transformers. This article, based on a pamphlet published by Signal Transformer, describes the application of isolation transformers in electronics equipment.

Introduction

Adequate isolation between a power source and a user of electronic equipment ensures the safety of that equipment. Given the high voltages that exist in modern electronic equipment, proper isolation protects an operator from contact with excessive electrical energy should a short circuit occur in the equipment. Isolation transformers have represented a traditional solution for providing high isolation in electronic circuitry.

Even with the increased use of efficient, switched-mode power supplies (SMPS), isolation transformers can improve the overall isolation of an electronic design without severe penalties in added size, weight, and cost.

Isolation transformers offer an effective means of meeting the requirements of domestic and international safety standards for electronic equipment. In the United States, for example, such standards are set by the Occupational Safety

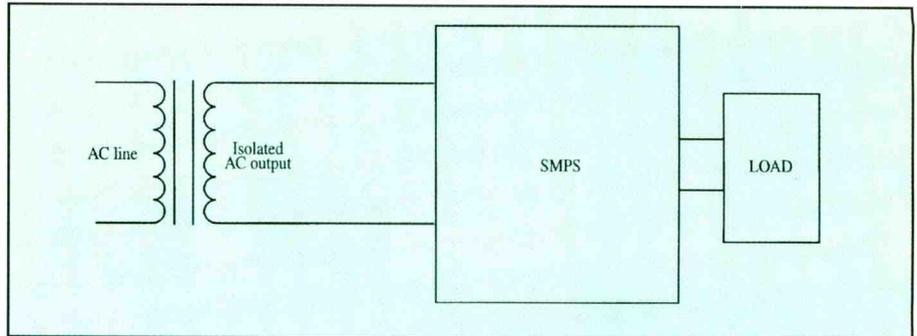


Figure 1, An isolation transformer placed before a linear power supply, or a switched-mode power supply can provide safe operation in accordance with a variety of standards.

and Health Administration (OSHA), with product testing performed according to appointed laboratories, such as Underwriters Laboratories (UL). Throughout Europe, safety standards are established by the International Electrotechnical Commission (IEC), with testing performed by the laboratories of individual member nations, such as the Verband Deutscher Elektrotechniker (VDE) in Germany.

Isolation transformers enable a variety of electronic systems to meet safety requirements. Such systems include medical diagnostic equipment, computer systems, and telecommunications equipment. The systems may incorporate linear power supplies, SMPS, and sometimes a combination of both. A single isolation transformer can help an electronic design meet all of its isolation requirements. With proper system design, an isolation transformer can also help reduce the size and cost of the power-electronics components following it in a design.

Understanding UL

Several techniques commonly provide isolation when designing electronic equipment. Fuses or circuit breakers, for example, can protect both the equipment and its operator from overvoltage conditions or surges of high-voltage energy. Careful component placement and printed-circuit-board (PCB) layout can provide adequate room for creepage and clearance of components in close prox-

imity of high voltages.

Creepage is defined as the shortest distance between two conductors, measured along the surface of the insulators. Clearance is the shortest path through the air between two conductors that must be isolated. Each component subject to creepage and clearance must meet the requirements in UL, CSA, VDE, or other applicable standards. An isolation transformer can reduce the impact of meeting these requirements by reducing the line voltage from hazardous to nonhazardous levels.

Decreasing the need to consider creepage and clearance in an electronic design can improve a product's time to market, simplify its circuit layout, and reduce its cost. An isolation transformer is considerably more effective than a full-wave bridge rectifier in screening electronic equipment from high input voltages. Unfortunately, an isolation transformer can add cost, weight, size, and increased cooling requirements to a design. But it represents a reliable solution for increased isolation, even for systems employing switching power supplies.

Switching power supplies convert ac voltage to dc voltage directly in an off-line rectifier followed by a capacitive filter. The converted high voltage is switched at frequencies from thousands of times per second (kilohertz rates) to millions of times per second (megahertz rates).

Usually, semiconductor devices, such as silicon bipolar transistors or silicon metal-oxide-semiconductor field-effect

transistors (MOSFETs) are used to switch the voltage waveforms on and off. The output voltage of a switching power supply is proportional to the pulse width of the switched or chopped waveform and the duty cycle of the pulse wavetrain. By varying the pulse width of the output waveform, the output voltage can be automatically adjusted.

The isolation transformer used in conjunction with an SMPS can be smaller than the transformer needed to achieve the same levels of isolation and voltage step-down functions when used in conjunction with a lower-frequency 50/60-Hz linear power supply with the same power rating. As a result, switching power supplies are smaller, lighter, and dissipate less power than equivalent linear regulated power supplies. Because of this, SMPS have long been used in airborne, military, and space applications where weight and size were key design requirements.

When used with a switching power supply, an isolation transformer can prevent higher-order harmonic signals from

degrading the performance of adjoining circuitry. This is especially important in computers or other equipment incorporating microprocessors, which rely on harmonically rich, high-frequency clock signals for their timing. Improperly isolated, these harmonic signals can appear as interference to other functions in the system, even resulting in excessive output-voltage ripple in the power supply.

Isolation transformers are specified in terms of the amount of isolation that they provide, usually given as the root-mean-square (RMS) voltage, as well as the power rating, in terms of volts-amperes (VA). Additional specifications include efficiency (in percent) and the tolerance of the voltage regulation (in percent).

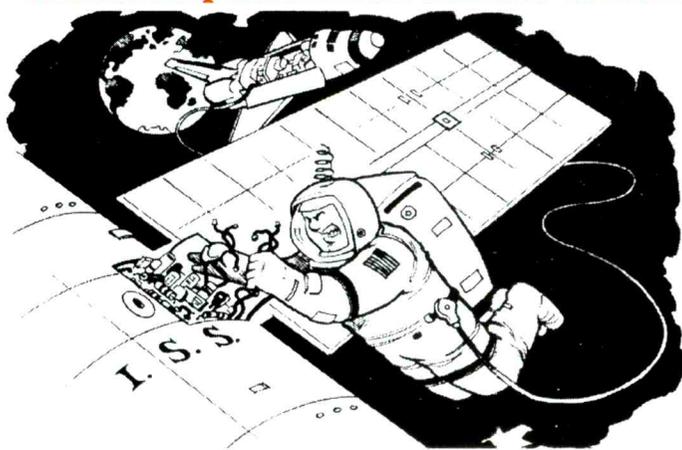
Switching power supplies can be designed with either internal or external isolation transformers, although greater isolation is achieved by means of external isolation. When an external isolation transformer is placed within an electronic design in series with a switching power supply, the output voltage from the transformer is

reduced to a level that is no longer hazardous to the operator of that equipment (Figure 1). Because there is no hazardous voltage after the transformer, the subsequent circuitry is below the voltage threshold (30.0Vrms or 42.4Vdc peak open circuit for Class 2 circuits) required for circuits to meet creepage and clearance electronic safety requirements. Because the transformer provides adequate isolation within a single component, there is no longer a need to achieve distributed isolation throughout the circuitry of a product. Because the voltage following the transformer is low, smaller components (such as inductors and capacitors) can be used throughout the remaining circuitry.

In many cases, standard off-the-shelf switching power supplies can be used in the design because of the relaxed creepage and clearance requirements of lower-voltage circuitry. Isolation transformers that meet international safety standards can be specified for use with both linear and switching power supplies, with a variety of power ratings. For example, low-

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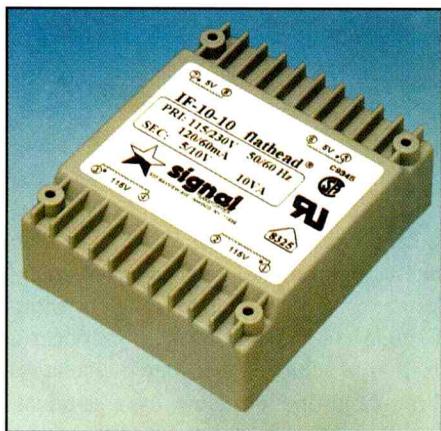


Figure 2. Incorporation of an isolation transformer such as this Flathead transformer by International can help manufacturers design and manufacture products that meet UL, IEC, VDE, and CSA standards.

profile isolation transformers in Signal Transformer's International Flathead series meet a wide range of United States and international standards, including UL 506, IEC 950, as well as German VDE standards and Canadian CSA standards. The transformers, with heights as low as 0.69in., have standard isolation of 4000Vrms and can be supplied with ratings from 2VA to 30VA with dual primaries of 115/230V, 50/60-Hz operation (Figure 2).

These compact transformers can be used on densely packed PCBs.

Isolation transformers represent an effective means of achieving high isolation in distributed-power systems, such as computers and telecommunications systems. In a typical distributed power system, multiple dc-to-dc converters, rather than a single, centralized power source, provide voltage and current to the system's subsystems and circuits. Small, efficient converters can typically generate 200 W or more at a specific location, helping to overcome voltage drops common when power is transmitted over a distance within a system. By locating converters on each of the system's circuit boards, the system can be assembled in a modular fashion, speeding and simplifying manufacturing and testing processes. Thermal design is simplified in the same way, since heat is distributed throughout the system, rather than concentrated in one location.

Even though isolated dc-to-dc convert-

ers can be used to achieve high isolation in such a modular, distributed-power architecture, they are expensive compared to nonisolated converters. A better approach is the use of nonisolated dc-to-dc converters where necessary in a distributed-power system, with a single isolation transformer providing the necessary high-voltage isolation. In this way, each dc-to-dc converter need not meet the high-voltage isolation, creepage, and clearance safety requirements for a particular United States or international electronic safety standard. A single isolation transformer can provide the isolation and the low-voltage transformation to simplify the safety requirements of subsequent circuitry.

Otherwise, each converter or separate power supply must be specified to applicable United States and international safety requirements, greatly increasing the overall cost of the equipment.

Isolation transformers are commonly used with linear power supplies to improve the amount of isolation in the overall circuit. But such transformers can also pay huge dividends when incorporated into high-frequency switching power supplies. They can improve the isolation of a design, as well as enable the overall power-supply circuitry to be made smaller, lighter, less complicated, and less expensive.

In Europe, the IEC either directly or indirectly sets the electrical safety standards for a great many individual nations. The IEC's chief standard for Safety Isolation and Safety Isolating Transformers is the IEC 1558 (recently replacing the IEC 742). In contrast, the European Community (EC) version of the IEC 1558 is EN61558. An additional IEC standard, IEC-601-1, is generally accepted throughout Europe as the standard by which medical electronic equipment must comply (such as UL 544 in the United States and C22.2 No. 125 in Canada).

As with the UL requirements, IEC 950 specifies the amount of leakage current that can be allowed while still gaining certification. Per IEC 950, leakage current should not exceed 3.5 mA for Class I machines and 0.25 mA for Class II machines. Class I electronic products that are designed for hand-held use must be

limited to 0.75 mA or less leakage current.

In order to simplify the design and manufacture of electronic products in Europe, a great deal of consolidation has taken place in the European electronic safety standards. The EC standard EN 60950 is an example of this trend. It is designed to provide an umbrella standard that safety agencies in various countries can use either as is or with modifications that satisfy local needs.

Consolidation of standards is also affecting countries such as Germany, well-known and respected for its own safety standards per the Verband Deutscher Elektrotechniker (VDE). Even though the organization has seen many other nations adopt many of its reference standards, including VDE 0805 and VDE 0750, even Germany is moving toward adoption of the IEC and EN standards as consolidation continues.

The expected end result is a set of electrical safety standards that is uniformly adopted and recognized throughout all Europe. ■



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www.nesda.com

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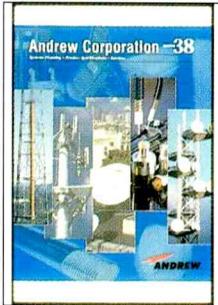
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Catalog of wireless RF system products

Andrew Corporation has published its full product catalog number 38. This publication is a reference tool for wireless RF system planners and product specifiers. The 752-page full color printed catalog 38 is a complete reference source for the



company's products and services. Featured material includes detailed product descriptions, specifications, planning guides, technical data, and system planning software information. New sections cover Broadband Antenna Products, PerforMax™ Base Station Antennas, ValuLine antennas, and ISM, MMDS, and UNII Band Passive Products. The revised HELIAX coaxial cable section offers standard VSWR specifications for cables. New cable attenuation figures are now specified at an industry-standard 20 degrees C. The completely updated Terrestrial Microwave Products section includes antennas and waveguides. Ordering tables in this section now display RPE (Radiation Pattern Envelope) figures. The catalog is also available on-line at www.andrew.com. This version may be viewed on-line and pages can be sent via e-mail as .pdf files or in fax format. On-line catalog 38 has improved keyword-, page number-, and type number-searching features.

Andrew Corporation
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Catalog of fiber optic test equipment

Fotec is offering a new catalog of test equipment and tools for installing fiber optic networks of the communications systems for the next millennium. The cover of the catalog symbolizes the multimedia technologies made possible by networks such as the Internet that are revolutionizing the way the world communicates. The

catalog includes the company's full line of fiber optic test equipment, tools and training materials. New products in this catalog include the ACT2 Fiber Optic Cable Certifier and the PC-based OTDR.

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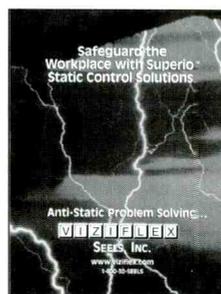
Telecom website

Jensen Tools has just launched Jensen Telecom Online1 a new niche catalog specifically targeted toward telecom professionals. This new site offers telephone1 cable and electrical test equipment, service aids, hand tools, cutting1 stripping and crimping tools, cable and accessories and many other products from leading manufacturers. Search for specific items by product name, product number, or manufacturer name, or browse our extensive offerings in seven categories. New products for telecom workers are featured in a special section, offering the opportunity for an early look at new industry items. Jensen has recently introduced the JTS line of telephone test sets. These are featured on the site, along with Jensen's existing lines of JTM handheld meters and JTK(r) original tool kits. You can also design your own custom kit online in two easy steps with Jensen's "Create-A-Kit" at www.jensentools.com.

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Static control products

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Viziflex Static Solutions
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Custom arm catalog

Waldmann's complete line of arm solutions featuring extensive arm styles and weight load capacities are shown in the company's newest comprehensive Arm Solutions brochure. The arm sizes, ranging from 16 to 32 inches, can be customized to specific application requirements and have the capacity to hold devices from 1/2-lb. to 18 lbs. of weight. The broad range of fully adjustable gooseneck and articulated arm configurations are designed to hold and easily integrate into an array of OEM medical and industrial devices such as: digital cameras, flat screen computers, splash guards, instruments, tools, microscopes, lasers, and more. These articulating arms are constructed with durable internal spring and band mechanisms and most models offer horizontal and vertical mounting. Gooseneck model features a flexible shaft that holds position without vibration. A four-hole mounting base pattern is available. Several models offer a head joint movement range of 160 degrees up-and-down and 360 degrees side-to-side for maximum positioning. Plus, the articulating joints can be rendered flexible or locked into place for stay-put reliability. A 60 mm (2.4-inch) mounting pin is standard for these models and a 1/2-inch pin is offered.

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Wholesale/Retail Information, Frequently Asked Questions, Technical Support, Electronics Chat Lines, Other Hobbyists/Technicians/Engineers, Product Datasheets, Books & Magazines, Product Support Software, Electronics Discussion Groups, Free Product Samples, Firmware, Software, Product Support, IC Pinouts, Company Contacts, Email, Product Pictures, Contests, Product Information, Hardware, Projects and more About the Author: John J. Adams is co-owner of InfiNet-FX, an Internet consulting service for businesses, specializing in the electronics industry on the Web. John has studied computers and electronics for 20 years. Now he teaches classes on Basic Electronics, as well as Computing and Internet Basics, and provides companies with alternative advertising methods.

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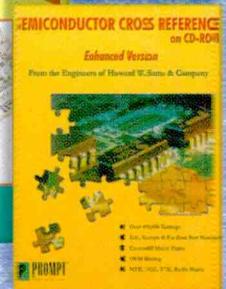
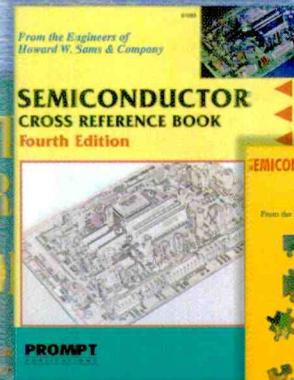
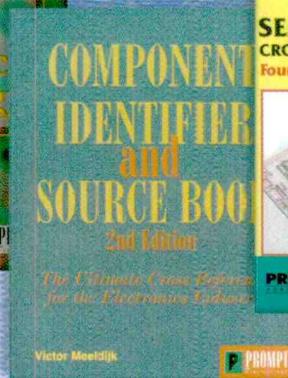
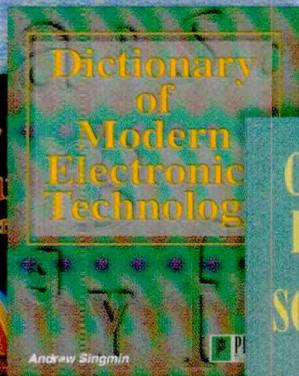
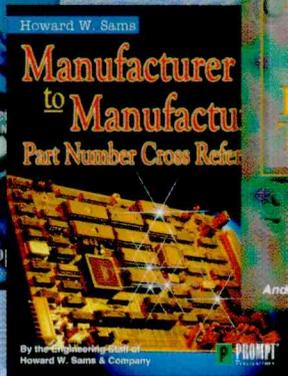
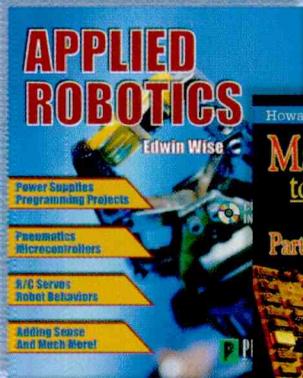
Umax UC-630 scanner service manual/schematics/repair manual/operators manual/setup. Will buy or pay copy costs. Contact: L. Hicks, 1218 S. 257th Place, Des Moines, WA 98198.

IC Part # DEC0015B. Also service manual for Emerson VCR953. Will buy or copy. Contact: Murray Goldstein, 1622 Granfern Avenue, West Palm Beach, FL 33415, phone: 561-966-8862.

Zenith 9-351 deflection module, used. Contact: Ray's TV, Box 70, Lacombe, LA 70445, E-mail: wwwray@webtv.net.

SAE Model #P101 pre-amp or part #11-0224 (ICU210). SAE Model T101 stereo receiver or part # Fd 612U14 (tuner unit). Contact: Just Electronics, 316 North Lake Street, Mundelein, IL 60060, phone: 847-949-8808.

Output transformer for Crosley radio model 12A. Must be original. Contact: Paul Williams, 236A Beaver Valley Pike, New Providence, PA 17560-9622, phone: 717-786-3803.



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