

THE MAGAZINE FOR PROFESSIONAL ELECTRONIC AND COMPUTER SERVICERS

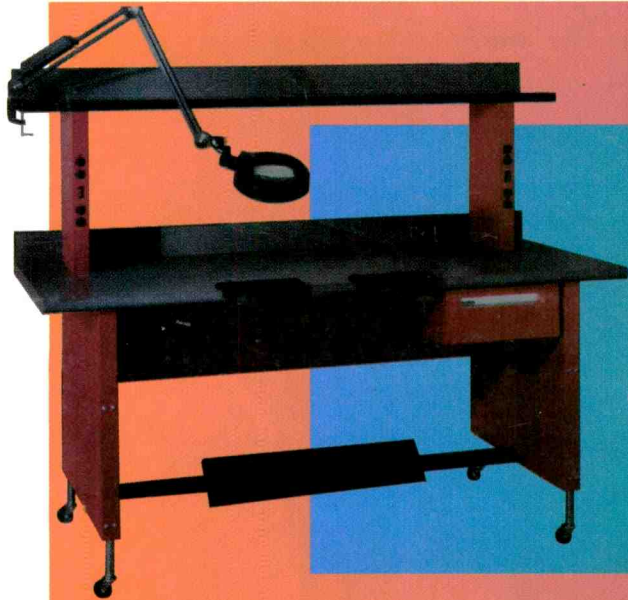
ELECTRONIC™

Servicing & Technology

February 2001

Phone Systems

Troubleshooting Vertical Problems in the RCA CTC177

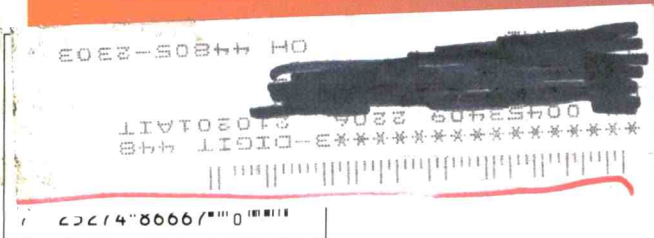


- *Service Center Management Trends*
- *Service Center Management Software*

- *Troubleshooting and Repairing TV/VCR Combinations*



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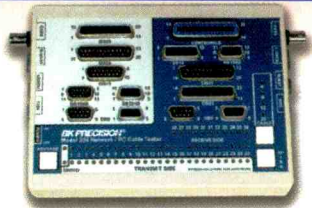


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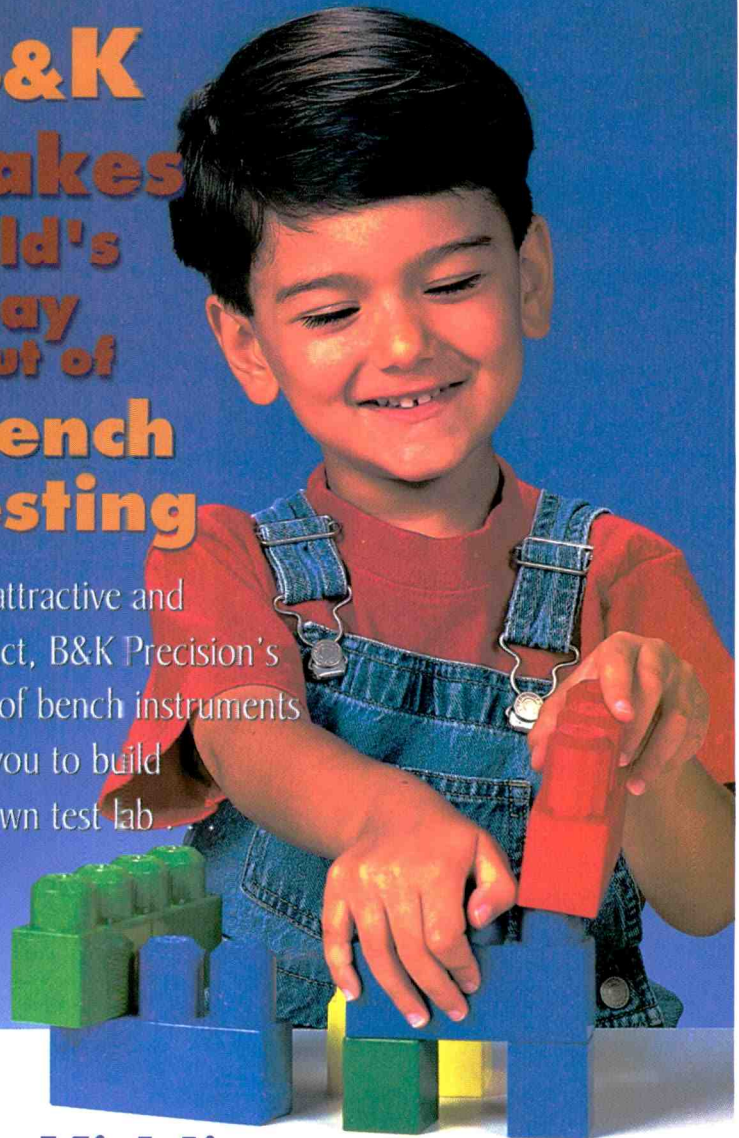
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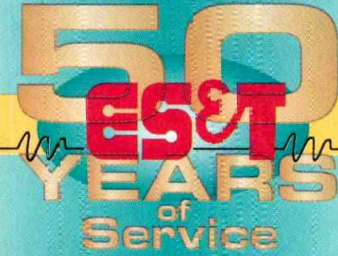
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ES&T Staff

No longer does the telephone company take responsibility for your clients telephone system. The telephone company only brings the line to the customers home, creating more opportunities for the professional servicer who learns the basics of telephone systems and how they operate.

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Bob Rose

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Homer L. Davidson

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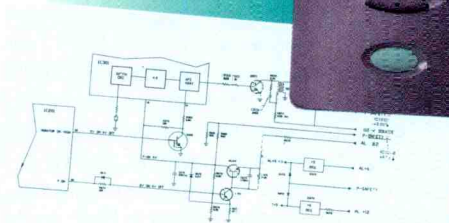
National All Service Convention was held early in February. Here is an outline of what visitors found when they got to Orlando.

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Industry reaction to this development



"...savvy service managers have responded by providing their on-site technicians with enhanced training, more well-stocked trucks, a broader array of test equipment and more detailed service literature so that they can, if possible, complete the service call on the first visit."



Cover Photos Courtesy of Teclab and Panasonic

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Editorial

by Nils Conrad Persson

AFTER 50 YEARS, IT'S IN-HOME SERVICE AGAIN

The January issue of *ES&T* told readers that this year, 2001, the first year of the new millennium (for us purists), is the 50th anniversary of the founding of this magazine. It's an accomplishment for any enterprise to remain in business for 50 years, especially in these unsettled times. It's an accomplishment that we're proud of.

Just for the record, none of us now associated with *ES&T* was there at the outset. We're not that old. But I've been here for about 19 years. It's quite amazing to ponder the changes in consumer electronics that I've seen in those 19 years. Even more amazing is to think about the changes that have taken place in consumer electronics in the fifty years that *ES&T* has been around.

The changes that have taken place have occurred on a number of fronts. For starters, the technology itself, and the quality of audio and video have progressed by leaps and bounds. For another thing, the manufacturers that make the products have changed dramatically. The way the products are sold, and the merchants who sell them have changed. And as readers of this magazine know very well, everything about servicing of the products has changed

Lets take a look at the technology. Fifty years ago (can it have really been that long?) televisions, radios and record players (as they were called then) were all based on vacuum tubes. Picture tubes were monochrome, and TV sound was poor. Radios and record players didn't produce great sound, either. And, of course, the sources of recorded sound were plastic platters of various sizes that could be played at 33-1/3, 45, or 78 rpm. Because the music recorded on these platters was played back by turning the platter while the needle rode in a groove, any cracks, chips, or even static electricity was picked up and amplified along with the music.

The community of manufacturers of these products was reasonably limited. There were companies like RCA, GE, DuMont, Motorola, Magnavox, Zenith and a few others who made and sold TVs in the United States. And for the most part, these sets were sold through individually-owned furniture or appliance, or furniture and appliance stores, or specialty radio/TV stores.

Which leads us to the nature of TV/radio service at that time. Because the products were based on tubes, which were inherently unreliable by their very nature, they failed often. It wasn't unusual for the TV or the radio to go out several times a year because a tube had failed. When the homeowner called the TV serviceman (as service technicians were known in those days) he would visit the home and carry in his trademark tube tester and tube caddy. Because TVs of those days were built on heavy metal chassis, and most were floor model sets, carry in was not usually an option. Besides, people were still used to having tradesmen in, and having milk, bread and other products delivered to their doors.

The service technician plugged the tube tester into the power outlet, then proceeded to check tubes in the faulty unit. As often as not he tested them all, since it was more cost effective to replace not only tubes that had failed, but tubes that were on the verge of failure as well. Because the products failed often, and most fixes were nothing more than changing a tube or two or three, consumer electronics service was a lucrative business, and didn't generally require very much study.

For *ES&T* (then *PF Reporter*), and the other consumer electronics magazine then in existence, *Electronic Technician/Dealer* (*ETD*) magazine those were halcyon days too. The circuitry of

those products was simple, and the complete schematic diagram could be printed on a single 8-1/2 by 11 piece of paper. Thus, when *ETD* printed its "Tekfax" schematic diagrams (*ES&T* didn't carry schematics at that time), they could print the schematics for several sets in a single issue of Tekfax.

Things changed over the years. Transistors were invented, followed later by integrated circuits. Monochrome picture tubes gave way to color units. Picture screen sizes increased. On the radio and audio scene, high fidelity was introduced, followed by stereo high fidelity, and FM began carrying high-fidelity stereo audio. And for the classical music audiophile, those were wonderful days because little but classical could be found on FM.

On the manufacturing front, sets from Japan: Sharp, Sony, Panasonic and others, began to show up in the U. S. market. Discount stores began to appear on the scene, and because electronics products were no longer the difficult to use, mysterious, product they once were, people began picking them up in those stores like so many jelly beans.

All of that changed the situation of service centers. More of these products were carried in for service. These units were more reliable, less expensive, and more complex than the products that service centers were used to seeing. Moreover, being based on either transistors or integrated circuits, servicing of these sets required desoldering/resoldering of components far more than had been the case with tubes. Service technicians had to go back to the books to become more intimately acquainted with the circuitry and operation of these products. Service managers had to go back to the books to reexamine what it took to remain profitable in this new world of service.

You might think that after all that things would slow down a little. As we have seen, that hasn't happened. More recently, just in the past decade, really, computers and all their peripherals have become consumer electronics products. And even as they were being introduced, computers have undergone rapid evolution. From devices of limited capability based on user-unfriendly command driven operating systems, they have developed into easy to use products with user-friendly graphic operating systems with amazing power and practically limitless storage capacity. They have truly become all-purpose information processing devices.

But it's not only computers that have only recently been introduced. Homes now fairly bristle with advanced technology products and systems like home theater, cordless telephones, cable and satellite TV, near lifelike video games, home networks, high-capacity disk-based audio/video recorders, and, of course powerful computers.

The very difficult challenge for service technicians and service managers is to constantly learn, to keep up with all these products and the technical and business demands they make on the service centers. We know it's not easy.

Electronic Servicing & Technology was founded in the early days of consumer electronics service, and has reported on many of the changes that have occurred in that industry from then until now. For those of you who will still be around in another 50 years, it will be interesting to see where another 50 years has brought us.

Conrad Persson

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ELECTRONIC

Servicing & Technology

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

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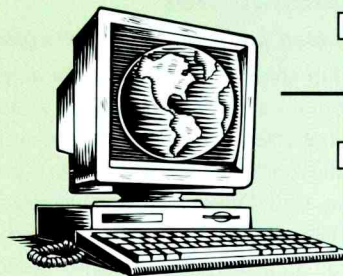
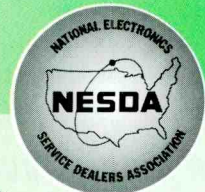
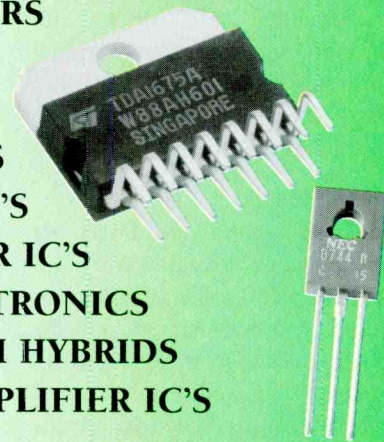
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Panja Reports Revenue Increases 24% to \$24.2 Million for Fiscal Third Quarter

RICHARDSON, TX, January 29, 2001 – Panja Inc. (Nasdaq: PNJA), today announced financial results for the fiscal third quarter ended December 31, 2000.

Net sales for the third quarter increased 24% to \$24.2 million, compared to \$19.5 million in the fiscal 2000 third quarter.

The Company's gross profit margin increased to 51% for the third quarter, compared to 50% in the third quarter ended December 31, 1999. The Company continues to focus on new sourcing agreements which the Company anticipates will result in improved gross margin in fiscal 2002.

Nine Month Results

For the nine months ended December 31, 2000, net sales increased 21% to \$71.3 million compared to \$58.7 million in the comparative prior year period. For the nine months ended December 31, 2000, the Company reported a net loss of \$851,000, or \$0.09 per diluted share, compared to a net loss of \$3.4 million, or \$0.40 per diluted share in the year-ago period.

With the quarterly figures Panja also

announced these developments:

Four New Members added to the Panja Partner Program (P3).

Four companies have become P3 partners. Sony's CIS (Consumer Integrated Systems) group, Kenwood USA, Biamp Systems, and Fujitsu.

Panamax, manufacturer of surge protection products, and Panja has teamed to develop a technology that requires all connections to equipment to pass through a protector specifically designed for Panja Home Automation systems and P3 Partner components.

Outlook

Looking ahead, the Company expects that fourth quarter per share results will show significant year-over-year improvements, meeting or beating current analyst earnings expectation of a loss of \$0.04 per share.

Panja Moves Headquarters

Panja has moved to 3000 Research Drive, Richardson, Texas 75082.

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www.panja.com

State Recycling Managers Favor Provider Responsibility

More than 90% of recycling managers responding to annual STATE RECYCLING LAWS UPDATE survey published by Raymond Communications, indicated they favor some form of "producer responsibility" in the U.S. Of the 42 states responding to the survey, 27 of 29 answering a question on EPR favored the idea. The survey results, as well as an updated version of 32 issue summaries and a complete 50-state wrap of existing laws will be in the new State Recycling Laws Update Year-End Edition 2000, to be published in early September.

The SRLU survey also showed the vast majority of recycling managers are concerned about electronics waste. While only a few states have any strategy to deal with the issue, eight indicated they expect legislation within three years. Almost half - 16 - indicated that there should either be EPR legislation, advance disposal fees, or some other policy aimed at ensuring manufacturers do their part. Most responses reflected a concern that there is a financing gap on electronics recovery that must be addressed in some way.

The report features nine tables of laws covering the U.S. and Canada.

Three states enacted or amended heavy metals bans in products, with New Hampshire passing a major ban on mercury in products. (*More on page 9*)

The Emergence of the "Digital Consumer"

"What consumers want can be summed up in three words: convenience, control and choice."

A supersession, "Outfitting the Digital Consumer," at the 2001 CES provided insights on what consumer's really want in their digital products. According to FamilyPC Editor-In-Chief Robin Raskin, who led the first part of the supersession, the promise for the digital consumer includes products that are all digital, simple to use and inexpensive. Furthermore, these products must feature total data synchronization, a human interface and input, and the ability for future upgrades. On the other side, some of the obstacles barring the widespread adoption of digital devices include products that don't talk to one another, a lack of installers, and gadgets that become obsolescent.

Raskin conducted a "tour" of a digital home looking at some of the products found in the connected home. Several consumer electronics companies, among them Cevia, Compaq, Dell, DirectTV, eWire, Gateway, Intel, Kerbango, Logitech, Microsoft, Mivo and Samsung, helped demo products for the digital home.

Part two of "Outfitting the Digital Consumer" was a panel discussion moderated by Steve Fox, editor of CNET Online, and included Morgan Gunther, TiVo; Ki Won Lee, Samsung Electronics Co. Ltd.; Paul Liao, Panasonic Technologies Inc. and Matsushita Electric Corp. of America; Frank Luntz, commentator/ author; Joseph McQuire, GoAmerica Communications;

Michael Moore, Cisco Systems Inc.; and Tyler Nelson, Research in Motion, Ltd.; Calin Pacurariu, HandSpring Inc. Panelists agreed that there has been a definite convergence with digital technology and that those who build simple, easy-to-use products will win with consumers. The panel discussed the Internet Home Alliance launched in October to promote the Internet lifestyle to consumers. Cisco's Moore said, "Our focus is to educate the consumer. But there is no single Holy Grail device in the home that addresses interoperability issues." Frank Luntz summarized the session saying, "What consumers want can be summed up in three words: convenience, control and choice."

ES&T is looking for News

Electronic Servicing & Technology magazine is expanding its news coverage.

Manufacturers, Distributors and other vendors are welcome to send news of people changes (including field service and product people), franchise additions and changes, warranty enhancements or alterations, financial news, policy changes and other information useful to the service professional. Photos and other graphics will be used as appropriate.

Servicers are also encouraged to forward news of importance on these and other subjects.

Send to: ES&T, Industry News, 403 Main St. Fl 2, Port Washington, NY 11050. 516-883-3382, Fax: 516-883-2162, mmei@mainlymarketing.com.

ATSC Issues Request for Proposals for VSB Enhancements

The Advanced Television Systems Committee (ATSC) Specialist Group on RF Transmission (T3/S9) has issued a Request for Proposals (RFP) for enhancements to ATSC transmission specifications. The activity is aimed at addressing emerging digital television (DTV) applications, including mobile services.

The RFP, which is available at http://www.atsc.org/RFP_VSB.pdf, was

Distributor Vance Baldwin Moves into New Quarters

Southern Florida Distributor, Vance Baldwin has moved into a 35,000 Square Foot facility in Davie, Florida. The new facility features a number of improved service systems including automated tracking, conveyor system picking, package verification systems.

Vance Baldwin provides parts fulfillment, service aids, original replacement parts, remote control pro-

grams and a variety of product exchange programs for service centers. Vance Baldwin supports servicers of computers, printers and consumer electronics ... and has full Internet E-Commerce capability.

The new address for Vance Baldwin is 7060 State Road 84, #12, Davie, FL 33317. Tel: 954-969-1811, Toll Free: 800-432-8542, Fax: 800-552-1429. www.vancebaldwin.com

ATSC & SBE Announce Cooperative DTV Education Effort

The Advanced Television Systems Committee (ATSC) and The Society of Broadcast Engineers (SBE) have agreed to

cooperate in developing educational materials and activities to assist broadcasters as they implement digital television.

SBE and ATSC will work together to develop a variety of training opportunities for broadcast engineers. These will include a manual that summarizes the essential aspects of ATSC standards, regional workshops on DTV implementation, and resources for local chapter activities. In addition the training materials will also cover the Program and System Information Protocol (PSIP) and Data Broadcast Standards. ATSC will also help develop DTV questions to be used in SBE certification programs.

Forum to Develop Language for In-Car Electronic Network

The Consumer Electronics Association (CEA) R-6 Mobile Electronics Committee is working with the Society of Automotive Engineers (SAE), the IDB Forum and automobile manufacturers to develop the products and functions that will be available on the Intelligent Transportation System Data Bus (IDB). IDB is a serial communication bus that creates an open, non-proprietary standard architecture allowing car owners to install multiple electronic devices without the need for complicated wiring or intensive installation. This digital in-car control network allows for easy, cost-effective and safe plug-and-play integration of new entertainment, wireless communications, navigation, personal digital assistants (PDA), telematics, antitheft and vehicle tracking

features, easily, cost-effectively and safely in any IDB equipped vehicle. General Motors Corp. and other automobile manufacturers have announced plans to release IDB equipped cars by 2004 or sooner.

To expedite the development of IDB products by consumer electronics manufacturers and facilitate the extensive testing to be undertaken by the automakers, the CEA Technology and Standards Department hosted the IDB A/V Message Set meeting in conjunction with the 2001 International CES. The purpose of the January 7, meeting was to examine the various "use cases" for in-vehicle entertainment and determine the functions that will be controlled through the bus.

Development of the IDB physical layer

was another topic of discussion during the January 7 meeting. Specifically, attendees addressed the need for a common interface that would allow any device manufacturer to connect to the bus. The group identified the inherent challenge presented by the harsh automotive environment particularly given the number of insertion cycles over the 10-year life of a car. To address this issue the R-6 Committee elected to develop a connector that is appropriate for consumer electronics devices and to provide the proposal to the automakers as a recommendation.

Review of the connector design will be the primary agenda item for the next R-6 meeting, tentatively scheduled for May 2001 in Washington, DC.

Sharp Signs Agreement With Sears

Recently, Sharp Electronics entered into an agreement with Sears for service on their microwave ovens. Industry reaction to this development has been very strong and ES&T has received a number of press releases and communications on the subject. We have also been in contact with Sharp regarding an original copy of their announcement and their views and observations on their decision. At

press time Sharp decided to delay a response to us until after a proposed meeting of service and retail association executives. This meeting was to be held during the NASC, but we have been advised that logistics and other concerns caused it to be postponed.

ES&T will provide an update in the March issue and will present Sharps' response and input as it is received.

From Wayne Markman

NESDA Industry Relations Chairman

Sharp announced this week that they had signed an agreement with Sears allowing Sears to become authorized service for Sharp microwave ovens. The reason for the decision was supposedly a lack of qualified servicenters in many areas of the country.

This decision has already had a chilling effect on both servicers and dealers of white goods and brown goods.

Most troubling is that the NESDA's Industry Relations Committee met with manufacturers including Sharp last week and nothing was said. We feel that our relationship with Sharp is good and that they could have met with us during CES (or before) and solicit our input before making this decision. Obviously, they could have spoken with NESDA and still come to the decision that Sears was their best option. It is NESDA's position that the independent service community CAN deliver the service that Sharp requires, provided that Sharp is willing to pay a rate that is profitable for servicers, including extras for travel beyond the normal service areas.

I spoke with several selling dealers and they are extremely upset with the notion that a Sears truck could be dispatched to their customer's home to perform warranty service.

Sears reportedly has agreed not to take advantage of the database of consumers provided by Sharp.

I cannot imagine that Sears will not solicit these consumers for a service contract or a Sears credit card. Once a contract is sold or a Sears credit card issued, the customer is converted to a Sears customer. I believe that Sears main reason for making this deal is to get their foot in the door and ultimately provide warranty service across the country for everything and everyone.

When the independent servicers are driven out, Sears can negotiate from a position of strength and will hold the manufacturers hostage. It is NESDA's position that authorizing a national selling dealer to provide warranty fulfillment for other non servicing dealers is unfair to the dealers and the independent service community and will severely harm the industry. The notion that we are not allowed to provide warranty service for products sold by Sears but they can provide warranty for everyone is blatantly unfair.

This issue should unite all trade associations, both white goods and brown goods servicers and selling dealers. Our voice MUST be heard in our opposition to this deal.

We should shed light on the fact that a company

like Hitachi has put their faith in independent service and Sharp has opted to use Sears for warranty fulfillment. Hitachi has made service literature available to all and has provided tech assist to the industry. Their decision to pay COD rates for warranty work shows their commitment to us. Hitachi is obviously concerned over the plight of the independent service community and has made the decision to use its resources to help us survive.

They cannot do it alone, we encourage others to follow their lead. We encourage servicers to respond to Hitachi and provide the best possible service for Hitachi customers.

We would have preferred that Sharp take a similar approach, rather than enlist the services of Sears, which we believe will prove detrimental to our industry.

From Mike Webber

NESDA President

This morning I spoke with one of the independent retailers that I do service work for. He carries Sharp microwaves. He asked me to fax Sharp's letter to him so he could present it to his buying group. He is very concerned that this is another example of the independent retailer being squeezed by this industry. He also informed me that two other appliance manufacturers tried this same approach a few years back and that it was not successful. He no longer sells those brands. He also indicated he will no longer sell Sharp microwaves. I will be curious to see what Best Buy's reaction will be to this move!

I have been in contact with representatives of the other national trade associations, and I feel that there is going to be unanimous opposition to Sharp's decision. Quite possibly Sharp will have done more to unite the independent service industry than anyone can imagine.

As President of NESDA, I feel that we must unite to work with the manufacturers that support the independent servicer and we must try to educate those that don't. We must become better business people to survive in the atmosphere our industry is today. Our association is the key to our future, and nesdanet is our voice.

NARDA

NARDA executive director, Elly Valas, wrote to Chuck Schaefer, vice president, Sharp Electronics, objecting to Sharp's newly announced policy effective February 1 of referring microwave repair customers to Sears. She said that "retailers work very

hard to earn the loyalty of customers... it is not in their best interest to promote and sell products that will be serviced by competing dealers" and urged Schaefer to reconsider the new policy.

NARDA vice president Randy Whitehead, Service West, Salt Lake City, is scheduled to meet with Schaefer and other independent service executives on February 9 to discuss the new policy.

If you would like to write to Sharp expressing your opinion of the new policy, the address is Mr. Chuck Schaefer, Vice President, Sharp Electronics, 1300 Naperville Drive, Romeoville, IL 60446.

Please send a copy of your letter to Elly at NARDA headquarters.

Open Letter to Electronic Manufacturers

Scotty Philips, NYESDA

Some electronic manufacturers have come around to realize they need the servicing industry to assist, promote and gain respect of their company.

Other manufacturers have not!

This letter is written for the awareness of business ethics for the "other" manufacturer. Specifically, are you conducting business with a "Do unto others, if you can get away with it" attitude?

Do you operate outside the realm of common business practice and courtesy, placing business goals way ahead of doing the "right thing"?

It's time to change the way you do business, and do some real damage control.

Unethical manufacturers may win in the short run, but they usually lose in the long run. Sometimes the losses are heavy. At the loss of respect.

The people who service your products, who recommend your products, who buy your products....WON'T.

Ron Sawyer on Sharp/Sears

Professional Service Association

Sharp Authorizes Sears for Service Authorized service centers for Sharp have now received a letter dated December 20, 2000 that states that in the best judgment of Sharp Electronics, they have seen fit to authorize Sears to provide warranty service on microwaves, air conditioners and vacuum cleaners. They are very quick to note that the "home entertainment" product categories are not included in this action.

The rationale for this decision is based entirely on their concern for you the independent service center

who would have to take people away from their service bench to make a timely service call to the customer's home which will cut into your productivity and reduce your profitability.

The second reason given for this decision is the fact that appliance service centers have been declining in recent years and that made it necessary to pursue an agreement with a national service provider. Since Sears was in the best position to provide the service that Sharp requires, the decision was made.

It was also noted in the letter, that considerable care was taken to prohibit Sears from utilizing Sharp-supplied customer data for the sale of any Sears product or services provided by Sears.

The letter goes on to reassure servicers that it is not Sharp's intention to replace their independent service network with a national service provider and that they have no plans to add any other product categories to the agreement "at this time". The Sharp service locator will list both Sears and the closest independent service center to the person making the inquiry. Sharp goes on to explain that the decision to enter into this agreement with Sears is simply designed to improve the service coverage that they provide to their home appliance customers.

Well now, don't you just feel warm and fuzzy all over to know that big brother Sharp is so interested in your well being that he has for all practical purpose taken at least microwave ovens out of your hands to make you more profitable. As far as air conditioners and vacuums are concerned, they pay such low rates for warranty service, that appliance service centers will not accept the work because it is so unprofitable to them.

Now let's take a look at that statement about appliance service centers steadily declining in recent years. It is true that appliance service centers have declined in recent years, but electronics service centers have and are continuing to decline at a much more accelerated rate to the point where at this time there are far more appliance service centers nationally than electronics service centers. If the fact that declining service centers is the rationale used for making this decision to go with a national service provider, then where does that leave electronic service centers in the future. This is especially true when Sharp states in this letter that they have no plans to include other product categories at "this time".

Another statement in this letter that bears further scrutiny is the part about "Considerable care was taken to ensure that Sears could not utilize the Sharp-supplied data for the sale of any Sears product or services". First of all, I don't know how you would stop them from doing that since the information that goes into their computer system will place the consumer on the mailing list for all Sears direct mail and phone solicitations. I believe the key word here is "Sharp-supplied data". Since the information on warranty customers will come directly from the consumer and not from Sharp, there is no responsibility for Sharp to police this clause of the agreement. Furthermore,

when the Sears truck pulls up in front of the customer's home to service that Sharp product that was purchased at Best Buy or some other retailer, what kind of a message does that send to consumers and retailers?

And lastly, why did it take almost a month to get this letter out to service centers? Could it be that a national service summit was scheduled to take place at the CES show in Las Vegas and it would have been too embarrassing to announce it before that meeting and receive the heat in person?

Regardless of the spin that Sharp has tried to put on this announcement, I believe that service centers should be wary and consider this action a preview for things to come.

Texas Electronics Association

The Board of Directors of the Texas Electronics Association at the January 21, 2001 meeting unanimously agreed that Sharp's decision to allow Sears to service products that were formerly repaired by independent servicers is very detrimental to the independent electronics service industry. Since Sharp

From Richard Mildenberger, CET/CA

*NESDA Region 2 Director
GYNESDA Editor*

I am forwarding an article which subject may be of interest to your retail readers.

SEARS NOT TOO SHARP!

Editorial by Vic Gerry

If you were Circuit City, Best Buys, The Wiz or any other Electronics / Appliance Retailer, the last thing you would want to see is a Sears truck pulling up to your customers home to service an item that you sold. Well, it's happening! Sharp Electronics has signed a deal that will have Sears service it's Microwave Ovens, Air Conditioners and Vacuum Cleaners, this policy has not yet extended to Electronics. On December 20, 2000 (Actually it was more like January 16, 2001) Sharp Electronics released a letter informing their Independent Service Network that, Sears would be added to the Sharp Service Network to repair the items I just mentioned.

What a surprise it was to find out that Mr. Charles (Chuck) Schaefer, VP of Sharp Service, had signed the letter informing us about Sears. Unfortunately he failed to mention it to the leaders of NESDA, NARDA, PSA and ETA when they met with him on Monday, January 8th during a National Service Summit. The letter dated December 20 did not go out until after the Summit. THIS DOES NOT PLAY WELL WITH THE SERVICE COMMUNITY! Mr. Schaefer and his staff should be ashamed they didn't have the guts to tell us to our face that they had entered into an agreement with Sears.

By the time you read this editorial the entire

has decided to remove a product category that was at least marginally profitable, they are leaving us with products such as large screen TV on which their rates are far below the cost of doing business.

According to Sharp, the lack of qualified independent servicers in certain areas was their reason for joining Sears. We believe it has more to do with the rate of warranty reimbursement than the number of qualified technicians available to service the product. If service centers were able to pay technicians a competitive wage in today's market place there would not be a technician shortage in our industry. If we were paid better rates we could afford to pay our technicians a livable wage and be able to attract new people to our industry.

The decline in the cost of consumer electronic products has eliminated the repair of many product categories after the warranty expires on these items. The taking away of certain in-warranty product lines from independent service is increasing. We therefore feel that if these trends continue, Sharp will soon find itself having to have Sears repair more than just the product categories they are currently having them service.

sales world will know about the unholy alliance. I wonder how many millions of dollars Sharp Sales will lose? Was this worth it? Wouldn't it have been better and less expensive to pay the existing Service Centers their GOING RATE and a bonus for service out of their normal area? This would have accomplished the same goals.

"WHEN WILL THEY EVER LEARN"? Approximately 13 years ago, some of you will remember, Sharp Electronics original Master Center Service Plan. Over a weekend, New York Service Dealers awoke to find new Sharp Authorized drop off centers scattered about the Queens area. In some cases these drop off centers were located right near an existing Sharp Authorized Service Center, WHY? Well, it seems that Mr. Art Sherman, VP of Sharp Service and Ms. Jan Corbin, Service Coordinator, had come up with an idea! Allow a large Service Center to takeover all service in the area. WHY? Sharp couldn't get all of its product line serviced by the regular service centers, WHY? PERHAPS Sharp didn't pay a realistic rate? Well, nevertheless, because of Sharp's SNEAK ATTACK, the local associations, TESA of Long Island and METSDA (the New York City Association) along with NESDA had to take action. Without going into endless details, SHARP COULDN'T STAND THE BAD PRESS, ALL THE WAY BACK TO JAPAN! The Master and Select Service Centers of today are not what was originally planned. Thanks to the hard working and relentless leaders of the Electronic Service Associations, Sharp gave in and changed a horrible plan into a tolerable situation. ■

Service Center Management Trends

By the ES&T Staff

The world of consumer electronics has changed immensely over the past several decades. Entertainment in the home has gone from a living room with a TV and maybe a stereo sound system to some form of home theater system. Where once the video display device was a 19" or maybe 25" TV set, it's now a 30+" monster that's both TV and video monitor, either direct view or projection.

But it's not just the home consumer electronics setting that has changed. Manufacturers have made substantial changes in the way they provide service support. Some manufacturers, notably Thomson, have stopped making paper service manuals available. In those cases, service literature is delivered on CD-ROM. A number of manufacturers now have internet web sites and provide service literature and other support services from those sites.

Changes of this magnitude in consumer electronics products, and in the way manufacturers support service on their products, dictate that service centers make changes in the way they manage their business. Following are some of the trends that your service center may already be involved in, or soon to be experiencing.

One Service Center Owner's Observations

This section is based on an article written by William S. "Bill" Warren, CET/CSM of Tennessee, which appeared in the October 2000 issue of the Massachusetts ETG State Guild News. In the article, Warren described some of the features that he believes that a service center of today ought to have, or at least consider.

Loading/unloading of large items: A service company needs a real loading dock that is made for loading and unloading of product from the types of trucks you are using. To accommodate different types of trucks you need either more than one dock or some sort of adapter.

Demo area: One of the easiest ways to

prevent unnecessary returns (or whatever you wish to call them) is to demonstrate the proper operation of each unit at the time it goes out. This means you should have easy connections to demonstrate whatever types of products you service. We had a patch panel for audio that allowed for demo'ing speakers, as well as hooking up any kind of equipment you could want. In addition we had video and RF sources (RF on each different band) as well as a signal generator handy so our counter personnel could give a signal for whatever channel

"...savvy service managers have responded by providing their on-site technicians with enhanced training, more well-stocked trucks, a broader array of test equipment and more detailed service literature so that they can, if possible, complete the service call on the first visit."

they might have had trouble with. The demo area should be apart from the general counter so you can have "private" one-on-one without interruptions.

Accessories area: I recommend that it not be a separate area. This said, if you want to sell accessories, there is only one good way I have found - be sure your people TRY to sell items to each and every customer. I found that incentives worked well.

Service lift: The best I have seen are custom benches with hydraulic lifts. If you have the room, I saw one setup where the servicer had roll around carts with hydraulic lifts on them. The cart's wheels retracted to lock the cart firmly in place once it was positioned. This allowed for the set to be picked up only once. The carts had a pretty good lift range to them so you didn't have to pick up very high to place on the cart yet would raise the product to a good level for service.

Burn-in room: It depends on volume of work done and types of work done. But I firmly believe that all sets should be run

for 24 hours prior to returning them to the customer. I had the area next to the counter (out of sight of the customer) so my counter people could keep an eye on them. (techs repair - other functions can be handled by lower cost labor)

Lighting: electricity and lights are just not that expensive. Work areas should be well lighted, clean, and well ventilated. I also gave each tech a fluorescent magnifying lamp and a swing-arm high intensity lamp on each bench.

Service on Site

In the early days of television and television service, many sets were console models, frequently as part of a TV/radio/phono combination. These large heavy units were usually serviced in the home. As sets generally became smaller, and solid-stage-based, they became harder to fix on site and easier to carry in to the service center. The new servicing paradigm became service on the bench in the service center.

Today the pendulum has begun to swing in the opposite direction again. Large-screen, direct view or projection, sets are heavy and cumbersome, and so not easy to carry into the service center without causing damage to the product or the client's home, or injury to the technician. Moreover, manufacturers have made strides to make today's sets more modular, and so easier to service in the home.

As a result, savvy service managers have responded by providing their on-site technicians with enhanced training, more well-stocked trucks, a broader array of test equipment and more detailed service literature so that they can, if possible, complete the service call on the first visit.

Hookup Service

I was talking to Mike Viscardi, owner of PIR TV/Video Service Center just the other day. In addition to the business I wanted to discuss with him, I asked him the general question "how's business going?" His reply, unlike that of many other service center owners who are bemoaning the dearth of business, was that things are great. He

has more business than he can keep up with. That made my ears perk up.

Mike told me that one of the things he has been doing is in-home hookup business. Ordinary people with no technical skills at all buy a TV/monitor, a 5.1 channel surround-sound receiver with Dolby noise reduction, a VCR, a DVD player, a CD player, and maybe a TiVO-based recorder, and receive signals from cable, satellite, and sometimes local commercial TV signals, and want to be able to access the internet from their home theater location as well.

These consumers see all the input connectors, all the output connectors, all the remote controls and all the wires and throw up their hands in fear. They call Mike, who, for a cool \$250.00, comes in, makes order out of the chaos and explains to them how to operate all of those remote control devices.

Hazardous Waste Disposal

Consumer electronics products contain hazardous waste. For example, both the solder used to interconnect components, and the glass from which CRTs are fabricated contain lead. There are a number of other various toxic materials in most electronics products. This has been an ongoing problem, but now that rapid advances in technology and low product prices have fostered a throw-away mentality among consumers, the flow of electronics products from homes to waste disposal facilities has increased alarmingly.

A number of state and local governments have begun to restrict the materials that citizens and companies may send to the dump. Massachusetts, for example, will no longer allow the dumping of any CRT's. NYS Senate has a similar proposal in the hopper. These devices must be recycled. Minnesota and Florida have passed legislation to restrict dumping of consumer electronics products. New York State has recycling legislation in the works and other states will no doubt follow.

The following is the President's Message from the September-October-November 2000 Watts Current, the Florida Electronic Sales and Service Association magazine, written by Marge Bluze. It summarizes to some extent the

experiences of George and Marge Bluze of SOS Electronics in Florida in disposing of some older consumer electronics products in Florida. This signals a need for all service centers to consider such issues in formulating service center policies and procedures.

"Dear FESA Members and Industry Friends, I have been writing about the problems of disposing of electronic hazardous waste for some months now. I thought I was fairly well educated until it became necessary to give up our storage garage due to a substantial rent increase. We had to dispose of our old TVs, VCR's, modules, PC boards, CRT's, computers and printers. We never realized how much "stuff" we had accumulated over this period of time.

"After making several phone calls, I found out we couldn't just load up a truck and run it to the local solid waste disposal-recycling area. We had to have the storage garage cleaned out by October 1st. The earliest day available for disposal was November 15th. The local disposal area got in touch with Creative recycling, located in Tampa, and they called with a suggested solution for our problem. They offered to send a truck to our store and do an on-site pick-up. We saved a great deal of money by disassembling, removing and categorizing all the hazardous waste from their cabinets etc. If you choose not to do this you pay the highest rate per pound depending upon the size of the CRT.

Below is a list of pricing for Business and Governmental Agencies:

Per Lb. Pricing:

Large Televisions	\$0.20
Small TV's (19" and under)	\$0.25
Monitors	\$0.30
Microwaves Printers & Copiers	\$0.30
Plotters	\$0.03
Stereos, Camcorders & VCR's	\$0.05
Radios & Keyboards	\$0.05

Per Lb. Rebates:

Floppy, Tape & Hard Drives	\$0.25
Interface & CD ROMs	\$0.20
Telephones & Power Supplies	\$0.10
CPU's	\$0.05

"At this time, the servicing dealer is the one who is left with all the cost and inconvenience to ensure proper disposal; better

known as left holding the bag. This is Grossly unfair. Our ultimate goal is to have this responsibility assigned to the party most responsible by amount contributed to our collective stream of hazardous waste. Even if you now require estimate fees upfront those amounts will be insufficient to protect you from this most recent state implied risk. It will become necessary to include any potential disposal cost with your estimate fees to avoid becoming your area's public electronic dumpster. The fee can be applied to the repair or reflined when the unit is picked up as appropriate."

Unique Services

When a new technology comes along, most of us abandon the old and embrace the new. For example, I have a perfectly good Garrard turntable and a large stack of vinyl LPs that contain music that once was, and still remains, dear to me. But the turntable is on a shelf in the basement, and the LPs languish in storage. My CD changer is convenient, sounds great, and I have lots of CDs for it. I believe that most people have made substantially the same conversion from vinyl to CDs.

A substantial minority of people do not make wholesale changes so quickly. They may embrace the new, but for whatever reason want to hang on to the old. These are the folks who still have 33 $\frac{1}{3}$, 45, 78rpm turntables, vacuum-tube amplifiers, and old, perfectly-functioning 13-inch monochrome TVs.

It is proper for a technician to point out to a potential client that a given repair does not make economic sense. But it is also important to listen to that client. If their answer is "I understand, but I still want it fixed," if it's within the realm of possibility, it might be a good idea to take on the repair. It could lead to a satisfied customer as well as to a lucrative sideline in fixing antique TVs, radios, turntables, speaker reconing and who knows what.

Personal Computer/Internet/Home Networking

Millions of consumers have successfully introduced personal computers and all the attendant peripherals into their homes. Millions more haven't the vaguest idea where to even start, but would like

to. Some consumer electronics service centers have added a profitable sideline to their businesses by offering to install computers, install software and get it up and running.

With more and more broadband connections and homes with multiple computers, people will increasingly want to network their computers. In answer to this need to network, manufacturers are introducing new ways to network: at least two forms of wireless, as well as products that allow consumers to network computers via power lines and telephones.

Service centers that have not looked into the potentially lucrative sideline of helping local consumers become computer/internet literate might at least have a look and see if it's for them.

Words of the President of NESDA

In his "President's Message: Planning to Survive in the 21st Century," published

in the ProService Millennium Directory & Yearbook, published by the National Electronic Service Dealers Association, Wayne Markman addressed many of the issues and trends that affect consumer electronic service centers.

"While many of the forecasters (at the organization's annual convention and trade show) alluded to it, none spoke openly about the present state of the industry. But I'm sure they know as well as we that the independent service industry is in trouble. Of course, some of our people are in danger because they did not heed the warnings to change, and as a result, continued in the rut of business as usual. But if challenges are opportunities, we can afford only so many opportunities. In addition to the things we know we must do as professionals, we are at the mercy of many other factors that are not our fault. I will list some of them as follows:

There is serious erosion of the retailer network. Many of the selling dealers who utilized and recommended our servicers to consumers, have disappeared. What's left are the high profile megastores with their own service departments, frequently subsidized by sales.

The situation of lower-priced finished goods vs. the high cost of replacement parts and repairs continues to shrink the repair market.

High-technology units require more time to service, even if it is just to verify proper operation. For example, it is quite time consuming to fully check the operation of a five-channel audio receiver, even when there is no hardware failure.

The "new consumer (including the manufacturer) expects more/better/faster service for less money. They expect flawless performance from their products, and when it does fail, they expect it to be returned not in weeks, but in days, or hours. But there is no apparent willingness to pay proportionally fore for this better service.

Servicers are facing greatly increased risk in dealing with larger, heavier sets. We risk grave injury to ourselves and to our technicians, especially the more senior ones in an increasingly litigious climate. We also risk damaging floors and

cabinetry and potentially face refinishing charges that exceed the total repair bill.

What can we do to remain viable? I suggest the following:

Concentrate on in-home service. For most service centers there is no future in small product repair.

Diversify. Don't think of repairing a "product" for a living; think of meeting the customer's every entertainment need.

Modify our mindset on how we charge for our services, both in- and out-of-warranty. While every individual repair job doesn't have to produce a profit, every category must be profitable, or must lead directly to more profits from elsewhere.

Accept all of the computer-based support services offered by manufacturers. This is the wave of the future, and you cannot escape it if you are to survive.

Embrace concepts such as accessory sales, interconnectivity, and installation. While you will still need to repair some products, you must mentally place yourself in the consumer-problem-solving business.

"I am convinced that if we can remain tough enough to survive the next few years, the digital products that are on the horizon will provide unparalleled service opportunities. However, we will have to heed the advice of the manufacturers and prepare ourselves and our service centers to promptly and properly repair these new and different products."

The More Things Change...

The French have an expression: "Plus ca change, plus c'est la meme chose (the more it changes, the more it stays the same)." There is still some truth to that, but today it might properly be said "The more things change, the more other things change." And they change at dizzying speed. There are forces at work on a number of fronts: advancing technology, new products, manufacturers, the financial community, government, consumers, that are affecting consumer electronics service. Service centers need to remain aware of the trends that are affecting them, and establish their own trends in order to not only cope, but prosper, as these changes continue to unfold. ■



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Service Center Management Software

By the ES&T Staff

When thinking about the benefits that a personal computer brings to a business enterprise, it's interesting to try to pin down which of them is the most useful. One of the most useful things a computer can do for a business is store names, addresses, and other personal data on the business's clients and prospects, including comments on their needs, preferences, etc. And that data can be retrieved and manipulated in dozens of ways. Moreover, the computer makes it a cinch to search for that data and find it almost instantaneously. But then, there's the ability of a computer to store text and allow it to be printed out, perfectly, over and over, without ever typing it in again. Another useful ability of computers is to store data about inventory, to update that information effortlessly, and to provide reports about that data in any way it's useful.

And how about the ability to connect via the internet to suppliers, clients, and the world at large?

Ok, sure; computers crash from time to time making them

one of the most frustrating products to deal with. And it takes time to learn to use a computer. But even with their shortcomings and faults, personal computers are a necessity to do business in today's world. And that includes consumer electronics service centers.

Service Center Management

A number of successful service center owners/managers recognized the value of computers to the service center a long time ago and took steps to incorporate many of the capabilities of the personal computer into the business. A few of these "early adopters" developed some pretty good software programs, and have since gone into the business of selling their software to other service centers. The following text describes the capabilities of one of these service management software packages. Most of the available service center management software packages have a similar set of functions with some variations here and there.

• Automatic Customer Search

When adding a new record, the system will check the database for a previous record for the customer being added. If one exists, all of the customer's information will be transferred to the new work order. The system will also search archived records.

• Automatic Labor Rates

The system will automatically provide the correct labor rate for each repair selected on the Work Order input screen. These rates are entered and maintained in separate database files and are available by manufacturer, model number, 3rd Party or product. You can also create your own fixed labor rate database that will hold an unlimited number of pre-coded labor rates that can automatically be applied to itemize labor for each repair. You will have the ability of applying up to 10 itemized labor charges to each repair.

• Automatic Serial Number Check

Upon entering a serial number on the Work Order input screen, the system will immediately check the database for previous repairs and inform you of the last date that unit was serviced. You also have the option of pressing a function key and display a history of each time that serial number was serviced.

• Zip Code Database

When entering a zip code on the Work Order input screen, the system will automatically retrieve the City and State for the Zip Code database.

• Parts Cross Reference

The software has a unique way of cross-referencing parts. When you add parts into the Inventory database, you can assign a generic number to each part number. When you request a cross-reference lookup, the system will display every part in your inventory that uses the same generic number. You can see at a glance each replacement part along with its cost and retail amounts. Another window will be displayed with up to ten additional replacement suggestions. This method allows you to use your entire inventory as replacement parts for other part numbers searched.

• Model Number Database

A separate database file will track model numbers and will allow you to assign C.O.D., Warranty and 3rd Party labor rates for each. The system will automatically retrieve the correct rate upon request. This file will also track the length of warranty for each model and alert the user the warranty status of each repair.

• Service Literature Database

This file will allow you to track your service literature and cross reference manual numbers with Sams and microfiche. Pressing a function key from the Work Order entry screen provides instant look-ups.

• Manufacturer's Rates Database

This file will categorize assigned labor rates for each product assigned to each manufacturer. These rates are available upon request from the Work Order input screen.

• Printed Warranty Forms

Select to print on continuous NARDA Electronic repair form #923, NARDA Appliance repair form #360, NARDA Work Order form #ss-100, and NESDA form #N5CN. the software is also capable of printing your company information on forms ordered without the company imprint.

• C.O.D. and 3rd Party Invoices

Invoices are printed on plain computer paper. Only charges that apply to each will be printed. You have the ability to print a C.O.D. invoice that also has 3rd Party or Warranty Charges and only show the C.O.D. charges. The same holds true for printing 3rd Party invoices with other charges attached.

• **Over-the-Counter Quick Sale**

This feature will provide a short entry screen that will integrate into your Inventory for a quick over-the-counter sale.

• **Batch Billing and Payments**

All Warranty and 3rd Party Claims can be billed and printed as a batch. The system will automatically select all work orders that are ready for billing for any given period of time. There is also a feature to print a report on all un-billed claims. This is a full proof way to be certain all claims are being billed on time and none are missed.

When it comes time to apply payments, the software makes the process simple and quick. Display all claims for all open accounts in a browse window and simply mark which ones you want to pay. The system will automatically update all associated files with a touch of a key.

• **Complaint and Service Codes**

The system comes equipped with all the EIA complaint and service codes built in. You also have the ability to edit, delete or add additional codes as needed. Look-up and selection windows are available on the work order input screen upon request.

• **Automatic Claim Numbers**

The software will let you choose between an Automatic, a Modulus, or a Manual numbering system. The Modulus system will use the same numbering format as the NARDA and NESDA forms. These settings are selectable through the Utility Set-Up menu.

• **Automatic Warranty Status**

Upon entering a purchase date on the work order input screen, the system will alert you of the warranty status for parts and labor remaining on the product selected.

• **Validations**

When marking a warranty repair completed, the system will validate all required fields and will alert you of any fields missing. This feature alone will save many unnecessary rejections.

• **Fully Integrated Inventory and Purchase Ordering**

When entering parts on the work order input screen, the software will link directly into the Inventory and Purchase Order files for automatic updating and validations. If a part entered is not in inventory or the quantity entered is larger than the quantity available, you are alerted and given the opportunity to assign the part to a purchase order. The system will automatically use an open P.O. for the vendor selected, or will create a new one. Purchase orders can be closed and batch printed at any time. The Purchase order menu will allow for full control and tracking of open P.O.'s including browse screens. When parts are received, the system automatically updates all related files. A full-featured menu will provide reports and information to completely control your inventory.

• **Revenue Reports**

The software will provide many reports that will help you with the accounting end of your business. Revenue evaluation reports will break down revenue for any period of time and also for any selected category. Daily Income Summary, Balance reports, and Method of Payment Reports will provide everything you need know about revenue received.

• **Accounts Receivable Reports**

The software will provide control for receivables for both warranty and 3rd party open invoices. Aging reports will break down receivables for current, over 30, over 60, over 90, and over 120 days.

• **Statements**

The software will provide printed statements for your open account customers. You can print a statement for any selected account or a batch process will print statements for all open accounts. The statements are formatted to fit into a standard dual window envelope.

• **Billing Control**

A billing window will provide tracking on payments for each invoice. Partial and split payments are also supported. With

this screen, you can tell at a glance what is paid and what is still open for each billing category.

• **Work Order Reports**

Many reports are provided in the work order menu to control every phase of a repair. You can report on incomplete units, completed units not returned, units waiting for parts, units unclaimed, units returned and not paid and much more.

• **Store Status Reports**

The software is capable of handling multi-store servicing. For example, let's say you handle service for all K-Mart stores in your area. You can track repairs separately for each store and provide status reports for each as well. You can even locate repairs using a store's work order or P.O. number or unit serial number. Print out a delivery report for each store with ease.

• **Technician Reports**

Reports are provided for detailed technician productivity for any period of time as well as technician work assignments.

• **Model Number Service Report**

The system will quickly display or print out all previous repairs to a particular model number or a group of model numbers. The report is formatted to show the complaints, service performed, parts used and comments for each repair. The system will even search archived files for information.

• **Employee Database**

The Employee file will keep track of general information for each employee. You can set up employee codes to be used for work order assignments and various reports.

• **File Maintenance**

The software provides separate menus to maintain files for Vendors, Manufacturers, Stores, and 3rd Parties. Each file will provide a browse screen for look-ups and the ability to print the contents of the files.

• **Utility Features**

A Utility menu is also provided to allow you to change the set-up parameters to

customize the program. The system will accept all tax structures used in the United States. You can configure the system to apply sales tax in any combination needed. Customize various letters and post cards with ease.

• Archiving History Files

It is very important to be able to handle files when they begin to grow and age. The archiving feature in the software will allow you to remove records for a selected period of time and store them in history archives. These history files can then be backed up and removed from your hard drive or you can leave them on your drive so the software can access them for future reference. You are provided with a complete history menu that will allow you to locate, browse and display archived records with the same ease as regular records. The software will even look into your archived files when creating new records in order to retrieve information from previous repairs.

• Sperry Markup Feature

On of the software's special features is its ability to automatically assign a retail price whenever you input a cost price to an inventory or work order record. The system is equipped with the Sperry Markup Table. This table can be modified to any markup structure you wish, or can be completely disabled. If changes are made, the system will automatically recalculate the entire inventory with the new markup scheme. Another unique feature is its ability to automatically increase or decrease prices assigned to parts in the inventory file by percentages for any selected vendor.

• Label Functions

A label menu is provided that will allow you to print mailing labels by a number of selected file sorts. As an example, if you wanted to address everyone in a certain zip code, area code, or perhaps everyone who owned a particular brand or product.

• Printer Drivers

The software service manager comes with built-in printer drivers for over 850 dot

matrix and laser printers. LPT port assignments will allow you to pre-assign printers to all the different types of documents and will also allow you to switch the output to any selected port on the fly.

• User Profiles

The software has a unique security access system built-in. You will be able to set-up user profiles for each user and assign separate user names and passwords. Each profile can be customized allowing you to grant or deny access for over 100 areas of the program. User files are hidden and encrypted for security.

• Tapping the Power of the Computer

In addition to the benefits of the personal computer mentioned at the outset of this article, other major benefits of using computers are speed, consistency and accuracy. By using the personal to automate repetitive tasks, everything is done the same way every time. Once you have checked and double checked the spelling of the names and addresses of your clients, once you have proofread their telephone numbers, product serial numbers, component part numbers, when you call them up to use in a transaction, they will always be correct. No one will transpose digits, misspell a client's name, or order an incorrect part number.

At a cost of around \$2,000.00 for an advanced computer, and a few hundred dollars for a service management software package, service centers of today can hardly afford to be without such a powerful assistant.

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February 2001

Electronic Servicing & Technology 15

Phone Systems

By the ES&T Staff

There was a time, and not so long ago, when the telephone line coming into the house was just that; a telephone line. The local telephone company took responsibility for the wire right up to the telephone, and leased the telephone to you. You used the telephone and its associated wiring for one thing: making and receiving telephone calls.

Things were a lot simpler then. Not necessary most convenient and economical to the homeowner, but no question it was simple. If you had a problem with your telephone, or the wiring, the telephone company came out and solved the problem. No charge.

Things Have Changed

Today, the telephone company brings the telephone wire up to a box that they place on the outside of your house. The box has two sides; the telephone company side, and the homeowner's side. This unit is called a "Network Interface Device" (Figure 1). If you have a problem with your telephone and you call the phone company, if they come to your home and find that the problem is on the telephone company side, they'll correct it at no charge. If they come to your home and determine that the problem is on your side of the box, they'll charge you for the visit and give you the option of having

company that provides you with service probably uses your telephone connection to communicate. If you have a dial-up internet connection, you're transmitting and receiving data via that telephone wire. Some homes are using the internal home telephone wiring to network their computers.

If a consumer electronic service center sends a technician out to a residence to troubleshoot any of a number of problems, he may be getting into areas where the telephone line figures significantly. If he is not to look foolish, or compound problems by doing the wrong things, it might be a good idea if he is familiar with how the telephone wiring is connected.

A Word About Safety

For the most part, telephone systems deliver voice frequency signals at low voltage and current levels; quite safe. But, and this is a big but, when the telephone rings, the ring voltage is around 90V and delivers enough current to activate an old telephone ringer. As one who was working

on a telephone system once when someone called in, I can tell you it's not a pleasant experience to have this signal applied to your fingers. And no doubt it can be dangerous under the wrong conditions, so before you begin working on a telephone system, disconnect the line at the box.

Furthermore, as telephone wires can conduct the energy from a direct lightning hit, or the voltage induced by a lightning that strikes near a telephone wire, never work on a telephone system when there are thunderstorms in the area.

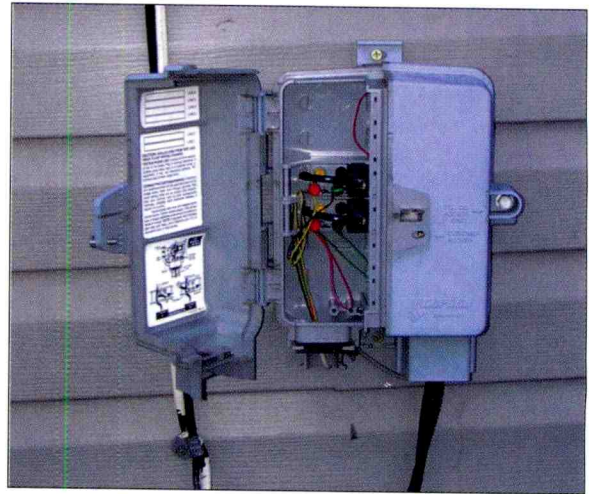


Figure 1 This unit is called a "Network Interface Device". Note that there are two jacks and plugs, and red, green, black and yellow wires, revealing that there are two lines coming into this home. Note also that one of the wires feeding the device has been painted, and one has not. This is an older home to which the second phone line was added a considerable time after the first line was installed.

Here's another caution. A web site I visited recommended against working on telephone systems if you're wearing a pacemaker. I'm not sure why that is, but if you wear a pacemaker, you should look into this if you're thinking of working on a telephone system.

A Single-Line Residential Telephone System

If you're going to be working on a telephone system, what you see will most likely depend on the age of the residence, and/or whether or not the owner has at one time or another ordered a second line. In older homes, the telephone company would have only run a single telephone line, and it would have terminated in the basement somewhere near where the line enters.

If this is a newer home, or if the homeowner has at some time or another added a second line, there will probably be a service box where the service enters, and there will be two lines available whether or not both are in use.

It was a clever move on the part of telephone companies to provide a two-line system. A hefty percentage of homes now

(Continued on page 18)

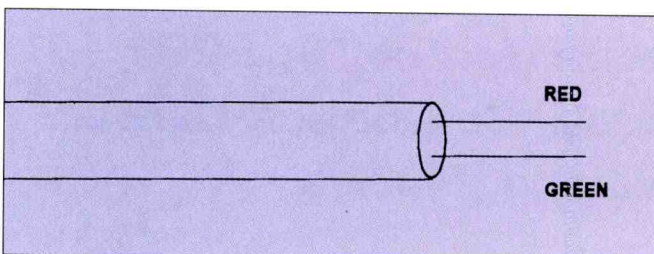


Figure 2. If you inspect the telephone wiring in a home with a single telephone line, you'll find that there are only two wires: red and green.

them correct the problem, or getting some other contractor to do it.

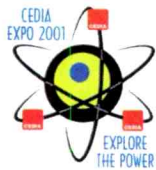
Perhaps even more important, the telephone wiring in your home and the telephone company's connection to the outside world does a lot more than it used to. If you have a satellite TV system, the

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STR3125	2.87			221-149-02	1.54	221-284	7.35	221-498	5.18	221-712-01	27.37	221-900-01	17.08
STR5412	3.85	ZENITH* TUNER ASSYS		221-153	34.30	221-285-02	16.66	221-516	6.93	221-712-02	27.37	221-900-04	27.44
STR10006	5.24	175-2410	27.93	221-154	16.73	221-285-03	15.26	221-518-02	27.93	221-713-03	29.05	221-911A	52.00
STR13006	4.34	175-2770	24.99	221-155-02	17.88	221-289-09	2.81	221-520	26.53	221-714-02	29.05	221-913	22.75
STR16006	4.83	175-2771	24.99	221-157-02	11.69	221-289-11	4.75	221-521	24.43	221-718-01	21.98	221-913-02	22.75
STR30110	2.17	ZENITH* IC'S		221-158	1.05	221-289-38	4.75	221-522	18.48	221-731	6.68	221-924-01	10.39
STR30115	2.86	221-40	4.13	221-158-03	1.05	221-296	4.20	221-524-01	22.82	221-732-01	54.81	221-937	4.83
STR30120	2.17	221-42	2.10	221-158-04	1.05	221-297	2.59	221-528	3.14	221-733	21.35	221-940-02	17.57
STR30123	2.17	221-43	2.45	221-160	3.78	221-300	8.71	221-537	16.09	221-744	24.07	221-940-04	17.22
STR30125	2.17	221-45-01	2.24	221-160-01	3.78	221-301	1.05	221-538-01	31.23	221-750	6.85	221-947-01	30.00
STR30130	2.17	221-48	.63	221-164	2.45	221-303	2.73	221-542-01	7.97	221-752-02	12.08	221-948-01	21.84
STR30135	2.17	221-62	2.03	221-166-05	1.53	221-304	2.66	221-544-01	28.70	221-753-04	28.56	221-949-01	21.84
STR40090	3.44	221-69	1.75	221-167-05	.91	221-305-02	40.25	221-545	4.03	221-754-02	29.05	221-987-01	7.97
STR50041A	4.13	221-77	3.50	221-169	4.90	221-306	18.83	221-546	2.03	221-761	.28	221-997-01	9.74
STR50103A	3.92	221-78	5.91	221-174-02	2.81	221-314	9.80	221-552	5.11	221-773-02	27.65	221-998-06	9.77
STR51041	4.34	221-81	7.60	221-175-01	6.93	221-345	5.60	221-554-01	33.40	221-774-02	28.14	221-1006-02	23.10
STR52041	9.73	221-83	15.47	221-177	1.75	221-349	2.42	221-557	9.17	221-776-01	29.05	221-1006-03	25.76
STR52100A	4.34	221-88	5.17	221-179-01	12.53	221-359	1.37	221-562	21.77	221-791-01	6.23	221-1006-05	25.84
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STR60001	4.59	221-94	10.54	221-182-10	.14	221-369	15.54	221-568	11.76	221-808-01	14.38	221-1058	18.95
STR83145	8.33	221-96	2.10	221-182-18	.14	221-370	8.82	221-571	31.29	221-808-02	14.38	221-1060	29.25
STRD1005T	3.44	221-97	2.24	221-184-02	4.13	221-371-01	36.26	221-571-01	31.29	221-811-02	14.38	221-1138-01	25.06
STRD1206	4.34	221-99	2.24	221-184-04	.50	221-373-02	26.74	221-576-01	6.36	221-812	30.17	221-1155	4.13
STRD1406	3.85	221-100	4.75	221-184-05	7.97	221-376	35.84	221-586	7.49	221-813	11.13	NAP* TUNERS	
STRD1806	4.13	221-102-01	6.93	221-187	1.26	221-379	2.81	221-587-01	6.30	221-814	21.42	340297-1	27.93
STRD3010	3.85	221-103	2.03	221-187-01	9.73	221-380-01	6.44	221-590	8.47	221-844	2.02	340313-5	36.39
STRD3015	3.85	221-104	2.45	221-190	9.73	221-382-01	.84	221-599	30.17	221-845	6.36	340354-2	29.99
STRD3030	3.85	221-106	2.10	221-199	9.73	221-386	16.74	221-599-02	28.49	221-849	4.75		
STRD3035	3.85	221-112	2.24	221-200	29.68	221-394	9.17	221-604-01	36.19				
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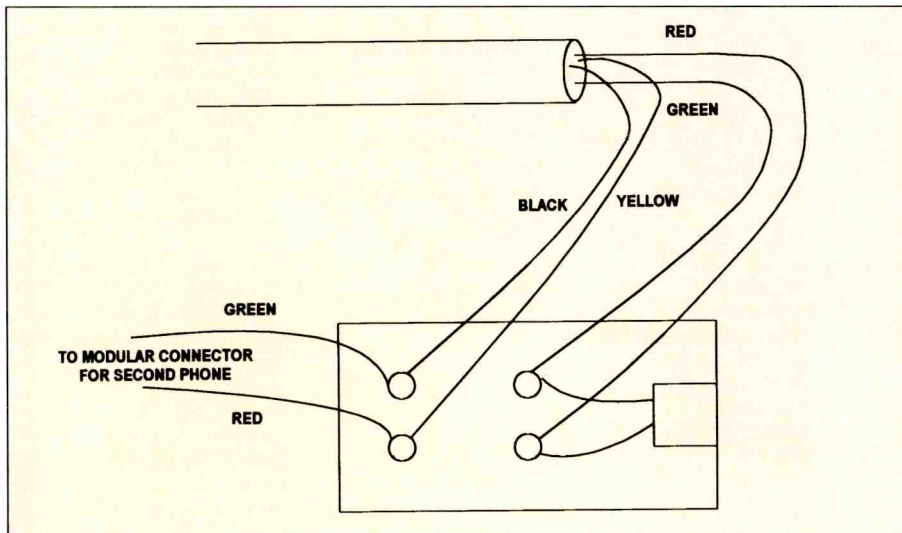


Figure 3. If the two lines are to be broken out at a modular plug, the red and green feed wires will be connected to the red and green wires of the modular jack. The incoming black and yellow wires will be connected to the green and red wires of another length of phone wire, which will be connected to the green and red wires of another jack.

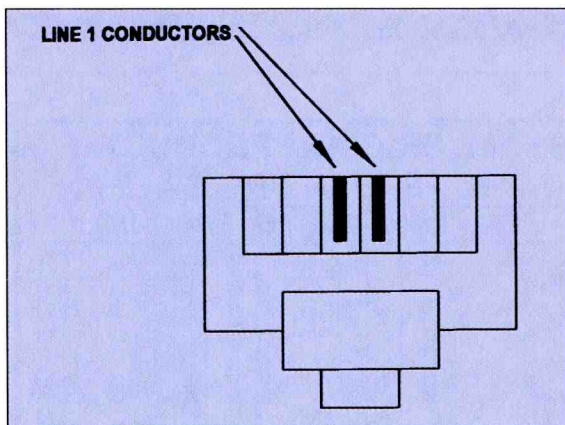


Figure 4. When single line is in use, the connections at the RJ-11 modular connector will look like this.

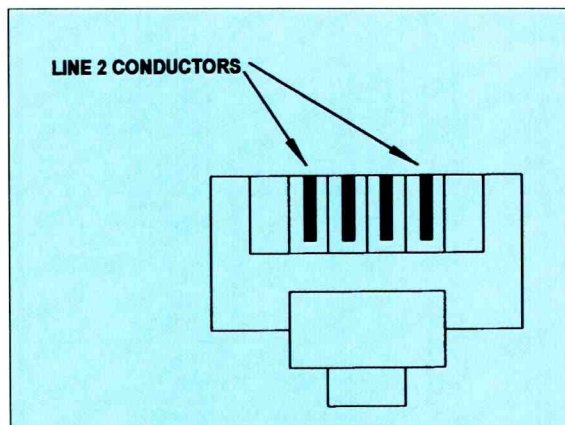


Figure 5. When two lines are in use, four wires will appear at the modular connector, as shown here.

add a second line at one time or another. Since the second line is already right there, it takes no time to activate it, but the telephone company charges a good fee to do the work.

If this is an older residence that has never had a second line installed, there may be only two lines installed, most likely red and green. In a typical wiring diagram, the red wire will be labeled as T1, or just T, and the Green as R1, or just R (Figure 2). These designations go back to the old days of telephony when a live operator routed telephone calls. The jack that the operator used to make connections, not unlike an audio jack of today but much larger, had a metal tip to which one of the conductors was connected, and a metal ring, to which the second conductor was connected. These conductors were known as “Tip” and “Ring,” or T and R.

Of course, if the telephone system in a home only has two wires, understanding it and troubleshooting it are pretty straightforward.

Two Lines

If the home you’re working in has a two-line telephone system, and it’s installed properly, every wire in the house has four conductors: Red, Green, Black and Yellow. It would be silly to make a run of any length with only two wires. You never know where the resident might want a second phone line.

Given today’s modular telephone connectors, there are several ways to break out the two phone lines. For starters, if a two-line telephone is to be connected, the installer merely has to connect the conductors of each color to the matching insulation color on the connector. When the two-line telephone is plugged in, it’s wiring scheme is set up to mate with that of the connector.

Another Connection Method

If two separate telephones are to be used, the installer might run all four wires to the modular connector but only connect the red and green incoming wires to the red and green terminals of the connector. Then he would connect a green wire to the incoming black wire, and a red wire to the incoming yellow wire, and run those to the second modular connector, and make the properly color coded connections there: green to green and red to red (Figure 3).

Using Line Splitting Plugs

Figure 4 shows the connections that appear at the RJ-11 modular connector when a single line is being used. Figure 5 shows the connections for both lines as they connect to the connectors of a standard RJ-11 modular phone plug.

Telephone device manufacturers make devices that allow a technician working on a phone system to break out each of the lines separately. There are a couple of devices that you can use to break out two lines separately from a modular plug at which two lines are present. One of these devices is a two-line splitter. It plugs into a modular plug, and has two separate output plugs: one for each line.

If you want to break out the two lines separately, but also have a jack that has both lines present so you can route both

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lines to another location, a three-way splitter (Figure 6) that has three output plugs: Line 1, Line 2, and Line 1&2, is available.

It Pays to Know About Telephone Wiring

Once merely the conduit that brought conversations from afar into the home, and owned and operated by the telephone company, today's residential telephone systems may be used for telephone conversations, personal computer digital transmission and reception, administrative lines for the satellite TV subscriber, and for home networking. If a technician encounters a problem that is somehow related to one of these functions, a knowledge of what those red, green, black and yellow wires are doing may help him in his quest to restore things to working order. ■



Figure 6. You can run all four wires to a modular jack, and then split out the two lines using a splitter such as this. Note that in one outlet of the splitter, the two wires of line one appear, while the two wires of line two appear at the other outlet. In this three-way splitter, both lines appear in the third outlet, so the two lines may be run further.



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Troubleshooting and Repairing a Philips-Funai TV-VCR "Combis"

By Bob Rose

I have come to the reluctant conclusion that TV-VCR combinations (which I call combis) aren't going away. I wish they would, but they won't. If you keep up with the industry, you know that Panasonic, to name just one manufacturer, has even come out with a TV-VCR-DVD contraption. I don't like them and don't recommend them because they are exceedingly difficult to work on.

Oh, the circuitry doesn't bother me; neither do the mechanics. However, getting to the problem areas to make critical waveform and voltage measurements does. I recall one training session where the instructor said that the engineers finally agreed to align the cutouts in the plastic circuit board retainer with certain critical IC's to make these checks a bit easier. But it still isn't easy. I vividly remember the one that had a blown horizontal output transistor. I had to remove 23 screws, two shields, and the VCR deck, and take the circuit board out of its retainer to get to the offending part. Reassembly was almost as difficult.

But these little engineering gems aren't going away. Since they are a source of revenue, I have vowed to work on them as long as the customer can afford my services. Therefore, I'm going to stop griping and get on with the subject at hand, which is troubleshooting and repairing a Philips-Funai combi. I have chosen as the subject of this article the Philips' CCU combi, a unit that has been on the market for almost four years. I selected the CCU for three reasons. First, if you learn to work with one model, you have a good foundation for learning how to work with other models. There will naturally be differences, but there will also be a host of similarities. Second, there are lots of them in consumer hands and wear brand names other than Magnavox and Funai. Third, I have good notes on this model.

Based on my experience and the questions I am asked, I decided to major on the area that gives us the greatest trouble; namely the power supply. Let me

rephrase that, the electrical area that gives the greatest trouble. May I assume that you are able to fix the mechanical problems efficiently and speedily? May I also assume that you now know about the center LED problem? That being the case, shall we move on then to the power supply and associated circuitry?

The Basic Power Supply

These switch mode power supplies, like others, have three basic elements: (1) the oscillator, (2) rectifier-filtering, and (3) regulation-feedback (Figure 1). The oscillator consists of a switching transistor, a transformer, a means of frequency control, and a "kickback" circuit. The rectifier-filtering circuits are made up of

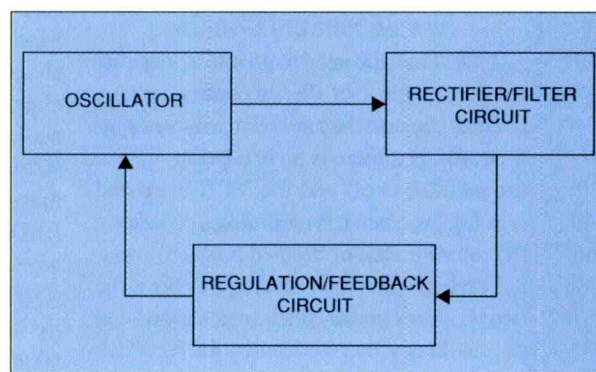


Figure 1

a series of diodes, capacitors, and linear regulators. The regulation-feedback circuit consists of two voltage-monitoring circuits, an optic driver, an optic coupler, and a duty cycle controller.

The oscillator develops a waveform that drives the transformer. The magnetic energy developed in the primary of the transformer during the oscillator's (or switch's) on time is coupled to the secondary when the switch turns off. The collapsing magnetic energy creates an ac waveform that is rectified by the diodes in the secondary circuits and used to replenish the dc voltage stored in the associated capacitors. The regulation-feedback circuit (or loop) samples the output voltage and passes the sample on to the optic coupling circuit which in turn passes it along to the duty cycle con-

trol circuit which adjusts the drive of the switch, holding the output voltage at the stated level. As we shall see, the feedback circuit monitors the +12V line when it is standby or when just the VCR is on and the +112V line when the TV part is turned on.

What You Don't Know Will Hurt You

Yep. What you don't know will most surely hurt you, just as it has risen up and beaten me over the head more than once. So, let's delve a bit deeper into the electronic marvel (?) called a switching power supply. You might want to look at Figure 2 as the discussion progresses.

The Oscillator

Line voltage comes into the power supply via F601 and L601 to the bridge rectifier circuit (four discrete diodes). As you can see, the degauss coil is in parallel with the bridge diodes and is active only when the set is first plugged in. The bridge diodes and C602 supply about +155V to the MOSFET switch (Q601) through the primary of T601. The +155V is also applied to the gate of the switch through resistors R607 and R624 to the base of Q601 to provide a start up voltage for the power supply. When the start up voltage exceeds +0.7V, current begins to flow from R604, Q601, and the primary of T601 to the +155V supply. The power supply has in effect "fired up."

The current through the primary of T601 is coupled across each secondary winding by the magnetic field that has developed around the primary winding. As you see from Figure 2, all of the secondary windings are wound 180 degrees out of phase with the primary (note the black dots placed in each of the windings.). There is, however, one notable exception. The L2 winding which is defined by pins two and three, is in phase with the primary, meaning it provides positive feedback through an RC network to the gate of the switch. This is the circuit that keeps the switch biased on.

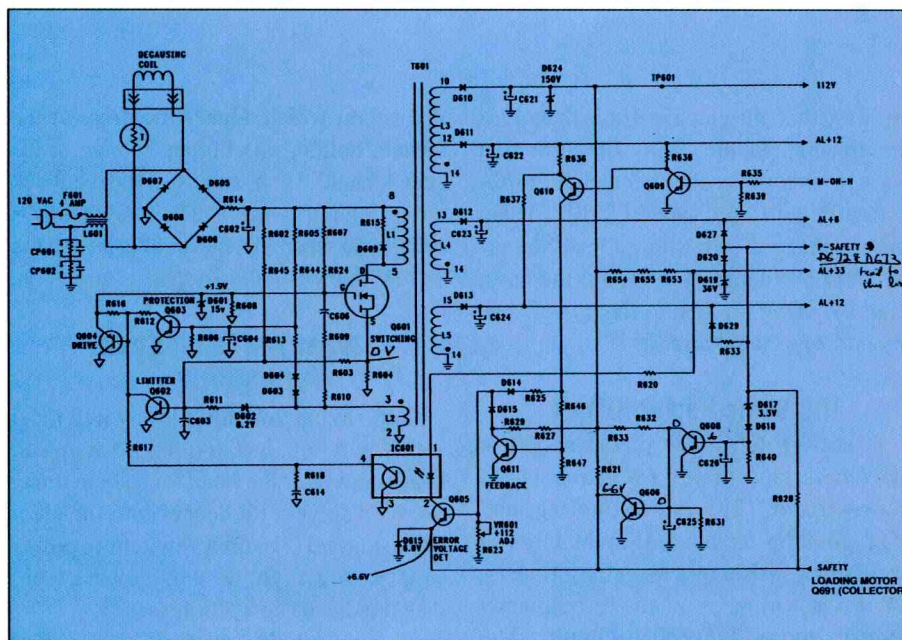


Figure 2

The time comes when the switch reaches saturation and current through the primary stabilizes. As the current stabilizes, the magnetic field developed by the expanding current in the primary of T601 also stabilizes. The magnetic fields in the secondary circuits cannot maintain themselves, and they collapse (reversing polarity when they do). It is at this time that the diodes in the secondary windings (D610, D611, D612, D613) become forward biased and cause their associated capacitors to charge.

Now pay attention to this. The collapsing magnetic field around winding L2 applies a negative pulse through the RC network to the gate of the switch. The negative pulse turns the switch off. When the switch turns off, the magnetic field again switches polarity as it collapses. This action permits the filter capacitors in the secondary circuit to charge just a little bit more and helps the L2 winding to keep the switch off. As time wears on (we're talking milliseconds here), the secondary fields switch polarity again and collapse completely. This action permits the L2 winding to generate a positive pulse through the RC network. The positive pulse turns the switch back on, and the cycle repeats itself.

The Secondary Circuits

I don't feel the need to go into a deep discussion of most of the secondary voltage sources because they are relatively straightforward. But there is an exception. When the monitor is off and the VCR is up and running (as when it is recording a program), the microprocessor holds the MOH (monitor on high) line low. During this time, the two +12V secondary lines are averaged and the resulting voltage is used by the feedback circuit to provide a means to regulate the power supply. The +112V is present, but it isn't used by the feedback line.

Things change when the monitor comes on line. The MOH line removes the low applied to the base of Q609 allowing the base to go positive through pull-up resistors in the microprocessor circuit. Q609 turns on and turns Q610 off. When Q610 turns off, the AL +12V line cannot supply voltage to base of Q611, forcing Q611 to turn off. This action removes the clamp applied to anode of steering diode D615. The result is the +112V line via R627 and R629 now becomes the voltage source that is monitored by the feedback loop.

The rest of the power supply works exactly as it did when the VCR only was on or when the entire unit was in standby. We have an old saying here in Tennessee,

"There is more than one way to skin a cat." Looks as if this one has been skinned every possible way, doesn't it?

Feedback and Regulation

The feedback circuit provides an input to the error detection circuit by providing a varying voltage reference to the cathode of the LED inside IC601. Here's how it works. The +33V provides B+ for the anode of the LED while Q605 provides a varying voltage to the cathode which it obtains by monitoring one of two secondary voltages.

A sample of the regulated voltage (either the +12V or the +112V) is applied to the base of the optic driver transistor (Q605), which controls the amount of current flowing through the LED portion of IC601. If the load increases, the voltage on the base of Q605 decreases, causing less current to flow through the LED portion of IC605. Since the LED glows less brightly, the transistor portion of IC605 begins to turn off, causing the duty cycle controller (Q604) to stay off a bit longer. (Note: the phototransistor is part of a voltage divider network that consists of its internal resistance R618, R618, R616 and the start up resistor network.) If Q604 stays off longer, the switch (Q601) stays on longer placing more energy into the primary winding of the transformer (T601). This sequence of events has the effect of raising the output voltages on the secondary side of T601.

If the load on the secondary decreases, the base voltage on Q605 increases, causing the LED inside to IC601 to glow brightly, causing the transistor portion to conduct harder, causing Q604 to turn on sooner, which turns the switch (Q601) off sooner.

Keep in mind the fact that until regulation occurs, pin 4 of IC601 should increase as the ac input to the power supply increases. When regulation starts, the voltage on pin 4 should decrease in order to pull the output of the power supply down to the correct value.

The Protection Circuits

Our "electronic marvel" has four, yes four, protection circuits, described in the following text.

Overvoltage-Overcurrent Protection

This circuit samples the voltage developed by R604, the resistor in the source of the switch. If the voltage it develops rises beyond a certain point, Q602 turns on and grounds base drive to the switch.

When the power supply is working normally, Q602, which is part of a voltage divider network consisting of R602, R645, R603, and R604, is biased off. If Q601 draws too much current, the voltage drop across R604 increases to the point where it raises the voltage on the base of Q602 enough to turn it on. When it turns on, Q602 pulls the base of Q604 low, grounding drive to the base of Q601, and power supply stops operating. This circuit protects the power supply from excessive current.

The overvoltage protection circuit consists of feedback from winding L2, zener diode, D602, and resistor 611. If the positive voltage swing on feedback winding L2 exceeds 8.2 volts (the rating of D602), D602 conducts and turns Q602 on, which shuts down the power supply.

P-Safety

The P-safety circuit consists of two transistors configured as switches whose inputs are tied through steering diodes (D627, D620, D629) that are connected to each secondary voltage source. A short or excessive load on one of the monitored lines is routed through the corresponding steering diode and triggers the protection circuit. When it is triggered, the circuit applies a ground to the emitter of the error detection transistor (Q605) causing it to turn on hard and disable the power supply.

The circuit works like this. A steering diode turns on because it has detected a short on the line it monitors. The diode pulls the P-safety line low, which removes the bias voltage on the base of Q608 (configured as a switch), turning it off. When it turns off, the collector of Q608 goes high, permitting the voltage divider consisting of R633, R632, and R631 to pull the base of Q606 high, turning it on. Q606 now clamps the emitter of Q605 to ground and lets the LED inside IC601

light up like a Christmas tree. The power supply comes to screeching halt.

Incidentally, if the short is a momentary one, the power supply won't shut down. The short has to last long enough for C626 to discharge through R640. When C626 loses its charge, then and only then will Q608 turn off and start the chain of events that disables the power supply.

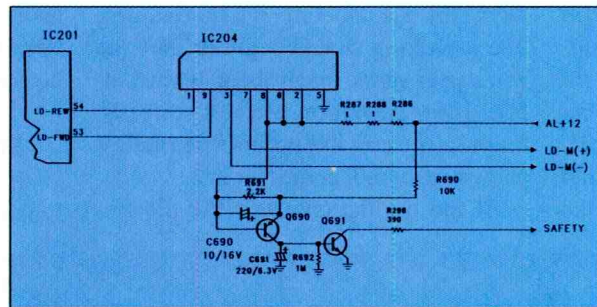


Figure 3

Permit me to summarize the P-Safety circuit like this. It provides protection against shorts and overloads in most of the voltage sources developed by the power supply.

Safety Protection

If you look in the lower right hand corner of Figure 2, you will see the notation "safety." The circuit effectively monitors the loading motor circuit.

If it senses a heavy load on the line caused by a jammed cassette, a defective carriage, or a shorted loading motor driver IC, the safety circuit comes on line and provides a ground path for the emitter of Q605, shutting down the power supply. Figure 3 ought to give you enough details to make sense of the circuit.

Folks, make a note of this one because you will see it.

Shutdown Latch Protection

Centered on Q603 and its associated components, the shutdown latch activates only when the power supply has been turned off by one of the above circuits. Once the latch sets, the power supply won't restart until ac has been removed and reapplied.

Here's how it works. D603 and D604 keep the voltage on the negative terminal

of C604 at about -8.2V when the power supply is operating within its normal range. As you see by studying Figure 2, these diodes develop the -8.2V by rectifying the pulses developed by secondary winding L2. The negative voltage is applied to the base of Q603 to keep it turned off.

If one of the shutdown circuits becomes active, the MOSFET (Q601) turns off.

When it turns off, winding L2 doesn't produce the pulses that D603 and D604 rectify to charge C604. C604 is permitted to charge in the positive direction via resistors R605 and R645. The positive charge is applied to Q603 and causes it to turn on. When it turns on, Q603 clamps gate drive to Q601. The protection latch (it is a latch) holds Q601 in an off condition until ac has been removed and C604 discharges.

Make a note of two important facts. First, C604 needs a bit of time to lose its positive charge. Don't expect to remove ac and expect the power supply to come on line when you immediately reapply it. Second, it looks as if the voltage on the base of Q603 is a good indicator of the condition of the power supply, doesn't it?

Troubleshooting The Power Supply

The time has come to get practical. Some of you like a "trouble tree" approach to finding faults. I offer you Figure 4, which I have taken from a Philips' training manual. Use it if you like in conjunction with the following discussion.

Unlike some power supplies, the CCU supply begins to run and regulate at 40Vac to 45Vac. I assume that you know you must use an isolation transformer to service it. As the applied ac increases, the frequency of the switch decreases, as does the on time of the MOSFET switch. According to the literature, its free-running frequency is about 222kHz when just the VCR is running and about 80kHz when the TV and VCR are on.

The training literature points out that the power supply can be operated without the VCR deck by following this procedure: (1)

Remove ac power. (2) Disconnect CN602 and CN601 on the power supply circuit board and CN301 and CN575 on the main circuit board. (3) Remove the VCR section from the cabinet. (4) Short J610 to J611 on the power supply circuit board. "Short-M-On Def" is screened on the circuit board next to these jumpers.

Some like to divide the troubleshooting procedure in half. They think in terms of problems with the power supply when just the VCR is on line versus power supply problems when the VCR and TV are both on line. That's a good approach, but I prefer to present the material a little differently. Use whichever method that works for you. I'm going to present the method that works for me.

Checking the Voltage on C604

Lanny Logan has written a great book, "Power Supply Troubleshooting and Repair" that you may order from Prompt if you choose. It is one of those books that you will find a use for on more than one occasion. In the chapter on free-running and pulse width controlled SMPS, Mr. Logan, who works for Philips, suggests that you check the voltage potential across C604 as a first step in troubleshooting this power supply. I agree. When you do, you will encounter one of three conditions.

No Voltage Across C604

If you find no voltage, the power supply hasn't started. Think in terms of one of two possibilities. First, the +155V source may not be available as a voltage source of the capacitor. The fuse, R614, or a loose connection may be the culprit. Second, Q603 may have a shorted base-emitter junction. You shouldn't have any problem locating the reason for "no voltage" across C604.

Negative Voltage Across D604

If you find a negative voltage, you may correctly assume that the switch is properly working and the system has not been latched in a shutdown condition.

Turn your attention to one of the two possible modes of failure: a failure in the standby condition with just the VCR on or a failure in the full power mode when both monitor and VCR are on.

First, plug the power supply into an isolation transformer, properly load the +112V source, and bring the ac up while you look at the drain of the MOSFET with a scope. You need to keep in mind the fact a DMM is sometimes just not enough. The waveform should begin to show up when your variac reach about 40Vac output. If the waveform behaves correctly, the problem most like occurs when the TV part of the combi comes on line.

If the oscillations start but the fre-

quency doesn't change as you increase the applied ac from 0V to about 45V, suspect the feedback path or the regulation circuit, which naturally raises the question, "how do I check those paths?"

Mr. Logan suggests that you monitor the voltage at the collector of Q605 or the voltage at pin 2 of IC601. Use cold ground as your reference. With the ac input at about 40V, you should measure about 25.7V. If the voltage isn't present, go directly the AL +33V source and to R620. If, on the other hand, the voltage is higher than +26V, Q605 hasn't turned on. Check the base for a voltage of about 7.3Vdc. If the 7.3V isn't present, poke around Q611 and Q609 and Q610. If the voltage is 7.3V, check the transistor itself.

If the voltage on the collector of Q605 is correct, you may logically proceed to the hot side of the power supply using hot ground as reference. Begin by looking at pin four of IC601 for approximately 0.5Vdc. If this voltage is correct, suspect Q604. If the voltage at pin four of IC601 is much higher than 0.5V the phototransistor is more than likely open, meaning an new IC601 ought to cure the problem. If there is no voltage on pin four, suspect R616 and/or R617. I wouldn't rule out the possibility that IC601 is defective because these devices often do strange things in circuit.

Positive Voltage Across C604

If you find a positive voltage, you are looking at a power supply that is in shutdown. Based on the discussion up to this point, you know that one of the protection circuits has been activated, D603 or D604 has opened, or Q601 hasn't started oscillating. Of course, there may be other causes, but these three seem to head the list. Don't fret, because finding the problem isn't as difficult as you might think.

1. Begin by plugging the unit into a variac-isolation transformer and slowly bringing the voltage up to 40Vac while you look at the drain of the MOSFET with a scope. If you don't detect oscillation, begin again by checking the gate voltage as you

bring the applied ac up to about 40V. The bias voltage ought to begin at 0V and rise slowly as the ac increases until oscillation begins.

2. If the dc bias doesn't budge from 0V, think in terms of a shorted Q601 or the +155V not getting to the gate (meaning an open startup resistor). I've done the check a time or two only realize I didn't have the +155V. Therefore, make certain you have it.

A quick service note before moving on. A lightning strike may have-and often does-damage Z601, a zener placed in the gate circuit of Q601. It may even check good in and out of circuit but fail when power is applied. The same applies to D615 and D624 on the secondary side of T601.

(Continued on page 33)

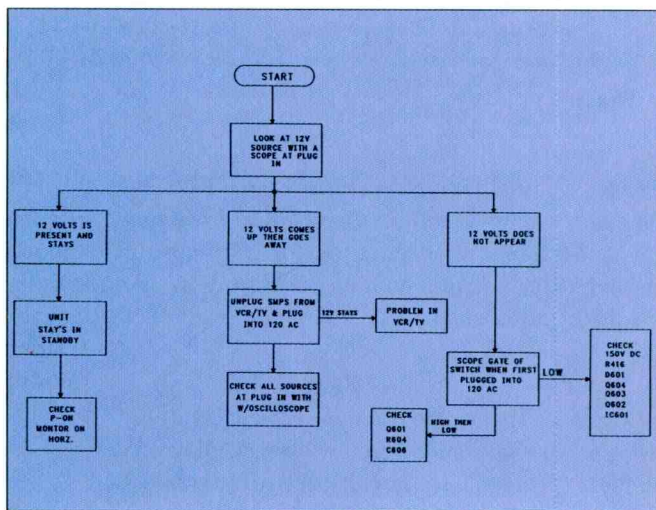


Figure 4

Lightning spikes travel rapidly on an ac line and are often coupled right across T601 to the +112V line so quickly that the protection circuits built into the power supply can't respond properly. So, replace these three zeners before you return the repaired, lightning-damaged unit to the customer.

3. Assume the dc bias comes up but doesn't reach the point where the MOSFET turns on by the time the applied ac reaches 40V to 45V. Think then in terms of the MOSFET itself or one of the components in its immediate circuit, like R604.

4. The next step is to check D603 and D604 for an open condition. If they are good, you are safe assuming that C604 is able to receive a negative charge from winding L2.

5. On the other hand, you may notice oscillations that begin and quickly stop. In other words, the power supply is going into some kind of shutdown, but which one? As you bring the ac up to the 40V to 45V, note if the shutdown occurs about as soon as oscillations start. If it does, suspect an overcurrent condition or a short on one of the secondary voltage sources.

Connect a 150ohm resistor from the base of Q602 to hot ground. Bring the ac up slowly again and note whether the still supply shuts down but takes more time to do so. If it does, the overcurrent circuit has tripped the shutdown. But if the power supply shuts down at the same time as before, suspect a shorted condition on one of the secondary voltage sources. Confirm your suspicion by checking the base voltage of Q608. If it isn't about 0.0V, check for a shorted Z615 or a shorted Q606. If the voltage is 0.0V, you have confirmed that a safety protection circuit has activated.

Having reached that conclusion, you must determine which load is causing shutdown. Begin by removing ac, unsoldering one end of each protection diode (one at a time, of course), waiting the appropriate time for the C604 to discharge, and bringing the ac slowly up to the req-

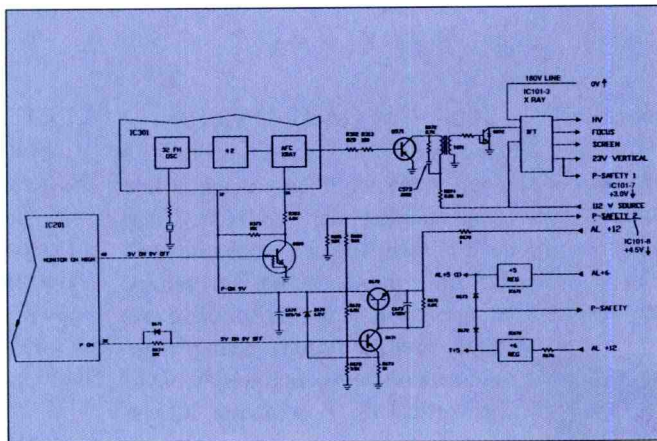


Figure 5

uisite voltage while you monitor the condition of the power supply. A quicker procedure for locating the short may be to measure the resistance between the cathode of each diode (D610, D611, D612, D613) and ground. An extremely low resistance reading should indicate the short.

A Summary of Shutdown Causes

I have learned a thing or two that I will pass along to you. Shutdown in almost all of the units I have serviced were caused by a failure of the loading mechanism—a jammed cassette, a binding cam gear, or a defective carriage. In the remaining few instances, I have been able to locate loaded secondary voltage sources by taking the resistance measures I mentioned. The culprit usually turned out to be something as common as a shorted horizontal output transistor. But, and you know this, things aren't always simple, meaning you need to keep the whole troubleshooting guide in mind.

Here's another way to visualize the material I just covered. If the cathode of D615 is 0.0V and the P-Safety line is also at 0.0V, look for a load on one of the secondary voltage sources or a problem in the VCR loading mechanism. If the cathode of D615 is positive, look for the problem in the optic coupler, the limiter circuit, or the latch circuit.

Failure in the Full Power Mode

I feel the need to cover one more item before I conclude this discussion: failure

of the power supply when the monitor comes on line. The VCR section may, in other words, work perfectly, but the unit fails when you turn the TV section on. Mr. Logan points out that you ought to be able to find the cause of this problem by taking voltage readings at various test points, including Q609 and Q610.

1. Does the TV come on when it receives a power on request? If it doesn't, check to see if Q609 and Q610 turn Q611 off. Make the check by measuring the voltage on the base of Q611.

2. If voltage is still present on the base of Q611 after the on command has been given, you may be sure Q609 and Q611 haven't done their job. Begin by confirming a voltage change on the base of Q609. The transition should be from a low to a high. If you don't witness the transition from low to high, proceed directly to the microprocessor (Figure 5). If the base of Q609 goes high, check the base of Q610 for a low. If you don't find the low, check Q609 for an open. If it goes low, check Q610 for a short. If you don't find a voltage on the base of Q611, check the base for a short.

Assuming these voltages are correct, you need to move your meter lead to IC601 where you ought find these voltages if the set is working properly: +28.7V at pin 1; +27.3V at pin 2; and a positive 1.4V at pin 4. Pin 3 is at hot ground potential. If you use these values, I believe you should be able to pinpoint the reason for the failure in reasonably good time.

Conclusion

The time has come to wrap up this discussion. I need to stress that, though the power supply looks forbidding, you can tackle the problems it gives with reasonable confidence if you organize your troubleshooting. Don't think in terms of shortcuts if you haven't been "elbow deep" in one before because short cuts just might not work. Proceed in a logical and consistent fashion, and I believe you will be surprised at the results. ■

Troubleshooting Vertical Problems in the RCA CTC177

by Homer L. Davidson

When servicing a television set that has vertical symptoms including lack of vertical sweep, it is far easier to locate the defective component than if the set has an intermittent or rolling picture problem. Most symptoms of problems in the vertical cir-

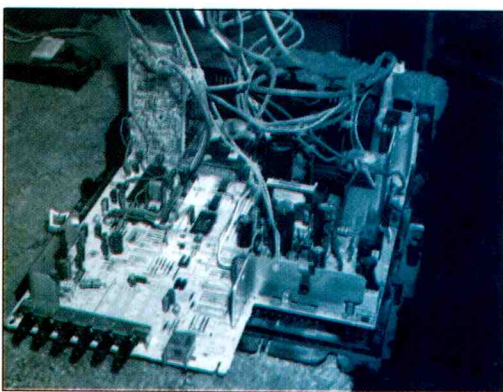


Figure 1. Poor tuner grounds in the CTC175, CTC177 and CTC187 chassis have caused many different vertical problems.

cuits consist of a white horizontal line across the screen, insufficient vertical sweep, picture down from the top, a bright picture with retrace lines, and vertical foldover problems. Poor tuner grounds in the CTC175, CTC177 and CTC187 chassis have caused many different vertical conditions (Figure 1).

Besides poor tuner grounds, that might produce vertical problems, look outside the vertical circuits for a bad EEPROM IC. A defective EEPROM IC can cause intermittent vertical problems, retrace lines in the raster, poor horizontal and vertical sync, and a dead chassis. The EEPROM component is connected directly to the system control (U3101) IC in all three chassis.

Intermittent symptoms of a dead set, or a symptom of no vertical sweep, can be caused by poorly soldered tuner grounds. Partial loss of vertical sweep at the top of the screen can result from bad soldered grounds in the tuner. Resolder all grounds under the tuner shield whenever the problem is vertical and other related TV symptoms.

Dead – No Vertical Sweep

Failure of vertical sweep results in a raster that consists of only a white line across the middle of the TV screen. Often the dead chassis with no vertical sweep begins with a problem in the low voltage power supply source or vertical drive and output circuits. A quick voltage measurement on the voltage supply pin of the vertical drive or output IC can determine if the voltage source is normal. Sometimes other TV circuits are affected by the same voltage source. By scoping the output drive IC and vertical output IC terminals; you can determine if the vertical circuits are functioning.

If no vertical drive waveform is found on pin 1 of U4501, suspect a defective deflection IC or incorrect voltage of the source feeding the deflection IC. Another possible cause of a dead chassis with no vertical sweep may be absence of, or incorrect output of, the 12V or 7.5V voltage source, in the low voltage circuits, feeding the vertical deflection IC. Measure the deflection supply voltage source (7.5V) at pin 32 of the T-chip (U1001)

If the voltage at pin 32 is low, or 0V, suspect a defective component in the vertical deflection IC supply voltage source (Vcc). Check R4517 (24 Ω) and R4702 (3.9 Ω) resistance in the 12V and 7.5V sources. Resistor R4517 provides 12V to the vertical yoke circuits.

Often R4517 becomes burned, while R4702 is found open, accompanied by a shorted silicon diode CR4704 (Figure 2). Suspect C4705 (1000 μ F), C4129 (100 μ F) and C4101 (150 μ F) if the output of the 7.5 voltage source is low. Check these electrolytics with the ESR meter. CR4704 has caused many failures of vertical sweep in the

CTC177 chassis.

Another common cause of failure of vertical sweep in these sets is a defective vertical output IC. If you encounter a set in which the symptom is failure of vertical sweep, scope pin 1 of the vertical output IC. If the input drive waveform and the 25V voltage source are normal but there is no output waveform from at pin 5 of U4501, replace the output IC; it is defective. A shorted vertical output IC has been known to blow the main fuse (F4001). Replace the vertical output IC (TDA8172) with a manufacturer's exact replacement part, number (215531) or an NTE1788 or SK9875 universal replacement IC (Figure 3).

Another cause of failure of vertical sweep is a defective surface mounted (SMD) component off of pin 18 of U1001. Replace C4501 (0.1 μ F) SMD capacitor if you encounter open conditions in the filter network. Check C4501 and C4503 with the ESR meter. Remove C4501 from the circuit for accurate tests since it is paralleled with capacitor C4503 (Figure 4).

Intermittent Vertical Sweep

If the problem is intermittent vertical sweep, it is usually more difficult to locate the defective component since the chassis has to act up before the intermittent process begins. Monitor the drive waveform at pin 17 of the deflection IC (U1001) with the scope. If the waveform of the vertical sweep signal changes or ceases completely, suspect a defective drive IC (U1001).

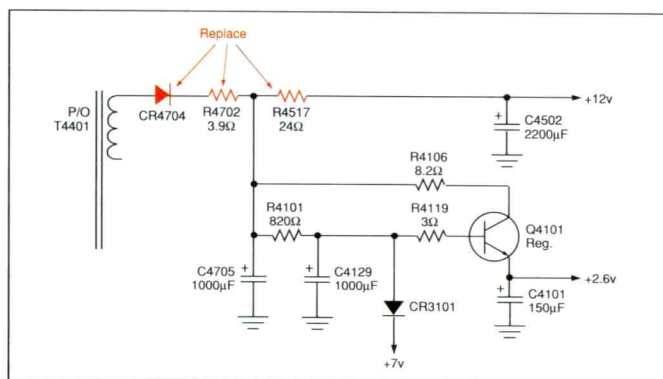


Figure 2. If the symptom is failure of vertical sweep in the RCA CTC177 chassis, replace CR4504, R4702 and R4517.

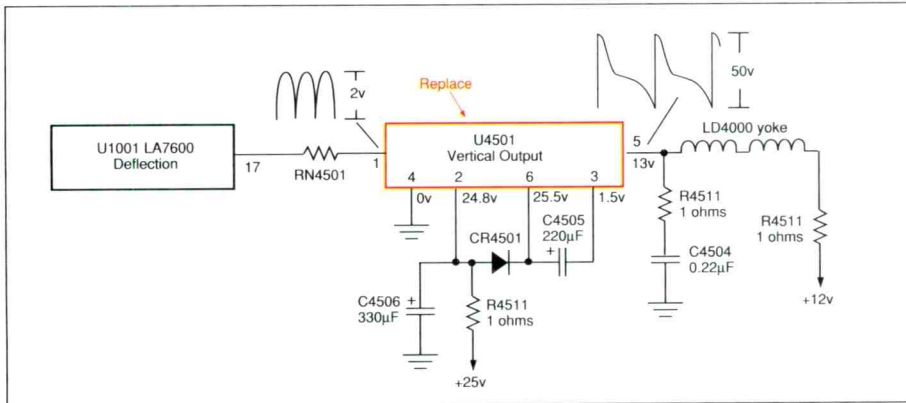


Figure 3. Replace vertical output IC (U4501) to correct a symptom of vertical sweep failure.

On the other hand, if the drive waveform remains when the raster shrinks or collapses to a horizontal white line, proceed towards the vertical output IC.

CR4704 in the low voltage power supply has been known to become open and cause intermittent vertical sweep problems. Failure of vertical sweep accompanied by failure of the audio may be caused by an intermittent silicon diode (CR4704). Whenever possible, replace CR4704 with exact part replacement (164588).

Intermittent loss of vertical sweep has been caused by poor grounds in the tuner section. If you encounter this problem, resolder all tuner ground terminals for intermittent vertical sweep or partial loss of vertical sweep. Since the tuner grounds have caused many vertical and other problem symptoms in the CTC177 chassis, touch up all tuner grounds with the soldering iron before tackling the vertical circuits.

If the vertical drive waveform at pin 17 disappears or is different than shown on the schematic, suspect a defective deflection T-chip (U1001). Make sure the volt-

age deflection source is present and no vertical output drive waveform, before removing U1001. This T-chip (LA76100) has been known to produce intermittent loss of vertical sweep and vertical sync problems (Figure 5).

Picture Rolls Down Constantly

Improper vertical sync developed inside the T-chip can cause the picture to roll down continuously, or to roll from left to right. Usually these two vertical symptoms are caused by a defective T-chip (U1001). If you encounter this problem, replace the LA76100 vertical deflection IC with an exact manufacturer's replacement: part number 215524 (Figure 6). Before replacing this multileaded IC, confirm that it is defective. Replacing U1001 can turn into several hours of critical service bench time.

Blown Fuse – Improper Vertical Sweep

A dead shorted vertical output IC (U4501) can cause the main fuse to blow. If the 25V source feeding the vertical output IC becomes shorted, this destroys the 25V source traced back to the low voltage power supply secondary voltage source. The bottom leg of the 25V source

is tied directly to the 200V source of fly-back T4401 (pins 6 and 10). The 25V vertical output supply source is found directly on pin 10.

Try to determine which voltage source is blowing the main fuse by monitoring the various voltage sources. Notice if the raster collapses before the fuse blows. A 100W light bulb connected across the main fuse holder (F4001) in place of the fuse can determine if a short exists in the TV chassis. If the bulb becomes very bright, it indicates that a short or overload has occurred in the low voltage supply sources. If the bulb is barely lit, you know that no short exists.

If the bulb lit brightly, disconnect the set and disconnect the horizontal supply source (140V) from the horizontal output circuits by removing the output transistor (Q4401). When you reapply power to the set, if the bulb is still very bright, the shorted component is in another circuit. Replace the horizontal output transistor and move on to another voltage source.

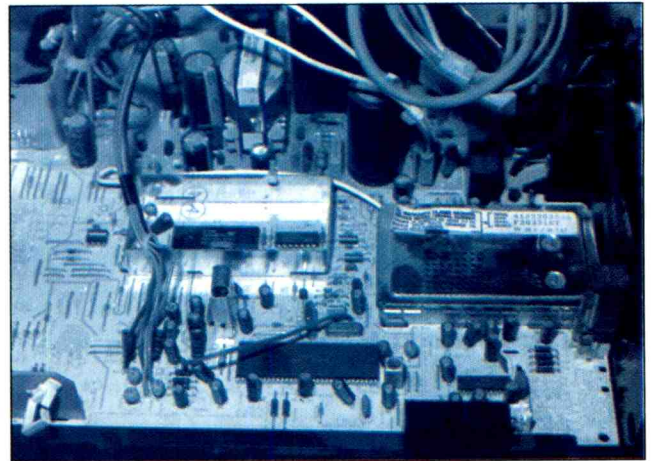


Figure 5. Intermittent loss of vertical sweep can be caused by a defective T-chip (U1001).

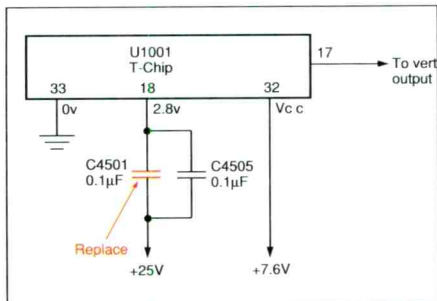


Figure 4. Check and replace C4501 and C4503 (0.1µF) capacitors to correct failure of vertical sweep.

Next check the vertical output circuits. Since removing the vertical output IC (U4501) takes more service time, remove one end of resistor R4511 (1Ω) from the 25V source feeding the 24V source at pin 2 of IC4501 (Figure 7). Now fire up the chassis and if the 100W bulb is quite dim, suspect vertical output IC (U4501). Double check for leakage by measuring the resistance of pin 2 of U4501 to common

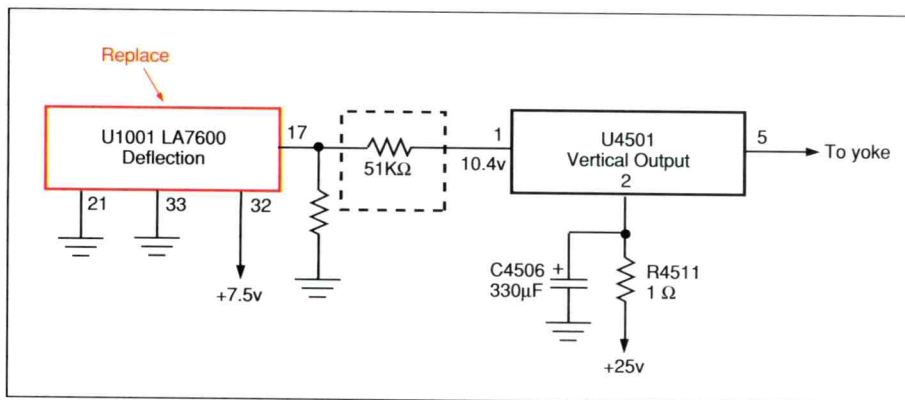


Figure 6. A Defective U1001 can cause vertical rolling symptoms in the picture of the CTC177 chassis.

ground. An extremely low resistance measurement here indicates a leaky vertical output IC.

Next, desolder pin 2 of U4501 from the pc wiring with solderwick and iron. Flick pin 2 of the IC to make sure it is loose from the pc wiring. Take another resistance measurement from the pc wiring pad to common ground. If the low resistance reading is gone, remove and replace the leaky vertical output IC.

Replace the shorted U4501 with a manufacturer's exact part number (215531) or a universal NTE1788 replacement. Now compare the resistance test from pin 2 to common ground with the original low resistance. Double check CR4501 and C4506 (330 μ F) off of pin 2 of the vertical output IC for leakage.

Bright Retrace Lines

An extremely bright screen with retrace lines may be caused by defective components in the video output, or leaky parts in the CRT circuits, vertical output and deflection circuits. Vertical retrace lines in the picture can be caused by

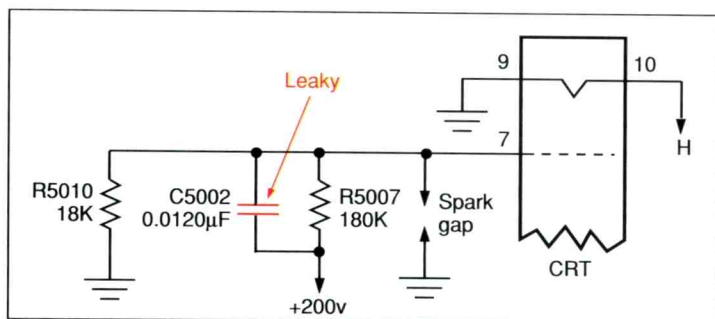


Figure 8. Leaky bypass capacitor C5002 can cause a bright raster with retrace lines in the picture.

CR4501, CR2702, R2702 (7.5K), and C2706 (22 μ F) electrolytic in the size control circuits.

Suspect a leaky bypass capacitor in the CRT circuits of V101 at pin 7. Replace C5002 (0.012 μ F, 250V) capacitor for leakage with a very bright raster and retrace lines in the picture. Check C5002 with the ESR meter for leakage or ESR problems (Figure 8). Do not overlook a defective vertical output IC (U4501) for retrace lines at the top of the picture. A faded picture with retrace lines can result from defective C4703 (47 μ F) electrolytic in the 200V source.

Vertical Foldover Problems

A frequent cause of vertical foldover problems is one or more defective electrolytic capacitors in the vertical feedback circuits from the output or vertical yoke circuits. Check for leaky or defective electrolytic capacitors C4504 (220 μ F) and C4506 (330 μ F) for foldover problems in the CTC177 chassis. Besides leakage tests, check the elec-

trolytic capacitors with the ESR meter for ESR problems (Figure 9).

Do not overlook a defective resistance network (RN4501) at the input terminal of the vertical output IC and feedback circuits of R4501 to pin 4 for possible vertical foldover problems. Check each internal resistor for correct resistance on the DMM. Replace the defective resistor network with the exact part number (215499). If the resistance network is not readily available, make up the bad network with individual resistors and solder them together as shown in the schematic

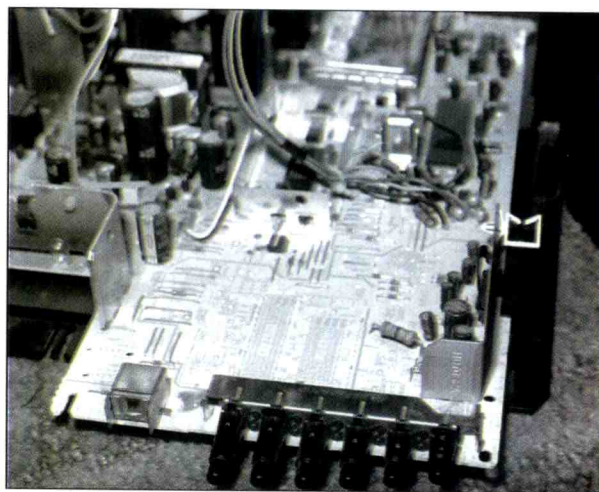


Figure 7. The vertical output IC is located on a separate metal heat sink.

Insufficient Vertical Height

Any of a number of problems can cause insufficient vertical height:

Improper vertical drive voltage from U1001, a defective vertical output IC (U4501), low 7.5V, 12V and 25V from the supplies feeding the vertical output circuits.

Check C4505 (220 μ F) and C4506 (330 μ F) electrolytics with the ESR meter if the symptom is improper vertical height, and double check C4502 (2200 μ F) with the ESR meter. An increase in resistance of R4511, R4519 and R4502 can cause lower applied voltage at the vertical output IC or vertical yoke winding, resulting in poor vertical height.

Intermittent shrinkage of vertical height at the top and bottom of the raster can be caused by the usual poor ground connections in the CTC177 tuner circuits.

Intermittent partial loss of vertical sweep can be caused by a defective U1001 (LA7610) IC. Intermittent height and pulling of the raster down from the top can be caused by poor soldered joints on the microprocessor ground shield. Last but not least, suspect a defective EEPROM (IC3201) when the problem is improper or intermittent vertical height.

Storm Damage – Vertical Circuits

After replacing the 5A fuse (F4001) and the switching IC regulator (U4101) in the switching power supply, the TV had a collapsed raster with no vertical sweep, indicating possible lightning damage. A check of the different voltage sources revealed that CR4704, R4702 (3.9Ω), R4517 (24Ω) were defective. CR4704 was shorted and both R4702 and R4517 were open. After I replaced those low voltage components, the vertical sweep was only two inches high on the screen.

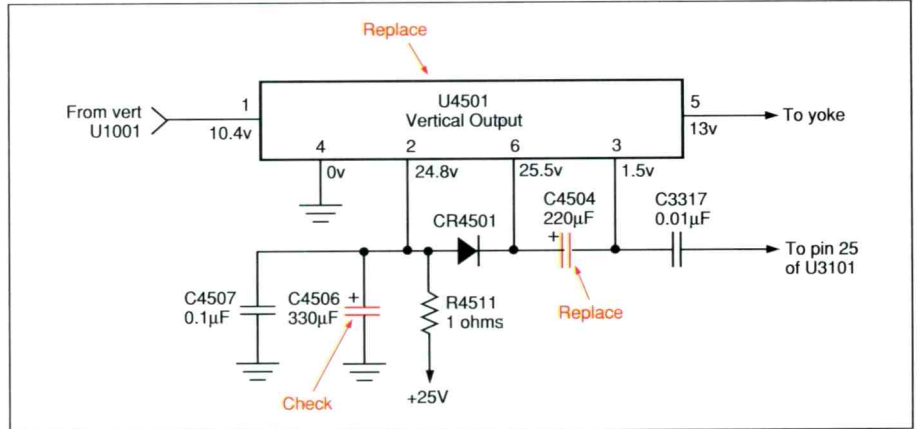


Figure 9. Check C4504 (220µ) and C4506 (330µF) for foldover symptoms in the vertical output circuits.

The voltage at pin 2 of the vertical output IC was extremely low. When pin 2 was removed from the circuit, the 25V source had increased. U4501 was replaced with a universal replacement (NTE1788). The storm damaged

CTC177 chassis was repaired by replacing several low voltage components in the 25V source and replacing the shorted vertical output IC. ■

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Product File: CAPACITORS

The Capacitor is one of the primary building blocks in electronics — and often the culprit in a malfunctioning system. Here is a review of Capacitor Basics.

What Makes a Capacitor?

A capacitor is nothing more than two pieces of metal separated by air or some other non-conducting material placed between them, called the dielectric.

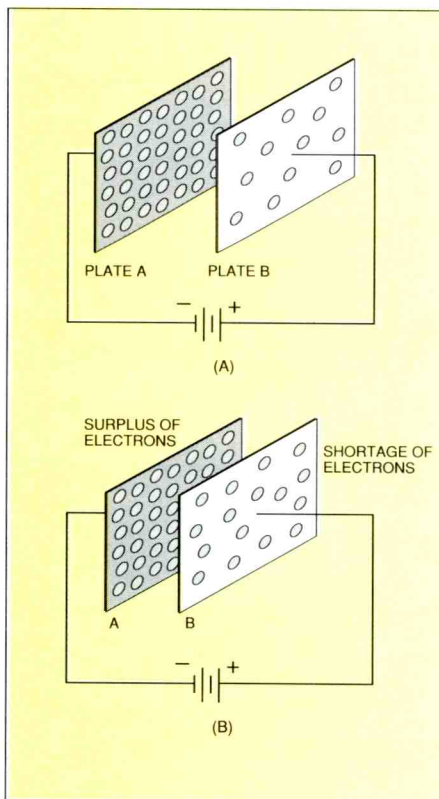


Figure 1

When the plates are first connected to a battery or any device capable of producing a difference of potential, a very high current flows to charge the capacitor. As the capacitor charges, the voltage between the plates builds up while the current decreases. In other words, the current decreases as the voltage increases. Eventually, the potential between the plates equals the voltage source, and the current drops to zero. The capacitor is now fully charged.

Capacitance

The charge on the capacitor depends on the voltage used to charge it. A bat-

tery, for example, with a high voltage creates a greater potential on the atoms making up the capacitor plates and this moves more electrons than a battery with a lower voltage. But there are other factors than voltage that affect the charge a given capacitor stores. The electrical size of the capacitor is one of those factors, and it is called the capacitance of the capacitor. Capacitance is measured in a unit called a Farad and is usually defined like this: A capacitor has a capacitance of one Farad when a voltage change of 1V/s across it produces a current of one ampere. A Farad, however, represents an extremely large capacity and is almost never used in electronics. Hence, the terms “microfarad” and “picoFarad.” But then you already know this.

Factors That Determine Capacitance

Three factors determine capacitance: the area of the plates, the spacing between them, and the dielectric that separates the two. Take a look at Figure 1. Which capacitor has the greater capacitance? Obviously, the capacitor in (B) has the greater capacitance because it has the larger plates. Now look at Figure 2. Which has the greater capacitance? Again, the one depicted in (B) because its plates are closer together than the plates of (A).

Dielectric

The third factor that affects capacitance is the dielectric: the material between the plates of the capacitor. Insulating materials exposed to electric fields are known as dielectrics. The atomic structure of an insulator is such that its electrons do not move freely from one atom to another. However, in a dielectric the electrons orbiting each nucleus are attracted to the + plate and repelled by the - plate of a capacitor, effectively distorting the orbits of the electrons in each atom. Illustration (A)

of Figure 3 is a representation of a single atom in a dielectric before a difference of potential is applied to the capacitor. Illustration (B) of Figure 3 depicts

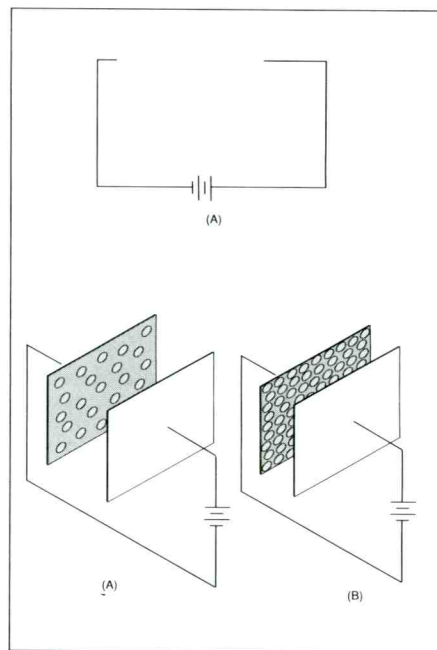


Figure 2

how the orbiting electron is affected by the electric field of a charging capacitor.

The extent to which the orbits of the electrons in the dielectric are distorted depends on the strength of the electric field. If you constantly increase the strength of the electric field, you reach the point where the orbiting electrons are torn free of their orbits and race toward the + plate of the capacitor. This is the point where the dielectric breaks down and causes the infamous “shorted capacitor.”

Dielectric Constant

Any discussion of dielectric ought to include some mention of dielectric constant. If you do much reading in the field, you will certainly stumble across it. It is defined as the amount by which the dielectric material increases the capacitance of a capacitor compared to

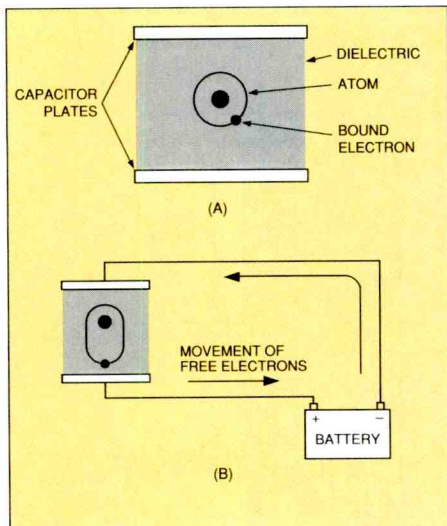


Figure 3

the capacitance when air is the dielectric. Table 1 lists the dielectric constant of some of the more common dielectric materials and is the kind of information you find when you consult an engineering text.

Dielectric Absorption

I ought also to mention dielectric absorption before I conclude this section. Go back for a moment to Figure 3. Assume that you have exposed the dielectric to a high difference of potential (voltage) after which you connect the two plates together to neutralize the charge. The stress on the electron orbits of the dielectric has therefore been removed, permitting them to return to their normal orbital position. However, if you investigate the capacitor closely, you will find that a small difference of potential still appears between the two plates after the initial discharge. This indicates that the electron orbits in the dielectric did not instantly return to their original positions. The residual electron orbit displacement in the dielectric held an induced charge in the plates in the same manner that the charge was induced when the voltage was applied. Engineers call this effect "dielectric absorption."

Here is a simpler definition taken from Sencore's tech tip number 105: "Dielectric absorption is the inability of a capacitor to release all its stored energy even if a dead short is applied across its leads."

Electrolytic Capacitors

Capacitors are often categorized by their dielectric such as air, porcelain, ceramic, oil, Bakelite, paper, rubber, Teflon, glass, mica, a chemical, etc. The dielectric in which we are especially interested is the chemical dielectric manufactured by placing a thin gauze soaked in an aluminum hydroxide solution between two, long strips of metal creating what we call an "electrolytic" capacitor (Figure 4).

Like any electrolyte, the aluminum hydroxide solution becomes a conductor by dissociating into positive and negative ions. When first assembled, such a capacitor is an electrical short circuit. It has to be "formed" into a capacitor by passing a direct current through the electrolyte between the two strips of aluminum. The dc current causes the negative hydroxide ions to become attracted to the positive foil where they chemically react with the aluminum to form a very thin layer of aluminum oxide that then becomes the dielectric of the capacitor. The forming current soon diminishes to a very small value, leaving a capacitor in which one plate is the positive aluminum foil and the other the electrolyte in contact with the negative foil. You see, the dielectric is the thin oxide layer, and this arrangement permits manufacturing capacitors that have an almost enormous capacitance.

How Electrolytic Capacitors Fail

Let's turn our attention now to how capacitors fail. Let me sharpen that just a bit. Let's turn our attention to how electrolytic capacitors fail since they are the subject of our discussion. They fail by (1) losing capacitance, (2) breakdown of the dielectric, (3) developing high dielectric absorption, or (4) developing what is called equivalent series resistance (ESR). Since the first two are more-or-less self-evident, I'm going to skip discussion of them and move

directly to numbers three and four.

Dielectric Absorption

What causes dielectric absorption? The potential energy of a charged capacitor is held in an electrostatic field that causes the dipoles in the dielectric to orient themselves along the lines of force (Figure 3). This is theory. In real life, all dielectrics have some degree of chemical polarity, meaning that some energy is stored as chemical changes in the dielectric molecules.

In the first step, an applied voltage causes an electrostatic field to build between the two plates, causing the dipoles in the dielectric to turn to face the lines of force. These twisted dipoles store energy, compared to the normal uncharged state in which all dipoles are randomly oriented to produce a zero charge.

After the first polarizing process, the dielectric contains two types of electrons,

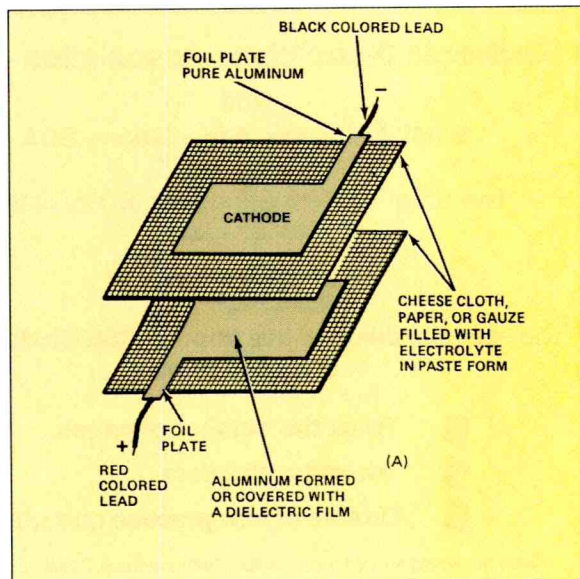


Figure 4

those that are bound and those that are free. The bound electrons saturate the negative plate and the surface dielectric. The free electrons move through the dielectric. The free electrons that travel from plate to plate cause a leakage current to flow, which a good Z meter is able to measure. But some free electrons move just part of the way through the dielectric and store energy chemically similar to the

way a battery does. These are the electrons that cause the phenomenon known as "dielectric absorption."

All capacitors have a certain amount of dielectric absorption. Unfortunately, it may get worse with time. Why? I'll skip the talk about all capacitors except for electrolytics. Moisture seems to be a prime culprit. As an electrolytic loses water, some of the dissolved chemicals may form salt crystals between the paper space and the aluminum oxide that serves as the dielectric. These crystals have a higher resistance than the normal, or wet, electrolyte solution, causing some parts of the oxide surface to have a series resistance (Figure 5). The series resistance doesn't cause increased leakage because the insulating oxide is still intact. You might think such a condition would increase what we call ESR, but it doesn't because adjoining sections of the paper may still have enough water to keep the resistance low. Moisture becomes the culprit, then, when it leaves the capacitor. During the drying, dielectric absorption becomes high because the electrolytic effectively develops hundreds of tiny resistor-capacitor networks connected in parallel (Figure 5). Some of the resistor-capacitor combinations have short time constants while others have long time constants.

Electrolytics also experience dielectric absorption if chemicals in the electrolyte solution or in the oxide layer change due

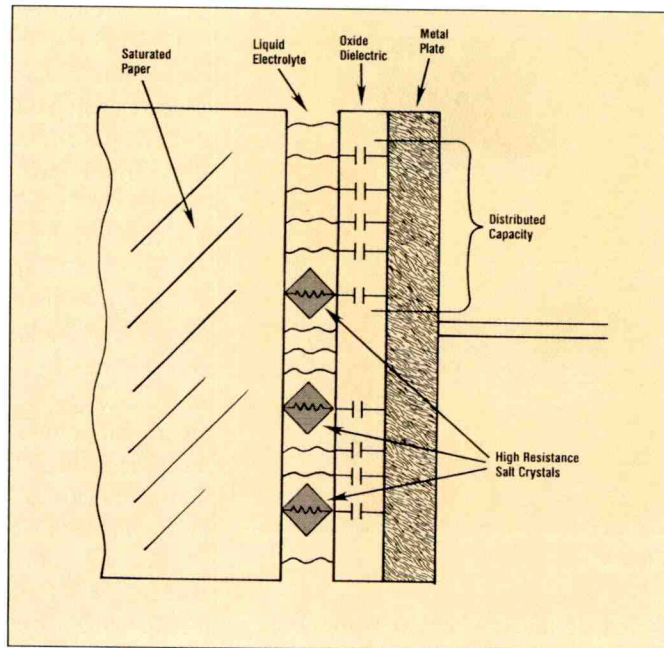


Figure 5

to contamination. Contaminants can seep through the seals of the capacitor and cause the capacitor to have a storage-battery action. The "storage battery action" may also combine with the drying action to cause even higher dielectric absorption levels.

As far as I know, there is no inexpensive piece of equipment on the market that permits you to evaluate a capacitor for dielectric absorption. There are Z meters that will do it, but they are not, shall I say, not inexpensive. I suppose I am like you in that I really don't think much about dielectric absorption, especially since I don't have the means to measure it. Maybe I should, but for the most part I don't. However, you and I do need to be aware of it.

Equivalent Series Resistance

But, I do pay attention to equivalent series resistance, affectionately known in our circles as "ESR." ESR is made up of the total electrical resistances in series with the plates of the capacitor. This includes the resistance of the metal leads, the plates and the connections between them (Figure 6). Electrical resistance in an electrolytic must also take into consideration the resistance in the wet electrolyte solution and in the layer of aluminum oxide, which contains high levels of water, called "hydrated oxide."

Therefore, a normal electrolytic capacitor has a certain ESR reading that we mostly ignore because it's small. However, ESR becomes a problem when it increases beyond acceptable levels. Two factors cause it to increase, (1) bad electrical connections in the capacitor and/or in the circuit and (2) a drying electrolyte solution.

A capacitor develops connection problems because the leads that come into a capacitor cannot be made of aluminum. You




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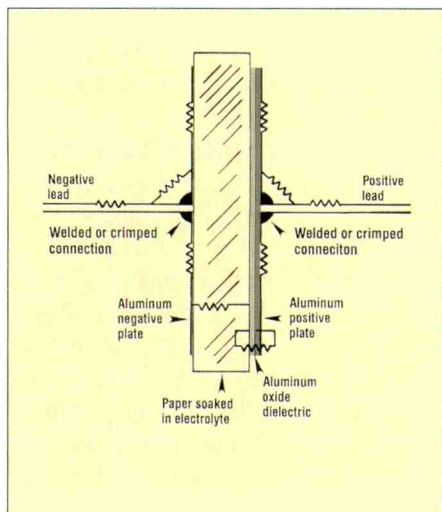


Figure 6

know why. You can't solder aluminum. The leads of the capacitor are therefore made of copper, which are attached to the aluminum plates either by a weld or by a mechanical crimp. A faulty connection between the plates and leads means high ESR. Even new capacitors can have defective electrical connections. Having installed new ones that didn't work in circuit because of defective internal connections, I now routinely check new ones before I install them.

A drying electrolyte solution is by far the biggest reason for high ESR. Water is an important ingredient in the manufacture of the electrolyte solution, which soaks the paper spacer between the two aluminum plates. The water carries the electrical charge from the negative aluminum plate to the surface of the insulating oxide on the positive plate. The oxide forms the capacitor's dielectric while the negative charge on the surface of the oxide forms the negative capacitor plate. Electrical resistance increases as the water evaporates. This is what we mean when we say a capacitor has dried out. And dry capacitors account for more failures in electrolytic capacitors than anything else.

A "dry electrolytic," one that has high ESR, causes a variety of problems in a television. If it is in the vertical section, it might cause complete loss of vertical deflection, retrace lines, underscan, or even overscan. If it is a filter in a scan

derived voltage source, it won't supply the necessary working voltage to a circuit or circuits and might be responsible for complete failure of the TV. If it is in the syscon voltage supply, it could cause a host of intermittent functions. If it is in an audio or MPX circuit, it might be responsible for symptoms that range from distortion to low audio to no

audio. If it is in a video circuit, it could cause symptoms from complete loss of video to loss of color or color sync. Remember the surface mount capacitors in Mitsubishi PIP circuit boards, Hitachi comb filters, and Zenith PIP modules? Or the surface mount electrolytics in Sony, Canon, and Sharp camcorders? ■



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Scanners

by the ES&T Staff

Just a short while ago, we presented an article on how scanners are designed, how they operate, and some of the things that can go wrong. This article will be more oriented to scanners from the point of view of the variety of scanners, the various levels of performance of scanners, and will go into some of the things that a service center can use scanners for. For those of you who haven't been keeping an eye on the scanner market, there's great news. Products that not long ago couldn't be had for much less than several hundreds to well over \$1,000 have tumbled in price to the point where the least expensive are less than \$100, and you can buy a very good, versatile, fast scanner for a few hundred dollars.

The Function of a Scanner

A scanner has one function. To convert an image from some solid medium: paper, photograph, film, transparency, into a digital file from which a computer may generate an image on the monitor screen. A good scanner, coupled with a powerful computer, can produce an image that is all but indistinguishable from the original.

If the material input to the scanner was a page of text, the output may be, instead of a digital image, a text file, something that you can call into a word processor and edit. But, in order for the computer to convert the page into a text file, the scanner first had to create a digital representation of the page, then optical character recognition (OCR) software was applied to the digital image to create the text file.

Levels of Scanner Sophistication

The simplest of scanners is just that: simple. It is basically a box with a glass or plastic plate onto which the user places the image to be scanned. The scan head is a linear array of sensors, charge coupled devices (CCDs), and a light source.

In a flatbed scanner, the scanner uses a stepper motor to step the scan head across the image to be scanned. Light from the cold-cathode lamp strikes the image, is reflected, and strikes the sensor array. The ultimate resolution of the scanner is deter-

mined by the number of sensing elements across the width of the scan head, and the number of steps taken by the stepping motor. The horizontal resolution of the scanner is defined by the number of sensors in the scan head, while the vertical resolution is defined by the number of steps made by the motor.

In a simple scanner, all the work is done by the computer, as driven by the software that comes with the scanner. The computer generates the information that



Figure 1

drives the scanner's motor, and collects and interprets all the information that it receives from the scan head. Thus, anytime someone wants to scan something, he must turn on the computer, start the software program, and begin the scan.

Depending on the capability of the computer, such as processor speed and available RAM, the user might have to shut down other software before beginning to scan a document. And the process might be relatively slow. With the scan-

ner and software here in the ES&T remote editorial office, it takes in the order of two minutes per page to scan something in.

Three Basic Types of Scanner

There are three basic types of scanner: handheld, flatbed and sheet fed. Handheld scanners are generally inexpensive. A handheld scanner consists of a scanning unit the user holds in his hand and drags it down the page. Because the other two types of scanners work better, and are relatively inexpensive, handheld units are not very popular. It's just very difficult to drag the scanner down the page at a consistent rate, and straight enough not to cause skew. Moreover, the scanning head is only a few inches wide, so in order to scan a full page, the scanner has to be dragged down the page twice and the two separate images thus created stitched together by the software.

The flatbed scanner is the most popular scanner, and the one most frequently seen. In the case of the flatbed scanner, the user places the document on top of a glass or plastic plate, and the scan head is moved beneath it. In the case of the sheet fed scanner, the paper is moved by a set of rollers past the scan head.

The advantage of the flatbed scanner is that it can be used to scan from not only single sheets of paper, but from a book or magazine, or just about any other large object.

The sheet fed scanner is about the size of a box of plastic wrap, and so may be placed between the keyboard and the monitor, so its advantage is that it takes up considerably less space. For the most part, though, sheet fed scanners produce only black and white images, and their resolution is generally not very high.

More Sophisticated Scanners

The more sophisticated (more expensive) scanners are easier to use, and faster. This type of scanner contains a great deal more electronics than do the simpler scanners. These scanners can be used in stand-alone mode. That is, the user can leave the computer off, and simply slip a photo or document on the bed and press a button. The scanner itself has the processor

power needed to step the scan head, collect the data from the sensor array, and store the digital image thus created in its memory.

Moreover, some of these scanners come with capabilities that other scanners don't have, such as an attachment that allows the user to scan slides and other transparencies. And these days it doesn't deplete the bank account to buy one of these powerful scanners. There's a scanner offered by Hewlett Packard, for example, in the \$300.00 range at the discount electronics and computer stores, that offers effortless scanning of normal paper documents and photos, but that also has an attachment that allows users to scan slides and other transparencies up to 5" x 5".

Document Feeders

If an office has a lot of documents that need to be scanned, a scanner can either be bought with an automatic document feeder, or a scanner that was designed to be compatible with a document feeder. With the document feeder in place, the user can load the hopper up with documents to be scanned and just let the scanner do all the work.

Hooking It Up

As with most computer peripherals, scanners come with a variety of ways to connect them. One connection scheme is to connect the scanner to the computer's parallel port, the same port that the printer uses. That raises the question of what

do you connect the printer to if the scanner is connected to the parallel port. It's simple, the scanner comes with a pass through port, so that the scanner is connected to the parallel port, and the printer is connected to the scanner's parallel output port in "daisy chain" fashion.

Amazingly, this works very well. I have had the experience of scanning in documents, then saving them to the hard disk, then printing each page out as it is finished scanning. Once the computer has set up a digital representation of the page and sent it to the printer, I can begin scanning another document, even while the page is printing.

I have no idea what the limit is on daisy chaining devices to the computer's parallel port, but I know of one person who has three peripherals connected daisy chain fashion to his computer's parallel port: a digital camera CompactFlash card reader that's set up as the computer's e drive, the scanner, and a HP LaserJet printer, and everything works just fine.

The only problem with connecting to the parallel port is that you have to provide the device with a source of power. In the one case just mentioned, the printer and the scanner each has its own source of power from the ac line, so that takes up two receptacle slots.

The folks who designed that CompactFlash card reader came up with a clever method of supplying power without requiring a bulky power supply. The device came with a cable that plugs into the computer's keyboard connector, and taps into that source of power. The end of the cable that plugs into the computer has a male end that plugs into the comput-



Figure 3

er's keyboard connector, and a female end that the keyboard cable plugs into. Just another form of daisy chain.

These days, you'll probably find that scanners come with one or more of several methods of connecting to the computer: a parallel port connector, a SCSI (small computer system interface) connector, or a USB (universal serial bus) connector.

Scanner Specifications

Getting back to basics, a scanner is a device that's designed to convert an image in some solid medium into a digital file that can be stored and manipulated by a computer. With that in mind, the most important specification for a scanner is its resolution. A digital representation of an image is essentially a bunch of dots, black and white or color, on the computer screen, or printed on a piece of paper. The more and smaller the dots, the sharper will be the digital image. Keep in mind, though, that the more and smaller the dots, the larger the digital file that represents the image.

For professional graphics work in which it's important that the image look as sharp as a photo, scanner resolution must be very high. Those scanners will be very expensive, and the files will be massive. For example, a high-resolution digitized photo that is sharp enough to be printed at 8 x 10 will take up a file that's somewhere in the range of 8Mbytes to 16 Mbytes.

For normal work that most small businesses do, resolutions can be much more modest, and the results will be adequate.

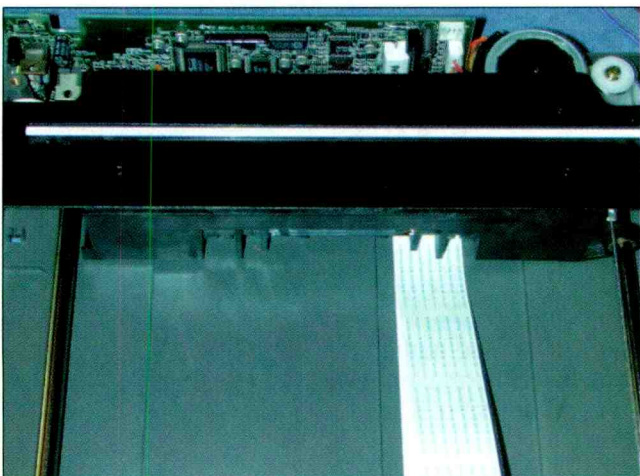


Figure 2

Manufacturers rate their scanners in terms of dots per inch (dpi) of resolution. For example, a scanner rated at 300 x 600 dpi separates each horizontal inch into 300 dots, and each vertical inch into 600 dots. A scanner capable of 600 x 1200 dpi, obviously is capable of separating each horizontal inch into 600 dots and each vertical inch into 1200 dots. Since the number of dots for each dimension is multiplied by two, the factor by which the size of file is increased is four. So a file at the higher resolution will be four times the size of the file at the lower resolution.

It's important to determine if the resolution specification is for true optical resolution. That's the only way you can accurately compare scanners. Some manufacturers advertise interpolated resolution. Interpolated resolution is achieved by operating on the scanned data with a software program, determining the mathematical average of the values of two adjacent dots and placing a dot of that value between them. This does not provide the same results as increasing the

actual resolution of the scanner.

Another specification that scanner manufacturers advertise is color depth. Most scanners are capable of 24 bits of color information. For all but the most demanding of graphics work, that number is adequate.

Uses of a Scanner

Whether or not a business needs a scanner depends on what kinds of images they might find it valuable to use. For example, if a company produces its own brochures, or other mailings, pictures of the service center can be scanned in and made part of the brochure. These days when so many companies maintain their own web sites, a scanner provides a way to input images that can increase the information content and attractiveness of the web page.

As inexpensive as scanners are these

days, it couldn't hurt for a service center to go out and spend in the neighborhood of a hundred bucks for a scanner, experiment with it, and see where it leads. If a scanner of that level is adequate, the enterprise can stick with it. But if it soon becomes apparent that something with more capability is needed, the management now has a much better idea of what they need, and can begin serious study to find a scanner of the right capability and a comfortable price range. ■

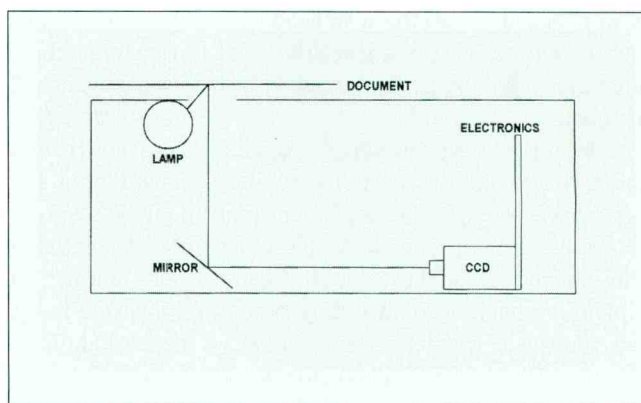


Figure 4

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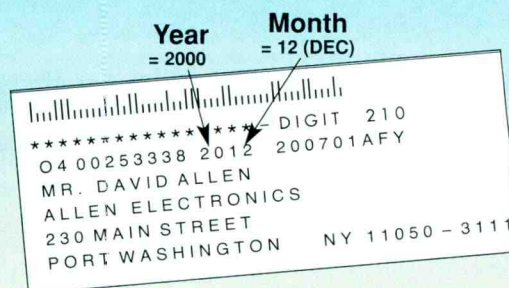
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NASC-2001

by the ES&T Staff

The National All Service Convention, sponsored by the Electronic Technicians Association (ETA) and the Professional Service Association (PSA), for 2001 was held Wednesday February 7 through Sunday February 11 at the Delta Orlando Resort in Orlando Florida. The convention included a School of Service Management, Training Seminars, a Trade Show, Industry Roundtable Discussions, Entertainment and an opportunity for attendees to network with their peers.



organization needed to spend considerable time on business management. The success of the NASC 2000 effort at providing business training, which resulted in 21 participants obtaining their Certified Service Manager (CSM) certificate, supported this conclusion.

It was therefore decided that not only would NASC 2001 offer a school of service management, but the content of the course would be expanded, to offer more in-depth training for those who may need additional knowledge. This year, the School of Management offered software tools designed to help service centers calculate and update their cost of doing business, and provided a simple method of developing personality profiles to understand and motivate consumers and employees. Another highlight of the convention was marketing of service businesses.

It was also determined that many of the

appliance technicians who have failed the certification exams are in need of basic knowledge to brush up on forgotten skills or to learn new basic skills that have never before been offered at a national convention. Appliance technicians for the first time were able to work toward that goal in a two-day workshop session in appliance basics. Several manufacturers sessions were held for electronics technicians.

In addition, there were hands-on workshops to learn how to understand customers and to turn negative situations into positive experiences. The convention leaders brought in tools for attendees to take home to help in hiring new employees to get the best of what is available psychologically and technically. Other topics that were held at the convention included: how to recruit, train and retain quality technicians for service centers; how to continue to provide warranty service and remain profitable, and a number of other topics that plague consumer electronics service centers.

A School of Service Management

After last year's convention, the PSA board of directors met to review the results of the NASC 2000 School of Service Management. It was determined that most of PSA's membership is composed of owners and managers. Because of this preponderance of managers in the membership, it seemed clear that the

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Circle (17) on Reply Card

Back to Basics

During the years that PSA has been certifying appliance technicians, they have been looking at the reasons for some technicians to fail a single module, or to fail the entire test. Since it is and has been PSA's intention to raise the quality of service nationally, it was felt that it is important to provide training in the areas where it is needed. Specifically, PSA has found that that many technicians are in need of reviewing the basics of electricity, troubleshooting techniques, properly using test equipment and understanding the theory of microwave oven operation.

To that end, the convention planners asked Whirlpool to assist them in presenting a basic electricity course that includes such basic ideas as Ohm's law, series/parallel circuits, reading schematic diagrams, tracing circuits.

Another informative session was presented by PSA's Mike Krokidas, who is an appliance service center owner, and a vocational instructor. This session covered the National Electrical Code and related local codes, work safety proce-

dures, proper use of test equipment in troubleshooting appliances, and the theory of microwave oven operation.

These sessions were set up in response to the comments of some more senior technicians who stated that they had forgotten some of the basics over the years, as well as younger technicians who commented that they had never been exposed to some of those basics.

Keeping Lead Out of Landfills

It was fortuitous that this convention was held in Florida. As reported elsewhere in this issue, in the article "Trends in Service Center Management," the disposition of end-of-life CRTs in TVs and computer monitors is an environmental issue on which Florida, Massachusetts and some other states have taken action. Florida has focused on CRTs as the most problematic material in the electronics waste stream because of their lead content. CRTs are the second largest source of lead in Florida's municipal solid waste stream, just behind lead acid batteries.

In a session on this subject area, a representative of Florida's environmental

organization described Florida's strategy, which includes regulatory streamlining, electronics recycling, infrastructure development, and some time-limited state funding to encourage the recycling of end-of-life electronics, and especially those containing CRTs.

Attendees learned that Florida's regulatory interpretation applies the hazardous waste regulations to CRTs, but specifies the "point of generation," and presents four management possibilities and how the hazardous waste regulations apply in each. Some of the actions being considered in Europe were presented, as well as some actions taken by the major electronics manufacturers.

Awards Banquet

One of the highlights of the convention was a presentation by Walt Herrin, Hitachi's National Service Manager, who was the guest speaker at the awards banquet. Herrin, who has been widely acclaimed as a strong supporter of independent consumer electronics service, provided his views on the future of independent consumer electronics service. ■

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New Products

Oscilloscopes

LeCroy Corporation is introducing a second generation of its midrange Waverunner series of two- and four-channel digital oscilloscopes (DSOs). The original oscilloscopes in this series



debuted on January 1, 1999, and are now joined by four new series instruments which feature a 350MHz to 500MHz bandwidth, higher sampling rate (1GS/s to 4GS/s), longer memory (up to 8 Mpts), and incorporate "WavePilot" and "QuickZoom" features for easy access to signal measurements. The DSOs also have an Advanced Trigger Package, which offers runt, and slew rate triggering. This move broadens the family to 12 models, providing a wide choice of value-oriented configurations for a variety of applications. The new instruments offer 350MHz or 500MHz bandwidth, 1GS/s to 4GS/s sampling rate, large color displays, long data-acquisition memory, and a strong analysis package.

LeCroy Corporation
Circle (18) on Reply Card

Rubber Keypad Repair Kit

CircuitWorks Rubber Keypad Repair Kit from Chemtronics permanently repairs rubber keypads by restoring conductivity to worn, intermittent, and nonconductive carbon contacts. This product easily returns rubber keypads to like-new condition, according to the manufacturer. This system is flexible and very durable. The kit provides a silver/carbon coating that is effective and long lasting. It repairs nonconductive keypads, offers excellent electrical conductivity, provides a wear-resistant coating with excellent adhesion. The

system has 72 hour pot life. Testing shows repairs can withstand over 500,000 simulated keystrokes.

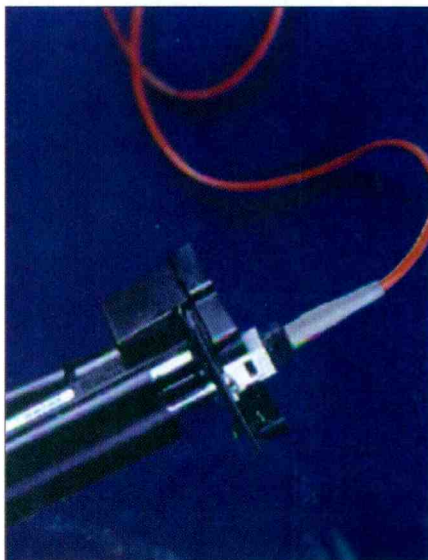
The product is useful for rework and repair applications including: telephones, controllers, carbon contact keyboards, communication equipment and miscellaneous keypads.

Here's how the product is applied. Pour the liquid in Part B into the container of Part A. Stir thoroughly for two minutes. Paint the worn carbon contacts with the mixed conductive material using the enclosed applicator brushes. Cure at room temperature (<25(C). Material dries tack-free in one hour. Repaired keypads can be returned to service in 24 hours. Ultimate properties are achieved in 72 hours. For faster drying, expose the material to approximately 190(F (90(C) for 10 minutes. Do not exceed 212(F (100(C).

Chemtronics
Circle (19) on Reply Card

Microscope for Fiber-Optic Connectors

Fotec has introduced a new microscope stage for the inspection of MT-RJ small form factor fiber-optic connectors.



The model V279 fits all MT-RJ connectors, with or without pins.

While most MT-RJ connectors are preterminated or use the prepolished/splice termination technique, the connectors are very sensitive to dirt and damage to the polished end. The microscope

allows checking the connector for dirt or damage.

The V100 microscope magnifies 100X and allows viewing both directly and at an angle for the best possible inspection of any connector. A built-in light source provides proper illumination of the viewed surface of the connector.

Fotec
Circle (20) on Reply Card

Connectivity Tester

The Net Tool Connectivity Tester combines cable, network and PC configuration testing in a palm-size tool. It identifies a jack as Ethernet, Phone,

Token Ring or inactive, and checks link pulse for speed, polarity, duplex, level information and receive pair. It resolves complex PC network configuration issues such as IP address,



default gateway, and email and web servers, while showing key network resources used by that PC such as servers, routers and printers. The tester simultaneously monitors network health (frames sent, utilization, broadcasts, errors, collisions) for full-duplex connections, with individual counts for both the desktop and network conversations. It shows protocol mismatches between the PC and the network, and identifies unwanted protocols that waste valuable bandwidth. It includes a Problem Log, which concisely lists problems detected on the PC and network such as addressing issues, email and web problems. The Standard tester provides single-ended testing of cable and desktop-to-network connectivity. It shows when a network drop is hot and identifies the service and the device on the other end. It also shows speed and duplex settings, and checks the health of frames being sent. The Inline tester is useful for network and PC tech-

New Products

nicians who install or troubleshoot networked PCs. It includes all of the standard features and comes with the inline function that allows users to eavesdrop on the complex PC-to-hub link pulse negotiation process to help resolve link connectivity issues.

Jensen Tools Inc.
Circle (21) on Reply Card

Cable Length Meter

The new CLM200 from Biddle Instruments is a handheld unit that measures the length of telecommunication, data communications, RF, small signal and power cables on drums, on cut lengths, or in installed sections. This meter is ergonomically designed, robust and simple to operate. It measures up to 6,000 feet and will detect and give distance to fault for opens and shorts. The unit is pre-programmed with the characteristics of 26 different standard cables to achieve the most accurate. Cable impedance and velocity factor are also user selectable to ensure that any cable construction and type can be measured. The meter comes with male and female BNC connectors and an alligator clip adapter for standard cables.



Jensen Tools Inc.
Circle (22) on Reply Card

Charge Analyzer

The enhanced model 711 Charge Analyzer from 3M tests the performance of static control products.

Featuring new housing dimensions, the 6" x 6" x 6" unit meets the requirements of ESD Standard 3.1 and IEC Technical Report 613450-5-1 and has a static decay time measurement of 0.1s to 99.9s. The updated analyzer includes two 11-digit LED bars that display separate positive and negative charge readings, as well as

three spacers that support the unit during horizontal airflow measurements for air ionizer performance tests. Additionally, the unit's test parameters are now menu driven.

Along with static decay testing, the unit can also be used as a voltmeter with an extended measurement range of 25v, 100v, 500v and 5kv. When used as a static field sensor, the product can store data and then transfer the information to a computer via a PC interface located on the back of the unit. An external field sensor is also included for making measurements in hard to reach locations.

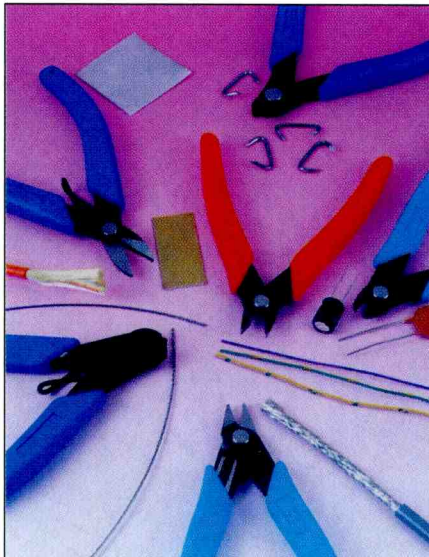
3M

Circle (23) on Reply Card

Ergonomic Hand Tools

A full line of specialty hand tools for creating crisp, clean cuts on a wide variety of substrates and crimping or forming soft and hard wire, with minimal squeezing effort, is available from Xuron Corp.

These feature the patented Micro-Shear flush cutter which employs by-pass cutting action to produce a clean, square cut using about half the force of convention-



al compression cutter says the manufacturer. Designed for repetitive tasks, these industrial-duty ergonomic tools have soft rubber grips and use light-action return springs rather than finger loops.

Suitable for a wide range of cutting, crimping, and forming tasks, the tools

include specialty head design such as the Model 9180 for cutting Kevlar fibers, Model 440 for cutting plastic tubing, mylar, sheet metal, and soft wire, the Model 2196 Hog Ring cutter, Model 670 cut and crimp tool for reaching into high density areas, and many others.

Xuron Ergonomic Hand Tools are priced from \$13.00 (list) each, depending upon model. A complete catalog and price list are available upon request.

Xuron Corporation
Circle (24) on Reply Card

New Product – Tool Suite Pro

Sencore introduces new toolsuite.doc Home Theater Tool Suite Home Theater Tool Suite Installation. Properly setup and RF distribution systems in a fraction of the time it takes.

The Tool Suite Pro Sencore includes:

1. The VP300 "VideoPro" Multimedia Generator delivers HDTV, NTSC, and Computer Monitor signals for accurate service and alignment of front and rear projectors, monitors, direct view displays, and video walls in all operating models.
2. The SP295 "SoundPro" Audio Analyzer is a professional quality audio analyzer designed to quickly equalize room acoustics, optimize speaker placement, and calibrate systems settings for concert quality sound!
3. The CP288 (Laptop) and CP290 (Portable) "ColorPro II" series of color analyzers help the user perform white balance calibrations on all video displays.
4. The SL754D "Channelizer" Digital Signal Level Meter is a rugged, handheld, weatherproof 863 MHz (including sub-band) signal level meter that measures both analog and digital signal levels. The unit features on button data collection of all system parameters for easy testing anywhere in the system. Includes FCC required CLI Leakage Testing function.
5. The CC299 Carrying Case made it easy to bring tools to the installation. It's built rugged, has wheels for easy transport, has storage space for, test leads, and service literature.
6. All tolls in the suite come with required cables and accessories.

Sencore Inc.
Circle (25) on Reply Card

Tape Teaches Basic Soldering and Desoldering Techniques

This hands-on instructional video displays the proper techniques for making perfect PCB solder joints, including surface mount technology (SMT). This video covers: cleaning and board preparation, iron types and wattages, tip styles and uses, solder, heatsinking, proper component placement, trace repair, and more. Learn how to make the proper equipment choices regarding iron wattages, solder thickness and styles, and other information to do the job right the first time. The last section of the video deals with proper desoldering methods using various vacuum and pump tools, as well as braids and wicks.

Electronix Corp.
Circle (26) on Reply Card

Catalog of Handling Equipment

Air Technical Industries offers a 48-page catalog that features handling equipment such as mobile hydraulic floor cranes, self-propelled reversible boom cranes, truck cranes, jib cranes, and gantry cranes. In addition, the catalog features a broad range of hydraulic scissor lift tables, turn tables, double scissor and tandem lift and tilt tables. The company has also pioneered the Zero Low Scissor Lift, affectionately called "The Magic Carpet Lift", which lowers flush to ground level and then is able to lift up to 50,000lbs to a desired height and is also featured in this catalog.

Other popular lines featured include dock lifts, maintenance personnel lifts, upender inverters and the Articularm. The Universal Lift, also referred to as the swiss army knife in lifting technology, is also included in this catalog.

Air Technical Industries
Circle (27) on Reply Card

Cisco Training

Global Knowledge announces the availability of their brochure on their hands-on authorized Cisco training. This authorized Cisco course covers the important information required to configure Cisco switches and routers in multiprotocol internetworks.

Twenty hands-on labs allow attendees to perform router and switch configurations on a LAN and WAN network.

Perform all basic configuration procedures to build a multirouter, multigroup internetwork that uses LAN and WAN interfaces for the most commonly used routing and routed protocols.

Attendees learn to install and configure Cisco routers and switches in multi-protocol networks, identify components and functions of the OSI Model, configure basic operation of Cisco IOS software, configure a router and switch from Command Line Interface, use system files to learn about neighboring devices, configure the Catalyst 1900 switch, extend switched networks with Virtual LANs (VLANs), and more.

Global Knowledge
Circle (28) on Reply Card

Tool and Test Equipment Catalog

Specialized Products announces the addition of Agilent tools for high-speed data testing to its 400-page Spring 2001 Catalog. The N1610B Service Advisor mainframe portable test tablet is Agilent's newest state-of-the-art platform for telco, residential access and line qualification applications. With its advanced Windows CE operating system and consistent graphical user interface, the Service Advisor provides an easy-to-use and versatile tool for installing and maintaining services at both the central office and outside plant.

Maximum test flexibility is provided via six optional interchangeable plug-in test modules. This modular architecture provides a cost-effective solution that can expand the Service Advisor's capabilities to meet future technology and requirements. It also enables users to rapidly switch test applications for first-tier-field deployment and second-/third-tier regional support.

Choose from five test modules. The mainframe can accept two single-width plug-in modules or one dual-width plug-in module. Hot-swap capabilities enable the user to change interfaces or test applications rapidly. Supports LAN and FlashROM PC cards.

Specialized Products Company
Circle (33) on Reply Card

Static Control Product and Services Catalog

A new catalog featuring static control products and services is now available

from 3M Electronic Handling and Protection Division. The 3M Static Control Products and Services catalog provides product data on 3M's complete line of static control products, such as workstation products, flooring, ionizers, test equipment, containers and bags.

The easy-to-use catalog is organized by product type and includes Product Referral Generator to help locate related products. The book also lists product descriptions, specifications, applications and other useful information to better understand the product before placing an order.

The catalog is available in standard paperback form or on CD-ROM. All of the company's static products and technical information are also available online at www.3M.com/ehpd.

3M
Circle (30) on Reply Card

New Web Sites

Web Site Supports Static-Control Industry

The static community now has a new web site to turn to for Electrostatic Discharge (ESD) support. Launched today, Static Planet (www.static-planet.com) takes the static world one giant step forward by creating a universal information source for all aspects of the ESD industry.

Sponsored by the 3M Electronics Handling and Protection Division with participation by Ion Systems and Tech Wear, Inc., Static Planet offers the latest in industry news, standards and trends; answers frequently asked questions; supplies links to ESD professional organizations; and provides an open forum for sharing ideas with other ESD professionals.

Coming soon, Static Planet will host the new web-based software application "Protect Your Product." This unique tool enables ESD managers to interactively develop static control programs customized to the environment of their facilities.

For the lighter side of ESD control, Static Planet features "Voltana," a feisty static superhero who battles ESD foes wreaking electro-static destruction. Along with her featured adventures, Voltana also hosts an "Ask Voltana" email forum, where visitors may send in their ESD dilemmas and questions.

3M
Circle (31) on Reply Card

Books

The Definitive Guide to PC Bus Theory and Applications

by Doug Abbot

\$49.95 Print, \$37.50 downloaded

The Peripheral Component Interconnect (PCI) Bus Specification is found inside every modern PC. Initially developed as a way to connect chips on desktop PC motherboards: PCI has now evolved into a standard for accommodating multiple high-performance peripherals to support graphics, video, SCSI, LAN, etc. A thorough working knowledge of the PC Bus is essential for anyone designing PC hardware or software.

Answering this need, LLH Technology Publishing has just published PCI Bus Demystified by Doug Abbott. The book is a practical guide to the intricacies of the PCI Bus and is based on the PCI Local Bus Specification 2.2 and related specifications such as the PC Hot-Plug Specification. Abbott begins with an overview of key PC Bus concepts including commands read and write transfers; memory and I/C addressing; error handling, interrupts; and configuration transactions and registers. Building on this foundation Abbott then discusses more advanced topics such as PCI-to-PCI-bridge architectures, PCI power management interfaces, the PCI BIOS, Plug-and-Play configuration and the new Compact PCI specification. Essential PC Bus data is summarized in the books appendices for quick reference.

Doug Abbott's skills and experience uniquely equipped him to write this book. He is the founder of Intellimetrix a Silver City, NM engineering design and consulting firm, Abbott's creative approach to design has been applied to projects ranging from simple power supply monitors to instrumentation systems for crash testing and engine analysis. He also conducts seminars on PC technology and embedded programming issues for the University of California-Berkeley and numerous Silicon Valley firms.

The accompanying Windows CD with this book includes a complete e-book version of the text. Readers can load the e-book version onto their desktop or notebook PC and search for specific words or phrases in the text; each instance of the

word or phrase is highlighted in the e-book. In addition, each index term is hyperlinked to areas in the text where it is found.

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ES&T Readers Speakout

READER OPINION SURVEY/COMMENTS

To ES&T

Let us hope that the enthusiasm of your new venture as expressed in December 2000 "Viewpoint" proves to maintain, even increase your circulation.

The avalanche of new technology and new product can be daunting to the Techs in the trenches because service data and parts availability lag so far behind. In that gap, enter the customer with this product, now broken, defective or malfunctioning; and with little understanding or patience for even the most reasonable explanation of cost of repair. Or who wants to pay Zenith \$300.00 (plus service mark-up, shipping and labor) to replace a picture tube in a television when a new Zenith 27" stereo television costs \$279.99 at K-Mart? Perhaps these serve as a partial explanation for Techs leaving the field and increases product in landfills. You are correct in that no one seems to be an expert, but if you will maintain your editorial schedule as outlined-not neglecting the "To be scheduled or added as available..." items, the service industry will retain a most valuable periodical. Thank you all for your hard work.

Sincerely, W.C. - Otis Orehards, WA

OCTOBER

Your schematics do not contain enough information to repair projection TV's, cameras, TV/VCR's. As a TV/VCR tech I find the information on TV's adequate. Shaw's TV - Vacaville, CA

Include key sequences, hidden buttons, to enter service menu. List of service codes in menu, alignment instructions - even if this means one less page of schematic. M.A. - Oriedo, FL

NOVEMBER

Delete: Playstations, camcorders, key-boards/organs. Expand: DVD, Digital TV, HDTV, Home theater. Television Systems. L.S. - Hardwick, MA

We do not like this new type of Profax - pullouts are better to use - its cheaper for you to publish- I'm sure tech articles are great. We need articles DVD players. I've been in service 1951. Earld Auto Visual Services E.L.L. - Shasta Lake, CA

Please continue to supply servicing tips. Also, Test Your Knowledge column. P.D.T. Sr. - Orlando, FL

I would like to see articles on DVD players repair and 21st century televi-

sion repair. I would also like to see articles on home and auto receivers repair and trouble shooting.

M.B. Electronics - Montegut, LA

I find articles by Bob Rose very useful. Keep up the good work.

Easingwood Holdings, LTD
- Langley B.C. Canada

I would like to see item on tube electronic repair now and again. Plus I would like to see books printed with good pictures with the schematic.

G.E. - Bronx, NY

I found your 2001 Editorial schedule to cover an excellent cross-section. As a retired industrial electronics tech., I restrict my repair work just to VCR's to keep my mind active.

D.D.S. - Merced, CA

More articles on HDTV, VCR's, TV power supplies. More articles by Homer L. Davidson.

E.N. - Aurora, NC

More VCR repair tips. More camcorder repair. More on CD-Players and Recorder players.

Feikert VCR Cleaning Service
- D.F. - Montrose, IA

You should add more tips to repair CD player's and more big screen color TV's. Symptoms like high voltage supply problems, for Mitsubishi, Magnavox, Pioneer, Hitachi, etc. etc. It will help sell more magazines. Thank You.

Al's TV Repair - Salinas, CA

Please expand the monitors technical update scheduled for the May 2001 issue.

AGH Research Labs
- A.H. - Sacto, CA

Add: DSL and wireless Internet to computers. Delete VCR service. If more than a belt or fuse not worth repairing. Same for CD players, same for Playstations.

Anon

More articles about repairing newer TV's.

ANON

DECEMBER

My October issue arrived the last day in October. My November issue arrived the 1st week in December. My December issue arrived today, January 5th! Why do you send out so late? My phone bill is rising calling you.

TV-VCR Fixer - Virginia Beach, VA

A few more HDTV diagrams wouldn't hurt.

M.C. - Des Plaines, IL

More articles by: Bob Rose and Homer Davidson. More TV and VCR articles.

S.R.C. - Mentone, CA

Enjoyed reading "Intermittent TV shut down problems." and "What's inside those HDTV set top boxes?"

B.L. Cravens TV Scranton, AR

More on troubleshooting techniques for digital cameras and more on home theater systems setup and repairs.

Note: This issue was very good.

Audio Equipment Repair - J.J., Phila, PA

Would like more articles on newer stereo systems. Example: (Panasonic model SACH94M)

Chassis Check - J.F.J., Continental, OH

I went into TV servicing in 1951. At 80 1/2 years old I'm still helping my old boss who has three (3) motels.

J.H.M. - Bradford, PA

The new Profax looks good!

B.R.M. - Synder, TX

More about troubleshooting procedures.

L.Z. - Fair Lawn, NJ

Great Magazine, keep up the good work. Information on Sony Play Station repairs and speaker repair. Allied-Trillium - Hamilton, Canada - I as a Bio-Medical Engineer Technician would like to see issues on the Bio-Medical field.

D.H. - Orlando, FL

I would like to see some Canadian distribute of replacement parts advertised.

L.R. - Drayton Valley

We need more articles like HL Davidsons (page 6). However, he should "proof Read" his parts references. He always makes mistakes.

Allied TV - Seattle, WA

Old Profax was much better. These are barley worth it. It could lead to canceling our subscription. What happened to schematics, these are block diagrams.

Jenkintown Sound & Security
- Jenkintown, PA

The price of STR is very good but the problem we need to order 10 pieces minimum and I need 5 pieces only. For each kind so the price is good but 10 pieces minimum is too much. Thanks. J.S. - Valley Stream, NY.

HELP-LINE -

I need HELP, I got one of those dogs at Mitsubishi - VS-458R - no high volt supply. I replaced STR-370 reg. Horz-output 2SD-870 - Hotz driver - 25C-2482, etc. Still blow fuse - 901-1.6 amp. And Z 901-1CP-38. Appreciate your help. (831) 422-3135

Alvarez TV - H.A. - Salinas, CA

Need inforon Bench Test Jig for large TV. What happened to Telematic Test Jig System cannot locate the company.

Quality Electronic Service
- A.M.F. - Meherrin, VA

I need a place I can send my modules to be repaired; I have a Mitsubishi model VS. 458-R nobody can repair. Appreciated you help is a main board #935B11202.

Al's TV Repair - Salinas, CA

I can not get service schematic for a Zenith 25" color TV model #SR2552S. Sam's do not have it. Can you get me a copy of this brand?

RF Radio Electronics - Honaker, VA

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

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Letter to the Editor

The recent passing of my father KENNETH E. HULL SR., C.E.T., has raised some questions about Winstips. The electronics troubleshooting software. Even though my father has expired, doesn't mean the company will too.

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Sincerely,

Doug Hull

Any Questions should be directed to:

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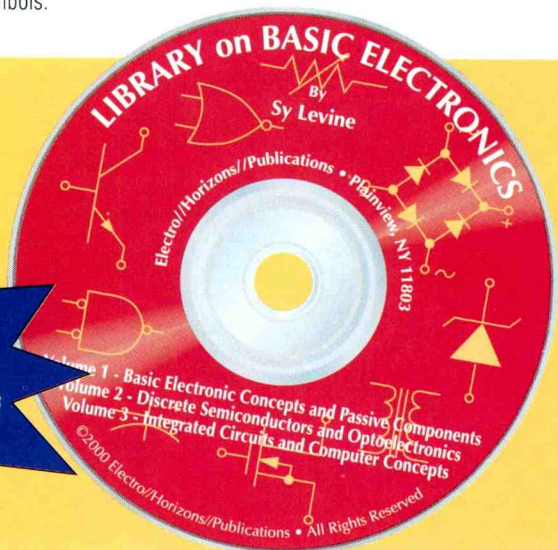
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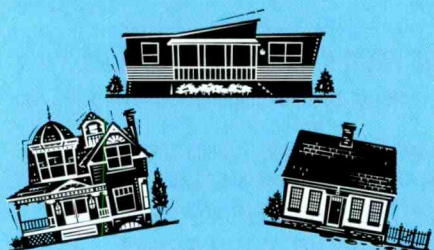
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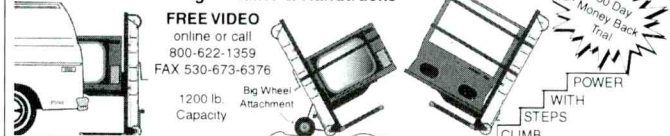
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JAN	CES SHOW ISSUE NASC PREVIEW	2000 ANNUAL INDEX OF ARTICLES AND PROFAX SCHEMATICS	DVD	Playstations	Materials Handling: ESD to Moving Equipment		50th Anniversary – History Part 1	CONSUMER ELECTRONICS SHOW (CES) 2001 January 6-9, Las Vegas Convention Center, Alexis Park & Riviera, Las Vegas NV
FEB	NASC SHOW ISSUE	REFERENCE ISSUE on Service Tips: CD's, Webs and OEM contacts	Scanners	VCR/TV Combos	Service Management Software	Phone Systems	Service Center Management Trends	NATIONAL ALL SERVICE CONVENTION (NASC), February 7-11, Delta Resort, Orlando, FL
MAR	COMDEX PREVIEW NASC REVIEW	TOOLS AND TOOLCASE SHOWCASE and Review	Printers	VCRs	Test Equipment Update	Designing Your Showcase Site	Circuit Board Rework Opportunities, Solutions	ELECTRONIC HOME EXPO March 7-10, Orange County Convention Center Orlando, FL NSCA National Systems Integration Expo, Mar 8-10, Orange County Conv. Center, Orlando FL.
APR	COMDEX SHOW ISSUE EDS PREVIEW	DISTRIBUTION SHOWCASE and Review	Rewritable Disk Systems	CCTV	Test Probes/ Accessories Update	Antennas/ Top Boxes for HDTV	50th Anniversary – History Part 2	COMDEX/CHICAGO 2001 (Formerly COMDEX-Spring) April 3-5, McCormick Place, Chicago, IL
MAY	COMDEX REVIEW, CABLE-TEC SHOW ISSUE, EDS SHOW ISSUE, NETWORK+INTEROP SHOW ISSUE	15th ANNUAL WEB and BUYER'S GUIDE. Includes multiple manufacturer/ distributor listings in the Product Directory and a Company Contact Directory, including Web and Email addresses	Monitors	Marine Electronics	Electronic Servicing Supplies	Audio/Sound Installation and Maintenance	Cost of Service Today	CABLE-TEC EXPO 2001, May 8-11, Orlando, FL. ELECTRONIC DISTRIBUTION SHOW & CONFERENCE (EDS), May 15-17 (May 14 Educ.), Las Vegas Hilton, Las Vegas, NV. NETWORK+INTEROP, May 6-11, Las Vegas Conv. Center, Las Vegas, NV
JUN	EDS, COMDEX, CABLE-TEC & NETWORK REVIEWS		GPS/Auto, Marine, etc.	Camcorders	Soldering Desoldering	Network Installation and Maintenance	Learning Programs	
JUL	NPSC PREVIEW		AutoComputer Systems	Microwave Ovens	Oscilloscope Update	Servers	50th Anniversary History Part 3	
AUG	NPSC SHOW ISSUE CEDIA PREVIEW	REPLACEMENT PARTS SHOWCASE and Directory	Firewire	Digital TV	Multimeter Update	Lighting	Complying with Environmental Considerations	NPSC (NESDA/ISCET) Conference, July 30-Aug. 4, Riviera Hotel, Las Vegas, NV
SEP	CEDIA SHOW, NETWORK+INTEROP SHOW ISSUE	HOME THEATRE SHOWCASE and Review	Telecom Test Equipment	HDTV	Transformers	Power Management	Home Theatre Opportunities	CEDIA, Sept 5-9, Indianapolis Convention Center, Indianapolis, IN. NETWORK+INTEROP, Sept. 9-14, Atlanta, GA
OCT	CEDIA, NETWORK REVIEW, COMDEX PREVIEW	MANUFACTURERS PRODUCT BRAND Directory	PC Testing Tips	Keyboards/ Organs	SMD	Servicing \$10,000+ TVs	50th Anniversary – History Part 4	
NOV	COMDEX SHOW ISSUE		Computer Software Diagnostics	Cassette Mechanisms	Power Supplies	Rear Projection	Servicing TVs Today	COMDEX-FALL 2001, Nov. 12-15, Las Vegas Convention Center, Las Vegas, NV
	COMDEX REVIEW	TEST EQUIPMENT SHOWCASE and Review	Internet Access	CD Players	MPU's	Security	New Technology Update	

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

Signal Source Video pattern generator 1219 \$150.00, Biotech Electro surgical analyzer \$75.00, Strobe light tachometer \$100.00, Microfiche reader \$65.00, Weller solders station \$55.00, Tube caddy w/112 tubes \$100.00, 265 loose tube \$195.00, Static Mat \$25.00, Heath Kit Courses on: Semiconductor Devices, Electronic Circuits, and DC Circuits each includes parts kits for experiments \$50.00 each, NRI VCR course \$25.00, Heath Kit General Class Amateur Radio course \$60.00, Zenith Transoceanic radio \$300.00, Stromberg Carlson short-wave radio \$300.00, Scott 299c Stereo amp \$40.00, Kenwood 2mtr handy talkie w/ accessories \$200.00, Will ship COD and Add shipping to all prices. (E. Leduc, 319 So. Hall St., Manchester, NH 03103 **Phone (603) 669-1533, E-mail: edleduc@prodigy.net**)

Wavetek Signal Analysis Sams 450 at \$200.00, also Sams Digital Model III at \$300.00, Both in soft cases. Alex Minelli 718 Michigan St. Hibbing, Minn. 55746.

WANTED

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

EICO HF-32 mono tube amplifier from the 60's, any condition. Have one, need a second for stereo.

Or as parts, at minimum, need its power and output transformers- will build the rest. John Agugliaro, CET. phone: (845) 947-2748, email: JAGUGL4546@aol.com

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

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

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

Sams auto radio repair manuals (AR manuals). Early editions preferred. Call Gene, (401) 231-6504 anytime.

Need Flyback transformer Toshiba #TFB4042AD for TV monitor CZ2094. Call Transistor Clinic at 810-774-1230 or write at 23419 Gratiot Avenue, Eastpoint, MI 48021.

Hitachi Projection Color TV-model# 46EX1B. Need yoke for television Part# 2442842. Will pay shipping & handling. Contact: Raymond Howey at (804) 321-8377. 3614 Delaware Ave. Richmond, VA 23222

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



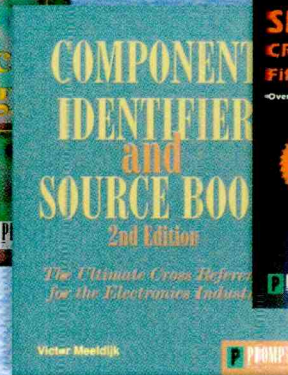
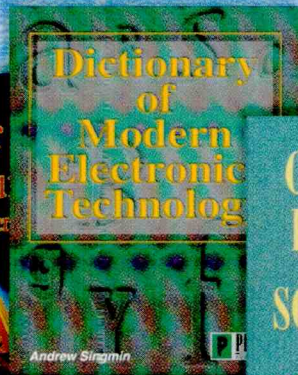
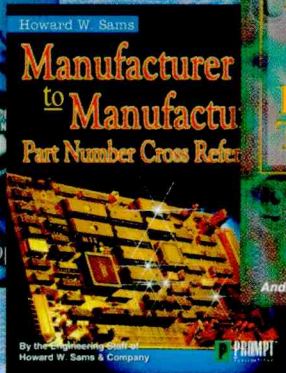
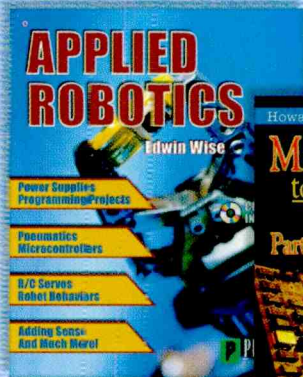
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