

THE MAGAZINE FOR PROFESSIONAL ELECTRONIC AND COMPUTER SERVICERS

# ELECTRONIC™

Servicing & Technology

May/June 2001

## BIG DOUBLE ISSUE

### 15TH ANNUAL BUYERS' GUIDE & WEB DIRECTORY — OVER 1,300 COMPANIES!

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- *The Cost of Service Today*
  - *Audio/Sound Installation & Maintenance*
  - *Monitors*
  - *Camcorders*
  - *ProService Review from NESDA*

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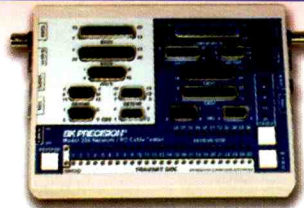
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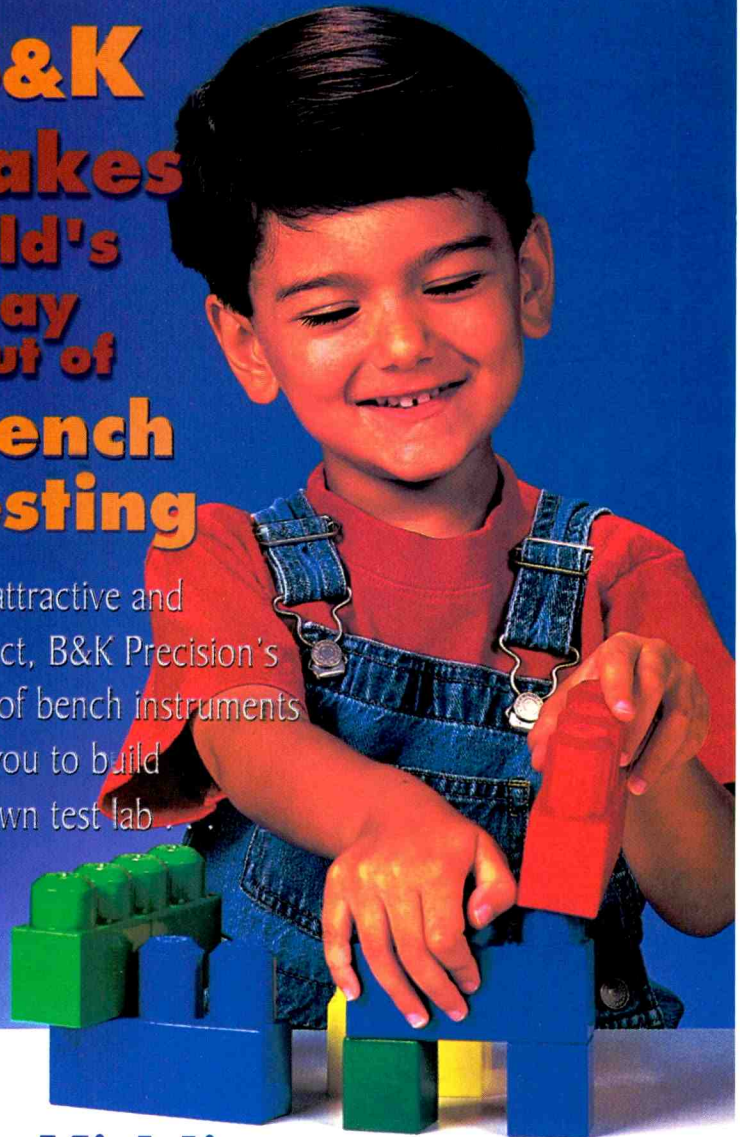
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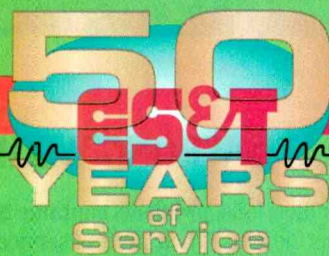
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### NOTE TO OUR FRIENDS:

This Combined May/June issue is a result of the unexpected size of the Buyer's Guide and family health problems. We appreciate your patience and consideration during this difficult time. ES&T will publish an extra issue at year end similar to the previously produced (and discontinued) Profax issue.

### FEATURES

#### THE COST OF SERVICE TODAY \_\_\_\_\_ 8

ES&T Staff

Repairing sophisticated electronics equipment is only part of the job for today's Professional Servicers...increasingly difficult is the job of determining the price of the repair. ES&T and NESDA provide input for determining your key price points.

#### AUDIO/SOUND INSTALLATION AND MAINTENANCE \_\_\_\_\_ 10

Bob Rose

New sound systems and offerings by the consumer manufacturers provide new opportunities and challenges for the Professional Servicer. Bob Rose explores the questions and provides a guide to resources.

#### COMPUTER MONITORING TROUBLESHOOTING & REPAIR \_\_\_\_\_ 16

Adapted from Sams Book of the Same Title

Understanding computer monitors is a first step to profitable repair business. The ES&T staff provides a quick review of monitors, and how they work.

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ES&T Staff

The new camcorders are extremely small and compact. As such their components are often more difficult to identify, troubleshoot and repair. Sometimes repair may not even require opening the unit if you know the right codes and connections.

#### 15TH ANNUAL BUYERS' GUIDE & WEB DIRECTORY \_\_\_\_\_ 26

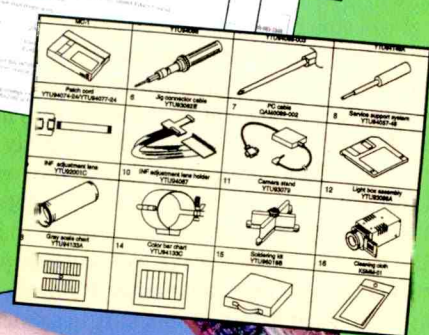
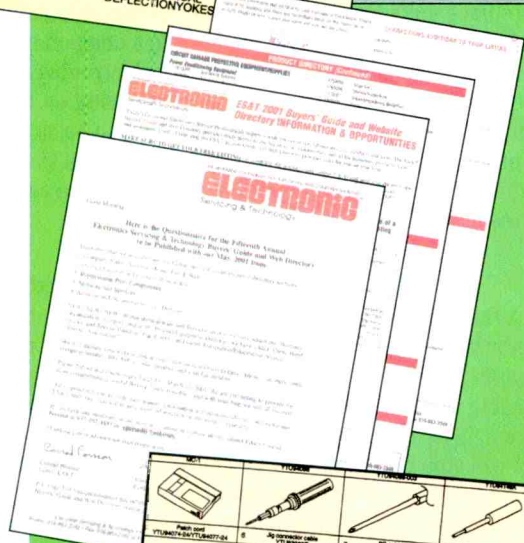
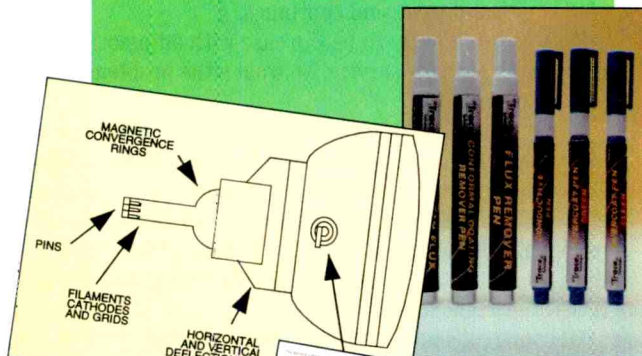
The ES&T staff has compiled a comprehensive list of more than 1,300 vendors and their offerings to the Professional Consumer Electronic Service Community.

#### BIG DOUBLE PROFAX \_\_\_\_\_ 55

With this May/June double issue, we also present a double Profax beginning on Page 55.

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# Editorial

by Nils Conrad Persson

## WHAT'S WRONG WITH THE CONSUMER ELECTRONICS SERVICE INDUSTRY?

By all indications, problems continue to exist in the consumer electronics industry. Thousands of service centers have gone out of business and the trend continues.

This does not seem to be the case with automotive service, and many other kinds of service. So what's the problem? A number of factors are involved.

For starters, many consumer electronics products are priced so low that it is not economical to fix them. But one thing the automotive service industry learned is that it is frequently more cost-effective to R&R (Remove and Replace) modules than to troubleshoot and repair them at the component level. It might be time for consumer electronics manufacturers and servicers to revisit the same possibility.

Of course, it's an anathema for many skilled service technicians to replace modules. They love the challenge of troubleshooting, and want to track the problem down to a component, or components. And, of course, many consumer electronics products are not designed to be serviced by replacing modules. But service centers, and the manufacturers who want to be sure they remain in business, must take steps to keep servicing a viable and profitable pursuit, and module replacement in some servicing procedures may help.

### Don't Subsidize Others' Mistakes

A related problem is that manufacturers have let themselves be victimized by mass merchandisers. Because of cut pricing to retailers, there isn't enough money in the pot to pay servicers reasonable warranty rates. The result is a system in which manufacturers, in essence, ask servicers to subsidize the cost of service.

I will stop here and say that this is not the case with all manufacturers. Some manufacturers are well-known for providing fair warranty rates. But many pay as little as they can get away with.

Another problem: in some cases, mass merchandisers buy products with no manufacturer's warranty at a discount. The mass merchandiser then applies its own warranty to the product. The problem for independent service centers here is that they have no chance to service that product while it is under warranty. And because the purchaser will probably purchase an extended warranty from the same retailer, it's likely that independent service will never get an opportunity to service that product at full rates.

Which brings us to the whole business of extended warranties. There's little enough money to be made in consumer electronics service in the first place, but large financial organizations want as big a piece of that little pie as they can get, so they underwrite extended warranties, or, if you prefer, service contracts. Then when the manufacturer's warranty runs out, and the independent service center has an opportunity to service the product, he is asked to service it at warranty rates, often below his cost of doing business. (Some extended warranty companies provide a reasonable rate, but many do not).

And of course when a self-servicing company, or an extended warranty company, goes belly up, the consumer has to pay for service he thinks he already paid for once, and the entire service business gets a black eye. More than one servicer has been left holding a bag full of unpaid claims when one of these third-party

warranty companies folded.

There are several things a service center can do to improve the situation. A good place to start is in negotiating reasonable warranty rates with manufacturers.

### Know Your Costs

The best way to negotiate reasonable warranty rates is to know what every hour of labor costs. This issue includes an article on that very subject. Read it; calculate your cost of doing business, and be informed when you go into negotiations with the manufacturer.

What else can you do to be paid in accordance with your efforts? A number of service managers are offering different levels of service; not unlike the different levels of service offered by airlines: first class, coach and standby. Mike Webber, President of NESDA has picked up the idea and has been recommending that all servicers give it a try.

Does it work? Here's what Randy Whitehead, a service center owner in Utah, and past president of NESDA, says in the Kansas Electronics Association newsletter. "Today a manufacturer called and asked if I would consider doing work for them. It was a simple chassis swap that required no alignments at all, and they would send the chassis in advance.

"I asked them how much they were willing to pay. They offered \$125.00 for that straightforward chassis swap. I then asked what level of service they wanted. "You can have first class, economy, or standby service. First class is within 24 hours, economy is within 72 hours, and a standby repair will be performed within a week, whenever we are close to the customer." He then asked, "What are the rates for each class of service?" "\$225 for first class, \$165 for economy, and \$125 for standby."

"After consulting internally, the manufacturer came back on the line. "We want the economy class for our customers. When you get the contracts, just mark out the pre-printed amount and write in the \$165. That will be fine."

"I have never had such an easy time negotiating."

Many service centers are reluctant to antagonize a manufacturer fearing, they'll go to the guy down the street. It might be wise to let them do just that. Then when the guy down the street closes his doors you can negotiate reasonable rates.

One more thought. While you're calculating your cost of doing business, do a few calculations on individual manufacturers volume and rates work. Don't forget to add in the cost of the time it takes to get paid for your work by these manufacturers or a warranty firms. Armed with this information, you might even post a sign letting your customers know which manufacturers products you service promptly, and which will be serviced when you get around to it and why.

We may make the consumer aware that the cheapest buy at the discounter will not get the same service as purchasing a first class brand from a first class retailer, ie: if you get on board in steerage, you travel and land in steerage. There are no free upgrades.

*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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## **ATSC RF Task Force Completes Work and Publishes Report**

The Advanced Television Systems Committee (ATSC) Task Force on RF System Performance has completed its work. The Task Force was formed in March 2000 to examine technical issues related to DTV RF system performance and to make appropriate recommendations regarding potential ATSC technical initiatives. "The RF Task Force performed a very valuable service, providing an open industry forum for discussion of RF-related issues," said Mark S. Richer, ATSC Executive Director. "Active participation of broadcasters, consumer electronics manufacturers, semiconductor manufacturers, professional equipment manufacturers and others made the Task Force successful."

As a part of its activity, the Task Force completed a comprehensive report, "Performance Assessment of the ATSC Transmission System, Equipment and Future Directions". Among other things, the Task Force concluded that newer generation 8-VSB receivers largely meet the goals of outdoor reception by fixed receivers in accordance with the FCC DTV planning factors. Another major finding of the Task Force is that the main limiting factor for indoor, pedestrian and mobile reception is adequate field strength at a given location, not the modulation standard. This report is available at [www.atsc.org](http://www.atsc.org).

Even before its final conclusion, the work of the Task Force led to important new work

begun last year in the ATSC Specialist Group on RF Transmission (T3/S9). Earlier this month, T3/S9 received ten responses to its Request for Proposals (RFP) for enhancements to ATSC transmission specifications. The RFP, which was issued on January 25th, with responses due on April 2nd, was aimed at addressing emerging digital television (DTV) applications. Respondents to the RFP include the following organizations: ADC Telecommunications, Broadcom, Conexant Infotainment Systems, Merrill Weiss Group, Patel-Limberg-McDonald,

NxtWave Communications, Oren Semiconductor, Philips, Sarnoff Corporation, and Zenith Electronics.

"We are extremely happy with the high level of interest in this effort," said John Tollefson, Vice President, CTO of PBS and Chairman of T3/S9. "The thoroughness and quality of the responses are very encouraging." Evaluation of these proposals will be done in accordance with the due process procedures of the ATSC. ATSC may combine various aspects of multiple responses into a final specification.

## **One-Millionth DTV Product Sold**

Demonstrating the strong momentum in the transition to digital television (DTV), the Consumer Electronics Association (CEA) announced the sale of the one-millionth DTV product. The announcement comes on the heels of total first quarter sales of DTV products released at NAB2001. It was reported that sales of DTV sets and displays from manufacturers to dealers totaled 234,558 units, or dollar sales of more than \$462 million, representing a unit increase of 158 percent over last year's first quarter results.

In just three short years television manufacturers have produced more than 250 models of DTV products and have enhanced their affordability even while

improving the performance of these products. CEA reports additional DTV sales figures, which reflect the wide array of products available in the retail market.

### **Percent of DTV Products Sold in Various Categories**

Direct-View .....	23%
Projection .....	77%
HD Capable .....	86%
16X9 .....	32%
4X3 .....	68%
49" and Under* .....	38%
50" - 54" .....	27%
55" - 59" .....	16%
60" and Over .....	20%
*Including direct-view	

## **AOL Time Warner, Bertelsmann, EMI and RealNetworks Create New Platform for Online Music Subscription Services**

AOL Time Warner Inc., Bertelsmann AG, EMI Group plc, and RealNetworks, Inc. announce a venture which will create a platform for online music subscription services. This platform - MusicNet - will combine an extensive collection of downloadable and streaming music with advanced technology. The end result will greatly accelerate the roll-out of online music subscription services for consumers across multiple distribution networks, including RealNetworks and the America Online family of interactive brands later this year.

Under the agreement, RealNetworks, EMI, Bertelsmann and AOL Time Warner will each own a minority stake in MusicNet.

The companies' music subsidiaries - EMI Recorded Music, BMG Entertainment, and Warner Music Group - will each separately license their music to MusicNet on a non-exclusive basis. RealNetworks will contribute its industry-leading Internet media delivery technology. MusicNet will operate as a standalone independent company. MusicNet, as both a technology provider and a music clearinghouse, will operate as a standalone independent company and will license its "private-label" platform to companies seeking to sell music subscription services under their own brands. The company's goal is to distribute music profitably to as many outlets as possible. MusicNet will initially license its platform

to America Online and RealNetworks, each of which plans to launch branded online subscription services later this year. MusicNet will also license its platform to other distribution outlets, including Napster, provided such outlets satisfy legal, copyright and security concerns.

This marks the first time a majority of the major record companies has licensed music to a venture whose goal is mass subscription distribution over the Internet. MusicNet will offer distributors an extensive collection of popular music content over one platform, and will benefit recording artists by providing new opportunities to reach fans and other consumers with their music in a secure and protected fashion.

## **CEA and NAB Announce Joint DTV Promotional Activities**

The Consumer Electronics Association (CEA) and the National Association of Broadcasters (NAB) have announced a joint digital television (DTV) promotional program to begin this fall. The DTV program is targeted to consumers, will combine print/broadcast advertising, a local-retailer tie-in and a public relations campaign to raise the awareness of the products and programming options for digital television.

The announcement of the CEA/NAB campaign was made at NAB 2001. NAB

President and CEO Edward O. Fritts said, "DTV offers consumers better picture quality and a plethora of new services that will be free of charge to viewers. This effort will educate consumers about the benefits of digital and high-definition television, and serve as a reminder that DTV's time has come."

"We already have seen enthusiasm for this campaign from manufacturers and retailers," said Gary Shapiro, president and CEO of CEA.

## **William S. Warren Named by Herrin**

William S. Warren, CET/CSM, has been named Sr. Manager, Field Operations by Walt Herrin, Hitachi Home Electronics (America), Inc.

Warren is well known throughout the industry for his involvement in association affairs and as owner of Warren Electronic Service, in Knoxville, TN for the past 28 years. He is in the process of moving to San Diego to take on his new position.

## **USB Specification Expanding, Boosting Performance 10 to 20 Times Beyond Current Capacity**

The PC industry leaders who brought Universal Serial Bus (USB) technology from concept to mainstream market acceptance within four years are developing a next generation USB 2.0 specification that will extend performance by 10 to 20 times over existing capabilities. Compaq, Hewlett-Packard, Intel, Lucent, Microsoft, NEC, and Philips will jointly lead this initiative, which will enable new classes of high performance peripherals.

With the increased availability of USB-enabled PCs and USB peripherals on the

market today, the need for legacy dependent input/output (I/O) connectivity is decreasing significantly. USB 2.0 will be a significant step towards providing additional I/O bandwidth and broadening the range of peripherals that may be attached to the PC.

USB's quick proliferation as the replacement of serial and other PC ports for I/O devices in peripherals such as digital joysticks, phones, scanners and digital cameras has accelerated the production and availability of such devices. More than

100 were in the marketplace at the end of 1998, with hundreds more expected during 1999.

USB 2.0 will extend the capabilities of the interface from 12 Mbps, which is available on USB 1.1, to between 120Mbps and 240 Mbps on USB 2.0, providing a connection point for next-generation peripherals which complement higher performance PCs. USB 2.0 is expected to be both forward and backward compatible with USB 1.1, and to result in a seamless transition process for the end user.

## **Philips Semiconductors Announces First IEEE 1394-1995 Compatible Audio/Video Link Layer Controller Targeting Consumer Electronics Market**

Targeting the connection of consumer and computer electronics, Philips Semiconductors has announced the PDI1394L11, an IEEE 1394-1995 compliant audio/video link layer controller featuring an embedded A/V layer interface. IEEE 1394-1995 High Speed Serial Bus Interface Standard provides a means of interconnecting a variety of consumer electronics, including digital audio devices, digital VCRs and digital video cameras easily to multimedia PCs and workstations. The new controller includes an embedded A/V layer optimized for digital video per IEC 1883 specifications — a widely-agreed upon method for transporting digital video over 1394-1995. The A/V layer provides a byte-wide interface designed to accommodate various digital video formats, such as MPEG-2 and DVC.

According to Allen Light, Technical Marketing Manager for Digital Interface Products, "By optimizing our link layer controller for peripherals, we simplify the design of products like digital VCRs and set-top boxes that connect with 1394-1995. To date, similar products in the marketplace have been designed for specific buses such as PCI, creating difficulties for these peripheral manufacturers. Digital video is an exciting new application for computers and consumer electronics, and 1394-1995 brings it all together."

The IEEE 1394-1995 standard provides simultaneous real time (isochronous) data transfers and non-time dependent (asynchronous) data transfers, allowing devices with real-time data requirements, such as live digital video from a camcorder to share the same bus

as a non-real time device such as a computer disk drive.

With isochronous data transfer, unlike the asynchronous buses common in today's PCs, the data is delivered at a constant and reliable rate — eliminating the need for expensive memory buffers. The PDI1394L11 is hot pluggable, allowing a peripheral to be used in a true plug-and-play mode. This permits devices like camcorders and VCRs to be connected without having to power down equipment or reconfigure bus logic. Traditionally, adding new capabilities to PCs has been a difficult process for consumers. However, with 1394-1995 enabled peripherals, it will just be a matter of plugging them in. The IEEE 1394-1995 architecture is designed to be scaleable, allowing faster peripherals in the future.

## **CEA Files Opposition to Mandatory DTV Receiver Standards**

In a brief filed with the Federal Communications Commission (FCC), the Consumer Electronics Association (CEA) stated its vehement opposition to a petition requesting that the FCC reconsider its ruling pertaining to performance standards for digital television (DTV) receivers. "CEA and its members strongly oppose broadcasters' continued calls for government-imposed performance standards for digital television receivers," the brief states. "As the Commission recognizes, 'DTV receiver manufacturers, driven by market forces, are continuing to make significant improvements in their products, particularly in the area of indoor reception and multipath signal handling capabilities.' The Commission correctly concluded that gov-

ernment mandated performance standards would impede innovation and lead to lowest common denominator solutions." The brief was filed in response to a petition by a group of broadcasting organizations, who have asked the FCC to reconsider its ruling in the DTV Biennial Review Order, which declined to adopt mandatory performance standards for DTV receivers.

CEA's arguments focus on two distinct points: (1) that the FCC lacks the requisite statutory authority to impose such standards upon manufacturers, and (2) that mandatory receiver standards are a poor policy decision, due to the thriving consumer marketplace for DTV products. With regard to the FCC's authority in the matter, CEA argues that "While drafting the All-Channel

Receiver Act, the 87th Congress explicitly considered and rejected the possibility of granting the Commission the general authority to set receiver performance standards. As discussed in previous pleadings submitted before the Commission, the legislative history of the statute clearly bears out this fact."

In terms of the policy implications, CEA cites previous decisions by the FCC to rely on market forces to govern DTV receiver design, "Throughout its DTV proceedings, the Commission has recognized the inherent difficulties of predicting consumer demand... The Commission was properly reticent about predicting market demand. Equipment manufacturers, motivated by market demands, are in the best position to respond quickly to marketplace changes."

## **Sams Announces Big Screen & Projection Set Coverage**

Indianapolis, IN. Sams Technical Publishing has announced the release of coverage on Big Screen and Projection Sets, called PHOTOFACT® GOLD.

PHOTOFACT® GOLD addresses the need for service literature covering Big Screen and Projection sets. Sams' customers have indicated a definite need for service literature for this growing product segment.

The 1st PHOTOFACT® GOLD will be included in the June 2001 POM and is also available from participating

Sams Distributors beginning in June 2001 and covers GE model 46GW948YX3. The 2nd PHOTOFACT® GOLD will be available in August 2001 and each month thereafter.

Sams Technical Publishing is seeking input from the service community to help determine which Big Screen and Projection Sets to cover. Make and model numbers should be forwarded to [samstech@samswebsite.com](mailto:samstech@samswebsite.com) to be considered for future PHOTOFACT® GOLD sets.

## **PTS Electronics Corporation Signs Exclusive Agreement With EchoStar/HTS**

Bloomington, Ind. - PTS Electronics Corporation has signed an exclusive agreement with EchoStar Technologies Corporation to provide repair, parts and accessories for its C-Band products.

Under this agreement, PTS will also provide technical assistance to EchoStar/HTS customers with questions on repair or set-up. Currently, all EchoStar parts orders, service and inquiries are being handled through the Arvada, Colo. facility of PTS.

EchoStar Technologies Corporation is one of the world's largest home satellite manufacturers. EchoStar Technologies Corporation, formerly Houston Tracker Systems, is a division of EchoStar Communications Company (NASDAQ:DISH, DISHP). Other subsidiaries of EchoStar Communications Company include Dish Network( and EchoStar Satellite Service.

PTS Electronics is one of the largest independent electronic service companies in the nation. Established in 1967, PTS currently employs more than 600 technical and support staff. The firm's corporate headquarters are located in Bloomington, Ind., with additional facilities in Arvada, Colo. and Tustin, Calif.

## **PTS Electronics Corporation Expands HDTV Capabilities**

Bloomington, Ind. - PTS Electronics Corporation, has expanded its servicing capabilities to include HDTV boards for models of Zenith, RCA and Hitachi product lines.

"We will be continuing our investment in the expansion of HDTV service to include other major brands," said David Melwid, Sales and Marketing Director for PTS Electronics. "More capabilities will be added as the demand for HDTV service increases," he said.

Melwid added that PTS is positioning itself to handle all types of future electronic products, even beyond HDTV. "We have a large staff dedicated to providing service to assist manufacturers and servicenters

with the potential challenges of servicing new products. We can provide service data that will enable manufacturers to improve the reliability of their products."

PTS contracts with manufacturers and works with authorized warranty servicenters to handle the repair and rebuilding of television tuners and mainboards for most major product lines. PTS also keeps an inventory of products that can be shipped the same day from their warehouse. Melwid added, "PTS has the unique ability to ship product in the same manner a distributor would, and we can also provide service on a board if we don't currently have one in stock. This would be a repair and return type situation."





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# The Cost of Service Today

“How much should I charge a customer for servicing a TV? Or a VCR? Or any other product?” That’s a question we hear from readers from time to time. The answer is both very simple, and quite complicated. You charge the customer the amount that it costs you to fix that product, plus a reasonable amount for profit. That’s pretty much the same way that retailers of any product determine the sale price. That’s the simple part.

The hard part of the answer to that question is to determine what your cost is. Very simply, and we’ll get to the details in a moment, you add up everything that it’s costing your company to be in business, add a factor for a reasonable amount of profit, determine the actual productive hours worked by all of your technicians, divide the cost by the number of hours and that’s what you need to charge per hour for labor. The cost of parts, service center materials, etc, has to be added to that.

## Making Those Calculations

NESDA, the National Electronic Service Dealers Association, has done a great deal of study into the accounting necessary to determine what it costs a service center to stay in business. If you’re not using some kind of proper method, such as theirs, to calculate your cost of doing business, determining what you should charge for service is just shooting in the dark.

NESDA was kind enough to allow us to present their form to help readers determine their costs of doing business. What follows is the essence of that form, the NESDA-Approved Industry-Standard Electronics Service Center Costs-of-Doing-Business and Hourly Labor Rate Determinations.

All independent service centers need to know their hourly labor rate based upon their actual, known costs of doing business applied to their required profit percentage. To aid the dealer in determining these figures, NESDA has provided the instructions and work sheet shown on the facing page.

## Calculating the Cost of House Calls

Determining the cost of making a house call has its own set of calculations. The following calculations, based on infor-

mation provided by a service center should be considered as illustrative only. Many actual factors are not considered. However, even if you perform a calculation such as this without all the information you need, at least you’ll have some idea of what your costs are. That’s better than nothing. And it might open your eyes wide in terms of what a vehicle and drive can be costing your business.

Lets pick a number for the cost of the vehicle when brand-new. Say \$25,000. Let’s say that it will be possible to use the vehicle heavily for three years. That comes to roughly \$8,000 per year. Now add approximately an equal amount for fuel, lube, tires, maintenance, insurance, taxes, and miscellaneous.

This brings the cost of the vehicle to \$16,000 per year. Add in the salary of the technician who is running around in it; say \$24,000, to make a total of \$40,000. If you use the vehicle for 250 days out of the year, that makes the cost of that vehicle and driver \$160 per day.

As a rough rule of thumb, the revenues from your business involving that vehicle and driver will have to be approximately four times that amount to break even: \$640. It would not be unusual for the vehicle to travel 100 miles in a day plus whatever time the technician spends in the home. Again making a very rough approximation, the outside technician with this vehicle could make, say, eight (or more realistically, six) calls, he would have to make an average of \$80 (\$110) on each call (labor only).

Furthermore 100 miles traveled for eight calls translates to 12.5 miles per call. If your particular situation is different, your vehicle could have to travel fewer, or more miles per call, on the average. Your own experience will allow you to calculate an approximate cost per mile to drive the vehicle. In this case, if we have described an average day above, it would be \$160/100, or \$1.60 per mile.

Here’s a simple example. If the driver has to drive 20 miles to a home, at 40mph, that would cost the company 20mi X \$1.60/mi, or \$32, plus the driver’s pay, say \$24 for 1/2 hour, for a total of \$56.00. Just to get to the home. If the service can’t be performed

in the home, it will cost as much to deliver the product back to the home once it’s been serviced. If the size and weight of the product were such that two men were required on this call, that would add considerably to the cost. Add in some more for “protection” for those inevitable callbacks

We’ve heard of one service manager who is now charging a nominal amount of \$200.00 for a service call on a wide screen set. He adjusts it downward according to the difficulties encountered. Extreme downward pricing consists of the customer having the set sitting in the driveway to be lifted into the vehicle and receiving it same way to about \$76.00 each way.

As we said at the outset, the calculations performed here are extremely rough. We present them merely to help readers see the high cost of maintaining a vehicle and driver. Moreover, we based this calculation on the purchase of a vehicle. It might be a better idea for a business to lease a vehicle. One, it allows the business to keep the capital that would otherwise be tied up in a vehicle for better purposes. Two, it simplifies the calculations for determining the monthly cost of the vehicle. Three, it might present certain tax advantages.

## Get Help?

This article provides service managers with some useful information to help them determine their cost of doing business, so they can have a realistic number on which to base their service pricing. However, keeping the books and doing the accounting are complex processes; especially in light of the city, state and federal tax requirements, and all kinds of other laws, regulations, etc. that impinge on a small business today.

Even for a small, one-person service center, there should be professional help in handling the money. If you can’t afford someone full time, find someone who will keep your books, and someone who will do your accounting on a part time basis. It will free you up to concentrate on the business, will probably result in a more sound financial basis for the company, and let you sleep better at night, especially come April each year. ■

## INSTRUCTION SHEET FOR HOURLY LABOR-RATE CALCULATIONS

### To Calculate the Hourly Labor Charge

First, determine your expenses:

(1A) List the total amount of all productive or saleable salaries (technicians' wages and contract labor [payments for technical services not on your payroll]);

(1B) List non-saleable salaries, such as office personnel, delivery people, trainees, non-technical managers, officers, etc.;

(1C) Add all other expenses, such as rent and/or mortgage payments; depreciation; interest on borrowed capital; vehicle purchases and maintenance; gasoline and motor oil; telephone and facsimile charges; heating oil, gas and/or electric services; business licenses, taxes, and insurance; staff and employee insurance and pension plans; advertising and promotion; office supplies; tools and test equipment purchases and maintenance; service aids and chemicals; technical manuals; technical and management schools; books, study tapes and trade publications; trade association dues; convention registration fees, travel and lodging; civic clubs and community participation and/or donations; delivery costs; postage and freight charges; credit losses; etc. (But do not include the cost of saleable parts, products or other items for re-sale; these are not applicable to this formula. Also, if you are in product sales, deduct any portion of total business expenses allocated to sales, including rent, advertising, utilities, vehicles, etc.)

(1D) Enter the amount of profit you require as an owner/investor. Include reasonable but appropriate high-risk-capital return on moneys invested by yourself and others, and anticipating growth needs for updated equipment, etc. (A normal and acceptable figure might be from 18-20%. Example: If you have \$200,000 invested in your business and desire a 20% return, you would enter \$40,000 here.)

(1T) Then, combine the above figures to arrive at your total business overhead costs. Secondly, divide this down to technical labor sold for each hour per technician: At this point, if you know the total number of billable technician hours worked, counting all full-time and part-time technicians, for the time period, divide the preceding figure by that hourly figure and enter it directly and skip the following steps (2)-(6), proceeding directly to item (7). If not, continue with the following steps.

(2) Divide the total overhead costs by the total number of working days in the time period considered (i.e., a 5-day work week for 6 months/26 weeks) equals 130 working days. (Include only days where your technicians actually worked.)

(3) The resulting figure is your total daily cost of doing business.

(4) Divide your daily cost of doing business by the total number of hours your technicians work per day. (If you are open for technical services eight hours per day, divide by 8.)

(5) The resulting figure is your total hourly cost of doing business (CDB).

(6) Then, divide the business' hourly cost of doing business by the number of technicians available. (If you have a full-time technician

working an 8-hour day and another working an average of 5-1/2 hours per day, divide by 1.6875. If the owner averages 2-hours per day on the bench, add another .25 to the divisor.)

(7) The resulting figure is your basic hourly, per-technician CDB.

(8) Divide by your efficiency factor. Figure the amount of technician time lost on non-billable paperwork, parts procurement, training, recalls, paid holidays, paid vacations, coffee breaks, sick days, etc. The best way to arrive at this is to multiply the number of total technician hours worked during a time period by your current hourly wage; then divide that by the amount of money you actually billed as labor during the same period. Example: 2080 hours at \$70-hr. equals \$145,600 potential, divided into \$102,000 actually billed, equals a 70% efficiency factor. (In the absence of exact figures, you might assume an acceptable industry average of approximately 75%. In that case, divide the previous figure by .75.)

(9) The resulting figure is your adjusted hourly per-technician CDB.

(10) Every business is entitled to make a reasonable profit on sales. This is an incentive to own your own business and to grow. A normal and acceptable figure might be from 4% to 7%. Enter % of before-tax operating profit needed per hour. (This should be after your salary, listed in 1B, and after the return on your investment, listed in 1D.) (11) Add the profit percentage (10) to your adjusted hourly CDB (9).

The result is your total billable hourly labor rate based upon your actual costs of doing business.

### Work Area Work Sheet

Information for period of:

	to	
1A: Total technical salaries	+	\$ _____
1B: Other non-sales salaries	+	\$ _____
1C: All other service-related expenses	+	\$ _____
1D: Required business profit	+	\$ _____
1T: Total business overhead	=	\$ _____
2: # of workdays in period ?		_____
3: Daily CDB (cost of doing business)	=	\$ _____
4: # of work hrs. in a day		_____
5: Hourly CDB	=	\$ _____
6: Avg. # techs per period		_____
7: Basic per-tech hrly. CDB	=	\$ _____
8: Efficiency factor		_____ %
9: Adj. Hourly CDB/tech	=	\$ _____ 1x
10: % of op. profit needed	x	_____ %
11: Add lines 9 and 10		
Equals Hourly Billable		
Labor Rate Per Tech	=	\$ _____ 1x

NESDA: National Electronics Service Dealers Association;  
2708 W. Berry St., Ft. Worth TX 76109-2397  
(817) 921-9061, Fax (817) 921-3741, www.nesda.com

# Audio/Sound Installation and Maintenance

By Bob Rose

Things used to be relatively straightforward in the living or family room when it came to entertainment. There was a monochrome TV set; probably around 13 inches, a radio, and a record player. And they were all connected together in one unit. Over the years this situation has evolved. TVs began to offer color, then the available sizes grew, manufacturers began to offer rear projection sets, LCD screens, plasma screens.

Over the same period, audio became stereo, then quadraphonic, then back to stereo. Nowadays the audio broadcast with NTSC TV has improved, HDTV and media such as DVDs offer 5.1 channel surround sound, DVD players have a number of possible output formats, including fiberoptic. Various audio systems offer "digital to the speaker," meaning that the conversion from digital to analog, and amplification of the signal is done at the speaker. Looming just over the horizon is 1394, also known as firewire.

Adding a further complicating factor is the move to create home networks, which, in addition to connecting many computers in the home together, and allow appliances to talk to each other, also allow audio and video to be distributed throughout the home with amazing ease.

Another factor that affects home audio systems is the subjectivity of the listening experience. What constitutes "good" sound? For the purist, good sound from an audio system is that sound that faithfully reproduces the original. For a teenager, good sound might be the most bass possible at the loudest volumes possible. For a home-theater viewer, good sound makes the house vibrate when the jets take off from the deck of the carrier in "Top Gun." Good sound is not what the technician deems that it is, but what the owner of the system perceives it to be.

## Matched Components

One of the most obvious and most important considerations in audio systems is that components need to be matched in terms of power. The amplifier should have adequate power to power the speakers. If the amplifier is underpowered, there will be a tendency for listeners to operate the unit at close to its maximum output capac-

ity. That causes clipping. Clipping, in turn, creates harmonics of the audio signal that can damage the speakers.

On the other hand, the speakers should have adequate power handling capacity to be able to handle the power from the amplifier. If the speakers are not adequate to handle that power, and the listener cranks the power level too high, the speakers will fail.

Author Steve Lindemann did a great job of detailing many of the factors that a technician should be aware of when tackling an audio system in the article "Servicing Audio Equipment," in the November 2000 issue of this magazine, so we won't go into any of that here. More to the point, we will be taking a look at some of the factors that affect today's cutting edge audio systems, and tomorrow's audio systems.

## Surround Sound

Not every home of today has an audio system that is wired for surround sound (5.1 channel audio: see Figure 1), but the trend is definitely in that direction. Read the flyers from any of the discount electronics stores on any given Sunday and you'll see surround sound systems for a few hundred dollars. And they're moving briskly.

Moreover, today's movies offer surround sound, and when they're recorded on DVD, the disk usually provides the consumer with the same type of sound that was available in the movie original; provided that the audio system in the home is capable of decoding and playing it back. Perhaps even more important, HDTV has the capability of providing CD quality surround sound, and large numbers of consumers want to be able to hear that kind of sound.

## More Options

There are so many options that a technician who answered a call to a home equipped with all of the types of equipment could find himself bewildered. For example, let's say that there's some music playing. It could be coming from a CD, or the radio, or it could be coming from an inter-

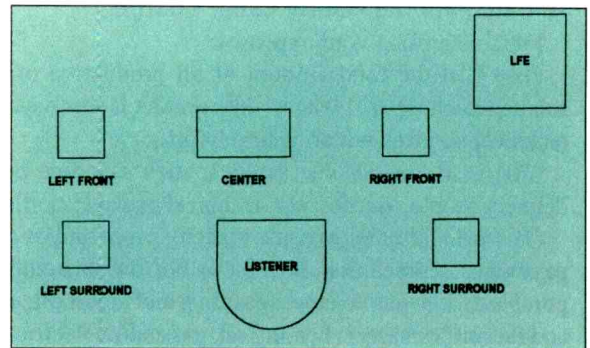


Figure 1. The 5.1 channel audio system consists of six channels: left front, center, right front, left surround, right surround, and the low frequency effects (LFE, or .1) channel.

net radio station, or it might be music such as a .wav file or an MP3 that originated on the web, but was since downloaded and recorded on a CD-ROM rewritable disk.

And, of course, it could be playing from speakers that are located in the room where the music is originating from, or it could be playing from speakers located anywhere else in the house. And depending on precisely where the speakers are placed, the sound could be reaching those speakers via wires, or fiberoptic, or infrared, or a low-power radio connection.

## Home Wiring for the Turn of the Century and Beyond

Consumers these days have homes full of electronics products: TVs, stereos, home theater systems, CD players, DVD players, VCRs, personal computers (frequently more than one) and more. Frequently an occupant of the home would like to control and/or enjoy those devices from and in more than one place in the house.

In many cases, it wouldn't be especially difficult for that type of connection to be made, but it would require making a few holes, pulling some wire, installing some connectors, receptacles, etc. That adds to the mess factor, and increases costs. Because of this factor that mitigates against networking electronics products in the home, a group of companies and organizations has begun a consumer educational campaign. The campaign, called "Wiring America's Homes" is led by members of the Home Automation Association. It was created through the joint efforts of industry leaders dedicated to educating consumers, builders

and remodelers about the need for and potential of structured wiring in the home.

This is information that will certainly affect consumer electronics service technicians troubleshooting in homes at some time in the future, so this seemed an opportune time to bring this information to their attention. There is also the distinct possibility that consumer electronics service centers might be called on to be consultants in the effort of installing structured wiring. The more information they have at their disposal about this subject, the better. What follows was gathered at the organization's website.

### Calling for a Major Shift

The consortium is calling for a major shift in the way homes are built today, as home wiring hasn't significantly changed in more than 50 years. The same wire installed to support one television and telephone in years past is expected today to support extensive entertainment systems, home offices and security networks.

### Goals

Wiring Americas' Homes wants builders, remodelers and their customers to appreciate the value of a "connected home" and

## Wiring America's Homes Participating Organizations

CABA  
CommScope  
Copper Development Association  
E.H. Publishing  
Home Automation Association  
IBM  
Intel Corporation  
Lucent Technologies

MJM Advertising  
OnQ Technologies Inc.  
Panja  
Parks Associates  
Residential Cabling Systems  
SMART HOUSE, Inc.  
SUPERIOR ESSEX Group, Inc.  
Telect

understand that the installation of an advanced wiring system can enable families to fully enjoy the lifestyle benefits of emerging technologies in the home. The organization has established recommended, upgrade and minimum residential wiring solutions necessary to experience a "connected home" lifestyle. Wiring Americas' Homes is supported by more than 15 technology companies and organizations.

Wiring Americas' Homes is dedicated to educating consumers, builders and remodelers to the importance of incorporating a strong wiring infrastructure in the home. The organization is promoting the slogan "Get Connected for Living" to help communicate the importance and value of a "connected home." Additionally, Wiring Americas' Homes is operating a toll-free number so consumers can have access to more information (1-888-NEW-WIRE).

## Wiring Americas' Homes Web Site

Wiring Americas' Homes, a consumer educational campaign led by members of the Home Automation Association, has introduced a comprehensive online resource to help consumers understand how to get the most out of their technologies by creating a "connected home" environment. The new Web site, [connectedhome.org](http://connectedhome.org), simplifies the "connected home" concept and provides consumers with the information they need to talk to their builders/remodelers about structured wiring. Consumers can get answers to their questions about structured wiring and the "connected home," find out more about the organization's established wiring standards, and browse through the high-tech applications made available through advanced wiring.

A "connected home" is one that is joined from room to room and to the world outside

## Sencore Launches 4-Day Home Theater Installation and Calibration Training Seminar

Sencore has launched a four-day hands-on training seminar entitled "Maximizing Home Theater Performance." Sencore has teamed with The Imaging Science Foundation (ISF) and the Home Acoustics Alliance (HAA) to help you learn from industry professionals what it takes to sell, install, and calibrate world-class Audio and Video Systems.

Millions of households invest in home theater systems every year, each expecting to experience cinema-like sound and picture quality in the comfort of their home. Providing a quality installation that virtually transports home theater viewers into the middle of a movie, TV show, sporting event, or concert requires far more than simply making the correct connections between components.

"Maximizing Home Theater Performance" enables you to provide the best possible installation for your customer! This seminar is divided into two parts:

Part 1: Producing Picture-Perfect Video ISF Certification Seminar ~ Calibrating and aligning video displays for optimum viewing.

Part 2: System Setup For Superb Sound -

Making the audio components and listening room perform together.

Course Description: In this seminar you will learn what makes a good home theater, including pitfalls to avoid, check lists to follow, and ways to build your installation business. You'll learn how the entire room ambiance including the video image, sound quality and room acoustics are as much a part of a home theater environment as are the electronic components themselves. Plus, you'll receive extensive hands on training on how to efficiently use the right tools, and make measurements that eliminate guesswork and subjective decisions.

Who Should Attend: Home Theater Installers / A/V Contractors / Field Service Managers / Video Technicians / Audio Technicians / Educators / A/V Dealers / A/V Distributors

Producing Picture-Perfect Video Objectives: How to sell quality installation / Understand display types, formats & signals / Understand basics of picture reproduction / Understand luminance, color & saturation / Intensive hands-on video display setups / Obtain ISF Certification

System Setup for Superb Sound Objectives: Understand basics of home theater audio / Understand home audio signal formats / Understand how rooms and speakers interact / Correct & efficient audio analysis equipment use / Analyze room RTA & ETG data / How to identify and control room modes / Selection and placement of room treatments / Extensive hands-on measurements / Extensive Hands-on system and room calibration / Obtain HAA Certification

Course Materials: ISF Certification / HAA Certification / Sencore "Home Theater Tool Suite" Certification / Workbooks (audio and video) / Color chromaticity chart / Equipment for hands-on labs / Color Theory & Analysis Training CD / 10+ hours of hands-on experience / Free registration to Sencore's on-line Color Calibration Library / Home Theater Installation Checklist

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FEATURES	DESCRIPTION	BENEFITS
Distribution Box	The distribution box is a stand-alone piece of equipment that contains distribution devices for voice, data and video. It must be located in the home in a place that is readily accessible to cabling maintenance.	The distribution center allows the wiring system to be customized and evolved as new technologies are developed. It provides universal access to various networking elements within the home as well as connectivity to service providers.
Recommended Wiring	Recommended wiring consists of: <ul style="list-style-type: none"> <li>• two CAT 5 cables (CAT 5e preferred)</li> <li>• two RG-6 quad shielded coax cables</li> <li>• one dual CAT 5/dual coax outlet to key rooms in the house, including: home office/den/study, kitchen, family room/great room, each bedroom, multimedia room, master bathroom, utility room, dining room.</li> </ul>	Recommended wiring provides for basic and advanced services, including multimedia and interactive communications services. This grade supports both current and developing technologies including multiple communication technology in the home office (multiple computers, fax machines, phone lines, etc.) and extensive home theatre capabilities (DVD, etc).
Star Topography	All cables are strung in a star formation which allows all wires to have a direct link from the distribution box to the outlet.	The efficient star topography allows system changes to be made without the hassle of having to pull new wires. In addition, services are not disrupted or impaired by other online connected devices.
Universal Service Outlets	Designed to support a full range of communication technologies with a variety of flexible configurations, including voice, data and video.	Universal outlets allow the homeowner to determine which technologies will be used in each specific room in the home. Even after the wiring system installation is complete, outlets can be changed to meet the changing needs of the homeowner.

**Figure 2.** The Home Automation Association calls this the minimum solution for wiring modern homes so that computers, appliances, entertainment devices and security systems will be able to be networked throughout the home.



# ETA-I

## Electronics Technicians Association, International



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by a network, integrating communications, entertainment and security systems together for more convenient control of the home environment. "Connected homes" are built for today with an eye toward tomorrow, enabling homeowners to maximize the capabilities of current home products and systems, while preparing to support future technological developments.

Wiring Americas' Homes was created through the joint efforts of a number of organizations, dedicated to educating consumers and builders about the need for and potential benefits of structured wiring in the home. The organization has established recommended, upgrade and minimum residential wiring solutions necessary to experience a "connected home" lifestyle.

For more information or to request an informational brochure, call 888-NEW-WIRE.

### A Call to Action

The organization issued the following press release in September. The world's leading technology companies are calling for a change in how new homes are being built in order to ensure the nation's new homes are wired to keep pace with the ever-changing technology revolution.

These companies, including Intel Corporation, IBM and Lucent Technologies, are part of Wiring Americas' Homes, a consumer educational campaign of the Home Automation Association sponsored by 15 leading technology companies. Wiring Americas' Homes has developed basic wiring standards to give both builders and consumers a checklist to determine if their new home is being built to accommodate the latest in communications, entertainment and security technologies.

"We are asking home builders to help ensure that today's new homes will not be technologically obsolete at move in, effectively preventing families from realizing the potential value of today's "connected


home," said William Lane, chairman of Wiring Americas' Homes. "The wiring solutions we have developed give consumers a gauge for determining if their new home is going to support their communication and entertainment needs in the future, while also providing the builder with clear direction on what a connected home should include."

### The Connected Home


Wiring Americas' Homes sees the home environment rapidly changing as people continue to incorporate evolving technologies into their lives. Whether professionals are connecting from home to their corporate server or children are connecting to their classrooms, the Internet is creating a gateway that opens a new world of opportunity in the home. "As multiple-PC households grow and as Internet service and content providers continue to expand offerings in home office, education, commerce and entertainment, the need for a networked home will rapidly become very important to consumers," said David Nash, marketing director for Intel Architecture Lab's Connected Home Initiative. "Our research has shown that delivering the Internet anywhere in the home that the family works and plays will remove the final barriers to enjoying all its benefits." But home computing with Internet capabilities is just one aspect of a "connected home." Networking home systems gives consumers the ability to integrate two or more of the many technologies found in a home, including communications, computers, audio/visual, entertainment, security, lighting controls, utilities and environmental controls. That integration, or networking of home systems and appliances, is what gives homeowners maximum control and flexibility to use technology in ways that offer the greatest impact on their personal needs. Affordable structured wiring systems have been on the market for several years and are readily available and supported by well-trained installer networks in virtually all U.S. markets. And, they are rapidly growing in popularity, with industry experts projecting that 45 percent of all single-family homes built in the U.S. will incorporate whole-house structured wiring by 2004 (Parks Associates research). However, Wiring Americas' Homes believes in most cases new homes built today are not equipped with the necessary wiring infrastructure to support a "connected home."

And, builders are not aggressively embracing established construction practices that would allow consumers to enjoy the full value of today's home technologies. "The standard new home today features a wiring package designed 50 years ago, yet it serves a family that is growing more reliant on technology every day," said Mark Schmidt, director of marketing and business develop-

ment for IBM Home Networking. "How do you tell someone who just purchased a new home that it's not built to accommodate off-the-shelf home entertainment systems, or that their children will have limited access to the wide range of educational opportunities available on the Internet?" "Structured wiring is one of the fastest growing construction products in the country, and we are



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FEATURES	DESCRIPTION	BENEFITS
Distribution Box	The distribution box is a stand-alone piece of equipment that contains distribution devices for voice, data and video. It must be located in the home in a place that is readily accessible to cabling maintenance.	The distribution center allows the wiring system to be customized and evolved as new technologies are developed. It provides universal access to various networking elements within the home as well as connectivity to service providers.
Minimum Wiring	Minimum wiring consists of: <ul style="list-style-type: none"> <li>• one four-pair UTP CAT 5 cable</li> <li>• one RG-6 coaxial cable to key rooms in the house, including: home office/den/ study, kitchen, family room/ great room, each bedroom.</li> </ul>	Minimum wiring provides the basic minimum structured wiring required for telephone, satellite, CATV and data services. This allows a homeowner to reap basic benefits such as multiple phone and modem lines and satellite television. Minimum wiring, while technically compatible with current cable modem or DSL broadband services, limits access to many services derived from the broadband pipe.
Star Topography	All cables are strung in a star formation which allows all wires to have a direct link from the distribution box to the outlet.	The efficient star topography allows system changes to be made without the hassle of having to pull new wires. In addition, services are not disrupted or impaired by other online connected devices.
Universal Service Outlets	Designed to support a full range of communication technologies with a variety of flexible configurations, including voice, data and video.	Universal outlets allow the homeowner to determine which technologies will be used in each specific room in the home. Even after the wiring system installation is complete, outlets can be changed to meet the changing needs of the homeowner.

**Figure 3.** The Home Automation Association calls this recommended solution for wiring modern homes so that computers, appliances, entertainment devices and security systems will be able to be networked throughout the home.



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not talking about a small niche of home automation techies," said Cynthia Pawlowski, senior offer manager for Lucent Technologies. "This is a high-volume, mainstream phenomenon that is happening right now. Multi-unit property owners are already successfully using built-in Internet access to lure residents, and we believe single-family builders will quickly see the value of structured wiring as a competitive marketing advantage.

"But it's not growing fast enough for consumers who don't realize that their new homes built today aren't equipped for the future," Pawlowski added.

### The Home Wiring Solution

While there is no single wiring solution that can encompass all lifestyle needs, Wiring Americas' Homes has established a recommended solution, upgrade solution and minimum solution for structured wiring systems in new homes. These solutions are based on the approved industry standard (TIA 570-A).

Regardless of size, location or cost of a new home, incorporating the recommended solution provides homeowners with a wide range of opportunities not available through traditionally wired homes. This solution was designed to help ensure optimum access to all existing and developing

home communication, entertainment, security and control technologies. In addition, industry experts believe that building a home to these standards will help add value to the home at resale. Wiring Americas' Homes' recommended solution calls for connections for data, phone, and entertainment through generic multimedia outlets placed throughout the home with multiple locations in select rooms. Multimedia outlets have connections for multiple phone lines over a high-speed "CAT 5" cable, entertainment options over two high quality "RG6 quad shielded coax" cables, and data access over a separate CAT 5 cable. The cables are managed at a common service center or distribution box. This allows for simplified, adjustable connections to distribute incoming communication and entertainment services and to control internal networking capabilities in any room.

While consumers can add to systems based on their personal needs, Wiring Americas' Homes estimates that, in general, homeowners can expect to pay as little as \$750 to \$2,000 for a recommended wiring solution. This is well below the cost of retrofitting wiring after a home is built, especially when installation costs are considered. The upgrade options allow the homeowner to identify special needs based on their personal interests, such as extensive home



office or home entertainment needs. The minimum solution was developed to establish the lowest threshold for consumers to still be able to incorporate basic home communication, entertainment and control systems. "Having access to technology in the home today is a necessity, not a luxury. Wiring Americas' Homes is advocating a basic expectation that the average consumer should have in order for their home to retain its value while allowing them the opportunity to realize the benefits of a connected home," said Lane, who serves as chief operating officer of SMART HOUSE, Inc.

### About Wiring Americas' Homes

Wiring Americas' Homes is a consumer educational campaign of the Home Automation Association sponsored by 15 leading technology companies focused on educating consumers and builders across North and South America about the importance of the wiring infrastructure of new homes accommodating the evolving demands and opportunities presented through technology today.

An educational Web site is currently under development to provide consumers and builders with information on wiring standards for new home construction. In the interim, those with questions regarding home wiring can call 1-888-NEW-WIRE for additional information. EDITOR'S NOTE: The Wiring Americas' Homes organization encompasses all the Americas, including the United States, Canada, Mexico, Central and South America.

### Minimum Solution

The Minimum Solution (Figure 2) provides an infrastructure to support and integrate basic systems—such as telephone, satellite, CATV and data services—now, while allowing for customization and evolution as new technologies are developed. This solution limits access to many services derived from the broadband pipe (used in the Recommended Solution).

### Recommended Solution

The Recommended Solution (Figure 3) provides an infrastructure to support basic and advanced systems, including multimedia and interactive communications services, home office components and home theatre capabilities. This solution allows both current and developing technologies to be integrated throughout the home.

### Upgraded Solution

The Upgraded Solution integrates the Recommended Solution with an added step to allow for easy upgrading to the wiring system. This includes the installation of 2-inch PVC piping from the attic to the basement for ease of pulling future wires and the use of fiber-optic cable, which provides maximum bandwidth for current and future technological applications.

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Things have changed so rapidly in just the past few years, and will continue to change rapidly, that it's possible that a technician who hasn't been made constantly aware of those changes could walk into a client's home and be completely bewildered by all of the new products and interconnections, including the audio systems. In future articles, we'll continue to keep service centers abreast of the latest in consumer electronics technology. ■

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# Monitors

Adapted with permission from the book "Computer Monitor Troubleshooting and Repair," by Joe Desposito and Kevin Garabedian, published by Sams Technical Publishing.

A computer monitor is an output device for a personal computer. As such, its job is to accept electronic signals supplied by the computer, process the signals, and present them to the user in an intelligible way. When a computer monitor fails at its job, it is up to a technician to find out what is wrong and repair the problem.

Before a technician can attempt to repair a computer monitor, a good understanding of computer monitor circuitry is needed. This article serves as the starting point in gaining this knowledge by providing an overview of the major circuits.

## High-Voltage Circuits

The high-voltage circuits are responsible for developing the high voltages needed for the anode and grids of the cathode

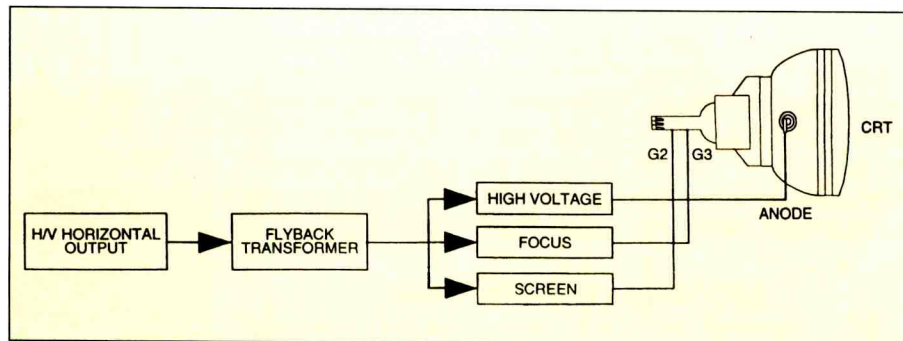


Figure 1. Simplified block diagram of the high-voltage section of a computer monitor, including the CRT and flyback transformer.

voltage, which goes to the third grid (G3). The screen voltage is about 400V to 450V, while the focus voltage is about 5,000V.

The horizontal output transistor is considered part of the high-voltage circuits, since this transistor switches the flyback transformer. The horizontal output transistor is the most stressed part in the monitor.

High voltages are also developed in the power supply. The power supply supplies about 100V to 200V to the collector of the horizontal output transistor.

array (VGA) mode, combine to construct the picture you see on the computer monitor display. The horizontal deflection yoke is typically connected to the collector of the horizontal output transistor. This transistor produces the horizontal deflection pulses needed to deflect the electron beam.

The picture displayed on the CRT would be unintelligible if not for synchronization. For horizontal synchronization, the computer provides a horizontal sync signal. This signal synchronizes the horizontal oscillator in the computer monitor, which produces a signal for the horizontal drive transistor. The primary function of this transistor is to drive the primary winding of the horizontal drive transformer. The secondary function of the horizontal drive transformer is to drive the horizontal output transistor, which drives the horizontal deflection yoke.

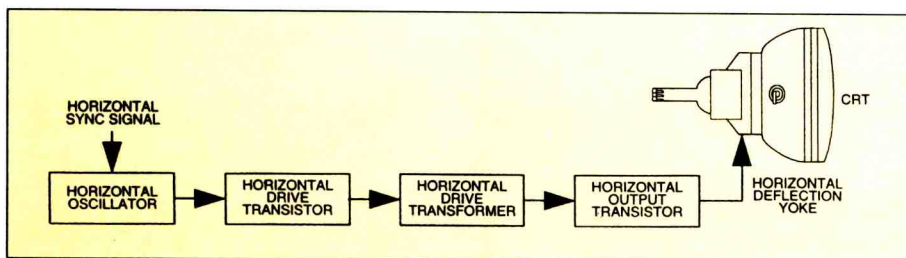


Figure 2. A simplified block diagram of typical horizontal circuits in a computer monitor.

ray tube (CRT). The anode of the CRT needs 20,000V to 30,000V depending on the size of the tube. This high voltage accelerates the electrons to a point where they can strike the phosphors at the front of the picture tube hard enough to produce light. This anode voltage is supplied by an integrated high-voltage transformer (IHVT) commonly called the flyback transformer.

Figure 1 shows a simplified block diagram of the high-voltage section of a computer monitor, including the CRT and flyback transformer.

The flyback transformer also produces the screen voltage, which goes to the second grid (G2) of the CRT and the focus

## Horizontal Circuits

In order for the electron beam inside of the CRT to make a sensible picture, the beam has to be deflected from the point of origin. In other words, the beam has to be deflected up and down, left and right. The horizontal circuits are responsible for deflecting the electron beam from left to right in a horizontal plane. A simplified block diagram of typical horizontal circuits is shown in Figure 2.

The horizontal circuits deflect the electron beam by energizing a coil around the neck of the CRT, called the horizontal deflection yoke. The horizontal lines traced on the screen of the CRT, for example 480 lines per frame in video graphics

## Vertical Circuits

The vertical circuits are responsible for deflecting the electron beam in the CRT up and down in a vertical plane. Without vertical deflection all you would see on the display is a horizontal line.

The computer sends a vertical sync signal to the monitor that varies in frequency depending on the current video mode. If the vertical frequency is 60Hz, for example, the picture on the screen changes 60 times every second. This sync signal is sent to the vertical oscillator in the computer monitor.

The vertical oscillator produces a sawtooth shaped signal. This signal is amplified by a vertical output transistor. The

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amplified signal drives the vertical yoke. A simplified block diagram of the vertical circuits is shown in Figure 3.

### Video Circuits

The video signals that come from the computer contain the information displayed on the computer monitor. In a color system, three video signals—red, green and blue—are sent from the computer to the monitor.

The three video signals combine to make up the colorful pictures you see on the display.

Each video signal coming from the computer ranges from 0V to 0.7V. The job of the monitor's video circuits is to amplify these weak signals. This amplification, which is identical for each signal, is

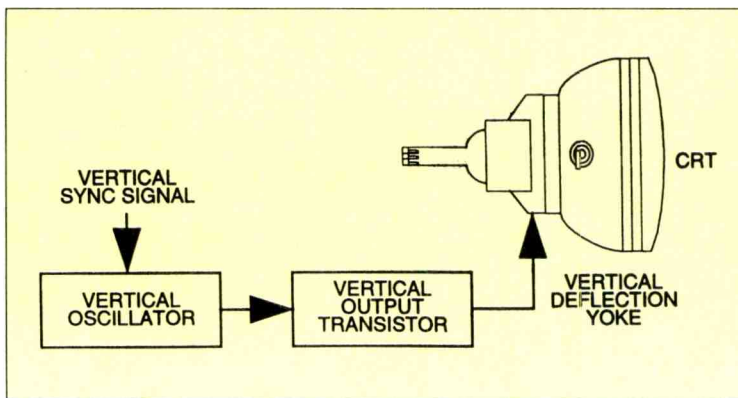


Figure 3. A simplified block diagram of the vertical circuits in a computer.

accomplished in several stages.

The final stage of amplification for each video signal is typically handled by a power transistor. Thus, there are three power transistors, one for the red video signal, one for the green, and one for the blue. Each transistor provides the current necessary to drive one cathode (red, green, blue) of the CRT.

A simplified block diagram of the video circuits is shown in Figure 4.

### The CRT

A cathode ray tube, or CRT, is a vacuum tube with a large rectangular face and a narrow cylindrical neck. This is the device responsible for displaying the information sent by the computer to the computer monitor.

Inside a color CRT are three cathodes—red, green and blue—which emit electrons when heated by a filament. There are also three grids. One accelerates the electrons, one focuses them, and one controls the brightness.

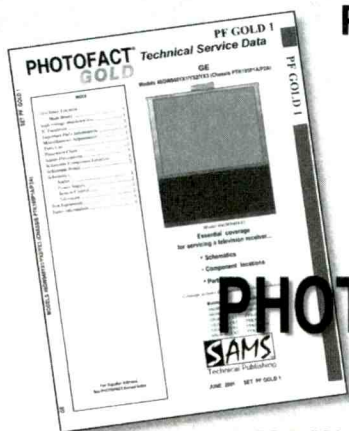
On the outside of the CRT, around the neck, are the horizontal and vertical yokes, which deflect the electron beams emitted by the three cathodes. Several

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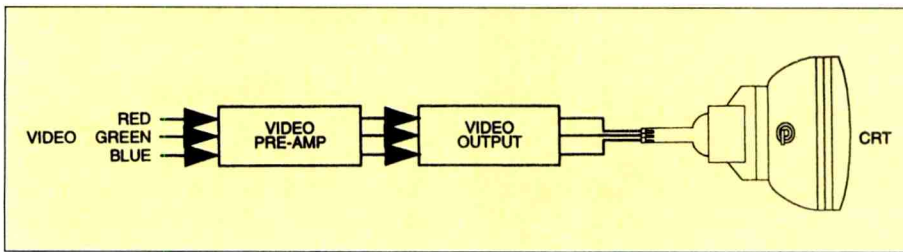


Figure 4. A simplified block diagram of the video circuits in a computer monitor.

magnet rings also surround the neck of the tube. These are used to converge the three beams, thus assuring color purity. At the back of the neck are the pins of the tube. These pins fit into a socket on the CRT printed circuit (PC) board. The anode (high-voltage) terminal is at the top center of the tube. A diagram of the CRT is shown in Figure 5.

### Monitor Controls

Computer monitor controls vary the image that is displayed on the CRT. Some monitors have analog controls, some have digital, and some have both. Some controls are external, meant to be adjusted by the end user, and some are internal, meant to be adjusted only by a qualified technician.

The vertical controls, such as vertical size, position, center and linearity work in conjunction with vertical circuits. Horizontal controls such as horizontal sync, size, position, center, and linearity work in conjunction with the horizontal circuits.

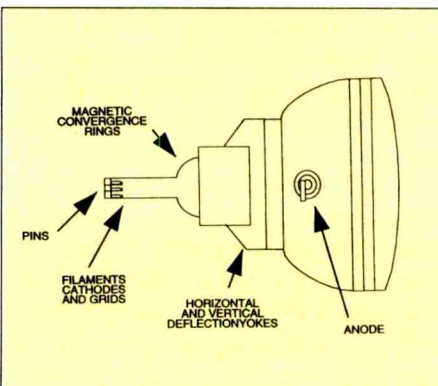


Figure 5. A simplified diagram of the CRT in a computer monitor.

The contrast and brightness controls are part of the video circuits, while the screen and focus controls are integrated into the flyback transformer. Other controls found on monitors are pincushion,

trapezoid and parallelogram controls.

Analog controls usually use potentiometers. Varying the resistance of the potentiometer changes the voltage at a specific point in the control circuit. Digital controls, on the other hand, typically use pushbutton switches. Pressing the switch sends a signal to a microprocessor and then to a digital-to-analog (D/A) converter. The D/A converter produces a voltage, which varies the monitor control.

### Microprocessor Circuits

Microprocessor circuits in a computer monitor typically include a microprocessor, a D/A converter and a memory chip. The main functions of the microprocessor are to process the signal coming from the digital controls of the monitor and to process the horizontal and vertical sync signals coming from the computer. The digital controls affect the image on the display. The vertical and horizontal sync signals provide the information needed for the monitor to automatically adjust itself to the current video mode of operation. Not all monitors have a microprocessor.

After processing the input signals, the microprocessor sends output signals to a D/A converter and also to other parts of the monitor, such as the power supply. The job of the D/A converter is to change the form of the signal from digital to analog. The resulting outputs are voltages, which are applied to various circuits of the computer monitor.

A memory chip is used to store the current settings of the monitor. This chip "remembers" settings even when the monitor is turned off. When the monitor is turned on again, the stored settings are used to set up the monitor for operation. A simplified block diagram of the micro-

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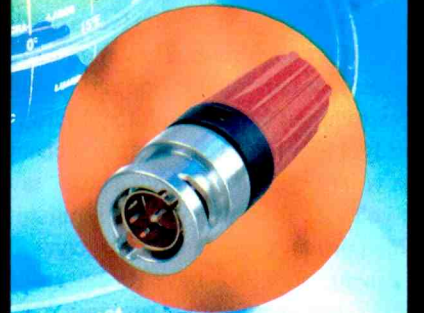
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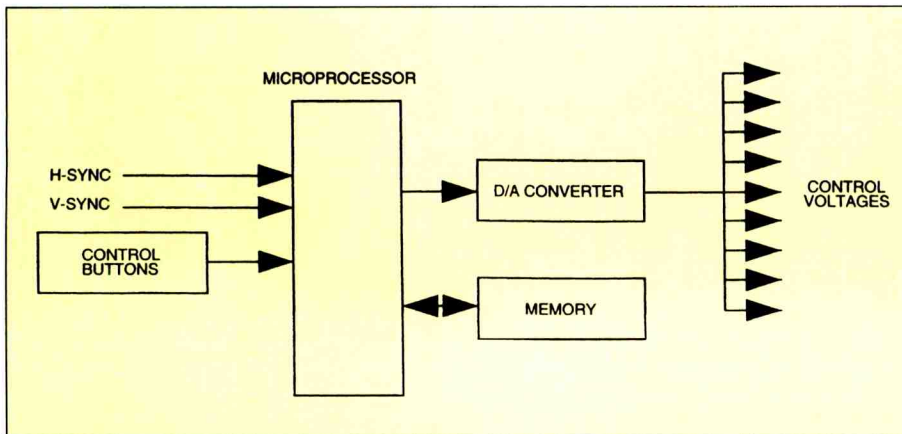


Figure 6. A simplified block diagram of the microprocessor circuits in a computer monitor.

processor circuits is shown in Figure 6.

### Power Supply Circuits

As its name suggests, the role of the power supply is to provide power to the rest of the circuits in the computer monitor. The power cord of the power supply plugs into an alternating current (ac) outlet. In the United States, the ac line provides approximately 120V, alternating at a rate of 60 cycles per second (120Vac). The job of the power supply circuitry is to transform this 120Vac into the various ac and direct current (dc) voltages required by the other circuits in the monitor.

There are two basic types of power supply, linear and switch mode. In a linear supply, the ac line voltage is fed to the primary of a transformer. The secondary of the transformer produces the various voltages required by the monitor. Fullwave (bridge) and half-wave rectifiers change the voltages from ac to dc. These "raw" dc voltages are fed to voltage regulators, which produce regulated dc voltages.

Linear supplies have been around longer than switch mode supplies. You'll find them in older monitors as well as in some newer models. Figure 7 shows a simplified block diagram of a linear power supply.

The newer switch mode type of power supply works like a switch. Voltage from the ac line passes through a radio frequency (rf) filter, which is a small coil with capacitors connected to ground. The purpose of the filter is to suppress electromagnetic interference (EMI). The ac voltage is rectified by a bridge rectifier

and filtered to produce a high dc voltage. A switching transistor converts this dc voltage back to a square wave type ac voltage. The switching frequency of the transistor varies from about 50kHz to 100kHz, depending on the load. This switching voltage is fed to a switch mode transformer.

Due to the switching action, the transformer takes current only part of the time. The secondary of the transformer produces the various voltages for the monitor. These are still ac voltages at this point. The ac voltages are rectified by special fast switching diodes to create dc voltages again and are then strictly regulated to produce the voltages required by the monitor.

The output voltage in a switch mode power supply is regulated through a feedback circuit. This feedback circuit typically includes an optoisolator that isolates the secondary side from the primary side of the power supply. A simplified diagram of a switch mode power supply is shown in Figure 8.

Keep in mind that the power supply always contains a fuse to disconnect power from the ac line if necessary. A blown fuse usually indicates further trouble in the power supply or in other circuits

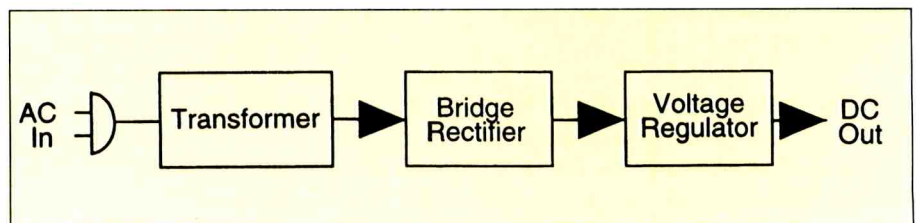


Figure 7. A simplified block diagram of a linear power supply in a computer monitor.

in the monitor.

### Monitor Types

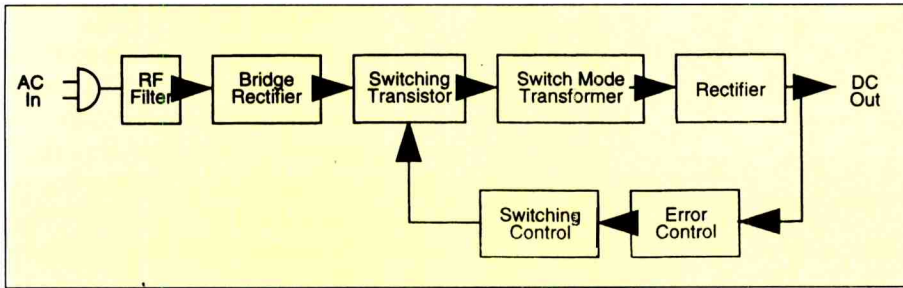
The graphics system of IBM and compatible personal computers has changed radically since the introduction of the IBM PC back in 1981. The original PC used the monochrome display adapter (MDA), which connected to a digital monochrome monitor. Shortly after, IBM introduced the color graphics adapter (CGA), which connected to a digital CGA color monitor. The next advance in graphics technology for IBM and compatible computers was the enhanced graphic adapter (EGA), which connected to a digital EGA color monitor.

By this time, the computer industry was clamoring for faster speeds and more colors from their graphics adapters. IBM responded by introducing a radically different graphics system called the video graphics array (VGA). VGA adapters connected to analog VGA color or monochrome monitors. From this point on, the PC graphics system has been an analog system, with further enhancements to resolution, speed, colors and so forth. For example, the 640 by 480 pixel VGA adapters were followed by the 800 by 600 super VGA adapters (SVGA). Monitors followed suit, sticking to the analog format.

### Digital Monitors

Digital monitors, both color and monochrome, accept a digital video signal from the computer. These monitors are very much out of date and will not work with the current crop of personal computers.

How do you tell the difference between a digital monitor and an analog monitor? One of the tell-tale signs is a 9-pin connector at the back of the digital monitor. All digital monitors that work with IBM and compatible computers have this connector. However, some older analog mon-



**Figure 8.** A simplified block diagram of a switch mode power supply in a computer monitor.

itors use this connector, too.

If you get a monitor in for repair and it has a 9-pin connector, you'll need a computer monitor pattern generator to check it out. These instruments usually have provision for testing older monochrome, CGA and EGA monitors. You can quickly switch between modes to determine the type of monitor. If you do not have a pattern generator, you will need a PC with an older graphics adapter, one capable of providing a digital video signal to the monitor.

Since digital monitors are used with out-of-date PC graphics technology, we

will not provide any details of their operation in this article.

### Analog Monitors

Analog monitors, both color and monochrome, accept an analog video signal from the computer. This is an important point. An analog monitor may have digital controls, for example, but this does not make it a digital monitor.

There are several different kinds of analog monitors that work with the current crop of IBM and compatible PCs. One type is the single frequency VGA monitor. Another type is the multiple frequen-

cy VGA/ SVGA monitor. This type of monitor operates at two and sometimes three different frequencies. Still another type is the multiscan monitor, which works at all VGA and SVGA frequencies within its parameters. A multiscan monitor automatically reads the signal from the graphics adapter in the PC and compensates accordingly. The specifications of multiscan monitors include a range of vertical frequencies (e.g., 50Hz to 90Hz) and a range of horizontal frequencies (e.g., 30Hz to 64kHz).

All of these monitors have a standard 15-pin connector at the back or at the end of an integral signal cable. The signals at the pinouts of this connector are shown in Figure 9. One exception that comes to mind is the original NEC Multisync monitor. The original NEC Multisync monitor accepts both digital and analog video inputs and has a 9-pin connector. To connect this monitor to a VGA or SVGA graphics card, you must use a 9-pin-to-15-pin adapter.

All analog monitors with 15-pin con-

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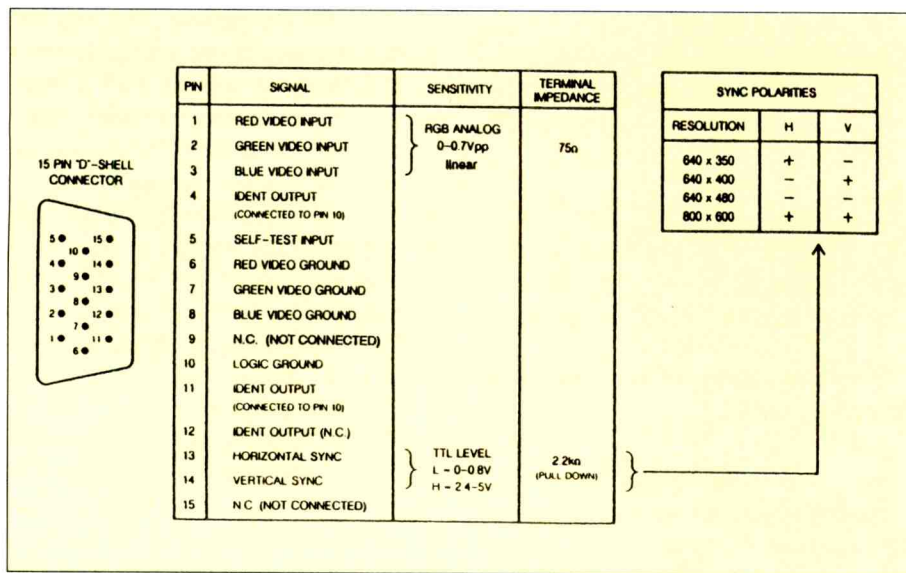


Figure 9. The signals at the pinouts of the standard PC 15-pin connector.

nectors support the standard 640 by 480 VGA mode. Once you go beyond this standard mode, there is no guarantee that a particular monitor will work in a particular graphics mode. This is especially true of multiple frequency monitors. To test a multiple frequency monitor, you have to know the monitor's specifications, which are not always available.

Another problem crops up with multiple frequency monitors. Graphics cards and monitors are supposed to follow the same video standards as outlined by Video Electronics Standards Association (VESA). Sometimes, one or the other slightly varies from the standard. When this happens, you cannot get a display on the monitor. This type of incompatibility can lead to the conclusion that the monitor is somehow defective. Usually, all that is needed to make the graphics adapter and monitor compatible is a slight adjustment of the horizontal hold or vertical hold control. This is rarely an end-user control. In most cases, to make this slight adjustment, you must remove the monitor's cabinet and track down the appropriate control.

Although you rarely see them anymore, monochrome analog VGA monitors do exist. Standard VGA/SVGA color adapters work fine with monochrome monitors. Pattern generators work with these monitors, too, displaying a gray-scale pattern instead of color bars.

Monochrome monitors use the green video input and ignore the red and blue video inputs on the 15-pin connector.

You should be aware that certain analog monitors do not adhere to the VGA standard. Years ago, when Apple II+ computers (and others of that type) were popular, you could connect them to analog monitors. These monitors, which have composite video inputs (RCA jacks), are still used today for video games, VCRs, and other equipment with a composite video output.

### Multimedia Monitors

Many computer systems include so-called multimedia monitors. These monitors are standard analog type multifrequency or multiscanning monitors with a built-in microphone and speaker volume control. Speakers are either attached to the side of the monitor or integrated into the monitor's cabinet. At the rear of the monitor are the speaker and microphone outputs.

There is no complex sound circuitry in a multimedia monitor. The PC sound circuits are typically on a sound card or on the motherboard inside the system unit of a personal computer. Thus, when repairing a multimedia monitor, you will not have to spend time troubleshooting mono or stereo sound circuitry.

### Computer Video Modes

It would certainly be easier to troubleshoot and repair computer monitors if all of them followed the same cookie-cutter design. As is evident from this article, this is not nearly the case. In this section, we provide information on the popular video modes produced by a typical graphics adapter.

When you install a graphics adapter in a PC compatible personal computer running under Microsoft Windows, you get to choose the resolution and number of colors you want to display on your computer monitor. Limits to resolution and color depend on the capability of the graphics adapter. In general, the higher the resolution and the more the colors you desire, the more memory you will need on the graphics adapter. Typically, you will choose one of the following resolu-

<b>VGA</b> 640 x 480	fH (Khz) fV (Hz)	37.861 72.809
<b>800/56Hz</b> 800 x 600	fH (Khz) fV (Hz)	35.156 56.250
<b>800/72Hz</b> 800 x 600	fH (Khz) fV (Hz)	48.077 72.188
<b>1024/60Hz</b> 1024 x 768	fH (Khz) fV (Hz)	48.363 60.004
<b>1024/70Hz</b> 1024 x 768	fH (Khz) fV (Hz)	56.476 70.069
<b>1280/60Hz</b> 1280 x 1024	fH (Khz) fV (Hz)	63.702 60.096
<b>MAC/832/75Hz</b> 832 x 624	fH (Khz) fV (Hz)	49.726 74.551

Figure 10. VESA standards for various video modes.

tions: VGA (640 x 480); SVGA (800 x 600); 1,024 x 768; or 1,280, x 1,024. The number of colors generally available is: 16; 256; 32K; 65K; or 16.8M. For each combination of resolution and color, the graphics card will output a specific vertical and horizontal frequency based on video standards set forth by VESA. These signals are sent to the monitor. Figure 10 lists current VESA and other video standards.

The vertical scanning frequency indicates the number of times the electron beam of the CRT sweeps the entire screen



and returns to the beginning of the next screen in one second. A scanning frequency of 72Hz means the screen is completely scanned 72 times per second. The vertical scanning frequency is different for each resolution (640 x 480, 800 x 600, etc.), and also can differ within a specific resolution (e.g. 800 x 600). Multiscan monitors automatically recognize the vertical scanning frequency and compensate for the timing differences.

The vertical scanning frequency is sometimes referred to as the refresh rate. At certain refresh rates the user may notice flicker on the screen. The ability to detect flicker varies from person to person. In general, a flicker-free refresh rate is considered to be 70Hz or higher. If a person complains about flicker, there is no way to solve the problem unless the monitor can work at higher refresh rates. For example, if a monitor works in SVGA

mode only at 60Hz, you cannot "fix" it so that it will work at 72Hz. At a 60Hz refresh rate, the user may complain about flicker.

The horizontal scanning frequency indicates the number of times the electron beam sweeps one scan line and returns to the beginning of the next line in one second. A scanning frequency of 64kHz means 64,000 lines are scanned per second. Multi scan monitors automatically recognize the horizontal scanning frequency and compensate for timing differences.

If you want to find out the exact frequencies the graphics adapter is sending to the monitor, connect a frequency counter to the adapter. Select a good ground for the counter and then check the horizontal sync frequency at pin 13 and vertical sync frequency at pin 14.

One last point. The video modes in use

today are primarily non-interlaced modes. In a non-interlaced system each frame contains all the scan lines (information) required to display a picture. In an interlaced system, a frame contains only one-half the number of scan lines required to display a picture. After each line is scanned, a space equal to the width of a scan line is skipped. The next frame fills in the skipped lines. The eye does not detect the missing scan lines due to the persistence of the phosphor on the CRT screen. ■

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# Camcorders

By the ES&T Staff

One of the major challenges to consumer electronics servicing technicians today has to do with the sheer size of the products. Projector sets and large screen direct-view sets are large and weigh a lot. Moving these sets into a position for convenient troubleshooting can present difficulties. Readyng them and trucking them to the service center when the repair can't be completed in the customer's home can bring tears to the eyes of a strong technician.

On the other end of the size spectrum, tiny products with tinier components and circuit traces can be nigh on to impossible (but not quite impossible) to gain access to and service. One example of this is the camcorder. These little jewels have shrunk to the point that you can hold pretty much the entire unit in the palm of one hand and shoot those important occasions like weddings, birthdays, holiday parties, vacations and the like. Unfortunately, that makes them so small, that it's a challenge for the technician

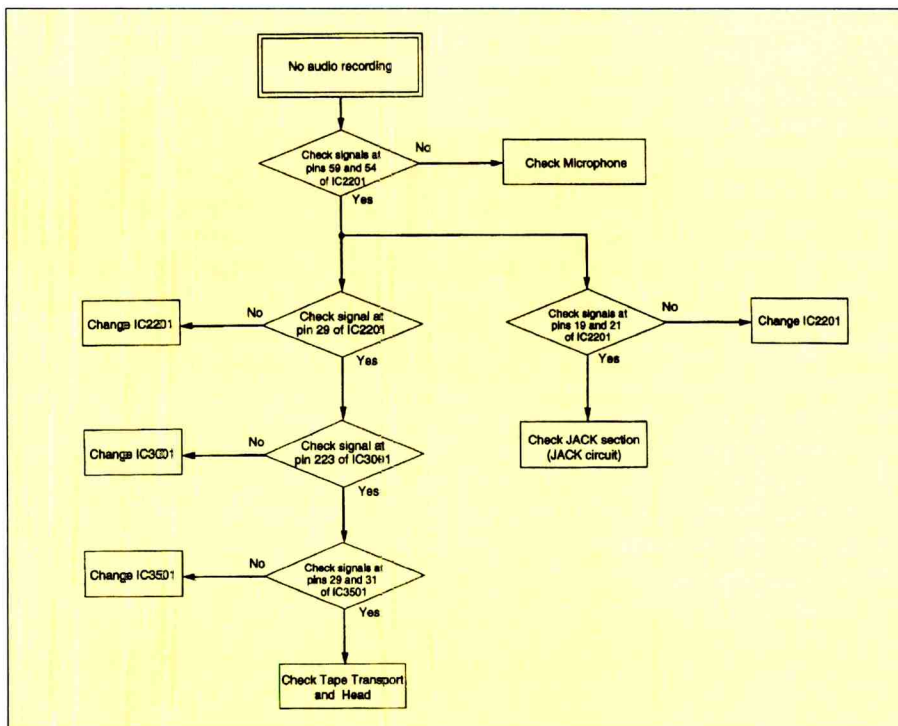


Figure 1. Trouble tree for the audio section when the symptom is no audio recording.

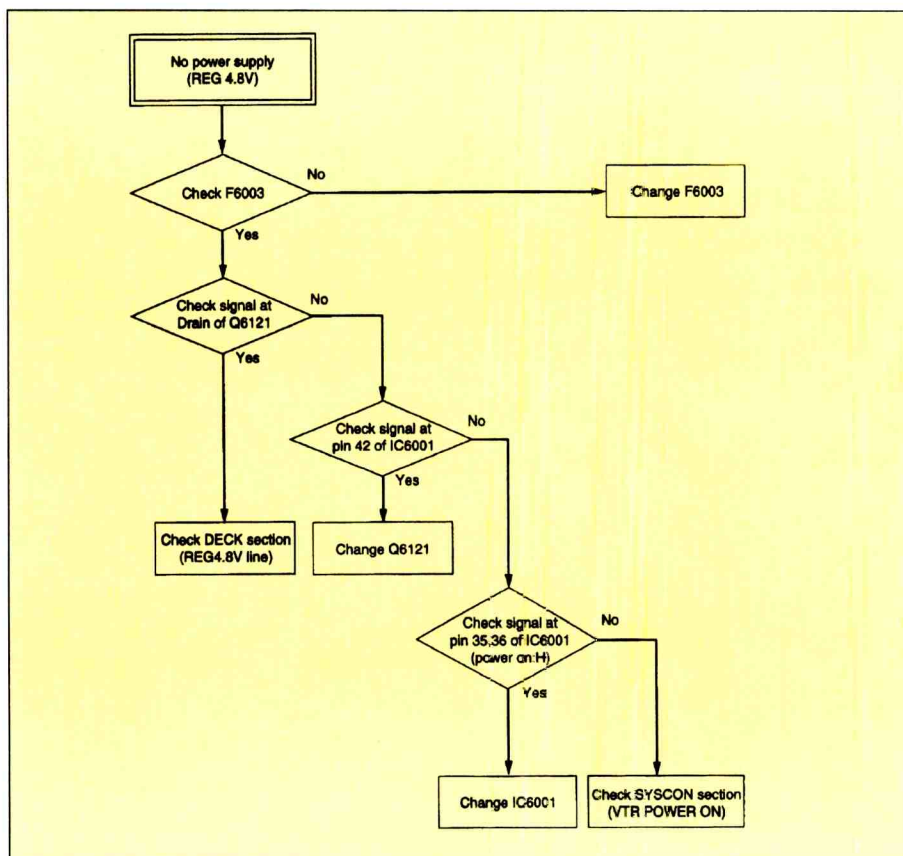


Figure 2. Follow this logical troubleshooting procedure when there is no measurable voltage coming from the regulated 4.8V power supply output.

to find a way to hold the thing immobile and get inside when things go wrong.

Moreover, the components inside are also tiny, closely packed together, and bristling with lots of pins. For example, the camcorder we're going to consider in this article, the RCA CC9370 boasts at least one IC, the camera DSP IC, that has as many as 288 pins. To give you an idea of what that means, I blew the diagram of that IC up to the size of a full 8-1/2 X 11 sheet of paper, and you can just read most of the smaller type. Some of the pin numbers are still too small to read. That means that anyone who plans on servicing these small devices had better have appropriate test probes and soldering/desoldering equipment available. It also means that you don't shotgun a unit like this. If you're going to replace an IC with almost three hundred pins, you want to be sure it's bad.

Moreover, the manufacturer has very cleverly fitted this unit, and others like it, with an electronic adjustment system, so that if the unit ever needs tweaking the service technician will not need as much as a screwdriver. Instead of taking the back (or side, or bottom panel) off, the technician just plugs in the adjustment cable, connects

the unit to a personal computer, and makes his adjustments.

The interconnect wiring diagram for this camcorder, which shows all the major functional blocks and how they're interconnected, is shown in the Profax in this issue. We wish we didn't have to spread it across four pages, but printed to fit on a single page the type would have been so small that it wouldn't have been at all useful. Moreover, that's the way the manufacturer's software prints it. You can have the schematic printed on one page, two pages, or four pages. Anything smaller than four pages and most of the schematics just aren't readable.

### Troubleshooting

Let's take a look at a few of the things that might possibly go wrong with this unit, then we'll provide you with a few trouble trees. Actually, a trouble tree is nothing more than a kind of shorthand way of describing the troubleshooting process. Looking at the trouble tree, it appears as though someone familiar with both troubleshooting and logic diagrams came up with the idea. It takes a little getting used to, but it's a nice compact way of representing the troubleshooting decision-making process.

As with logic diagrams, the trouble tree consists of rectangles that represent conditions, or actions, and diamond shaped elements that represent logical decision points: if the answer to the question is yes, take one action, if the answer to the question is no, take another action; and perhaps make another decision.

If the camcorder is not recording audio, for example (see the other schematic diagram in the Profax section), what could the problem be. It might be that the microphone is not working, or it might be that the electronics in the audio path are not working. A logical first step in troubleshooting this situation is to make an initial determination of whether the microphone is working or not. Connect the oscilloscope to the inputs to the audio circuit from the internal microphone, and speak into the microphone. If there's a signal at those points, the microphone is working, so the technician needs to check the circuitry. Otherwise, check the microphone.

Of course, these units come with jacks that allow the user to plug in an external

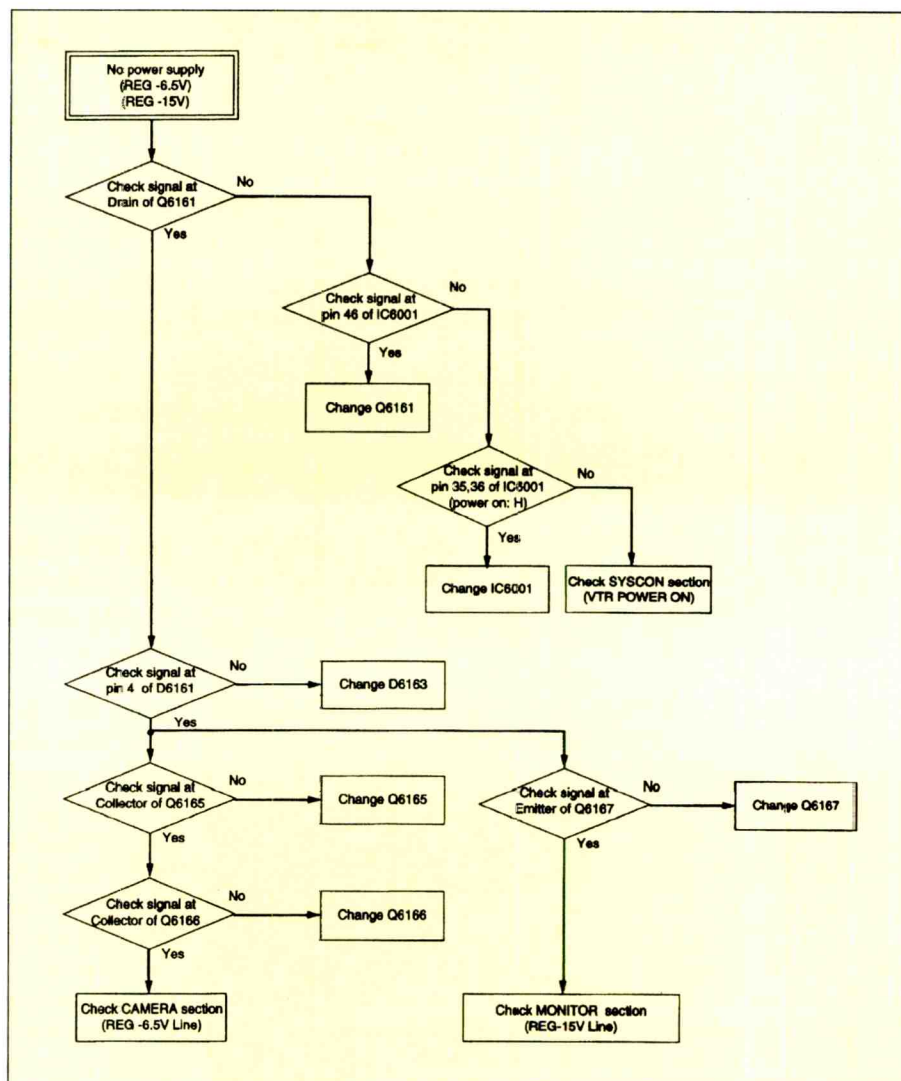


Figure 3. If there is no voltage output from the Regulated  $\bar{6}$ .5V and  $\bar{1}$ 5V power supply, use these steps to troubleshoot the problem.

microphone. If a jack has become damaged, a switch that should be open might be shorted, or a switch that should be closed might be stuck open. So a logical next step, once you know that the microphone is working, is to turn your attention to the jack section. If that inspection shows that the jacks are operating properly, then the problem has to be a faulty audio IC, so it should be replaced. Piece of cake. This one has only 64 pins.

### EVF/LCD Screen Error Messages

One of the wonderful things about microprocessor-based consumer electronics products is that they have some ability to perform self diagnostics, if the designers have designed that in. In the case of this

product, the designers have done so, and have used the electronic viewfinder/LCD screen to display the errors.

In the case of this unit, when an abnormal signal is supplied to the system control microprocessor, an error code is displayed on the EVF and the LCD screens. Figure 7 is a list of the likely cause of the error. When the error code is displayed, all controls, except for the power switch, are inoperative.

Here's one example. If the camcorder's display says E01, there's a problem with the loading portion of the unit. This message tells the technician that the encoder position has not shifted to the next point even though the loading motor has been try-

(Continued on page 99)

# 15TH ANNUAL

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### How the Buyers' Guide Was Compiled:

In late February *ES&T* mailed a four page questionnaire to a list of vendors including every firm listed in the 2000 directory and every firm on the *ES&T* advertiser/prospect promotion list. The Questionnaire offered a full listing including products and services provided at no cost to the company.

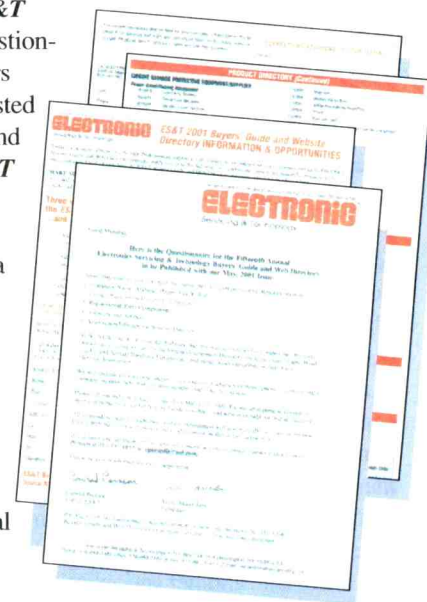
This was a significant undertaking and we appreciate the assistance of the several hundred vendors who participated and the patience of our subscribers.

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However an addendum to this directory will be published in the September issue of the magazine. Vendors are encouraged to provide updated information to *ES&T* in writing prior to August 20th, 2001.



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E-mail: darem@pts.com  
Web: www.pts.com

Q B Products \*  
Microwave Parts Div  
1260 Karl Court  
Wauconda IL 60084-1094

847-487-3333  
800-323-6856  
Fax: 847-487-2689

Radio Shack \*  
300 W 3rd St Suite 1400  
Ft Worth TX 76102  
800-442-7221  
800-422-7221  
Fax: 800-291-6515  
E-mail: commsales@radioshack.com  
Web: radioshack.com/b2b

RAG Electronics Inc.  
Box 2450 Turquoise Circle  
Newbury Park CA 91320  
805-498-9933  
800-732-3457  
Fax: 805-498-3733

R.C. Distributing Co \*  
PO Box 552  
South Bend IN 46624  
219-233-3053  
Fax: 219-289-1566  
E-mail: parts@rcdistributing.com  
Web: www.rcdistributing.com

Repcal Test Equipment LLC  
1 Crown Plaza  
Hazlet NJ 7730  
732-203-0890  
800-524-0747  
Fax: 732-203-0893  
E-mail: sales@repcal.com  
Web: www.repcal.com

Reset, Inc.  
49 Strathearn Place  
Simi Valley CA 93065  
805-584-4900  
Fax: 805-583-2900

RF Parts \*  
435 S Pacific Street  
San Marcos CA 92069  
760-744-0700  
800-737-2787  
Fax: 800-744-1943  
E-mail: rfp@rfparts.com  
Web: www.rfparts.com

Richardson Electronics, Ltd.  
40W267 Keslinger Road  
LaFox IL 60147  
630-208-2200  
800-348-5580  
Fax: 630-208-2550  
E-mail: Info@rell.com  
Web: www.rell.com

RNJ Electronics Inc. \*  
202 New Highway  
PO Box 667  
Amityville NY 11701  
516-226-2700  
800-645-5833  
Fax: 516-226-2770  
E-mail: rnject@rnject.com  
Web: www.rnject.com

RPC Electronics  
749 Miner Road  
Highland Heights OH 44143  
800-827-2650  
Fax: 440-461-4329



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Fax: 800-773-5320  
Web: [www.rselectronics.com](http://www.rselectronics.com)

Russell Industries  
3000 Lawson Avenue  
Oceanside NY 11572  
516-536-5000  
800-645-2202  
Fax: 516-764-5747  
E-mail: [info@russellind.com](mailto:info@russellind.com)  
Web: [www.russellind.com](http://www.russellind.com)

Salen Enterprises  
P.O. Box 915  
Morton Grove IL 60053  
773-736-0999  
Fax: 773-736-4238

Sears Parts Direct  
3333 Beverly Road  
Hoffman Estates IL 60179  
800-225-2864  
Fax: 847-286-1671  
E-mail: [vschrei@sears.com](mailto:vschrei@sears.com)

Service Electronics Inc.  
20 Hanes Drive  
Wayne NJ 07470  
973-872-1200  
Fax: 973-872-2068

SMH Electronics Co., Inc. \* †  
21 Pattersons Brook Road  
West Wareham MA 02576  
508-291-7447  
Fax: 508-291-7449  
E-mail: [lwalls@smhelectronics.com](mailto:lwalls@smhelectronics.com)  
Web: [www.smhelectronics.com](http://www.smhelectronics.com)

Sony Service Co. Parts Div  
National Parts Div.  
8281 N.W. 107th Terrace  
Kansas City MO 64153  
816-891-7550  
Fax: 800-821-5662

Specialized Prods Company \*  
1100 S Kimball Avenue  
Southlake TX 76092-9009  
817-329-6647  
800-866-5353  
Fax: 817-329-6195  
E-mail: [Spc@specialized.net](mailto:Spc@specialized.net)  
Web: [www.specialized.net](http://www.specialized.net)

Sprague Magnetics, Inc.  
12806 Bradley Avenue  
Sylmar CA 91342  
818-364-1800  
800-553-8712  
Fax: 818-364-1810  
Web: [earthlink.net/~sprague-magnetics/](http://earthlink.net/~sprague-magnetics/)

SR Components, Inc.  
52 Railroad Avenue  
Valley Stream NY 11580  
516-872-8100  
800-341-0003  
Fax: 516-872-8118

Herman H. Sticht Co., Inc.  
57 Front Street  
Brooklyn NY 11201  
718-852-7602  
800-221-3203  
Fax: 718-852-7915

Sun Equipment Corporation \*  
PO Box 97903  
Raleigh NC 27624-7903  
919-870-1955  
800-870-1955  
Fax: 919-870-5720  
E-mail: [sec@sunequipco.com](mailto:sec@sunequipco.com)  
Web: [www.sunequipco.com](http://www.sunequipco.com)

Tandy National Parts  
900 Terminal Road  
Fort Worth TX 76106  
817-415-5664  
Fax: 817-415-5632

A.G. Tannenbaum  
P.O. Box 386  
Ambler PA 19002  
215-540-8055  
Fax: 215-540-8327  
E-mail: [k2bn@agtannenbaum.com](mailto:k2bn@agtannenbaum.com)  
Web: [www.agtannenbaum.com](http://www.agtannenbaum.com)

TechAmerica  
Commercial Sales Division  
200 Taylor St Suite 6430  
Fort Worth TX 76102-7308  
800-442-7221  
Fax: 800-291-6515  
Web: [www.techam.com](http://www.techam.com)

Techni-Tool Inc. \*  
1547 N. Trooper Rd  
PO Box 1117  
Worcester PA 19490  
610-941-2400  
800-832-4866  
Fax: 800-854-8665  
E-mail: [sales@techni-tool.com](mailto:sales@techni-tool.com)  
Web: [www.techni-tool.com](http://www.techni-tool.com)

Techspray  
Po Box 949

Amarillo TX 79105  
806-372-8523  
800-858-4043  
Fax: 806-372-8750  
Email: [tspray@techspray.com](mailto:tspray@techspray.com)  
Web: [www.techspray.com](http://www.techspray.com)

Telogy  
3885 Bohannon Drive  
Menlo Park CA 94025-1001  
415-462-9000  
800-835-6494  
Fax: 415-462-5152

Test Equipment Connection Corp \*  
525 Technology Park  
Lake Mary FL 32746  
407-804-1299  
800-615-8378  
Fax: 800-819-8378  
E-mail: [sales@4testequipment.com](mailto:sales@4testequipment.com)  
Web: [www.testequipmentconnection.com](http://www.testequipmentconnection.com)

Test Equipment Depot \*  
99 Washington Street  
Melrose MA 02176  
781-665-1400  
800-996-3837  
Fax: 781-665-0780  
E-mail: [sales@fotronic.com](mailto:sales@fotronic.com)  
Web: [www.testequipmentdepot.com](http://www.testequipmentdepot.com)

3E Corp.  
Monitor Repair  
165 Front Street  
Chicopee MA 01013  
413-594-2772  
Fax: 413-594-7283  
E-mail: [3e-corp@worldnet.att.net](mailto:3e-corp@worldnet.att.net)

Time Motion Tools  
12778 Bookprinter Place  
Poway CA 92064  
619-679-0303  
800-779-8170  
Fax: 800-779-8171

TOPS Computer Company  
38 Forrest Lane  
Boxford MA 01921-2645  
508-887-5915  
Fax: 508-887-9216

Trilogy Magnetics Inc.  
424 N. Mill Creek Road  
Quincy CA 95971  
916-283-3736  
800-873-4323  
Fax: 916-283-3122

Tritronics, Inc.  
1306 Continental Drive  
Abingdon MD 21009  
410-676-7300  
800-638-3328  
Fax: 800-888-3293  
E-mail: [Tritronics@aol.com](mailto:Tritronics@aol.com)  
Web: [www.tritronicsinc.com](http://www.tritronicsinc.com)

Tucker Electronics Co.  
P.O. Box 551419  
Dallas TX 75355-1419  
214-348-8800

800-527-4642  
Fax: 214-348-0367  
E-mail: [Sales@tucker.com](mailto:Sales@tucker.com)  
Web: [www.tucker.com](http://www.tucker.com)

Union Electronics Distrib \*  
311 E. Corning Road  
Beecher IL 60401  
708-946-9500  
800-648-6657  
Fax: 708-946-9200  
E-mail: [Uedweb@unionel.com](mailto:Uedweb@unionel.com)  
Web: [www.unionel.com](http://www.unionel.com)

United Radio \* †  
2949 Erie Boulevard East  
Syracuse NY 13224  
315-446-8700  
315-446-7181  
Fax: 315-446-8505  
E-mail: [yourservicecenter.com](mailto:yourservicecenter.com)

Valtron Technologies  
28309 Avenue Crocker  
Valencia CA 91355  
805-257-0333  
800-2-VALTRON  
Fax: 805-257-0113  
E-mail: [Sales@valtron.com](mailto:Sales@valtron.com)  
Web: [www.valtron.com](http://www.valtron.com)

Vance Baldwin Electronics \*  
7060 State Rd. 84 Suite 12  
Fort Lauderdale FL 33317  
954-723-9191  
800-432-8542  
Fax: 954-723-9044  
E-mail: [info@vancebaldwin.com](mailto:info@vancebaldwin.com)  
Web: [www.vancebaldwin.com](http://www.vancebaldwin.com)

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3498 West 105th Street  
Cleveland OH 44111  
216-671-6712

V-M Audio Enthusiasts \*  
37530 East Meadowhill  
Northville MI 48167  
248-478-0990  
Web: [www.thevoiceofmusic.com](http://www.thevoiceofmusic.com)

Waytek Inc.  
P.O. Box 690  
Chanhassen MN 55317  
800-328-2724  
Fax: 800-858-0319

Wholesale Electronics Inc.  
P.O. Box 1011  
Mitchell SD 57301-7011  
605-996-2233  
800-351-2233  
Fax: 605-996-4300  
E-mail: [Wei@weisd.com](mailto:Wei@weisd.com)  
Web: [www.weisd.com](http://www.weisd.com)

Zack Electronics  
309 East Brokaw Road  
San Jose CA 95112  
800-323-5925  
E-mail: [info@zackinc.com](mailto:info@zackinc.com)  
Web: [www.zackinc.com](http://www.zackinc.com)

# 15TH ANNUAL ES&T BUYERS' GUIDE & WEB DIRECTORY 2001 PRODUCT DIRECTORY

TEST EQUIPMENT & ACCESSORIES • CIRCUIT PROTECTION • ESD • SUPPLIES • AV • TOOLS

## TEST EQUIPMENT

### AC LEAKAGE TESTERS

A.W. Sperry Instruments\*  
Alfa Electronics\*D\*  
AVO International\*  
Brunelle Instruments\*  
Consolidated ElctrnCs, Inc.\*D  
CSTS Inc.  
Cumberland Elect.\*D\*  
East Coast Transistor\*D  
Extech Instruments\*  
Joseph Electronics \*D\*  
L-Com Inc.  
M.A.T. Electronics\*D\*  
Metric Supply\*D  
Omnitron Electronics\*MD  
Print Products International\*D\*  
Protek Test & Measurement\*  
QuadTech, Inc.\*  
RAG Electronics Inc.\*D  
RS Electronics\*D  
**Sencore Electronics\***  
Simpson Electric  
Snap-On Incorporated  
Specialized Prods. Co.\*D\*  
Sun Equipment Co.\*D  
Techni-Tool Inc.\*D\*  
Tenma Test Equipment  
Test Equipment Depot\*D\*  
TIF Instruments, Inc.  
Time Motion Tools\*D  
Tucker Electronics Co.\*D  
Union Electronics Distrib\*D\*  
Vance Baldwin Electronics\*D\*  
Vector-VID Inc.\*  
Wholesale Electronics Inc.\*D  
Zack Electronics\*D

### AUTOMATED TEST EQUIPMENT

AVO International\*  
Computer Svcs of America\*D  
CSTS Inc.  
Cumberland Elect.\*D\*  
E.I.L. Instruments, Inc.\*D  
East Coast Transistor\*D  
Electroservice Laboratories\*D  
Electrotex, Inc.\*D  
Hi-Techniques, Inc.  
Huntron Instruments, Inc.\*  
IFR Systems\*  
Innersound, Inc.  
Innovations Inc.\*  
Jameco Electric Components\*D  
Jensen Tools \*D\*  
Joseph Electronics\*D\*  
Kelvin Electronics\*D  
National Instruments Corp.  
Omega Engineering, Inc.\*  
PC Instruments Incorporated  
Products International\*D\*  
Products International\*D\*  
QuadTech, Inc.\*

R.C. Electronics Inc\*  
Racal Instruments Inc.  
RS Electronics\*D  
Schlumberger Technologies  
Snap-On Incorporated  
Specialized Prods. Co.\*D\*  
Techni-Tool Inc.\*D\*  
Telogy\*D  
Test Equipment Depot\*D\*  
Time Motion Tools\*D  
Tucker Electronics Co.\*D  
UBM Corp\*  
Ultra-X, Inc.\*  
Vance Baldwin Electronics\*D\*  
Zack Electronics\*D

### BREAKOUT BOXES

Adapters.com\*  
Benedict Computer\*  
Computer Svcs of America\*D  
Cumberland Elect.\*D\*  
Dalco Electronics\*D  
E.I.L. Instruments, Inc.\*D  
Electro Standards Lab\*  
Electronix Express\*D  
Electrotex, Inc.\*D  
Harco Electronics\*D  
Heath Company  
HMC Electronics\*D\*  
Hosfelt Electronics, Inc.\*D  
International Disk Svcs, Inc.  
Jameco Electric Components\*D  
JDR Microdevices\*D  
Jensen Tools \*D\*  
Joseph Electronics\*D\*  
Kelvin Electronics\*D  
L-Com Inc.  
Nationwide Electronics\*D  
Omnitron Electronics\*MD  
Print Products International\*D  
Products International\*D\*  
RNJ Electronics Inc.\*D\*  
RS Electronics\*D  
**Sencore Electronics\***  
Specialized Prods. Co.\*D\*  
Techni-Tool Inc.\*D\*  
Test Equipment Depot\*D\*  
Time Motion Tools\*D  
Union Electronics Distrib\*D\*  
W.S. Jenks & Son\*D  
Wholesale Electronics Inc.\*D  
Zack Electronics\*D

### CELLULAR TELEPHONE TEST EQUIPMENT

Bird Electronics Corp.  
Cumberland Elect.\*D\*  
Electrotex, Inc.\*D  
Harco Electronics\*D  
IFR Systems\*  
Joseph Electronics\*D\*  
Keithley Instruments  
Marconi Instruments Inc.\*D  
Omnitron Electronics\*MD

Print Products International\*D  
Products International\*D\*  
Racal Instruments Inc.  
Schlumberger Technologies  
Specialized Prods. Co.\*D\*  
Techni-Tool Inc.\*D\*  
Telogy\*D  
Test Equipment Depot\*D\*  
Triplett Corp.\*  
Vance Baldwin Electronics\*D\*  
Zack Electronics\*D

### CONTINUITY TESTERS

A.W. Sperry Instruments\*  
AEMC Instruments\*  
Alpha Electric\*D  
AVO International\*  
Bel Merit Corporation  
Brunelle Instruments\*  
Cablescan  
Consolidated ElctrnCs, Inc.\*D  
CSTS Inc.  
Cumberland Elect.\*D\*  
Dalbani Corporation  
Digi-Key \*D  
E.I.L. Instruments, Inc.\*D  
East Coast Transistor\*D  
Electro Tool, Inc.\*D  
**Electronic Design Specialists\***  
**Electronix Corp\*D**  
Electrotex, Inc.\*D  
Extech Instruments\*  
Foley-Belsaw\*D  
Galco Ind. Electronics\*D\*  
GC Electronics\*D  
Harco Electronics\*D  
HMC Electronics\*D\*  
Hy Tec Dealer Service  
IET Labs, Inc.  
JDR Microdevices\*D  
Jensen Tools\*D\*  
JIT Resources, Inc.  
Joseph Electronics\*D\*  
Kelvin Electronics\*D  
L-Com Inc.  
L'il Bitty Tester\*  
MCM Electronics\*D\*  
Mouser Electronics\*D  
Omnitron Electronics\*MD  
Parts Express International\*D\*  
Print Products International\*D  
Products International\*D\*  
QuadTech, Inc.\*  
RAG Electronics Inc.\*D  
RNJ Electronics Inc.\*D\*  
Ronan Eng.\*  
RS Electronics\*D  
**Sencore Electronics\***  
Simpson Electric  
Specialized Prods. Co.\*D\*  
Sun Equipment Corporation\*D\*  
Tandy National Parts\*D  
TechAmerica\*D  
Techni-Tool Inc.\*D\*

Tenma Test Equipment  
Test Equipment Depot\*D\*  
Time Motion Tools\*D  
Union Electronics Distrib\*D\*  
Vance Baldwin Electronics\*D\*  
W.S. Jenks & Son\*D  
Wholesale Electronics Inc.\*D  
Zack Electronics\*D

### CRT TESTERS/RESTORERS

**BK Precision\***  
Bursa Electronic Dist. \*D\*  
C&S Sales\*D  
Computer Svcs of America\*D  
Connector Corporation  
Consolidated ElctrnCs, Inc.\*D  
Conway Engineering, Inc.  
Cumberland Elect.\*D\*  
East Coast Transistor\*D  
Electronic Parts Supply\*D  
**Electronix Corp\*D**  
Herman Panson Electronics\*D\*  
IET Labs, Inc.  
Jensen Tools\*D\*  
Joseph Electronics\*D\*  
Klein Instruments\*  
M.A.T. Electronics\*D\*  
MCM Electronics\*D\*  
Metric Supply\*D  
Omnitron Electronics\*MD  
Print Products International\*D\*  
Products International\*D  
RNJ Electronics Inc.\*D\*  
RS Electronics\*D  
**Sencore Electronics\***  
Sun Equipment Corporation\*D\*  
Telematic  
Test Equipment Depot\*D\*  
Time Motion Tools\*D  
Tritronics, Inc.\*D  
Tucker Electronics Co.\*D  
Union Electronics Distrib\*D\*  
Vance Baldwin Electronics\*D\*  
W.S. Jenks & Son\*D  
Wholesale Electronics Inc.\*D  
Zack Electronics\*D

### CURVE TRACERS

Computer Svcs of America\*D  
Cumberland Elect.\*D\*  
East Coast Transistor\*D  
Electrotex, Inc.\*D  
Hameg Instruments, Inc.  
Herman H. Sticht Co., Inc.\*D  
Huntron Instruments, Inc.\*  
IET Labs, Inc.  
Joseph Electronics\*D\*  
Omnitron Electronics\*MD  
Print Products International\*D  
Products International\*D\*  
RAG Electronics Inc.\*D  
**Sencore Electronics\***  
Sun Equipment Corporation\*D\*

Techni-Tool Inc.\*D \*  
 Tektronix, Inc.\*  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*D \*  
 Test Equipment Depot\*D \*  
 Time Motion Tools\*D  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D \*  
 Vance Baldwin Electronics\*D \*  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**DATA COMMUNICATION ANALYZERS/MONITORS/TESTERS**

Benedict Computer\*  
 Conway Engineering, Inc.  
 Cumberland Elect.\*D \*  
 Dalco Electronics\*D  
 E.I.L. Instruments, Inc.\*D  
 East Coast Transistor\*D  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D  
 Fotec Inc  
 Galco Ind. Electronics\*D \*  
 Global Specialties  
 Gould Instrument Systems Inc.  
 Harco Electronics\*D  
 International Disk Svcs, Inc.  
 Jensen Tools\*D \*  
 Joseph Electronics\*D \*  
 Marconi Instruments Inc.\*D  
 Omnitron Electronics\*MD  
 Print Products International\*D  
 Products International\*D \*  
 Racal Instruments Inc.  
 RS Electronics\*D  
 Schlumberger Technologies  
**Sencore Electronics\***  
 Simpson Electric  
 Specialized Prods. Co.\*D \*  
 Sun Equipment Corporation\*D \*  
 Techni-Tool Inc.\*D \*  
 Telematic  
 Telogy\*D  
 Telulex, Inc.  
 Test Equipment Depot\*D \*  
 Time Motion Tools\*D  
 Tucker Electronics Co.\*D  
 Vance Baldwin Electronics\*D \*  
 W.S. Jenks & Son\*D  
 Zack Electronics\*D

**DISC DRIVE ANALYZERS/TESTERS**

Accurite Tech. Inc\*  
 Computer Svcs of America\*D  
 CSTS Inc.  
 Cumberland Elect.\*D \*  
 Data Depot, Inc.\*D  
 Kenwood U.S.A.,Corp  
 Omnitron Electronics\*MD  
 Pioneer Research  
 RAG Electronics Inc.\*D  
 Specialized Prods. Co.\*D \*  
 Techni-Tool Inc.\*D \*  
 Test Equipment Depot\*D \*  
 Time Motion Tools\*D  
 Vance Baldwin Electronics\*D \*  
 W.S. Jenks & Son\*D

**DISTORTION ANALYZERS**

Alfa Electric\*D

Cumberland Elect.\*D \*  
 East Coast Transistor\*D  
 Galco Ind. Electronics\*D \*  
 Herman H. Sticht Co., Inc.\*D  
 Joseph Electronics\*D \*  
 Metric Supply\*D  
 Omnitron Electronics\*MD  
 Print Products International\*D  
 Products International\*D \*  
 RAG Electronics Inc.\*D  
 RS Electronics\*D  
 Schlumberger Technologies  
**Sencore Electronics\***  
 Specialized Prods. Co.\*D \*  
 Sun Equipment Corporation\*D \*  
 Techni-Tool Inc.\*D \*  
 Telogy\*D  
 Tenma Test Equipment  
 Test Equipment Depot\*D \*  
 Time Motion Tools\*D  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D \*  
 Vance Baldwin Electronics\*D \*  
 Zack Electronics\*D

**FREQUENCY COUNTERS**

Alfa Electric\*D  
 B&B Electronics Manufacturing  
 Bel Merit Corporation  
**BK Precision\***  
 Brunelle Instruments\*  
 Bursma Electronic Dist. \*D \*  
 C&S Sales\*D  
 Computer Svcs of America\*D  
 Consolidated Elctrnics, Inc.\*D  
 Cumberland Elect.\*D \*  
 Dalbani Corporation  
 Digi-Key\*D \*  
 E.I.L. Instruments, Inc.\*D  
 East Coast Transistor\*D  
 Electro Tool, Inc.\*D  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Electronix Express\*D  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D  
 Elenco Electronics\*  
 Extech Instruments\*  
 Fluke Corporation  
 Galco Ind. Electronics\*D \*  
 Global Specialties  
 Hameg Instruments, Inc.  
 Harco Electronics\*D  
 Heath Company  
 Herman H. Sticht Co., Inc.\*D  
 Herman Panson Electronics\*D \*  
 HMC Electronics \*D \*  
 Instek Corp.\*D  
 Jameco Electrnrc Components\*D  
 JDR Microdevices\*D  
 Jensen Tools \*D \*  
 Joseph Electronics \*D \*  
 Keithley Instruments  
 Kelvin Electronics\*D  
 Kenwood U.S.A.,Corp  
 Lascar Electronics Inc.\*  
 Leader Instruments Corp.\*  
 M.A.T. Electronics\*D \*  
 Marconi Instruments Inc.\*D  
 MCM Electronics\*D \*  
 Metric Supply\*D  
 Morrow Wave, Inc.  
 Mouser Electronics\*D

Nokia Mobile Phones  
 Non-Linear Systems\*  
 Omnitron Electronics\*MD  
 Parts Express International\*D \*  
 Print Products International\*D  
 Products International\*D \*  
 Protek Test & Measurement\*  
 RAG Electronics Inc.\*D  
 RNJ Electronics Inc.\*D \*  
 RS Electronics\*D  
 Salen Enterprises\*D  
**Sencore Electronics\***  
 Sibex, Inc.  
 Simpson Electric  
 Specialized Prods. Co.\*D \*  
 Sun Equipment Corporation\*D \*  
 Tandy National Parts\*D  
 TechAmerica\*D  
 Techni-Tool Inc.\*D \*  
 Telogy\*D  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*D \*  
 Test Equipment Depot\*D \*  
 TIF Instruments, Inc.  
 Time Motion Tools\*D  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D \*  
 Vance Baldwin Electronics\*D \*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**FUNCTION GENERATORS**

Alfa Electric\*D  
 B-B&W Electronics\*D  
 Bel Merit Corporation  
**BK Precision\***  
 Brunelle Instruments\*  
 Bursma Electronic Dist.\*D \*  
 C&S Sales\*D  
 Consolidated Elctrnics, Inc.\*D  
 Cumberland Elect.\*D \*  
 Dalbani Corporation  
 Digi-Key\*D \*  
 E.I.L. Instruments, Inc.\*D  
 East Coast Transistor\*D  
 Electro Tool, Inc.\*D  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Electronix Express\*D  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D  
 Elenco Electronics\*  
 Global Specialties  
 Hameg Instruments, Inc.  
 Harco Electronics\*D  
 Heath Company  
 Herman H. Sticht Co., Inc.\*D  
 Herman Panson Electronics\*D \*  
 HMC Electronics\*D \*  
 Instek Corp.\*D  
 Jameco Electrnrc Components\*D  
 JDR Microdevices\*D  
 Jensen Tools\*D \*  
 Joseph Electronics\*D \*  
 Keithley Instruments  
 Kelvin Electronics\*D  
 Kenwood U.S.A.,Corp  
 Leader Instruments Corp.\*  
 M.A.T. Electronics\*D \*  
 MCM Electronics\*D \*  
 Metric Supply\*D  
 Morrow Wave, Inc.  
 National Instruments Corp.

Omnitron Electronics\*MD  
 Parts Express International\*D \*  
 PC Instruments Incorporated  
 Print Products International\*D  
 Products International\*D \*  
 Protek Test & Measurement\*  
 RAG Electronics Inc.\*D  
 RNJ Electronics Inc.\*D \*  
 RS Electronics\*D  
 Salen Enterprises\*D  
 Sibex, Inc.  
 Specialized Prods. Co.\*D \*  
 Sun Equipment Corporation\*D \*  
 Tandy National Parts\*D  
 TechAmerica\*D  
 Techni-Tool Inc.\*D \*  
 Tektronix, Inc.\*  
 Teledata Systems  
 Telogy\*D  
 Telulex, Inc.  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*D \*  
 Test Equipment Depot\*D \*  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D \*  
 Vance Baldwin Electronics\*D \*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**GAUGES: HEAD PROTRUSION/SPRING TENSION OTHER**

Alfa Electric\*D  
 Cumberland Elect.\*D \*  
 Dalbani Corporation  
 Electronic Parts Supply\*D  
 HMC Electronics \*D \*  
 Hunter Products, Inc.  
 Jonard Industries Corp.\*  
 Joseph Electronics\*D \*  
 Omega Engineering, Inc.\*  
 Products International\*D \*  
 Sprague Magnetics, Inc.\*D  
 Techni-Tool Inc.\*D \*  
 Tentel\*  
 Test Equipment Depot\*D \*  
 TIF Instruments, Inc.  
 Union Electronics Distrib\*D \*  
 Vance Baldwin Electronics\*D \*

**GENERATORS, AUDIO**

A.G. Tannenbaum\*D  
 Alfa Electric\*D  
 AudioVisual Inc.\*D  
 Bel Merit Corporation  
**BK Precision\***  
 Brunelle Instruments\*  
 Bursma Electronic Dist.\*D \*  
 C&S Sales\*D  
 Compuvideo Test Instruments  
 Consolidated Elctrnics, Inc.\*D  
 Cumberland Elect.\*D \*  
 Dalco Electronics\*D  
 East Coast Transistor\*D  
 Electro Tool, Inc.\*D  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Electronix Express\*D  
 Elenco Electronics\*  
 Heath Company  
 Herman H. Sticht Co., Inc.\*D  
 Instek Corp.\*D  
 Joseph Electronics\*D \*  
 Kelvin Electronics\*D



Kenwood U.S.A., Corp  
 Leader Instruments Corp.\*  
 MCM Electronics\*D\*  
 Morrow Wave, Inc.  
 Multidyne Inc  
**Neutrik USA**  
 Parts Express International\*D\*  
 PC Instruments Incorporated  
 Print Products International\*D  
 Products International\*D\*  
 Protek Test & Measurement\*  
 RAG Electronics Inc.\*D  
 RNJ Electronics Inc.\*D\*  
 Salen Enterprises\*D  
**Sencore Electronics\***  
 Sun Equipment Corporation\*D\*  
 TechAmerica\*D  
 Techni-Tool Inc.\*D\*  
 Tektronix, Inc.\*  
 Telulex, Inc.  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*D\*  
 Test Equipment Depot\*D\*  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**GENERATORS, SIGNAL**

A.G. Tannenbaum\*D  
 Alfa Electric\*D  
 AudioVisual Inc.\*D  
 Bel Merit Corporation  
**BK Precision\***  
 Brunelle Instruments\*  
 C&S Sales\*D  
 Compuvideo Test Instruments  
 Consolidated Elctrnics, Inc.\*D  
 Conway Engineering, Inc.  
 Cumberland Elect.\*D\*  
 Dalbani Corporation  
 Dalco Electronics\*D  
 East Coast Transistor\*D  
 Electro Tool, Inc.\*D  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Electronix Express\*D  
 Electrotex, Inc.\*D  
 Elenco Electronics\*  
 Fluke Corporation  
 Global Specialties  
 Harco Electronics\*D  
 Heath Company  
 Herman H. Sticht Co., Inc.\*D  
 ICM Components\*D  
 IFR Systems\*  
 Instek Corp.\*D  
 Jensen Tools\*D\*  
 Joseph Electronics\*D\*  
 Kelvin Electronics\*D  
 Leader Instruments Corp.\*  
 Marconi Instruments Inc.\*D  
 MCM Electronics\*D\*  
 Metric Supply\*D  
 Morrow Wave, Inc.  
 Multidyne Inc  
 NCM Electronics  
 Omnitron Electronics\*MD  
 PC Instruments Incorporated  
 Print Products International\*D  
 Products International\*D\*  
 Quantum Data  
 R.C. Distributing Co.\*D\*  
 RAG Electronics Inc.\*D  
 Richardson Electronics, Ltd.\*D  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
 Salen Enterprises\*D  
**Sencore Electronics\***  
 Sirius Technologies  
 Sun Equipment Corporation\*D\*  
 TEAM Systems, Inc.\*  
 Techni-Tool Inc.\*D\*  
 Tektronix, Inc.\*  
 Ten-Lab\*  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*D\*  
 Test Equipment Depot\*D\*  
 Tucker Electronics Co.\*D

Richardson Electronics, Ltd.\*D  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
 Salen Enterprises\*D  
**Sencore Electronics\***  
 Sibex, Inc.  
 Specialized Prods. Co.\*D\*  
 Sun Equipment Corporation\*D\*  
 TEAM Systems, Inc.\*  
 TechAmerica\*D  
 Techni-Tool Inc.\*D\*  
 Tektronix, Inc.\*  
 Tektronix, Inc.\*  
 Telogy\*D  
 Telulex, Inc.  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*D\*  
 Test Equipment Depot\*D\*  
 Test Equipment Depot\*D\*  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 Vector-VID Inc.\*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**GENERATORS, VIDEO**

A.G. Tannenbaum\*D  
 AudioVisual Inc.\*D  
**BK Precision\***  
 Computer & Monitor Maintenance  
 Computer Svcs of America\*D  
 Compuvideo Test Instruments  
 Consolidated Elctrnics, Inc.\*D  
 Cumberland Elect.\*D\*  
 East Coast Transistor\*D  
**Electronix Corp.\*D**  
 Elenco Electronics\*  
 Fluke Corporation  
 Heath Company  
 Herman Panson Electronics\*D\*  
 Independence Electronics\*  
 Joseph Electronics \*D\*  
 Kelvin Electronics\*D  
 Klein Instruments\*  
 Leader Instruments Corp \*  
 MCM Electronics\*D\*  
 Metric Supply\*D  
 Morrow Wave, Inc.  
 Multidyne Inc  
 NCM Electronics  
 Omnitron Electronics\*MD  
 PC Instruments Incorporated  
 Print Products International\*D  
 Products International\*D\*  
 Quantum Data  
 R.C. Distributing Co.\*D\*  
 RAG Electronics Inc.\*D  
 Richardson Electronics, Ltd.\*D  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
 Salen Enterprises\*D  
**Sencore Electronics\***  
 Sirius Technologies  
 Sun Equipment Corporation\*D\*  
 TEAM Systems, Inc.\*  
 Techni-Tool Inc.\*D\*  
 Tektronix, Inc.\*  
 Ten-Lab\*  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*D\*  
 Test Equipment Depot\*D\*  
 Tucker Electronics Co.\*D

Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**HV PROBES**

Alfa Electric\*D  
 B-B&W Electronics\*D  
**BK Precision\***  
 Bursma Electronic Dist. \*D\*  
 C&S Sales\*D  
 Consolidated Elctrnics, Inc.\*D  
 Cumberland Elect.\*D\*  
 East Coast Transistor\*D  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Electronix Express\*D  
 Electrotex, Inc.\*D  
 Fieldpiece Instruments\*  
 Fluke Corporation  
 Fox International LTD, INC  
 Harco Electronics\*D  
 Herman Panson Electronics\*D\*  
 Joseph Electronics\*D\*  
 Kelvin Electronics\*D  
 M.A.T. Electronics\*D\*  
 Metric Supply\*D  
 Nationwide Electronics\*D  
 Omnitron Electronics\*MD  
 PC Instruments Incorporated  
 Print Products International\*D  
 Products International\*D\*  
 RAG Electronics Inc.\*D  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
**Sencore Electronics\***  
 Simpson Electric  
 Specialized Prods. Co.\*D\*  
 Sun Equipment Corporation\*D\*  
 Techni-Tool Inc.\*D\*  
 Tektronix  
 Telematic  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*D\*  
 Test Equipment Depot\*D\*  
 Test Products International Inc.\*  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**LOGIC ANALYZERS:  
 SIGNATURE/STATE**

Cumberland Elect.\*D\*  
 Dalbani Corporation  
 E.I.L. Instruments, Inc.\*D  
 East Coast Transistor\*D  
 Electronix Express\*D  
 Electroservice Laboratories\*D  
 Global Specialties  
 Harco Electronics\*D  
 Heath Company  
 Jensen Tools\*D\*  
 Joseph Electronics\*D\*  
 MCM Electronics\*D\*  
 Metric Supply\*D  
 Omnitron Electronics\*MD  
 Orion Instruments, Inc.  
 Print Products International\*D

Products International\*D\*  
 RAG Electronics Inc.\*D  
 RS Electronics\*D  
 Schlumberger Technologies  
 Specialized Prods. Co.\*D\*  
 Sun Equipment Corporation\*D\*  
 Tandy National Parts\*D  
 Techni-Tool Inc.\*D\*  
 Tektronix, Inc.\*  
 Telogy\*D  
 Test Equipment Connection Corp.\*D\*  
 Test Equipment Depot\*D\*  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Zack Electronics\*D

**LOGIC PROBES**

Alfa Electric\*D  
 B-B&W Electronics\*D  
 Bel Merit Corporation  
**BK Precision\***  
 Brunelle Instruments\*  
 Bursma Electronic Dist. \*D\*  
 C&S Sales\*D  
 Consolidated Elctrnics, Inc.\*D  
 Contact East\*D\*  
 Cumberland Elect.\*D\*  
 Dalbani Corporation  
 Data Depot, Inc.\*D  
 Digi-Key \*D\*  
 E.I.L. Instruments, Inc.\*D  
 East Coast Transistor\*D  
 ElectroIndustries\*  
 Electronic Parts Supply\*D  
 Electronix Express\*D  
 Electrotex, Inc.\*D  
 Elenco Electronics\*  
 Foley-Belsaw\*D  
 Global Specialties  
 Harco Electronics\*D  
 Heath Company  
 HMC Electronics \*D\*  
 Hy Tec Dealer Service  
 Jameco Electric Components\*D  
 JDR Microdevices\*D  
 Joseph Electronics\*D\*  
 Kelvin Electronics\*D  
 Kenwood U.S.A., Corp  
 L'il Bitty Tester\*  
 M.A.T. Electronics\*D\*  
 Metric Supply\*D  
 Micro 2000, Inc.  
 Omnitron Electronics\*MD  
 Parts Express International\*D\*  
**Philips Consumer Electronics\*D\***  
 Print Products International\*D  
 Products International\*D\*  
 RAG Electronics Inc.\*D  
 RS Electronics\*D  
 Salen Enterprises\*D  
 Sun Equipment Corporation\*D\*  
 Tandy National Parts\*D  
 TechAmerica\*D  
 Techni-Tool Inc.\*D\*  
 Tektronix, Inc.\*  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*D\*  
 Test Equipment Depot\*D\*  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*

W.S. Jenks & Son\*D  
Wholesale Electronics Inc.\*D  
Zack Electronics\*D

**LOGIC PULSERS**

Alfa Electric\*D  
B-B&W Electronics\*D  
**BK Precision\***  
Brunelle Instruments\*  
C&S Sales\*D  
Consolidated Electrncs, Inc.\*D  
Cumberland Elect.\*D\*  
E.I.L. Instruments, Inc.\*D  
East Coast Transistor\*D  
Electronic Parts Supply\*D  
Electronix Express\*D  
Elenco Electronics\*  
Global Specialties  
HMC Electronics\*D\*  
Hy Tec Dealer Service  
Jameco Electrnc Components\*D  
Joseph Electronics\*D\*  
Kelvin Electronics\*D  
**Philips Consumer Electronics\*D\***  
Print Products International\*D  
Products International\*D\*  
RAG Electronics Inc.\*D  
RS Electronics\*D  
Salen Enterprises\*D  
Sun Equipment Corporation\*D\*  
Techni-Tool Inc.\*D\*  
Tenma Test Equipment  
Test Equipment Connection Corp.\*D\*  
Test Equipment Depot\*D\*  
Tucker Electronics Co.\*D  
Union Electronics Distrib\*D\*  
Vance Baldwin Electronics\*D\*  
W.S. Jenks & Son\*D  
Wholesale Electronics Inc.\*D  
Zack Electronics\*D

**MAGNETRON TESTERS**

B-B&W Electronics\*D  
Cumberland Elect.\*D\*  
Electronic Parts Supply\*D  
Joseph Electronics\*D\*  
Omnitron Electronics\*MD  
Products International\*D  
Techni-Tool Inc.\*D\*  
Test Equipment Depot\*D\*  
Union Electronics Distrib\*D\*  
Vance Baldwin Electronics\*D\*  
W.S. Jenks & Son\*D  
Zack Electronics\*D

**METERS, CAPACITANCE/  
INDUCTANCE**

A.G. Tannenbaum\*D  
A.W. Sperry Instruments\*  
Alfa Electric\*D  
AnaTek Corp\*  
AVO International\*  
B-B&W Electronics\*D  
Bel Merit Corporation  
**BK Precision\***  
Brunelle Instruments\*  
Bursma Electronic Dist.\*D\*  
C&S Sales\*D  
Computer Component Source\*D  
Consolidated Electrncs, Inc.\*D  
Contact East\*D\*  
Creative Electronics  
CSTS Inc.

Cumberland Elect.\*D\*  
Dalbani Corporation  
Digi-Key\*D\*  
E.I.L. Instruments, Inc.\*D  
East Coast Transistor\*D  
**Electronic Design Specialists\***  
Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
Electronix Express\*D  
Electrotex, Inc.\*D  
Elenco Electronics\*  
Exttech Instruments\*  
Fieldpiece Instruments\*  
Fluke Corporation  
Foley-Belsaw\*D  
Galco Ind. Electronics\*D\*  
Global Micro-Parts Depot\*MD  
Global Specialties  
Harco Electronics\*D  
Herman H. Sticht Co., Inc.\*D  
Herman Panson Electronics\*D\*  
HMC Electronics\*D\*  
Hosfelt Electronics, Inc.\*D  
Hy Tec Dealer Service  
IET Labs, Inc.  
Independence Electronics\*  
Jameco Electrnc Components\*D  
JDR Microdevices\*D  
Jensen Tools\*D\*  
Joseph Electronics\*D\*  
Kelvin Electronics\*D  
Leader Instruments Corp.\*  
MCM Electronics\*D\*  
Metric Supply\*D  
Omnitron Electronics\*MD  
Pacer Industries, Inc.  
Parts Express International\*D\*  
**Philips Consumer Electronics\*D\***  
Print Products International\*D  
Products International\*D\*  
Protek Test & Measurement\*  
QuadTech, Inc.\*  
Radio Shack\*D  
RAG Electronics Inc.\*D  
RNJ Electronics Inc.\*D\*  
RS Electronics\*D  
Salen Enterprises\*D  
**Sencore Electronics\***  
Simpson Electric  
Specialized Prods. Co.\*D\*  
Sun Equipment Corporation\*D\*  
Tandy National Parts\*D  
TechAmerica\*D  
Techni-Tool Inc.\*D\*  
Telogy\*D  
Tenma Test Equipment  
Test Equipment Connection Corp.\*D\*  
Test Equipment Depot\*D\*  
Test Products International Inc.\*  
TIF Instruments, Inc.  
Time Motion Tools\*D  
Triplett Corp.\*  
Tucker Electronics Co.\*D  
Union Electronics Distrib\*D\*  
Universal Enterprises (UEI)  
Vance Baldwin Electronics\*D\*  
W.S. Jenks & Son\*D  
Wholesale Electronics Inc.\*D  
Zack Electronics\*D

**METERS, CLAMP ON**

A.W. Sperry Instruments\*  
AEMC Instruments\*

Alfa Electric\*D  
AVO International\*  
B-B&W Electronics\*D  
Bel Merit Corporation  
**BK Precision\***  
Brunelle Instruments\*  
Bursma Electronic Dist.\*D\*  
C&S Sales\*D  
Cleveland Inst. of Electronics\*  
Computer Component Source\*D  
Consolidated Electrncs, Inc.\*D  
Contact East\*D\*  
Cumberland Elect.\*D\*  
Dalbani Corporation  
Digi-Key\*D\*  
E.I.L. Instruments, Inc.\*D  
East Coast Transistor\*D  
Electro Tool, Inc.\*D  
ElectroIndustries\*  
Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
Electronix Express\*D  
Electrotex, Inc.\*D  
Elenco Electronics\*  
Exttech Instruments\*  
Fieldpiece Instruments\*  
Fluke Corporation  
Foley-Belsaw\*D  
Galco Ind. Electronics\*D\*  
Global Micro-Parts Depot\*MD  
Harco Electronics\*D  
Heath Company  
Herman Panson Electronics\*D\*  
HMC Electronics\*D\*  
Hosfelt Electronics, Inc.\*D  
Hy Tec Dealer Service  
Jameco Electrnc Components\*D  
Jensen Tools\*D\*  
Joseph Electronics\*D\*  
Kelvin Electronics\*D  
LEM Instruments Inc  
M.A.T. Electronics\*D\*  
MCM Electronics\*D\*  
Metric Supply\*D  
Morrow Wave, Inc.  
Mouser Electronics\*D  
Omega Engineering, Inc.\*  
Omnitron Electronics\*MD  
**Philips Consumer Electronics\*D\***  
Print Products International\*D  
Products Internationa\*D\*  
Protek Test & Measurement\*  
Radio Shack\*D  
RAG Electronics Inc.\*D  
RNJ Electronics Inc.\*D\*  
RS Electronics\*D  
Salen Enterprises\*D  
Simpson Electric  
Specialized Prods. Co.\*D\*  
Sun Equipment Corporation\*D\*  
TechAmerica\*D  
Techni-Tool Inc.\*D\*  
Tenma Test Equipment  
Test Equipment Connection Corp.\*D\*  
Test Equipment Depot\*D\*  
Test Products International Inc.\*  
TIF Instruments, Inc.  
Time Motion Tools\*D  
Triplett Corp.\*  
Tucker Electronics Co.\*D  
Union Electronics Distrib\*D\*  
Universal Enterprises (UEI)  
Vance Baldwin Electronics\*D\*  
W.S. Jenks & Son\*D

Wholesale Electronics Inc.\*D  
Zack Electronics\*D

**METERS, FIELD STRENGTH**

A.W. Sperry Instruments\*  
Alfa Electric\*D  
Bel Merit Corporation  
Bird Electronics Corp.  
Bursma Electronic Dist.\*D\*  
C&S Sales\*D  
Cumberland Elect.\*D\*  
East Coast Transistor\*D  
Electroservice Laboratories\*D  
Electrotex, Inc.\*D  
Excel Distributing\*D\*  
Exttech Instruments\*  
Galco Ind. Electronics\*D\*  
Harco Electronics\*D  
Herman H. Sticht Co., Inc.\*D  
Hy Tec Dealer Service  
Integrity Design & Research  
JDR Microdevices\*D  
Jensen Tools\*D\*  
JIT Resources, Inc.  
Joseph Electronics\*D\*  
Kelvin Electronics\*D  
Leader Instruments Corp.\*  
MCM Electronics\*D\*  
Metric Supply\*D  
Omnitron Electronics\*MD  
Print Products International\*D  
Products International\*D\*  
Protek Test & Measurement\*  
RNJ Electronics Inc.\*D\*  
RS Electronics\*D  
**Sencore Electronics\***  
Snap-On Incorporated  
Specialized Prods. Co.\*D\*  
Sun Equipment Corporation\*D\*  
Techni-Tool Inc.\*D\*  
Test Equipment Connection Corp.\*D\*  
Test Equipment Depot\*D\*  
Time Motion Tools\*D  
Tucker Electronics Co.\*D  
Union Electronics Distrib\*D\*  
Vance Baldwin Electronics\*D\*  
W.S. Jenks & Son\*D  
Zack Electronics\*D

**METERS, SIGNAL LEVEL**

Alfa Electric\*D  
B-B&W Electronics\*D  
Bursma Electronic Dist.\*D\*  
Conway Engineering, Inc.  
Cumberland Elect.\*D\*  
Dalbani Corporation  
East Coast Transistor\*D  
**Electronix Corp.\*D**  
Electronix Express\*D  
Fieldpiece Instruments\*  
Galco Ind. Electronics\*D\*  
Harco Electronics\*D  
Herman H. Sticht Co., Inc.\*D  
Jensen Tools\*D\*  
Joseph Electronics\*D\*  
Leader Instruments Corp.\*  
M.A.T. Electronics\*D\*  
MCM Electronics\*D\*  
Newport Electronics, Inc.  
Omega Engineering, Inc.\*  
Omega-Vanzetti, Inc.\*  
Omnitron Electronics\*MD  
Parts Express International\*D\*  
Prime Technology, Inc.

Print Products International\*  
 Products International\*D\*  
 Protek Test & Measurement\*  
 RAG Electronics Inc.\*  
 RNJ Electronics Inc.\*  
 RS Electronics\*D  
**Sencore Electronics\***  
 Snap-On Incorporated  
 Specialized Prods. Co.\*  
 Sun Equipment Corporation\*D\*  
 Techni-Tool Inc.\*  
 Tektronix, Inc.\*  
 Telogy\*D  
 Telulex, Inc.  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*  
 Test Equipment Depot\*D\*  
 Time Motion Tools\*D  
 Triplett Corp.\*  
 Tritronics, Inc.\*  
 Tucker Electronics Co.\*  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Zack Electronics\*D

**METERS, SOUND LEVEL**

Alfa Electric\*D  
 B-B&W Electronics\*D  
 Brunelle Instruments\*  
 Consolidated Elctrnrcs, Inc.\*  
 CSI/SPECO\*  
 Cumberland Elect.\*  
 E.I.L. Instruments, Inc.\*  
 East Coast Transistor\*D  
**Electronix Corp.\***  
 Exttech Instruments\*  
 Fieldpiece Instruments\*  
 Harco Electronics\*D  
 HMC Electronics\*D\*  
 Hunter Products, Inc.  
 Jameco Electrnc Components\*D  
 Jensen Tools\*D\*  
 Joseph Electronics\*D\*  
 Leader Instruments Corp.\*  
 M.A.T. Electronics\*D\*  
 MCM Electronics\*D\*  
 Metric Supply\*D  
 Omnitron Electronics\*MD  
 Pacer Industries, Inc.  
 Prime Technology, Inc.  
 Print Products International\*D  
 Products International\*D\*  
 Protek Test & Measurement\*  
 RAG Electronics Inc.\*  
 RNJ Electronics Inc.\*  
 RS Electronics\*D  
**Sencore Electronics\***  
 Simpson Electric  
 Snap-On Incorporated  
 Sun Equipment Corporation\*D\*  
 Techni-Tool Inc.\*  
 Telulex, Inc.  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*  
 Test Equipment Depot  
 Test Equipment Depot\*D\*  
 Time Motion Tools\*D  
 Tucker Electronics Co.\*  
 Union Electronics Distrib\*D\*  
 Universal Enterprises (UEI)  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*

Zack Electronics\*D  
**METERS, VOLTMETERS, AC**  
 A.G. Tannenbaum\*D  
 A.W. Sperry Instruments\*  
 AEMC Instruments\*  
 Alfa Electric\*D  
 AVO International\*  
 B-B&W Electronics\*D  
 Bel Merit Corporation  
**BK Precision\***  
 Brunelle Instruments\*  
 Bursma Electronic Dist. \*D\*  
 C&S Sales\*D  
 Calrad Electronics\*  
 Consolidated Elctrnrcs, Inc.\*  
 Contact East\*D\*  
 CSI/SPECO\*  
 Cumberland Elect.\*  
 Dalbani Corporation  
 Dranetz/BMI  
 E.I.L. Instruments, Inc.\*  
 East Coast Transistor\*D  
 Electro Tool, Inc.\*  
 Electronic Parts Supply\*D  
**Electronix Corp.\***  
 Electronix Express\*D  
 Electrotex, Inc.\*  
 Exttech Instruments\*  
 Fieldpiece Instruments\*  
 Fluke Corporation  
 Foley-Belsaw\*D  
 Fox International LTD, INC  
 Galco Ind. Electronics\*D\*  
 GC Electronics\*D  
 Global Micro-Parts Depot\*MD  
 Harco Electronics\*D  
 Herman H. Sticht Co., Inc.\*  
 Herman Panson Electronics\*D\*  
 HMC Electronics\*D\*  
 Hosfelt Electronics, Inc.\*  
 Hy Tec Dealer Service  
 Jameco Electrnc Components\*D  
 JDR Microdevices\*D  
 Jensen Tools\*D\*  
 Joseph Electronics\*D\*  
 Keithley Instruments  
 Kelvin Electronics\*D  
 Kenwood U.S.A.,Corp  
 Klein Tools, Inc.\*  
 Lascar Electronics Inc.\*  
 Leader Instruments Corp.\*  
 M.A.T. Electronics\*D\*  
 MCM Electronics\*D\*  
 Metric Supply\*D  
 Newport Electronics, Inc.  
 Nokia Mobile Phones  
 Non-Linear Systems\*  
 Omega Engineering, Inc.\*  
 Omnitron Electronics\*MD  
 Parts Express International\*D\*  
**Philips Consumer Electronics\*D\***  
 Prime Technology, Inc.  
 Print Products International\*D  
 Products International\*D\*  
 Protek Test & Measurement\*  
 Radio Shack\*D  
 RAG Electronics Inc.\*  
 RNJ Electronics Inc.\*  
 RS Electronics\*D  
 Salen Enterprises\*D  
 Schlumberger Technologies  
**Sencore Electronics\***  
 Simpson Electric

Snap-On Incorporated  
 Specialized Prods. Co.\*  
 Sun Equipment Corporation\*D\*  
 TechAmerica\*D  
 Techni-Tool Inc.\*  
 Tegam Inc.  
 Tektronix, Inc.\*  
 Telogy\*D  
 Telulex, Inc.  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*  
 Test Equipment Depot\*D\*  
 Test Products International Inc.\*  
 TIF Instruments, Inc.  
 Time Motion Tools\*D  
 Triplett Corp.\*  
 Tritronics, Inc.\*  
 Tucker Electronics Co.\*  
 Union Electronics Distrib\*D\*  
 Universal Enterprises (UEI)  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*  
 Zack Electronics\*D

**METERS, WOW AND FLUTTER**

Alfa Electric\*D  
 Brunelle Instruments\*  
 Cumberland Elect.\*  
 E.I.L. Instruments, Inc.\*  
 East Coast Transistor\*D  
 Electronic Parts Supply\*D  
 Herman H. Sticht Co., Inc.\*  
 Joseph Electronics\*D\*  
 Kenwood U.S.A.,Corp  
 Leader Instruments Corp.\*  
 Metric Supply\*D  
 Omnitron Electronics\*MD  
 Print Products International\*D\*  
 RAG Electronics Inc.\*  
 Sun Equipment Corporation\*D\*  
 Techni-Tool Inc.\*  
 Tenma Test Equipment  
 Test Equipment Depot\*D\*  
 Tucker Electronics Co.\*  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*  
 Zack Electronics\*D

**MICROWAVE LEAKAGE TESTERS**

A.W. Sperry Instruments\*  
 B-B&W Electronics\*D  
 C&S Sales\*D  
 Consolidated Elctrnrcs, Inc.\*  
 Cumberland Elect.\*  
 Dalbani Corporation  
 E.I.L. Instruments, Inc.\*  
**Electronix Corp.\***  
 Global Micro-Parts Depot\*MD  
 Joseph Electronics\*D\*  
 M.A.T. Electronics\*D\*  
 MCM Electronics\*D\*  
 Metric Supply\*D  
 Nationwide Electronics\*D  
 Omnitron Electronics\*MD  
 Print Products International\*D  
 Products International\*D\*  
 RAG Electronics Inc.\*

RS Electronics\*D  
 Simpson Electric  
 Techni-Tool Inc.\*  
 Telogy\*D  
 Test Equipment Connection Corp.\*  
 Test Equipment Depot\*D\*  
 Tritronics, Inc.\*  
 Tucker Electronics Co.\*  
 Union Electronics Distrib\*D\*  
 Universal Enterprises (UEI)  
 Vance Baldwin Electronics\*D\*  
 B-B&W Electronics\*D  
 W.S. Jenks & Son\*D  
 Zack Electronics\*D

**MULTIMETERS: ANALOG/DIGITAL**

A.G. Tannenbaum\*D  
 A.W. Sperry Instruments\*  
 AEMC Instruments\*  
 Alfa Electric\*D  
 AVO International\*  
 B-B&W Electronics\*D  
 Bel Merit Corporation  
**BK Precision\***  
 Brilliant King, Inc.  
 Brunelle Instruments\*  
 C&S Sales\*D  
 Calrad Electronics\*  
 Computer Component Source\*D  
 Computer Svcs of America\*D  
 Consolidated Elctrnrcs, Inc.\*  
 Contact East\*D\*  
 Conway Engineering, Inc.  
 CSI/SPECO\*  
 Cumberland Elect.\*  
 Dalbani Corporation  
 Digi-Key\*D\*  
 Dranetz/BMI  
 E.I.L. Instruments, Inc.\*  
 East Coast Transistor\*D  
 Electro Tool, Inc.\*  
 ElectroIndustries\*  
 Electronic Parts Supply\*D  
**Electronix Corp.\***  
 Electrotex, Inc.\*  
 Elenco Electronics\*  
 Exttech Instruments\*  
 Fieldpiece Instruments\*  
 Fluke Corporation  
 Foley-Belsaw\*D  
 Fox International LTD, INC  
 Galco Ind. Electronics\*D\*  
 Hameg Instruments, Inc.  
 Harco Electronics\*D  
 Heath Company  
 Herman Panson Electronics\*D\*  
 HMC Electronics\*D\*  
 Hy Tec Dealer Service  
 IET Labs, Inc.  
 Instek Corp.\*  
 Jameco Electrnc Components\*D  
 JDR Microdevices\*D  
 Jensen Tools\*D\*  
 Joseph Electronics\*D\*  
 Keithley Instruments  
 Kelvin Electronics\*D  
 Kenwood U.S.A.,Corp  
 L'il Bitty Tester\*  
 MCM Electronics\*D\*  
 Metric Supply\*D  
 Morrow Wave, Inc.  
 Mouser Electronics\*D  
 National Instruments Corp.

Omega Engineering, Inc.\*  
 Omnitron Electronics\*MD  
**Philips Consumer Electronics\*D\***  
 Print Products International\*D  
 Products International\*D\*  
 Protek Test & Measurement\*  
 Radio Shack\*D  
 RAG Electronics Inc.\*D  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
 Salen Enterprises\*D  
 Schlumberger Technologies  
 Simpson Electric  
 Snap-On Incorporated  
 Specialized Prods. Co.\*D\*  
 Sun Equipment Corporation\*D\*  
 TechAmerica\*D  
 Techni-Tool Inc.\*D\*  
 Tegam Inc.  
 Tektronix, Inc.\*  
 Telogy\*D  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*D\*  
 Test Equipment Depot\*D\*  
 Test Products International Inc.\*  
 TIF Instruments, Inc.  
 Time Motion Tools\*D  
 Triplett Corp.\*  
 Tritronics, Inc.\*D  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D\*  
 Universal Enterprises (UEI)  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**OSCILLOSCOPES**

Alfa Electric\*D  
 B-B&W Electronics\*D  
 Bel Merit Corporation  
**BK Precision\***  
 Brunelle Instruments\*  
 Bursma Electronic Dist.\*D\*  
 C&S Sales\*D  
 Cleveland Inst. of Electronics\*  
 Computer Component Source\*D  
 Compuvideo Test Instruments  
 Consolidated Elctrnics, Inc.\*D  
 Contact East\*D\*  
 Conway Engineering, Inc.  
 Cumberland Elect.\*D\*  
 Dalbani Corporation  
 E.I.L. Instruments, Inc.\*D  
 East Coast Transistor\*D  
 Electro Tool, Inc.\*D  
 ElectroIndustries\*  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Electronix Express\*D  
 Electrotex, Inc.\*D  
 Elenco Electronics\*  
 Exttech Instruments\*  
 Fluke Corporation  
 Galco Ind. Electronics\*D\*  
 Global Micro-Parts Depot\*MD  
 Global Specialties  
 Gould Instrument Systems Inc.  
 Hameg Instruments, Inc.  
 Harco Electronics\*D  
 Heath Company  
 Herman H. Sticht Co., Inc.\*D  
 Herman Panson Electronics\*D\*  
 Hi-Techniques, Inc.

HMC Electronics\*D\*  
 Hosfelt Electronics, Inc.\*D  
 Instek Corp.\*D  
 Iwatsu America  
 Jameco Electrnc Components\*D  
 JDR Microdevices\*D  
 Jensen Tools\*D\*  
 Joseph Electronics\*D\*  
 Kelvin Electronics\*D  
 Kenwood U.S.A.,Corp  
 Leader Instruments Corp.\*  
 LeCroy Corp.\*  
 M.A.T. Electronics\*D\*  
 Marconi Instruments Inc.\*D  
 MCM Electronics\*D\*  
 Metric Supply\*D  
 Morrow Wave, Inc.  
 Mouser Electronics\*D  
 National Instruments Corp.  
 Nokia Mobile Phones  
 Oldaker Corp.  
 Omnitron Electronics\*MD  
 Orion Instruments, Inc.  
 Panasonic Industrial Co.  
 Parts Express International\*D\*  
 PC Instruments Incorporated  
 Print Products International\*D  
 Products International\*D\*  
 Protek Test & Measurement\*  
 Radio Shack\*D  
 RAG Electronics Inc.\*D  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
 Salen Enterprises\*D  
**Score Electronics\***  
 Snap-On Incorporated  
 Specialized Prods. Co.\*D\*  
 Sun Equipment Corporation\*D\*  
 Tandy National Parts\*D  
 TechAmerica\*D  
 Techni-Tool Inc.\*D\*  
 Tektronix, Inc.\*  
 Telogy\*D  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*D\*  
 Test Equipment Depot\*D\*  
 Test Products International Inc.\*  
 Tritronics, Inc.\*D  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D\*  
 Universal Enterprises (UEI)  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**PERSONAL COMPUTER REPAIR/TEST EQUIPMENT**

AnaTek Corp\*  
 B&B Electronics Manufacturing  
 Computer & Monitor Maintenance  
 Computer Parts Unlimited\*D\*  
 CSTS Inc.  
 Cumberland Elect.\*D\*  
 Dalco Electronics\*D  
 Data Depot, Inc.\*D  
 Eagan Technical Services, Inc.  
 Electro Tool, Inc.\*D  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Electrotex, Inc.\*D  
 Elenco Electronics\*  
 Harco Electronics\*D

JDR Microdevices\*D  
 Jensen Tools\*D\*  
 Joseph Electronics\*D\*  
 MG Chemicals  
 Micro 2000, Inc.  
 Moody Tools, Inc.\*  
 Nationwide Electronics\*D  
 O.K. Industries, Inc.  
 Omega Engineering, Inc.\*  
 Omnitron Electronics\*MD  
 Print Products International\*D  
 Products International\*D\*  
 Richardson Electronics, Ltd.\*D  
 RNJ Electronics Inc.\*D\*  
**Score Electronics\***  
 Sharp Electronics Corp\*  
 SMH Electronics Co., Inc.\*D\*  
 Specialized Prods. Co\*D\*  
 Sprague Magnetics, Inc.\*D  
 Techni-Tool Inc.\*D\*  
 Telematic  
 Tenma Test Equipment  
 Test Equipment Depot\*D\*  
 Time Motion Tools\*D  
 Ultra-X, Inc.\*  
 Vance Baldwin Electronics\*D\*  
 Vector Electronic Co.\*  
 W.S. Jenks & Son\*D  
 Wescorp  
 Zack Electronics\*D

**RECEPTACLE CIRCUIT TESTERS**

Cumberland Elect.\*D\*  
 E.I.L. Instruments, Inc.\*D  
 East Coast Transistor\*D  
 Electro Tool, Inc.\*D  
**Electronix Corp.\*D**  
 Electrotex, Inc.\*D  
 Fieldpiece Instruments\*  
 Foley-Belsaw\*D  
 HMC Electronics\*D\*  
 Jensen Tools\*D\*  
 Joseph Electronics\*D\*  
 L-Com Inc.  
 MCM Electronics\*D\*  
 Omnitron Electronics\*MD  
 Print Products International\*D  
 Products International\*D\*  
 Radio Shack\*D  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
**Score Electronics\***  
 Specialized Prods. Co.\*D\*  
 Sun Equipment Corporation\*D\*  
 Techni-Tool Inc.\*D\*  
 Test Equipment Depot\*D\*  
 Time Motion Tools\*D  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**SEMICONDUCTOR TESTERS**

B-B&W Electronics\*D  
**BK Precision\***  
 Bursma Electronic Dist.\*D\*  
 Computer Component Source\*D  
 Consolidated Elctrnics, Inc.\*D  
 Cumberland Elect.\*D\*  
 E.I.L. Instruments, Inc.\*D

East Coast Transistor\*D  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Electronix Express\*D  
 Fox International LTD, INC  
 Galco Ind. Electronics\*D\*  
 Harco Electronics\*D  
 Hosfelt Electronics, Inc.\*D  
 IET Labs, Inc.  
 Innersound, Inc.  
 Innoventions Inc.\*  
 Jameco Electrnc Components\*D  
 Jensen Tools\*D\*  
 Joseph Electronics\*D\*  
 Keithley Instruments  
 L'il Bitty Tester\*  
 M.A.T. Electronics\*D\*  
 MCM Electronics\*D\*  
 Omnitron Electronics\*MD  
 Print Products International\*D  
 Products International\*D\*  
 Radio Shack\*D  
 RAG Electronics Inc.\*D  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
**Score Electronics\***  
 Specialized Prods. Co.\*D\*  
 Sun Equipment Corporation\*D\*  
 TechAmerica\*D  
 Techni-Tool Inc.\*D\*  
 Telogy\*D  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*D\*  
 Test Equipment Depot\*D\*  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**SPECTRUM ANALYZERS**

**BK Precision\***  
 Bursma Electronic Dist.\*D\*  
 C&S Sales\*D  
 Consolidated Elctrnics, Inc.\*D  
 Cumberland Elect.\*D\*  
 E.I.L. Instruments, Inc.\*D  
 East Coast Transistor\*D  
 Electronix Express\*D  
 Global Specialties  
 Hameg Instruments, Inc.  
 Harco Electronics\*D\*  
 Herman Panson Electronics\*D\*  
 Hi-Techniques, Inc.  
 IFR Systems\*  
 Integrity Design & Research  
 Jensen Tools\*D\*  
 Joseph Electronics\*D\*  
 M.A.T. Electronics\*D\*  
 Marconi Instruments Inc.\*D  
 MCM Electronics\*D\*  
 National Instruments Corp.  
 Omnitron Electronics\*MD  
 Print Products International\*D  
 Products International\*D\*  
 RAG Electronics Inc.\*D  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
 Schlumberger Technologies  
 Smith Design  
 Specialized Prods. Co.\*D\*  
 Sun Equipment Corporation\*D\*  
 Tandy National Parts\*D

Techni-Tool Inc.\*D\*  
 Technology Programs  
 Tektronix, Inc.\*  
 Telogy\*D  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*D\*  
 Test Equipment Depot\*D\*  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**TELEPHONE ANALYZERS/TESTERS**

AEMC Instruments\*  
**BK Precision\***  
 C&S Sales\*D  
 Consolidated Elctrnics, Inc.\*D  
 Conway Engineering, Inc.  
 CUI Stack  
 Cumberland Elect.\*D\*  
 Dolch Computer Sys.\*  
 East Coast Transistor\*D  
 Electro Tool, Inc.\*D  
 Elenco Electronics\*  
 Extech Instruments\*  
 Harco Electronics\*D  
 IFR Systems\*  
 Jensen Tools\*D\*  
 Joseph Electronics\*D\*  
 L-Com Inc.  
 M.A.T. Electronics\*D\*  
 MCM Electronics\*D\*  
 Metric Supply\*D  
 Omnitron Electronics\*MD  
 Panasonic Services Co.\*  
 Print Products International\*D  
 Products International\*D\*  
 Progressive Electronics\*D\*  
 RAG Electronics Inc.\*D  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
 Specialized Prods. Co.\*D\*  
 Sun Equipment Corporation\*D\*  
 Techni-Tool Inc.\*D\*  
 Tektronix, Inc.\*  
 Telogy\*D  
 Telulex, Inc.  
 Test Equipment Connection Corp.\*D\*  
 Test Equipment Depot\*D\*  
 Time Motion Tools\*D  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**TEMPERATURE SENSORS**

Alfa Electric\*D  
 Anritsu Products\*  
**BK Precision\***  
 Brunelle Instruments\*  
 Consolidated Elctrnics, Inc.\*D  
 Cumberland Elect.\*D\*  
 Dalbani Corporation  
 Digi-Key\*D\*  
 Dranetz/BMI  
 E.I.L. Instruments, Inc.\*D  
 East Coast Transistor\*D  
 Electronix Express\*D

Excel Distributing\*D\*  
 Extech Instruments\*  
 Fieldpiece Instruments\*  
 Galco Ind. Electronics\*D\*  
 Hexacon Electric Co.  
 HMC Electronics\*D\*  
 JDR Microdevices\*D  
 Jensen Tools\*D\*  
 Joseph Electronics\*D\*  
 Lascar Electronics Inc.\*  
 Multicore Solders  
 Newport Electronics, Inc.  
 Omega Engineering, Inc.\*  
 Omega -Vanzetti, Inc.\*  
 Omnitron Electronics\*MD  
 Onset\*  
 Pacer Industries, Inc.  
**Philips Consumer Electronics\*D\***  
 Print Products International\*D  
 Products International\*D\*  
 RAG Electronics Inc.\*D  
 Ronan Engineering\*  
 RS Electronics\*D  
 Simpson Electric  
 Sun Equipment Corporation\*D\*  
 Techni-Tool Inc.\*D\*  
 Technology Programs  
 Test Equipment Connection Corp.\*D\*  
 Test Equipment Depot\*D\*  
 Test Products International Inc.\*  
 Time Motion Tools\*D  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D\*  
 Universal Enterprises (UEI)  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**TRANSISTOR TESTERS**

A.G. Tannenbaum\*D  
 Bel Merit Corporation  
**BK Precision\***  
 Bursma Electronic Dist.\*D\*  
 Computer Component Source\*D  
 Consolidated Elctrnics, Inc.\*D  
 Cumberland Elect.\*D\*  
 East Coast Transistor\*D  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Excel Distributing\*D\*  
 Extech Instruments\*  
 Fieldpiece Instruments\*  
 Fox International LTD, INC  
 IET Labs, Inc.  
 Kelvin Electronics\*D  
 L'il Bitty Tester\*  
 M.A.T. Electronics\*D\*  
 Omnitron Electronics\*MD  
 Panasonic Services Co.\*  
 Print Products International\*D  
 Products International\*D\*  
 RAG Electronics Inc.\*D  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
 Salen Enterprises\*D  
**Sencore Electronics\***  
 Sun Equipment Corporation\*D\*  
 Techni-Tool Inc.\*D\*  
 Telogy\*D  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*D\*  
 Test Equipment Depot\*D\*  
 Test Products International Inc.\*  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D

Time Motion Tools\*D  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**VECTORSCOPES**

AudioVisual Inc.\*D  
 Compuvideo Test Instruments  
 Cumberland Elect.\*D\*  
 E.I.L. Instruments, Inc.\*D  
 East Coast Transistor\*D  
 Herman Panson Electronics\*D\*  
 Joseph Electronics\*D\*  
 Kenwood U.S.A.,Corp  
 Leader Instruments Corp.\*  
 Metric Supply\*D  
 Omnitron Electronics\*MD  
 Print Products International\*D  
 Products International\*D\*  
 RAG Electronics Inc.\*D  
 RS Electronics\*D  
 Salen Enterprises\*D  
**Sencore Electronics\***  
 Techni-Tool Inc.\*D\*  
 Tektronix, Inc.\*  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*D\*  
 Test Equipment Depot\*D\*  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Zack Electronics\*D

**WAVEFORM MONITORS**

AudioVisual Inc.\*D  
 Compuvideo Test Instruments  
 Cumberland Elect.\*D\*  
 E.I.L. Instruments, Inc.\*D  
 East Coast Transistor\*D  
 Fluke Corporation  
 Gould Instrument Systems Inc.  
 Herman Panson Electronics\*D\*  
 Hi-Techniques, Inc.  
 Jensen Tools\*D\*  
 Joseph Electronics\*D\*  
 Kenwood U.S.A.,Corp  
 Leader Instruments Corp.\*  
 MCM Electronics\*D\*  
 Metric Supply\*D  
 Omega Engineering, Inc.\*  
 Omnitron Electronics\*MD  
 Print Products International\*D  
 Products International\*D\*  
 RAG Electronics Inc.\*D  
 RS Electronics\*D  
**Sencore Electronics\***  
 Specialized Prods. Co.\*D\*  
 Sun Equipment Corporation\*D\*  
 Tandy National Parts\*D  
 Techni-Tool Inc.\*D\*  
 Tektronix, Inc.\*  
 Telogy\*D  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*D\*  
 Test Equipment Depot\*D\*  
 Test Products International Inc.\*  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D

Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**OTHER TEST EQUIPMENT**

A.W. Sperry Instruments\*  
 AEMC Instruments\*  
 AnaTek Corp\*  
 Anritsu Products\*  
 B&B Electronics Manufacturing  
 Bel Merit Corporation  
 Bird Electronics Corp.  
**BK Precision\***  
 Brunelle Instruments\*  
 Bursma Electronic Dist.\*D\*  
 C&S Sales\*D  
 Computer Component Source\*D  
 Consolidated Elctrnics, Inc.\*D  
 Conway Engineering, Inc.  
 Cumberland Elect.\*D\*  
 Dalco Electronics\*D  
 Dolch Computer Sys.\*  
 Dranetz/BMI  
 E.I.L. Instruments, Inc.\*D  
 East Coast Transistor\*D  
**Electronix Corp.\*D**  
 Electrotex, Inc.\*D  
 Elenco Electronics\*  
 Extech Instruments\*  
 Fieldpiece Instruments\*  
 Fluke Corporation  
 Fotec Inc  
 Global Specialties  
 Gould Instrument Systems Inc.  
 Hameg Instruments, Inc.  
 Herman Panson Electronics\*D\*  
 HMC Electronics\*D\*  
 Huntron Instruments, Inc.\*  
 IET Labs, Inc.  
 Independence Electronics\*  
 Instek Corp.\*D  
 International Light, Inc.  
 International Power Tchnlgies  
 Iwatsu America  
 JDR Microdevices\*D  
 Jensen Tools\*D\*  
 JIT Resources, Inc.  
 Joseph Electronics\*D\*  
 Keithley Instruments  
 Kenwood U.S.A.,Corp  
 Klein Instruments\*  
 Leader Instruments Corp.\*  
 LEM Instruments Inc  
 L'il Bitty Tester\*  
 Magellan Corp.\*  
 MagEyes\*  
 MCM Electronics\*D\*  
 MG Chemicals  
 Mouser Electronics\*D  
 Multicore Solders  
 National Instruments Corp.  
**Neutrik USA**  
 Newport Electronics, Inc.  
 Nokia Mobile Phones  
 Non-Linear Systems\*  
 Nutronix Inc.  
 Old Colony Sound Laboratory  
 Omega Engineering, Inc.\*  
 Omnitron Electronics\*MD  
 Pacer Industries, Inc.  
 Panasonic Industrial Co.  
 Print Products International\*D  
 Products International\*D\*  
 Prostat Corporation\*  
 QuadTech, Inc.\*

Quantum Data  
 R.C. Distributing Co.\*D \*  
 R.C. Electronics Inc.\*  
 RAG Electronics Inc.\*D  
 Richardson Electronics, Ltd.\*D  
 RS Electronics\*D  
 Salen Enterprises\*D  
**Sencore Electronics\***  
 Simpson Electric  
 Sirius Technologies  
 SMH Electronics Co., Inc.\*D \*  
 Snap-On Incorporated  
 Specialized Prods. Co.\*D \*  
 Spirig Advanced Technologies  
 Sun Equipment Corporation\*D \*  
 Synergetix\*  
 TechAmerica\*D  
 Techni-Tool Inc.\*D \*  
 Technology Programs  
 Tektronix, Inc.\*  
 Telogy\*D  
 Temprotronic Corp.\*  
 Ten-Lab\*  
 Tenma Test Equipment  
 Tentel\*  
 Test Equipment Connection Corp.\*D \*  
 Test Equipment Depot\*D \*  
 Test Products International Inc.\*  
 TIF Instruments, Inc.  
 Time Motion Tools\*D  
 Triplett Corp.\*  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D \*  
 Universal Enterprises (UEI)  
 Vance Baldwin Electronics\*D \*  
 Vector-VID Inc.\*  
 Viking Electronics  
 W.S. Jenks & Son\*D  
 Walker Scientific  
 Zack Electronics\*D

**TEST EQUIPMENT  
 ACCESORIES**

**AUDIO DUMMY LOADS**

Computer Svcs of America\*D  
 Cumberland Elect.\*D \*  
 Electronic Parts Supply\*D  
 Joseph Electronics\*D \*  
 MCM Electronics\*D \*  
 Metric Supply\*D  
 Omnitron Electronics\*MD  
 Parts Express International\*D \*  
 Print Products International\*D  
 Tenma Test Equipment  
 Test Equipment Depot\*D \*  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D \*  
 Vance Baldwin Electronics\*D \*  
 Zack Electronics\*D

**DECADE BOXES:  
 CAPACITANCE/  
 INDUCTANCE/RESISTANCE**

B-B&W Electronics\*D  
 Brunelle Instruments\*  
 Bursma Electronic Dist. \*D \*  
 C&S Sales\*D  
 Consolidated Elctnrncs, Inc.\*D  
 Cumberland Elect.\*D \*  
 E.I.L. Instruments, Inc.\*D  
 Electronix Express\*  
 Elenco Electronics\*

GC Electronics\*D  
 HMC Electronics\*D \*  
 Hosfelt Electronics, Inc.\*D  
 IET Labs, Inc.  
 JIT Resources, Inc.  
 Joseph Electronics\*D \*  
 Kenwood U.S.A., Corp  
 M.A.T. Electronics\*D \*  
 Omnitron Electronics\*MD  
 Prime Technology, Inc.  
 Print Products International\*D \*  
 QuadTech, Inc.\*  
 RAG Electronics Inc.\*D  
 RNJ Electronics Inc.\*D \*  
 Salen Enterprises\*D  
 Techni-Tool Inc.\*D \*  
 Test Equipment Depot\*D \*  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D \*  
 Vance Baldwin Electronics\*D \*  
 Vector-VID Inc.\*  
 W.S. Jenks & Son\*D  
 Zack Electronics\*D

**IC TEST CLIPS**

Adapters.com\*  
 B-B&W Electronics\*D  
 Bursma Electronic Dist.\*D \*  
 Computer Component Source\*D  
 Computer Svcs of America\*D  
 Consolidated Elctnrncs, Inc.\*D  
 Contact East\*D \*  
 Cumberland Elect.\*D \*  
 Dalbani Corporation  
 East Coast Transistor\*D  
 Electronic Parts Supply\*D  
 Electronix Express\*D  
 Electrotex, Inc.\*D  
 Emulation Technology, Inc.  
 E-Z Hook  
 Galco Ind. Electronics\*D \*  
 Harco Electronics\*D  
 HMC Electronics\*D \*  
 Hosfelt Electronics, Inc.\*D  
 Huntron Instruments, Inc.\*  
 Jameco Electrnc Components\*D  
 JDR Microdevices\*D  
 Jim-Pak\*D  
 Joseph Electronics\*D \*  
 Kelvin Electronics\*D  
 M.A.T. Electronics\*D \*  
 MCM Electronics\*D \*  
 Mouser Electronics\*D  
 Oldaker Corp.  
 Omnitron Electronics\*MD  
 Panasonic Services Co.\*  
**Philips Consumer Electronics\*D \***  
 Pomona Electronics  
 Premium Parts+ Elctnrncs Co\*D  
 Print Products International\*D  
 Radio Shack\*D  
 RS Electronics\*D  
 Sun Equipment Corporation\*D \*  
 Techni-Tool Inc.\*D \*  
 Tenma Test Equipment  
 Test Equipment Depot\*D \*  
 Test Products International Inc.\*  
 Time Motion Tools\*D  
 Union Electronics Distrib\*D \*  
 Vance Baldwin Electronics\*D \*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**POWER SUPPLIES, BENCH**

Alfa Electric\*D  
 B-B&W Electronics\*D  
 Behlman Electronics  
 Bel Merit Corporation  
**BK Precision\***  
 Bursma Electronic Dist.\*D \*  
 C&S Sales\*D  
 Calrad Electronics\*  
 Cascade Audio Eng.\*  
 Computer Component Source\*D  
 Computer Svcs of America\*D  
 Consolidated Elctnrncs, Inc.\*D  
 Contact East\*D \*  
 Cumberland Elect.\*D \*  
 Dalbani Corporation  
 Dalco Electronics\*D  
 E.I.L. Instruments, Inc.\*D  
 East Coast Transistor\*D  
 ElectroIndustries\*  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Electronix Express\*D  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D  
 Elenco Electronics\*  
 Elgar Electronics Corp\*  
 Excel Distributing\*D \*  
 Extch Instruments\*  
 Fluke Corporation  
 Foley-Belsaw\*D  
 Galco Ind. Electronics\*D \*  
 Global Specialties  
 Hameg Instruments, Inc.  
 Harco Electronics\*D  
 Heath Company  
 Herman H. Sticht Co., Inc.\*D  
 Herman Panson Electronics\*D \*  
 HMC Electronics\*D \*  
 Hosfelt Electronics, Inc.\*D  
 IET Labs, Inc.  
 JDR Microdevices\*D  
 Jensen Tools \*D \*  
 Joseph Electronics\*D \*  
 Kelvin Electronics\*D  
 Kenwood U.S.A., Corp  
 Leader Instruments Corp.\*  
 M.A.T. Electronics\*D \*  
 Marconi Instruments Inc.\*D  
 MCM Electronics\*D \*  
 Metric Supply\*D  
 Omega Engineering, Inc.\*  
 Omnitron Electronics\*MD  
 Print Products International\*D  
 Products International\*D \*  
 Radio Shack\*D  
 RAG Electronics Inc.\*D  
 RNJ Electronics Inc.\*D \*  
 RS Electronics\*D  
 Salen Enterprises\*D  
**Sencore Electronics\***  
 Sorensen\*  
 Specialized Prods. Co.\*D \*  
 Sun Equipment Corporation\*D \*  
 Tandy National Parts\*D  
 TechAmerica\*D  
 Techni-Tool Inc.\*D \*  
 Telogy\*D  
 Tenma Test Equipment  
 Test Equipment Connection Corp.\*D \*  
 Test Equipment Depot\*D \*  
 Total Power International\*MD  
 Tucker Electronics Co.\*D

Union Electronics Distrib\*D \*  
 Vance Baldwin Electronics\*D \*  
 Vector-VID Inc.\*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**TEST JIGS AND FIXTURES**

Adapters.com\*  
 Computer Component Source\*D  
 Cumberland Elect.\*D \*  
 Dalbani Corporation  
 East Coast Transistor\*D  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Emulation Technology, Inc.  
 E-Z Hook  
 Foley-Belsaw\*D  
 Jensen Tools\*D \*  
 Joseph Electronics\*D \*  
 M-Tronics\*D \*  
 Nationwide Electronics\*D  
 Omnitron Electronics\*MD  
 Print Products International\*D  
 Schurter, Inc.  
 Specialized Prods. Co.\*D \*  
 Techni-Tool Inc.\*D \*  
 Telematic  
 Test Equipment Depot\*D \*  
 Tritronics, Inc.\*D  
 Union Electronics Distrib\*D \*  
 Vance Baldwin Electronics\*D \*  
 W.S. Jenks & Son\*D  
 Zack Electronics\*D

**TEST LEADS AND PROBES**

A.W. Sperry Instruments\*  
 Adapters.com\*  
 Alfa Electric\*D  
 Avex Probes, Inc. (API)  
 AVO International\*  
 B-B&W Electronics\*D  
 Bel Merit Corporation  
**BK Precision\***  
 Brunelle Instruments\*  
 Bursma Electronic Dist.\*D \*  
 C&S Sales\*D  
 Calrad Electronics\*  
 Computer Component Source\*D  
 Consolidated Elctnrncs, Inc.\*D  
 Contact East\*D \*  
 CSTS Inc.  
 CUI Stack  
 Cumberland Elect.\*D \*  
 Dalbani Corporation  
 Dalco Electronics\*D  
 Digi-Key\*D \*  
 E.I.L. Instruments, Inc.\*D  
 East Coast Transistor\*D  
 Electro Standards Lab\*  
 Electro Standards Lab, Inc.  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Electrotex, Inc.\*D  
 Elenco Electronics\*  
 Emulation Technology, Inc.  
 E-Z Hook  
 Fluke Corporation  
 Galco Ind. Electronics\*D \*  
 Harco Electronics\*D  
 Heath Company  
 Herman Panson Electronics\*D \*  
 Hirschmann Electronics\*

HMC Electronics\*<sup>D</sup>\*  
 Hosfelt Electronics, Inc.\*<sup>D</sup>  
 Huntron Instruments, Inc.\*  
 Interconnect Devices, Inc.\*  
 Jameco Electronic Components\*<sup>D</sup>  
 JDR Microdevices\*<sup>D</sup>  
 Jensen Tools\*<sup>D</sup>\*  
 Jim-Pak\*<sup>D</sup>  
 Joseph Electronics\*<sup>D</sup>\*  
 Kelvin Electronics\*<sup>D</sup>  
 Kenwood U.S.A., Corp  
 LeCroy Corp.\*  
 M.A.T. Electronics\*<sup>D</sup>\*  
 MCM Electronics\*<sup>D</sup>\*  
 M-Tronics\*<sup>D</sup>\*  
 Oldaker Corp.  
 Omega Engineering, Inc.\*  
 Omnitron Electronics\*<sup>MD</sup>  
 Parts Express International\*<sup>D</sup>\*  
 PC Instruments Incorporated  
**Philips Consumer Electronics\*<sup>D</sup>\***  
 Pomona Electronics  
 Premium Parts+ Electronics Co\*<sup>D</sup>  
 Print Products International\*<sup>D</sup>  
 Probe Master, Inc.  
 Products International\*<sup>D</sup>\*  
 Radio Shack\*<sup>D</sup>  
 RAG Electronics Inc.\*<sup>D</sup>  
 RNJ Electronics Inc.\*<sup>D</sup>\*  
 RS Electronics\*<sup>D</sup>  
 Salen Enterprises\*<sup>D</sup>  
 Schurter, Inc.  
**Sencore Electronics\***  
 Simpson Electric  
 Specialized Prods. Co.\*<sup>D</sup>\*  
 Sun Equipment Corporation\*<sup>D</sup>\*  
 Tandy National Parts\*<sup>D</sup>  
 TechAmerica\*<sup>D</sup>  
 Techni-Tool Inc.\*<sup>D</sup>\*  
 Tegam Inc.  
 Tektronix, Inc.\*  
 Tenma Test Equipment  
 Test Equipment Depot\*<sup>D</sup>\*  
 Test Products International Inc.\*  
 TIF Instruments, Inc.  
 Time Motion Tools\*<sup>D</sup>  
 Tritronics, Inc.\*<sup>D</sup>  
 Tucker Electronics Co.\*<sup>D</sup>  
 Union Electronics Distrib\*<sup>D</sup>\*  
 Universal Enterprises (UEI)  
 Vance Baldwin Electronics\*<sup>D</sup>\*  
 W.S. Jenks & Son\*<sup>D</sup>  
 Wholesale Electronics Inc.\*<sup>D</sup>  
 Zack Electronics\*<sup>D</sup>

**TRANSFORMERS:  
ISOLATION/VARIABLE**

B-B&W Electronics\*<sup>D</sup>  
**BK Precision\***  
 Bursma Electronic Dist. \*<sup>D</sup>\*  
 C&S Sales\*<sup>D</sup>  
 Calrad Electronics\*  
 Consolidated Electrnics, Inc.\*<sup>D</sup>  
 Controlled Power Co.\*  
 Cumberland Elect.\*<sup>D</sup>\*  
 Electronic Parts Supply\*<sup>D</sup>  
**Electronix Corp\*<sup>D</sup>**  
 Electronix Express\*<sup>D</sup>  
 Electroservice Laboratories\*<sup>D</sup>  
 Electrotex, Inc.\*<sup>D</sup>  
 Elenco Electronics\*  
 Elgar Electronics Corp\*  
 Galco Ind. Electronics\*<sup>D</sup>\*  
 Harco Electronics\*<sup>D</sup>  
 Herman Panson Electronics\*<sup>D</sup>\*  
 Hosfelt Electronics, Inc.\*<sup>D</sup>  
 Jameco Electronic Components\*<sup>D</sup>  
 JDR Microdevices\*<sup>D</sup>  
 Joseph Electronics\*<sup>D</sup>\*  
 Kelvin Electronics\*<sup>D</sup>  
 M.A.T. Electronics\*<sup>D</sup>\*  
 Mouser Electronics\*<sup>D</sup>  
 Omnitron Electronics\*<sup>MD</sup>  
 Print Products International\*<sup>D</sup>  
 RAG Electronics Inc.\*<sup>D</sup>  
 RNJ Electronics Inc.\*<sup>D</sup>\*  
 RS Electronics\*<sup>D</sup>  
 Salen Enterprises\*<sup>D</sup>  
**Sencore Electronics\***  
 Staco Energy Products  
 Sun Equipment Corporation\*<sup>D</sup>\*  
 TechAmerica\*<sup>D</sup>  
 Tenma Test Equipment  
 Test Equipment Depot\*<sup>D</sup>\*  
 Union Electronics Distrib\*<sup>D</sup>\*  
 Vance Baldwin Electronics\*<sup>D</sup>\*  
 W.S. Jenks & Son\*<sup>D</sup>  
 Wholesale Electronics Inc.\*<sup>D</sup>  
 Zack Electronics\*<sup>D</sup>

Harco Electronics\*<sup>D</sup>  
 Herman Panson Electronics\*<sup>D</sup>\*  
 Hosfelt Electronics, Inc.\*<sup>D</sup>  
 Jameco Electronic Components\*<sup>D</sup>  
 JDR Microdevices\*<sup>D</sup>  
 Joseph Electronics\*<sup>D</sup>\*  
 Kelvin Electronics\*<sup>D</sup>  
 M.A.T. Electronics\*<sup>D</sup>\*  
 Mouser Electronics\*<sup>D</sup>  
 Omnitron Electronics\*<sup>MD</sup>  
 Print Products International\*<sup>D</sup>  
 RAG Electronics Inc.\*<sup>D</sup>  
 RNJ Electronics Inc.\*<sup>D</sup>\*  
 RS Electronics\*<sup>D</sup>  
 Salen Enterprises\*<sup>D</sup>  
**Sencore Electronics\***  
 Staco Energy Products  
 Sun Equipment Corporation\*<sup>D</sup>\*  
 TechAmerica\*<sup>D</sup>  
 Tenma Test Equipment  
 Test Equipment Depot\*<sup>D</sup>\*  
 Union Electronics Distrib\*<sup>D</sup>\*  
 Vance Baldwin Electronics\*<sup>D</sup>\*  
 W.S. Jenks & Son\*<sup>D</sup>  
 Wholesale Electronics Inc.\*<sup>D</sup>  
 Zack Electronics\*<sup>D</sup>

**VCR TEST JIG KITS**

Bursma Electronic Dist.\*<sup>D</sup>\*  
 Computer Component Source\*<sup>D</sup>  
 Cumberland Elect.\*<sup>D</sup>\*  
 Dalbani Corporation  
 East Coast Transistor\*<sup>D</sup>  
 Electronic Parts Supply\*<sup>D</sup>  
**Electronix Corp.\*<sup>D</sup>**  
 Electroservice Laboratories\*<sup>D</sup>  
 Foley-Belsaw\*<sup>D</sup>  
 Joseph Electronics\*<sup>D</sup>\*  
 M.A.T. Electronics\*<sup>D</sup>\*  
 M-Tronics\*<sup>D</sup>\*  
 Nationwide Electronics\*<sup>D</sup>  
 Omnitron Electronics\*<sup>MD</sup>  
 RNJ Electronics Inc.\*<sup>D</sup>\*  
**Sencore Electronics\***  
 Sharp Electronics Corp\*  
 Test Equipment Depot\*<sup>D</sup>\*  
 Tritronics, Inc.\*<sup>D</sup>  
 Union Electronics Distrib\*<sup>D</sup>\*  
 Vance Baldwin Electronics\*<sup>D</sup>\*  
 Zack Electronics\*<sup>D</sup>

**OTHER TEST EQUIPMENT  
ACCESSORIES**

Adapters.com\*  
 AEMC Instruments\*  
 Anritsu Products\*  
 Bel Merit Corporation  
**BK Precision\***  
 Bursma Electronic Dist. \*<sup>D</sup>\*  
 C&S Sales\*<sup>D</sup>  
 Chicago Case Company  
 Computer Component Source\*<sup>D</sup>  
 Compuvideo Test Instruments  
 Consolidated Electrnics, Inc.\*<sup>D</sup>  
 Cumberland Elect.\*<sup>D</sup>\*  
 Dalbani Corporation  
 Dalco Electronics\*<sup>D</sup>  
 Dandy Mfg. \*  
 E.I.L. Instruments, Inc.\*<sup>D</sup>  
 East Coast Transistor\*<sup>D</sup>  
 ElectroIndustries\*  
 Electronic Parts Supply\*<sup>D</sup>  
**Electronix Corp.\*<sup>D</sup>**  
 Electroservice Laboratories\*<sup>D</sup>

Electrotex, Inc.\*<sup>D</sup>  
 Elenco Electronics\*  
 Emulation Technology, Inc.  
 E-Z Hook  
 Fluke Corporation  
 Fotec Inc  
 Galco Ind. Electronics\*<sup>D</sup>\*  
 Gemini Inc.  
 Global Specialties  
 Hameg Instruments, Inc.  
 Herman Panson Electronics\*<sup>D</sup>\*  
 HMC Electronics\*<sup>D</sup>\*  
 Huntron Instruments, Inc.\*  
 IET Labs, Inc.  
 JDR Microdevices\*<sup>D</sup>  
 Jensen Tools\*<sup>D</sup>\*  
 JIT Resources, Inc.  
**Kenwood U.S.A., Corp**  
 L-Com Inc.  
 Leader Instruments Corp.\*  
 M.A.T. Electronics\*<sup>D</sup>\*  
 MagEyes\*  
 Medallion Case\*<sup>D</sup>\*  
 MG Chemicals  
 Moody Tools, Inc.\*  
 Mouser Electronics\*<sup>D</sup>  
 Nationwide Electronics\*<sup>D</sup>  
**Neutrik USA**  
 Omega Engineering, Inc.\*  
 Omnitron Electronics\*<sup>MD</sup>  
 Panasonic Services Co.\*  
 Parts Express International\*<sup>D</sup>\*  
**Philips Consumer Electronics\*<sup>D</sup>\***  
 Pomona Electronics  
 Premium Parts+ Electronics Co\*<sup>D</sup>  
 Print Products International\*<sup>D</sup>  
 Probe Master, Inc.  
 Products International\*<sup>D</sup>\*  
 R.C. Distributing Co.\*<sup>D</sup>\*  
 Radio Shack\*<sup>D</sup>  
 RAG Electronics Inc.\*<sup>D</sup>  
 RNJ Electronics Inc.\*<sup>D</sup>\*  
 RS Electronics\*<sup>D</sup>  
 Salen Enterprises\*<sup>D</sup>  
 Sencore Electronics\*  
 Sharp Electronics Corp\*  
 Simpson Electric  
 SMH Electronics Co., Inc.\*<sup>D</sup>\*  
 Specialized Prods. Co.\*<sup>D</sup>\*  
 Support Systems International  
 Synergetix\*  
 TechAmerica\*<sup>D</sup>  
 Techni-Tool Inc.\*<sup>D</sup>\*  
 Tektronix, Inc.\*  
 Telematic  
 Temptronic Corp.\*  
 Tenma Test Equipment  
 Test Equipment Depot\*<sup>D</sup>\*  
 Test Products International Inc.\*  
 Time Motion Tools\*<sup>D</sup>  
 Tritronics, Inc.\*<sup>D</sup>  
 Tucker Electronics Co.\*<sup>D</sup>  
 Union Electronics Distrib\*<sup>D</sup>\*  
 Universal Enterprises (UEI)  
 Vance Baldwin Electronics\*<sup>D</sup>\*  
 Vector Electronic Co.\*  
 W.S. Jenks & Son\*<sup>D</sup>  
 Zack Electronics\*<sup>D</sup>

**CIRCUIT DAMAGE  
PROTECTIVE  
EQUIPMENT/  
SUPPLIES  
Power Conditioning  
Equipment  
GROUNDING SYSTEMS**

Bi-Tronics Inc.\*<sup>D</sup>  
 Bivar Inc  
 Compuvideo Test Instruments  
 Cumberland Elect.\*<sup>D</sup>\*  
 Electroservice Laboratories\*<sup>D</sup>  
 Electrotex, Inc.\*<sup>D</sup>  
 HMC Electronics\*<sup>D</sup>\*  
 JIT Resources, Inc.  
 Time Motion Tools\*<sup>D</sup>  
 Vance Baldwin Electronics\*<sup>D</sup>\*  
 Viziflex Static Solutions\*  
 W.S. Jenks & Son\*<sup>D</sup>  
 Zack Electronics\*<sup>D</sup>

**POWER LINE MONITORS**

Bi-Tronics Inc.\*<sup>D</sup>  
 BMI-Basic Measuring Instrument  
 Computer Power Inc.  
 Consolidated Electrnics, Inc.\*<sup>D</sup>  
 Conway Engineering, Inc.  
 Cumberland Elect.\*<sup>D</sup>\*  
 E.I.L. Instruments, Inc.\*<sup>D</sup>  
 Electronic Specialists\*  
 Electroservice Laboratories\*<sup>D</sup>  
 Electrotex, Inc.\*<sup>D</sup>  
 Galco Ind. Electronics\*<sup>D</sup>\*  
 Global Specialties  
 Hosfelt Electronics, Inc.\*<sup>D</sup>  
 IFR Systems\*  
 JDR Microdevices\*<sup>D</sup>  
 Joseph Electronics\*<sup>D</sup>\*  
 M.A.T. Electronics\*<sup>D</sup>\*  
 PowerTronics  
 RS Electronics\*<sup>D</sup>  
 SL Waber, Inc.  
 Techni-Tool Inc.\*<sup>D</sup>\*  
 Time Motion Tools\*<sup>D</sup>  
 Tucker Electronics Co.\*<sup>D</sup>  
 Vance Baldwin Electronics\*<sup>D</sup>\*  
 W.S. Jenks & Son\*<sup>D</sup>  
 Wholesale Electronics Inc.\*<sup>D</sup>  
 Zack Electronics\*<sup>D</sup>

**STANDBY POWER SYSTEMS**

Best Power  
 Bi-Tronics Inc.\*<sup>D</sup>  
 Bursma Electronic Dist. \*<sup>D</sup>\*  
 Computer Power Inc.  
 Cumberland Elect.\*<sup>D</sup>\*  
 Dalco Electronics\*<sup>D</sup>  
 Digi-Key \*<sup>D</sup>\*  
 Electronic Specialists\*  
 Electrotex, Inc.\*<sup>D</sup>  
 Harco Electronics\*<sup>D</sup>  
 Hosfelt Electronics, Inc.\*<sup>D</sup>  
 J.S. Popper, Inc.  
 Joseph Electronics\*<sup>D</sup>\*  
 Meirick, Inc.  
 Parts Express International\*<sup>D</sup>\*  
 Powerline\*<sup>D</sup>  
 RS Electronics\*<sup>D</sup>  
 SL Waber, Inc.  
 Sorensen\*  
 Superior Electric\*

Superior Electronic  
Sutton Designs, Inc.\*  
Tripp Lite  
Vance Baldwin Electronics\*D\*  
W.S. Jenks & Son\*D  
Wholesale Electronics Inc.\*D  
Zack Electronics\*D

**SURGE/SPIKE PROTECTORS**

Best Power  
Bi-Tronics Inc.\*D  
Bursma Electronic Dist.\*D\*  
Calrad Electronics\*  
Computer Component Source\*D  
Computer Svcs of America\*D  
Consolidated Elctrnics, Inc.\*D  
Contact East\*D\*  
Cumberland Elect.\*D\*  
Dalbani Corporation  
Dalco Electronics\*D  
E.I.L. Instruments, Inc.\*D  
Eiger Electronics Inc.\*D\*  
Electro Standards Lab\*  
Electronic Parts Supply\*D  
Electronic Specialists\*  
**Electronix Corp.\*D**  
Electronix Express\*D  
Electrotex, Inc.\*D  
Excel Distributing\*D\*  
Galco Ind. Electronics\*D\*  
GC Electronics\*D  
Harco Electronics\*D  
Herman Panson Electronics\*D\*  
HMC Electronics\*D\*  
Hosfelt Electronics, Inc.\*D  
International Power Tchnlgies  
J.S. Popper, Inc.  
Jameco Electrnc Components\*D  
JDR Microdevices\*D  
Jensen Tools\*D\*  
Joseph Electronics\*D\*  
Kalglo Electronics Co.\*  
M.A.T. Electronics\*D\*  
MCG Surge Protection\*  
Meirick, Inc.  
Mouser Electronics\*D  
M-Tronics\*D\*  
Panamax, Inc.  
Parts Express International\*D\*  
**Philips Consumer Electronics\*D\***  
Phoenix Contact\*  
Powerline\*D  
Print Products International\*D  
Radio Shack\*D  
Recoton Corporation  
RNJ Electronics Inc.\*D\*  
RS Electronics\*D  
Schurter, Inc.  
Shape Electronics  
SL Waber, Inc.  
Specialized Prods. Co.\*D\*  
Sutton Designs, Inc.\*  
Techni-Tool Inc.\*D\*  
Time Motion Tools\*D  
Tripp Lite  
Tritronics, Inc.\*D  
Vance Baldwin Electronics\*D\*  
W.S. Jenks & Son\*D  
Wholesale Electronics Inc.\*D  
Zack Electronics\*D

**UNINTERRUPTIBLE POWER SUPPLIES**

B-B&W Electronics\*D  
Behlman Electronics  
Best Power  
Bi-Tronics Inc.\*D  
Bursma Electronic Dist.\*D\*  
Clary Corp.  
Computer Component Source\*D  
Computer Power Inc.  
Contact East\*D\*  
Controlled Power Co.\*  
Cumberland Elect.\*D\*  
Dalco Electronics\*D  
Digi-Key\*D\*  
Electronic Specialists\*  
Electronix Express\*D  
Electroservice Laboratories\*D  
Electrotex, Inc.\*D  
Elgar Electronics Corp\*  
Galco Ind. Electronics\*D\*  
Harco Electronics\*D  
Herman Panson Electronics\*D\*  
HMC Electronics\*D\*  
Hosfelt Electronics, Inc.\*D  
IFR Systems\*  
International Power Tchnlgies  
J.S. Popper, Inc.  
JDR Microdevices\*D  
Jensen Tools\*D\*  
Joseph Electronics\*D\*  
M.A.T. Electronics\*D\*  
Meirick, Inc.  
Morrow Wave, Inc.  
Nationwide Electronics\*D  
Netway 2000 Inc.\*D\*  
Parts Express International\*D\*  
Philtek Power Corp.  
Powerline\*D  
Print Products International\*D  
Products International\*D\*  
RNJ Electronics Inc.\*D\*  
RS Electronics\*D  
SL Waber, Inc.  
Specialized Prods. Co.\*D\*  
Staco Energy Products  
Superior Electric\*  
Sutton Designs, Inc.\*  
Techni-Tool Inc.\*D\*  
Total Power International\*MD  
Tripp Lite  
Vance Baldwin Electronics\*D\*  
W.S. Jenks & Son\*D  
Wholesale Electronics Inc.\*D  
Zack Electronics\*D

**VOLTAGE REGULATORS**

AVO International\*  
Bi-Tronics Inc.\*D  
Bursma Electronic Dist.\*D\*  
Computer Component Source\*D  
Computer Power Inc.  
Compuvideo Test Instruments  
Controlled Power Co.\*  
Cumberland Elect.\*D\*  
Dalbani Corporation  
Dalco Electronics\*D  
E.I.L. Instruments, Inc.\*D  
Electronic Parts Supply\*D  
Electronic Specialists\*  
Electronix Express\*D  
Electroservice Laboratories\*D  
Electrotex, Inc.\*D  
Elgar Electronics Corp\*

Harco Electronics\*D  
Hexacon Electric Co.  
Hosfelt Electronics, Inc.\*D  
JDR Microdevices\*D  
Joseph Electronics\*D\*  
Kelvin Electronics\*D  
Mouser Electronics\*D  
Panasonic Services Co.\*  
Parts Express International\*D\*  
Print Products International\*D  
Products International\*D\*  
Radio Shack\*D  
RS Electronics\*D  
Salen Enterprises\*D  
Shape Electronics  
SL Waber, Inc.  
Snap-On Incorporated  
Sorensen\*  
Specialized Prods. Co.\*D\*  
Staco Energy Products  
Superior Electric\*  
Sutton Designs, Inc.\*  
Tandy National Parts\*D  
TechAmerica\*D  
Time Motion Tools\*D  
Vance Baldwin Electronics\*D\*  
W.S. Jenks & Son\*D  
Wholesale Electronics Inc.\*D  
Zack Electronics\*D

**Electrostatic Discharge Protection ANTISTATIC CHEMICALS**

3M Electrnc Prods Division  
B-B&W Electronics\*D  
Bursma Electronic Dist.\*D\*  
Charleswater  
Chemtronics (ITW)  
Computer Component Source\*D  
Computer Svcs of America\*D  
Consolidated Elctrnics, Inc.\*D  
Cumberland Elect.\*D\*  
Dalbani Corporation  
Dalco Electronics\*D  
Desco Charles Water  
Digi-Key\*D\*  
East Coast Transistor\*D  
Eiger Electronics Inc.\*D\*  
Electro Dynamics, Inc.\*D  
**Electronix Corp.\*D**  
Electronix Express\*D  
Electroservice Laboratories\*D  
Electrotex, Inc.\*D  
Excel Distributing\*D\*  
Fox International LTD, INC  
Galco Ind. Electronics\*D\*  
GC Electronics\*D  
Harco Electronics\*D  
HMC Electronics\*D\*  
Hy Tec Dealer Service  
JIT Resources, Inc.  
Joseph Electronics\*D\*  
M.A.T. Electronics\*D\*  
Master Bond Inc.\*  
MCM Electronics\*D\*  
MG Chemicals  
Micro Care Corp.  
Miller-Stephenson Chemical Co.  
M-Tronics\*D\*  
Nationwide Electronics\*D  
**Philips Consumer Electronics\*D\***  
Print Products International\*D

Products International\*D\*  
Radio Shack\*D  
RNJ Electronics Inc.\*D\*  
Rogers Anti-Static Chemicals  
RS Electronics\*D  
Stoner, Inc.  
Syon Corporation  
Tandy National Parts\*D  
Tech Spray, Inc.  
Techni-Tool Inc.\*D\*  
Time Motion Tools\*D  
Tritronics, Inc.\*D  
Union Electronics Distrib\*D\*  
Vance Baldwin Electronics\*D\*  
Viziflex Static Solutions\*  
W.S. Jenks & Son\*D  
Wescorp  
Wholesale Electronics Inc.\*D  
Zack Electronics\*D

**ANTISTATIC IONIZATION DEVICES**

3M Electrnc Hndlg & Prot Div  
3M Electronic Prods Division  
Charleswater  
Computer Svcs of America\*D  
Contact East\*D\*  
Cumberland Elect.\*D\*  
Desco Charles Water  
Electro-Tech Systems, Inc.  
Electrotex, Inc.\*D  
Harco Electronics\*D  
HMC Electronics\*D\*  
JDV Products Inc.\*  
JIT Resources, Inc.  
Joseph Electronics\*D\*  
MCM Electronics\*D\*  
Nationwide Electronics\*D  
Print Products International\*D  
Products International\*D\*  
RS Electronics\*D  
Semtronics Corp.  
Simco Static Cntrl & Clnrn Prd\*  
Techni-Tool Inc.\*D\*  
Time Motion Tools\*D  
W.S. Jenks & Son\*D  
Wescorp  
Wholesale Electronics Inc.\*D  
Zack Electronics\*D

**ANTISTATIC MATS/BENCHTOPS/WRIST STRAPS/OTHERS**

3M Electrnc Hndlg & Prot Div  
3M Electronic Prods Division  
Aven Tools, Inc.  
B-B&W Electronics\*D  
Charleswater  
Clauss Electronics Div.  
Computer Component Source\*D  
Computer Svcs of America\*D  
Contact East\*D\*  
Cumberland Elect.\*D\*  
Dalbani Corporation  
Dalco Electronics\*D  
Desco Charles Water  
Digi-Key\*D\*  
Eiger Electronics Inc.\*D\*  
Electro Tool, Inc.\*D  
**Electronix Corp.\*D**  
Electronix Express\*D  
Electroservice Laboratories\*D  
Electro-Tech Systems, Inc.



Excel Distributing\*D\*  
 Fox International LTD, INC  
 Harco Electronics\*D  
 Herman Panson Electronics\*D\*  
 HMC Electronics\*D\*  
 Hosfelt Electronics, Inc.\*D  
 Jameco Electrnc Components\*D  
 Jensen Tools\*D\*  
 Jim-Pak\*D  
 JIT Resources, Inc.  
 Joseph Electronics\*D\*  
 Lista International Corp.  
 Micro Care Corp.  
 Mouser Electronics\*D  
 Nationwide Electronics\*D  
 New Pig Corp.\*D\*  
 Pomona Electronics  
 Print Products International\*D  
 Products International\*D\*  
 Richmond Technology-ITW\*  
 RNJ Electronics Inc.\*D\*  
 Rogers Anti-Static Chemicals  
 RS Electronics\*D  
 Semtronics Corp.  
 Specialized Prods. Co.\*D\*  
 Spirig Advanced Technologies  
 Sun Equipment Corporation\*D\*  
 Tandy National Parts\*D  
 TechAmerica\*D  
 Techni-Tool Inc.\*D\*  
 Teclab-Kalamazoo Tech Furn\*  
 Time Motion Tools\*D  
 Tritronics, Inc.\*D  
 Viziflex Static Solutions\*  
 W.S. Jenks & Son\*D  
 Wescorp  
 Wholesale Electronics Inc.\*D  
 Wiha Tools\*  
 Zack Electronics\*D

**ESD FLEXIBLE PACKAGING**

3M Electrnc Hndlg & Prot Div  
 3M Electronic Prods Division  
 Charleswater  
 Contact East\*D\*  
 Cumberland Elect.\*D\*  
 Dalco Electronics\*D  
 Desco Charles Water  
 Digi-Key\*D\*  
 Electroservice Laboratories\*D  
 Electro-Tech Systems, Inc.  
 Harco Electronics\*D  
 HMC Electronics\*D\*  
 Jensen Tools\*D\*  
 JIT Resources, Inc.  
 Joseph Electronics\*D\*  
 Nationwide Electronics\*D  
 Print Products International\*D  
 Products International\*D\*  
 Richmond Technology-ITW\*  
 RS Electronics\*D  
 Seco Industries  
 Semtronics Corp.  
 Techni-Tool Inc.\*D\*  
 Time Motion Tools\*D  
 Viziflex Static Solutions\*  
 W.S. Jenks & Son\*D  
 Wescorp  
 Zack Electronics\*D

**STATIC DETECTION METERS**

3M Electrnc Hndlg & Prot Div

3M Electronic Prods Division  
 Charleswater  
 Computer Svcs of America\*D  
 Contact East\*D\*  
 Cumberland Elect.\*D\*  
 Dalco Electronics\*D  
 Desco Charles Water  
 Digi-Key\*D\*  
 E.I.L. Instruments, Inc.\*D  
 Electroservice Laboratories\*D  
 Electro-Tech Systems, Inc.  
 Harco Electronics\*D  
 HMC Electronics\*D\*  
 Jensen Tools\*D\*  
 JIT Resources, Inc.  
 Joseph Electronics\*D\*  
 MCM Electronics\*D\*  
 Nationwide Electronics\*D  
 Print Products International\*D  
 Products International\*D\*  
 Prostat Corporation  
 RS Electronics\*D  
 Semtronics Corp.  
 Simco Static Cntrl & Clnrm Prd\*  
 Specialized Prods. Co.\*D\*  
 Techni-Tool Inc.\*D\*  
 Time Motion Tools\*D  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Wescorp  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**SUPPLIES/ACCESORIES/EQUIPMENT**

**BATTERIES**

**B&D Enterprises\*D\***  
 Bursma Electronic Dist.\*D\*  
 Computer Component Source\*D  
 Compuvideo Test Instruments  
 Consolidated Electrncs, Inc.\*D  
 Contact East\*D\*  
 Cumberland Elect.\*D\*  
 Dalbani Corporation  
 Dalco Electronics\*D  
 Digi-Key\*D\*  
 East Coast Transistor\*D  
 Eiger Electronics Inc.\*D\*  
 Electro Dynamics, Inc.\*D  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Electronix Express\*D  
 Electroservice Laboratories\*D  
 Electro-Tech Systems, Inc.\*D  
 Electrotex, Inc.\*D  
 Excel Distributing\*D\*  
 Fedco Electronics, Inc.\*D  
 Fixer Corp.  
 Fox International LTD, INC  
 Harco Electronics\*D  
 Herman Panson Electronics\*D\*  
 HMC Electronics\*D\*  
 Hosfelt Electronics, Inc.\*D  
 J.S. Popper, Inc.  
 Jameco Electrnc Components\*D  
 JBRO Batteries, Inc\*  
 JDR Microdevices\*D  
 Jim-Pak\*D  
 Joseph Electronics\*D\*  
 Kelvin Electronics\*D  
 M.A.T. Electronics\*D\*  
 Mouser Electronics\*D

M-Tronics\*D\*  
 Nationwide Electronics\*D  
 Nesco Batteries  
 Netway 2000 Inc.\*D\*  
 ORA Electronics  
 Pacific Coast Parts\*D\*  
 Panasonic Services Co.\*  
 Parts Express Internationa\*D\*  
**Philips Consumer Electronics\*D\***  
 Powerline\*D  
 Premium Parts+ Electrncs Co\*D  
 Products International\*D  
 Radio Shack\*D  
 Rechargeable Battery Recycling\*  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
 Sharp Electronics Corp\*  
 Specialized Prods. Co.\*D\*  
 Tandy National Parts\*D  
 TechAmerica\*D  
 Techni-Tool Inc.\*D\*  
 Time Motion Tools\*D  
 Total Power International\*MD  
 Tritronics, Inc.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**BENCHES/CABINETS**

Computer Svcs of America\*D  
 Contact East \*D\*  
 Cumberland Elect.\*D\*  
 Dalco Electronics\*D  
 East Coast Transistor\*D  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D  
 Excel Distributing\*D\*  
 General Devices Co. Inc.\*  
 Harco Electronics\*D  
 HMC Electronics\*D\*  
 I.A.C. Industries  
 J.S. Popper, Inc.  
 JDR Microdevices\*D  
 Jensen Tools\*D\*  
 JIT Resources, Inc.  
 Joseph Electronics\*D\*  
 Lista International Corp.  
 M.A.T. Electronics\*D\*  
 M-Tronics\*D\*  
 New Pig Corp.\*D\*  
 Print Products International\*D\*  
 Products International\*D\*  
 RS Electronics\*D  
 Specialized Prods. Co.\*D\*  
 Techni-Tool Inc.\*D\*  
 Teclab-Kalamazoo Tech Furn\*  
 Time Motion Tools\*D  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Workplace Systems, Inc.  
 Zack Electronics\*D  
 Zero Corp., East Div.

**CHEMICALS**

B-B&W Electronics\*D  
 Bursma Electronic Dist. \*D\*  
 CAIG Laboratories, Inc\*  
 Ciba Specialty Chemicals  
 Computer Component Source\*D  
 Computer Svcs of America\*D  
 Consolidated Electrncs, Inc.\*D

Contact East\*D\*  
 Cortec Corp.\*  
 CRC Industries, Inc.  
 Cumberland Elect.\*D\*  
 Dalbani Corporation  
 Dymax Corp.\*  
 Dynalyn, Inc.  
 E.I.L. Instruments, Inc.\*D  
 East Coast Transistor\*D  
 Echelon Industries\*D  
 Eiger Electronics Inc.\*D\*  
 Electro Dynamics, Inc.\*D  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Electronix Express\*D  
 Electrotex, Inc.\*D  
 Excel Distributing\*D\*  
 Fixer Corp.  
 Foley-Belsaw\*D  
 Four Star Chemical  
 Fox International LTD, INC  
 Galco Ind. Electronics\*D\*  
 GC Electronics\*D  
 Global Micro-Parts Depot\*MD  
 Harco Electronics\*D  
 Herman Panson Electronics\*D\*  
 HMC Electronics\*D\*  
 Hosfelt Electronics, Inc.\*D  
 Hy Tec Dealer Service  
 Jameco Electrnc Components\*D  
 Jensen Tools\*D\*  
 Joseph Electronics\*D\*  
 L.J. Enterprises\*D  
 M.A.T. Electronics\*D\*  
 MCM Electronics\*D\*  
 MG Chemicals  
 Micro Care Corp.  
 Miller-Stephenson Chemical Co.  
 Mouser Electronics\*D  
 M-Tronics\*D\*  
 Multicore Solders  
 Nationwide Electronics\*D  
 P.K. Neuses\*D  
 Parts Express Internationa\*D\*  
**Philips Consumer Electronics\*D\***  
 Planned Products  
 Premium Parts+ Electrncs Co\*D  
 Print Products International\*D  
 Products International\*D\*  
 Radio Shack\*D  
 Rawn Co. Inc.  
 Read/Right Div Texwipe\*  
 RNJ Electronics Inc.\*D\*  
 Rogers Anti-Static Chemicals  
 RS Electronics\*D  
 Russell Industries\*D  
 Stoner, Inc.  
 Syon Corporation  
 Tandy National Parts\*D  
 Tech Spray, Inc.  
 TechAmerica\*D  
 Techni-Tool Inc.\*D\*  
 The Texwipe Company/CleanTex  
 Tritronics, Inc.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**CLEANING SUPPLIES**

Bursma Electronic Dist.\*D\*  
 Chemtronics (ITW)

Computer Component Source\*D  
 Computer Svcs of America\*D  
 Consolidated Elctrnics, Inc.\*D  
 Contact East\*D \*  
 Cortec Corp.\*  
 CRC Industries, Inc.  
 Cumberland Elect.\*D \*  
 Dalbani Corporation  
 Dalco Electronics\*D  
 East Coast Transistor\*D  
 Echelon Industries\*D  
 Eiger Electronics Inc.\*D \*  
 Electro Dynamics, Inc.\*D  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D  
 Excel Distributing\*D \*  
 Falcon Safety Products  
 Fixer Corp.  
 Foley-Belsaw\*D  
 Four Star Chemical  
 Fox International LTD, INC  
 Global Micro-Parts Depot\*MD  
 Harco Electronics\*D  
 Herman Panson Electronics\*D \*  
 HMC Electronics\*D \*  
 Hosfelt Electronics, Inc.\*D  
 Hy Tec Dealer Service  
 Jameco Electrnc Components\*D  
 Jensen Tools\*D \*  
 Joseph Electronics\*D \*  
 L.J. Enterprises\*D  
 Leland Ltd., Inc.  
 M.A.T. Electronics\*D \*  
 MG Chemicals  
 Micro Care Corp.  
 Multicore Solders  
 New Pig Corp.\*D \*  
 P.K. Neuses\*D  
 Parts Express International\*D \*  
 PC Service Source\*D  
 Print Products International\*D  
 Products International\*D \*  
 Read/Right Div. Texwipe\*  
 Rogers Anti-Static Chemicals  
 RS Electronics\*D  
 Specialized Prods. Co.\*D \*  
 Stoner, Inc.  
 Syon Corporation  
 Tech Spray, Inc.  
 TechAmerica\*D  
 Techni-Tool Inc.\*D \*  
 The Texwipe Company/CleanTex  
 Time Motion Tools\*D  
 Tritronics, Inc.\*D  
 Union Electronics Distrib\*D \*  
 Vance Baldwin Electronics\*D \*  
 Viziflex Static Solutions\*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**LAMPS**

Aven Tools, Inc.  
 B-B&W Electronics\*D  
 Bonkote America, Inc.  
 Computer Svcs of America\*D  
 Consolidated Elctrnics, Inc.\*D  
 Contact East\*D \*  
 Cumberland Elect.\*D \*  
 Dalbani Corporation  
 Dazor Mfg. Corp.\*

Digi-Key\*D \*  
 Dymax Corp.\*  
 East Coast Transistor\*D  
 Electro-Mech Components\*  
 Electronic Parts Supply\*D  
 Electronix Express\*D  
 Electrotex, Inc.\*D  
 Elite Video\*D \*  
 Excel Distributing\*D \*  
 Foley-Belsaw\*D  
 Fox International LTD, INC  
 Galco Ind. Electronics\*D \*  
 Global Micro-Parts Depot\*MD  
 Harco Electronics\*D  
 Herman Panson Electronics\*D \*  
 HMC Electronics\*D \*  
 Hosfelt Electronics, Inc.\*D  
 Jameco Electrnc Components\*D  
 Jensen Tools\*D \*  
 Joseph Electronics\*D \*  
 Kelvin Electronics\*D  
 M.A.T. Electronics\*D \*  
 Mouser Electronics\*D  
 O.C. White  
 Panasonic Services Co.\*  
 Parts Express Internationa\*D \*  
 Premium Parts+ Elctrnics Co\*D  
 Print Products International\*D  
 Products International\*D \*  
 Radio Shack\*D  
 RNJ Electronics Inc.\*D \*  
 RS Electronics\*D  
 Schurter, Inc.  
 Sharp Electronics Corp\*  
 Shogyo International Corp.\*  
 Specialized Prods. Co.\*D \*  
 TechAmerica\*D  
 Techni-Tool Inc.\*D \*  
 Teclab-Kalamazoo Tech Furn\*  
 Time Motion Tools\*D  
 Tritronics, Inc.\*D  
 Union Electronics Distrib\*D \*  
 Vance Baldwin Electronics\*D \*  
 Waldmann Lighting Company\*  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**MAGNIFIERS**

Aven Tools, Inc.  
 B-B&W Electronics\*D  
 Bonkote America, Inc.  
 Computer Component Source\*D  
 Consolidated Elctrnics, Inc.\*D  
 Contact East \*D \*  
 Cumberland Elect.\*D \*  
 Dalbani Corporation  
 Dazor Mfg. Corp.\*  
 Digi-Key\*D \*  
 East Coast Transistor\*D  
 Edroy Products  
 Electro Tool, Inc.\*D  
 Electronic Parts Supply\*D  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D  
 Foley-Belsaw\*D  
 Harco Electronics\*D  
 HMC Electronics \*D \*  
 Hosfelt Electronics, Inc.\*D  
 Jameco Electrnc Components\*D  
 JDR Microdevices\*D  
 Jensen Tools\*D \*  
 Joseph Electronics \*D \*  
 Luxo Corp.

M.A.T. Electronics\*D \*  
 MagEyes\*  
 MCM Electronics\*D \*  
 O.C. White  
 Parts Express International\*D \*  
 Print Products International\*D  
 Products International\*D \*  
 Radio Shack\*D  
 RNJ Electronics Inc.\*D \*  
 RS Electronics\*D  
 Specialized Prods. Co.\*D \*  
 TechAmerica\*D  
 Techni-Tool Inc.\*D \*  
 Time Motion Tools\*D  
 Vance Baldwin Electronics\*D \*  
 W.S. Jenks & Son\*D  
 Waldmann Lighting Company\*  
 Zack Electronics\*D

**SHELVES/RACKS/BINS**

Bi-Tronics Inc.\*D  
 Bonkote America, Inc.  
 Computer Component Source\*D  
 Contact East\*D \*  
 Cumberland Elect.\*D \*  
 Electronic Parts Supply\*D  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D  
 Flat Earth Audio [ATC-Mana-Sme]\*D \*  
 General Devices Co. Inc.\*  
 HMC Electronics\*D \*  
 Hosfelt Electronics, Inc.\*D  
 Hy Tec Dealer Service  
 JDR Microdevices\*D  
 Jensen Tools\*D \*  
 JIT Resources, Inc.  
 Joseph Electronics \*D \*  
 M.A.T. Electronics\*D \*  
 MCM Electronics\*D \*  
 M-Tronics\*D \*  
 New Pig Corp.\*D \*  
 Parts Express International\*D \*  
 Products International\*D  
 Snap-On Incorporated  
 Specialized Prods. Co.\*D \*  
 Techni-Tool Inc.\*D \*  
 Teclab-Kalamazoo Tech Furn\*  
 Time Motion Tools\*D  
 Trace Racks  
 Vance Baldwin Electronics\*D \*  
 W.S. Jenks & Son\*D  
 Zack Electronics\*D

**SOLDER/DESOLDERING  
 BRAID/FLUX**

Aven Tools, Inc.  
 B-B&W Electronics\*D  
 Bursma Electronic Dist.\*D \*  
 C&S Sales\*D  
 Chemtronics (ITW)  
 Computer Component Source\*D  
 Consolidated Elctrnics, Inc.\*D  
 Contact East \*D \*  
 Cumberland Elect.\*D \*  
 Digi-Key\*D \*  
 East Coast Transistor\*D  
 Eiger Electronics Inc.\*D \*  
 Electro Dynamics, Inc.\*D  
 Electro Tool, Inc.\*D  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Electronix Express\*D  
 Electroservice Laboratories\*D

Electrotex, Inc.\*D  
 Excel Distributing\*D \*  
 Fixer Corp.  
 Foley-Belsaw\*D  
 Fox International LTD, INC  
 Galco Ind. Electronics\*D \*  
 Global Micro-Parts Depot\*MD  
 Harco Electronics\*D  
 Herman Panson Electronics\*D \*  
 Hexacon Electric Co.  
 HMC Electronics\*D \*  
 Hosfelt Electronics, Inc.\*D  
 Hy Tec Dealer Service  
 Internat'l Components Corp.\*D  
 Jameco Electrnc Components\*D  
 JDR Microdevices\*D  
 Jensen Tools\*D \*  
 Jim-Pak\*D  
 Joseph Electronics\*D \*  
 Kelvin Electronics\*D  
 Kester Solder  
 M.A.T. Electronics\*D \*  
 MCM Electronics\*D \*  
 MG Chemicals  
 Mouser Electronics\*D  
 M-Tronics\*D \*  
 Multicore Solders  
 Nationwide Electronics\*D  
 Newmar Corp., M.M.\*  
 Oldaker Corp.  
 Omnitron Electronics\*MD  
 Parts Express International\*D \*  
 PDR Xytronic\*MD \*  
**Philips Consumer Electronics\*D \***  
 Plato Products, Inc.  
 Premium Parts+ Elctrnics Co\*D  
 Print Products International\*D \*  
 Products International\*D \*  
 Radio Shack\*D  
 RS Electronics\*D  
 Soder-Wick Fine-Braid  
 Specialized Prods. Co.\*D \*  
 Spirig Advanced Technologies  
 Tandy National Parts\*D  
 Tech Spray, Inc.  
 TechAmerica\*D  
 Techni-Tool Inc.\*D \*  
 Time Motion Tools\*D  
 Tritronics, Inc.\*D  
 Union Electronics Distrib\*D \*  
 Vance Baldwin Electronics\*D \*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Xuron Corporation\*  
 Zack Electronics\*D

**TUBING**

3M Electrnc Hndlg & Prot Div  
 B-B&W Electronics\*D  
 Bi-Tronics Inc.\*D  
 Bursma Electronic Dist. \*D \*  
 Computer Component Source\*D  
 Consolidated Elctrnics, Inc.\*D  
 Cumberland Elect.\*D \*  
 Digi-Key \*D \*  
 East Coast Transistor\*D  
 Electronic Parts Supply\*D  
 Electronix Express\*D  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D  
 Fox International LTD, INC  
 Galco Ind. Electronics\*D \*  
 Harco Electronics\*D

Herman Panson Electronics\*<sup>D</sup>\*  
 Hosfelt Electronics, Inc.\*<sup>D</sup>  
 JDR Microdevices\*<sup>D</sup>  
 Joseph Electronics \*<sup>D</sup>\*<sup>D</sup>  
 M.A.T. Electronics\*<sup>D</sup>\*  
 Manhattan/CDT  
 Mouser Electronics\*<sup>D</sup>  
 Nelco\*<sup>D</sup>\*  
 Newman Corp., M.M  
 Panasonic Services Co.\*  
 Parts Express International\*<sup>D</sup>\*  
 Radio Shack\*<sup>D</sup>  
 RS Electronics\*<sup>D</sup>  
 Russell Industries\*<sup>D</sup>  
 Tandy National Parts\*<sup>D</sup>  
 Techni-Tool Inc.\*<sup>D</sup>\*  
 Union Electronics Distrib\*<sup>D</sup>\*  
 Vance Baldwin Electronics\*<sup>D</sup>\*  
 W.S. Jenks & Son\*<sup>D</sup>  
 Wholesale Electronics Inc.\*<sup>D</sup>  
 Zack Electronics\*<sup>D</sup>

**WIRE AND CABLE**

B-B&W Electronics\*<sup>D</sup>  
 Belden Wire & Cable\*  
 Bi-Tronics Inc.\*<sup>D</sup>  
 Bursma Electronic Dist.\*<sup>D</sup>\*  
 Cablescan  
 Calrad Electronics\*  
 Computer Component Source\*<sup>D</sup>  
 Computer Svcs of America\*<sup>D</sup>  
 Consolidated ElctrnCs, Inc.\*<sup>D</sup>  
 Contact East\*<sup>D</sup>\*  
 Cumberland Elect.\*<sup>D</sup>\*  
 Dalbani Corporation  
 Dalco Electronics\*<sup>D</sup>  
 Digi-Key \*<sup>D</sup>\*  
 East Coast Transistor\*<sup>D</sup>  
 Eiger Electronics Inc.\*<sup>D</sup>\*  
 Electro Dynamics, Inc.\*<sup>D</sup>  
 Electronic Parts Supply\*<sup>D</sup>  
**Electronix Corp.\*<sup>D</sup>**  
 Electronix Express\*<sup>D</sup>  
 Electroservice Laboratories\*<sup>D</sup>  
 Electrotex, Inc.\*<sup>D</sup>  
 Excel Distributing\*<sup>D</sup>\*  
 Fox International LTD, INC  
 Galco Ind. Electronics\*<sup>D</sup>\*  
 Global Micro-Parts Depot\*<sup>MD</sup>  
 Harco Electronics\*<sup>D</sup>  
 Herman Panson Electronics\*<sup>D</sup>\*  
 Hosfelt Electronics, Inc.\*<sup>D</sup>  
 Internat'l Components Corp.\*<sup>D</sup>  
 Jameco Electrnc Components\*<sup>D</sup>  
 JDR Microdevices\*<sup>D</sup>  
 Jensen Tools \*<sup>D</sup>\*  
 Jim-Pak\*<sup>D</sup>  
 Joseph Electronics\*<sup>D</sup>\*  
 Kelvin Electronics\*<sup>D</sup>  
 Liberty Wire & Cable, Inc.\*<sup>D</sup>\*  
 M.A.T. Electronics\*<sup>D</sup>\*  
 Manhattan/CDT  
 MCM Electronics\*<sup>D</sup>\*  
 Mouser Electronics\*<sup>D</sup>  
 M-Tronics\*<sup>D</sup>\*  
 Nationwide Electronics\*<sup>D</sup>  
 Oldaker Corp.  
 Panasonic Services Co.\*  
 Parts Express International\*<sup>D</sup>\*  
**Philips Consumer Electronics\*<sup>D</sup>**\*  
 Phoenix Contact\*  
 Premium Parts+ Electrncs Co\*<sup>D</sup>  
 Radio Shack\*<sup>D</sup>

RF Industries\*  
 RNJ Electronics Inc.\*<sup>D</sup>\*  
 RS Electronics\*<sup>D</sup>  
 Shogyo International Corp.\*  
 Tandy National Parts\*<sup>D</sup>  
 TechAmerica\*<sup>D</sup>  
 Techni-Tool Inc.\*<sup>D</sup>\*  
 Time Motion Tools\*<sup>D</sup>  
 Tritronics, Inc.\*<sup>D</sup>  
 Trompeter Electronics  
 Union Electronics Distrib\*<sup>D</sup>\*  
 Vance Baldwin Electronics\*<sup>D</sup>\*  
 Waytek Inc.\*<sup>D</sup>  
 Wholesale Electronics Inc.\*<sup>D</sup>  
 Winegard Co.  
 Zack Electronics\*<sup>D</sup>

**CARTS, HAND TRUCKS, SPECIAL HANDLING EQUIPMENT**

All Metall Designs\*  
 Contact East\*<sup>D</sup>\*  
 Escalera  
 Excel Distributing\*<sup>D</sup>\*  
 HMC Electronics \*<sup>D</sup>\*  
 Jensen Tools \*<sup>D</sup>\*  
 Joseph Electronics\*<sup>D</sup>\*  
 Lista International Corp.  
 LP International, Inc.  
 RNJ Electronics Inc.\*<sup>D</sup>\*  
 Specialized Prods. Co.\*<sup>D</sup>\*  
 Techni-Tool Inc.\*<sup>D</sup>\*  
 Teclab-Kalamazoo Tech Furn\*  
 Union Electronics Distrib\*<sup>D</sup>\*  
 Vance Baldwin Electronics\*<sup>D</sup>\*  
**AUDIO/VIDEO ACCESSORIES**

**AUDIO/VIDEO ACCESSORIES**

**A/B SWITCHES**  
 B-B&W Electronics\*<sup>D</sup>  
 Bi-Tronics Inc.\*<sup>D</sup>  
 Channel Master Div of Avnet  
 Computer Component Source\*<sup>D</sup>  
 Computer Svcs of America\*<sup>D</sup>  
 Consolidated ElctrnCs, Inc.\*<sup>D</sup>  
 Cumberland Elect.\*<sup>D</sup>\*  
 Dalbani Corporation  
 Dalco Electronics\*<sup>D</sup>  
 East Coast Transistor\*<sup>D</sup>  
 Eiger Electronics Inc.\*<sup>D</sup>\*  
 Electronic Parts Supply\*<sup>D</sup>  
**Electronix Corp.\*<sup>D</sup>**  
 Electronix Express\*<sup>D</sup>  
 Electrotex, Inc.\*<sup>D</sup>  
 GC Electronics\*<sup>D</sup>  
 Hosfelt Electronics, Inc.\*<sup>D</sup>  
 JDR Microdevices\*<sup>D</sup>  
 Joseph Electronics \*<sup>D</sup>\*  
 Kelvin Electronics\*<sup>D</sup>  
 M-Tronics\*<sup>D</sup>\*  
 Multidyne Inc  
 Nationwide Electronics\*<sup>D</sup>  
 Pacific Coast Parts\*<sup>D</sup>\*  
 Panasonic Services Co.\*  
 Parts Express International\*<sup>D</sup>\*  
 Pfanstiehl Corp.\*<sup>D</sup>  
 Recoton Corporation  
 RNJ Electronics Inc.\*<sup>D</sup>\*  
 TechAmerica\*<sup>D</sup>  
 Tritronics, Inc.\*<sup>D</sup>  
 Union Electronics Distrib\*<sup>D</sup>\*  
**FILTERS**  
 B-B&W Electronics\*<sup>D</sup>  
 Bi-Tronics Inc.\*<sup>D</sup>  
 Calrad Electronics\*  
 Cumberland Elect.\*<sup>D</sup>\*  
 Dalbani Corporation  
 East Coast Transistor\*<sup>D</sup>  
 Electronic Parts Supply\*<sup>D</sup>  
 Electronic Specialists\*  
 Electroservice Laboratories\*<sup>D</sup>  
 Electrotex, Inc.\*<sup>D</sup>  
 Joseph Electronics\*<sup>D</sup>\*  
 M.A.T. Electronics\*<sup>D</sup>\*  
 Microwave Filter Company, Inc.\*  
 Multiplex Technology, Inc.  
 Nationwide Electronics\*<sup>D</sup>  
 Pacific Coast Parts\*<sup>D</sup>\*  
 Panasonic Services Co.\*  
 Parts Express International\*<sup>D</sup>\*  
 Radio Shack\*<sup>D</sup>  
 RS Electronics\*<sup>D</sup>

Vance Baldwin Electronics\*<sup>D</sup>\*  
 Wholesale Electronics Inc.\*<sup>D</sup>  
 Winegard Co.  
 Zack Electronics\*<sup>D</sup>

**COUPLERS/SPLITTERS**

B-B&W Electronics\*<sup>D</sup>  
 Bi-Tronics Inc.\*<sup>D</sup>  
 Calrad Electronics\*  
 Channel Master Div of Avnet  
 Consolidated ElctrnCs, Inc.\*<sup>D</sup>  
 Cumberland Elect.\*<sup>D</sup>\*  
 Dalbani Corporation  
 Dalco Electronics\*<sup>D</sup>  
 East Coast Transistor\*<sup>D</sup>  
 Eiger Electronics Inc.\*<sup>D</sup>\*  
 Electronic Parts Supply\*<sup>D</sup>  
**Electronix Corp.\*<sup>D</sup>**  
 Electroservice Laboratories\*<sup>D</sup>  
 Electrotex, Inc.\*<sup>D</sup>  
 Excel Distributing\*<sup>D</sup>\*  
 Fox International LTD, INC  
 GC Electronics\*<sup>D</sup>  
 Hosfelt Electronics, Inc.\*<sup>D</sup>  
 Internat'l Components Corp.\*<sup>D</sup>  
 JDR Microdevices\*<sup>D</sup>  
 Kelvin Electronics\*<sup>D</sup>  
 M.A.T. Electronics\*<sup>D</sup>\*  
 M-Tronics\*<sup>D</sup>\*  
 Multiplex Technology, Inc.  
 Nationwide Electronics\*<sup>D</sup>  
 Pacific Coast Parts\*<sup>D</sup>\*  
 Panasonic Services Co.\*  
 Parts Express International\*<sup>D</sup>\*  
 Pfanstiehl Corp.\*<sup>D</sup>  
**Philips Consumer Electronics\*<sup>D</sup>**\*  
 Premium Parts+ Electrncs Co\*<sup>D</sup>  
 Radio Shack\*<sup>D</sup>  
 Recoton Corporation  
 RNJ Electronics Inc.\*<sup>D</sup>\*  
 RS Electronics\*<sup>D</sup>  
 Shogyo International Corp.\*  
 Support Systems International  
 Tandy National Parts\*<sup>D</sup>  
 TechAmerica\*<sup>D</sup>  
 Tritronics, Inc.\*<sup>D</sup>  
 Union Electronics Distrib\*<sup>D</sup>\*  
 Vance Baldwin Electronics\*<sup>D</sup>\*  
 Wholesale Electronics Inc.\*<sup>D</sup>  
 Winegard Co.  
 Zack Electronics\*<sup>D</sup>

Tritronics, Inc.\*<sup>D</sup>  
 Union Electronics Distrib\*<sup>D</sup>\*  
 Vance Baldwin Electronics\*<sup>D</sup>\*  
 Wholesale Electronics Inc.\*<sup>D</sup>  
 Zack Electronics\*<sup>D</sup>

**RF SWITCHERS**

B-B&W Electronics\*<sup>D</sup>  
 Bi-Tronics Inc.\*<sup>D</sup>  
 Bursma Electronic Dist.\*<sup>D</sup>\*  
 Calrad Electronics\*  
 Channel Master Div of Avnet  
 Computer Component Source\*<sup>D</sup>  
 Cumberland Elect.\*<sup>D</sup>\*  
 Dalbani Corporation  
 Designtech International\*  
 East Coast Transistor\*<sup>D</sup>  
 Eiger Electronics Inc.\*<sup>D</sup>\*  
 Electronic Parts Supply\*<sup>D</sup>  
**Electronix Corp.\*<sup>D</sup>**  
 Electrotex, Inc.\*<sup>D</sup>  
 Interconnect Devices, Inc.\*  
 Joseph Electronics\*<sup>D</sup>\*  
 Kelvin Electronics\*<sup>D</sup>  
 M.A.T. Electronics\*<sup>D</sup>\*  
 M-Tronics\*<sup>D</sup>\*  
 Multiplex Technology, Inc.  
 Nationwide Electronics\*<sup>D</sup>  
 Pacific Coast Parts\*<sup>D</sup>\*  
 Parts Express International\*<sup>D</sup>\*  
 Pfanstiehl Corp.\*<sup>D</sup>  
 Radio Shack\*<sup>D</sup>  
 Recoton Corporation  
 RF Parts\*<sup>D</sup>\*  
 RNJ Electronics Inc.\*<sup>D</sup>\*  
 RS Electronics\*<sup>D</sup>  
 Synergetix\*  
 Tritronics, Inc.\*<sup>D</sup>  
 Union Electronics Distrib\*<sup>D</sup>\*  
 Vance Baldwin Electronics\*<sup>D</sup>\*  
 Vutec Corp.\*<sup>MD</sup>\*  
 Wholesale Electronics Inc.\*<sup>D</sup>  
 Zack Electronics\*<sup>D</sup>

**SIGNAL MIXERS**

B-B&W Electronics\*<sup>D</sup>  
 Bi-Tronics Inc.\*<sup>D</sup>  
 Bursma Electronic Dist.\*<sup>D</sup>\*  
 Computer Component Source\*<sup>D</sup>  
 Cumberland Elect.\*<sup>D</sup>\*  
 Dalbani Corporation  
 East Coast Transistor\*<sup>D</sup>  
 Electronic Parts Supply\*<sup>D</sup>  
**Electronix Corp.\*<sup>D</sup>**  
 Electroservice Laboratories\*<sup>D</sup>  
 Electrotex, Inc.\*<sup>D</sup>  
 Joseph Electronics\*<sup>D</sup>\*  
 M.A.T. Electronics\*<sup>D</sup>\*  
 M-Tronics\*<sup>D</sup>\*  
 Multiplex Technology, Inc.  
 Pacific Coast Parts\*<sup>D</sup>\*  
 Parts Express International\*<sup>D</sup>\*  
 Pfanstiehl Corp.\*<sup>D</sup>  
 RNJ Electronics Inc.\*<sup>D</sup>\*  
 RS Electronics\*<sup>D</sup>  
 Tritronics, Inc.\*<sup>D</sup>  
 Union Electronics Distrib\*<sup>D</sup>\*  
 Vance Baldwin Electronics\*<sup>D</sup>\*  
 Zack Electronics\*<sup>D</sup>

**TOOLS**

**HEAT GUNS**

B-B&W Electronics\*D  
 Bi-Tronics Inc.\*D  
 Bursma Electronic Dist.\*D \*  
 Clauss Electronics Div.  
 Computer Svcs of America\*D  
 Consolidated Elctrnics, Inc.\*D  
 Contact East\*D \*  
 Cooper Tools  
 Cumberland Elect.\*D \*  
 Dalbani Corporation  
 Digi-Key\*D \*  
 East Coast Transistor\*D  
 Electro Tool, Inc.\*D  
 Electronic Parts Supply\*D  
 Electronix Express\*D  
 Electrotex, Inc.\*D  
 Fixer Corp.  
 Foley-Belsaw\*D  
 Galco Ind. Electronics\*D \*  
 Global Micro-Parts Depot\*MD  
 Harco Electronics\*D  
 Herman Panson Electronics\*D \*  
 HMC Electronics \*D \*  
 Hosfelt Electronics, Inc.\*D  
 Jameco Electrnc Components\*D  
 JDR Microdevices\*D  
 Jensen Tools\*D \*  
 Joseph Electronics\*D \*  
 Kelvin Electronics\*D  
 M.A.T. Electronics\*D \*  
 MCM Electronics\*D \*  
 Mouser Electronics\*D  
 Nelco\*D \*  
 Omnitron Electronics\*MD  
 Parts Express International\*D \*  
 PDR Xytronic\*MD \*  
 Print Products International\*D  
 Products International\*D \*  
 Radio Shack\*D  
 RNJ Electronics Inc.\*D \*  
 RS Electronics\*D  
 Snap-On Incorporated  
 Specialized Prods. Co.\*D \*  
 Sun Equipment Corporation\*D \*  
 Techni-Tool Inc.\*D \*  
 The Eraser Company, Inc.\*  
 The Malcom Company  
 Time Motion Tools\*D  
 Tritronics, Inc.\*D  
 Ungar, A Rubbermaid Co.  
 Union Electronics Distrib\*D \*  
 Vance Baldwin Electronics\*D \*  
 W.S. Jenks & Son\*D  
 Weller/Cooper Tools\*  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**JIGS/FIXTURES/VISES**

B-B&W Electronics\*D  
 Consolidated Elctrnics, Inc.\*D  
 Contact East \*D \*  
 Cooper Tools  
 Cumberland Elect.\*D \*  
 Dalbani Corporation  
 Digi-Key\*D \*  
 Electro Tool, Inc.\*D  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Electronix Express\*D  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D

Harco Electronics\*D  
 HMC Electronics \*D \*  
 Jameco Electrnc Components\*D  
 JDV Products Inc.\*  
 Jensen Tools\*D \*  
 Joseph Electronics\*D \*  
 Kelvin Electronics\*D  
 MCM Electronics\*D \*  
 Mouser Electronics\*D  
 M-Tronics\*D \*  
 Parts Express International\*D \*  
 Premium Parts+ Electrncs Co\*D  
 Print Products International\*D  
 Products International\*D \*  
 Radio Shack\*D  
 Snap-On Incorporated  
 Sun Equipment Corporation\*D \*  
 Techni-Tool Inc.\*D \*  
 Time Motion Tools\*D  
 Tritronics, Inc.\*D  
 Union Electronics Distrib\*D \*  
 Vance Baldwin Electronics\*D \*  
 W.S. Jenks & Son\*D  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D

**SOLDERING/DESOLDERING EQUIPMENT**

American Hakko Products\*  
 Aven Tools, Inc.  
 B-B&W Electronics\*D  
 Bonkote America, Inc.  
 Bursma Electronic Dist.\*D \*  
 C&S Sales\*D  
 Chip Quik  
 Computer Component Source\*D  
 Computer Svcs of America\*D  
 Consolidated Elctrnics, Inc.\*D  
 Contact East \*D \*  
 Cooper Tools  
 CRC Components\*D  
 Cumberland Elect.\*D \*  
 Dalbani Corporation  
 Digi-Key\*D \*  
 E.I.L. Instruments, Inc.\*D  
 East Coast Transistor\*D  
 Eiger Electronics Inc.\*D \*  
 Electro Dynamics, Inc.\*D  
 Electro Tool, Inc.\*D  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Electronix Express\*D  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D  
 Elenco Electronics\*  
 Emulation Technology, Inc.  
 Excel Distributing\*D \*  
 Fixer Corp.  
 Foley-Belsaw\*D  
 Fox International LTD, INC  
 Galco Ind. Electronics\*D \*  
 GC Electronics\*D  
 Global Micro-Parts Depot\*MD  
 Harco Electronics\*D  
 Heath Company  
 Herman Panson Electronics\*D \*  
 Hexacon Electric Co.  
 HMC Electronics\*D \*  
 Hosfelt Electronics, Inc.\*D  
 Howard Electrnc Insts Inc.\*D  
 Internat'l Components Corp.\*D  
 Jameco Electrnc Components\*D  
 JDR Microdevices\*D

Jensen Tools\*D \*  
 Jim-Pak\*D  
 Joseph Electronics\*D \*  
 Kelvin Electronics\*D  
 M.A.T. Electronics\*D \*  
 MCM Electronics\*D \*  
 METCAL\*  
 Metric Supply\*D  
 Mouser Electronics\*D  
 M-Tronics\*D \*  
 Multicore Solders  
 Nationwide Electronics\*D  
 Newman Corp., M.M.\*  
 O.K. Industries, Inc.  
 Oldaker Corp.  
 Omnitron Electronics\*MD  
 P.K. Neuses\*D  
 PACE, Inc.  
 Parts Express International\*D \*  
 PDR Xytronic\*MD \*  
 Plato Products, Inc.  
 Portasol, Inc.\*  
 Premium Parts+ Electrncs Co\*D  
 Print Products International\*D  
 Products International\*D \*  
 Radio Shack\*D  
 RNJ Electronics Inc.\*D \*  
 RS Electronics\*D  
 Snap-On Incorporated  
 Specialized Prods. Co.\*D \*  
 Spirig Advanced Technologies  
 Sun Equipment Corporation\*D \*  
 Tandy National Parts\*D  
 TechAmerica\*D  
 Techni-Tool Inc.\*D \*  
 Tenma Test Equipment  
 The Eraser Company, Inc.\*  
 The Malcom Company  
 Time Motion Tools\*D  
 Tritronics, Inc.\*D  
 Tucker Electronics Co.\*D  
 Ungar, A Rubbermaid Co.  
 Union Electronics Distrib\*D \*  
 Vance Baldwin Electronics\*D \*  
 W.S. Jenks & Son\*D  
 Wahl Clipper Corporation  
 Weller/Cooper Tools\*  
 Wholesale Electronics Inc.\*D  
 Xuron Corporation\*  
 Zack Electronics\*D

**TOOL CASES**

Aven Tools, Inc.  
 B-B&W Electronics\*D  
 C&S Sales\*D  
 C.H. Ellis Company, Inc.  
 Case Design Corp.\*  
 Chicago Case Company  
 Computer Component Source\*D  
 Consolidated Elctrnics, Inc.\*D  
 Contact East \*D \*  
 Cooper Tools  
 Cumberland Elect.\*D \*  
 Dalbani Corporation  
 Dalco Electronics\*D  
 Diversified Case Co., Inc.  
 East Coast Transistor\*D  
 Electro Dynamics, Inc.\*D  
 Electro Tool, Inc.\*D  
 Electronic Parts Supply\*D  
 Electronix Express\*D  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D

Elenco Electronics\*  
 Galco Ind. Electronics\*D \*  
 Gemini Inc.  
 Global Micro-Parts Depot\*MD  
 Harco Electronics\*D  
 Herman Panson Electronics\*D \*  
 Highland Products, Inc.  
 HMC Electronics\*D \*  
 Hosfelt Electronics, Inc.\*D  
 Hy Tec Dealer Service  
 Jameco Electrnc Components\*D  
 JDR Microdevices\*D  
 Jensen Tools\*D \*  
 Jonard Industries Corp.\*  
 Joseph Electronics \*D \*  
 Kelvin Electronics\*D  
 Klein Tools, Inc.\*  
 M.A.T. Electronics\*D \*  
 MCM Electronics\*D \*  
 Medallion Case \*D \*  
 M-Tronics\*D \*  
 Omnitron Electronics\*MD  
 P.K. Neuses\*D  
 Panasonic Services Co.\*  
 Parts Express International\*D \*  
 Premium Parts+ Electrncs Co\*D  
 Print Products International\*D  
 Products International\*D \*  
 Radio Shack\*D  
 RNJ Electronics Inc.\*D \*  
 RS Electronics\*D  
 Snap-On Incorporated  
 Specialized Prods. Co.\*D \*  
 Spencer Industries  
 Sun Equipment Corporation\*D \*  
 Tandy National Parts\*D  
 Techni-Tool Inc.\*D \*  
 Time Motion Tools\*D  
 Tritronics, Inc.\*D  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D \*  
 Vance Baldwin Electronics\*D \*  
 W.S. Jenks & Son\*D  
 Weller/Cooper Tools\*  
 Wholesale Electronics Inc.\*D  
 Zack Electronics\*D  
 Zero Corp., East Div.

**TOOL KITS**

Aven Tools, Inc.  
 B-B&W Electronics\*D  
 Bi-Tronics Inc.\*D  
 Bursma Electronic Dist. \*D \*  
 C&S Sales\*D  
 Clauss Electronics Div.  
 Computer Component Source\*D  
 Computer Svcs of America\*D  
 Consolidated Elctrnics, Inc.\*D  
 Contact East \*D \*  
 Cooper Tools  
 Cumberland Elect.\*D \*  
 Dalbani Corporation  
 Dalco Electronics\*D  
 East Coast Transistor\*D  
 Electro Dynamics, Inc.\*D  
 Electro Tool, Inc.\*D  
 Electronic Parts Supply\*D  
 Electronix Express\*D  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D  
 Elenco Electronics\*  
 Fixer Corp.  
 Foley-Belsaw\*D  
 Fotec Inc

Fox International LTD, INC  
 Global Micro-Parts Depot\*MD  
 Harco Electronics\*D  
 Heath Company  
 Herman Panson Electronics\*D\*  
 HMC Electronics\*D\*  
 Hosfelt Electronics, Inc.\*D  
 Hy Tec Dealer Service  
 Jameco Electrnc Components\*D  
 JDR Microdevices\*D  
 JDV Products Inc.\*  
 Jensen Tools\*D\*  
 Jim-Pak\*D  
 JIT Resources, Inc.  
 Jonard Industries Corp.\*  
 Joseph Electronics\*D\*  
 Kelvin Electronics\*D  
 Klein Tools, Inc.\*  
 M.A.T. Electronics\*D\*  
 MCM Electronics\*D\*  
 Moody Tools, Inc.\*  
 M-Tronics\*D\*  
 Omnitron Electronics\*MD  
 P.K. Neuses\*D  
 Panasonic Services Co.\*  
 Parts Express International\*D\*  
 PC Service Source\*D  
 Platt Luggage, Inc.\*  
 Premium Parts+ Electrncs Co\*D  
 Print Products International\*D  
 Products International\*D\*  
 Radio Shack\*D  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
 Snap-On Incorporated  
 Specialized Prods. Co.\*D\*  
 Spencer Industries

Sun Equipment Corporation\*D\*  
 Tandy National Parts\*D  
 TechAmerica\*D  
 Techni-Tool Inc.\*D\*  
 The Eraser Company, Inc.\*  
 Time Motion Tools\*D  
 Trompeter Electronics  
 Tucker Electronics Co.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 W.S. Jenks & Son\*D  
 Weller/Cooper Tools\*  
 Wholesale Electronics Inc.\*D  
 Wiha Tools\*  
 Zack Electronics\*D

**TOOLS, MISCELLANEOUS**

American Hako Products\*  
 Aven Tools, Inc.  
 B-B&W Electronics\*D  
 Bi-Tronics Inc.\*D  
 Bondhus Corporation  
 Bursma Electronic Dist.\*D\*  
 C&S Sales\*D  
 Calrad Electronics\*  
 Clauss Electronics Div.  
 Computer Component Source\*D  
 Consolidated Electrncs, Inc.\*D  
 Contact East\*D\*  
 Cooper Tools  
 Cumberland Elect.\*D\*  
 Dalbani Corporation  
 Dalco Electronics\*D  
 Digi-Key \*D\*  
 East Coast Transistor\*D  
 Electro Dynamics, Inc.\*D

Electro Tool, Inc.\*D  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Electronix Express\*D  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D  
 Elenco Electronics\*  
 Foley-Belsaw\*D  
 Fox International LTD, INC  
 Galco Ind. Electronics\*D\*  
 GC Electronics\*D  
 Global Micro-Parts Depot\*MD  
 Harco Electronics\*D  
 Herman Panson Electronics\*D\*  
 HMC Electronics\*D\*  
 Hosfelt Electronics, Inc.\*D  
 Hy Tec Dealer Service  
 Jameco Electrnc Components\*D  
 JDR Microdevices\*D  
 JDV Products Inc.\*  
 Jensen Tools\*D\*  
 Jim-Pak\*D  
 Jonard Industries Corp.\*  
 Joseph Electronics \*D\*  
 Kelvin Electronics\*D  
 Klein Tools, Inc.\*  
 Liberty Wire & Cable, Inc.\*D\*  
 M.A.T. Electronics\*D\*  
 MCM Electronics\*D\*  
 Micro Care Corp.  
 Moody Tools, Inc.\*  
 Mouser Electronics\*D  
 M-Tronics\*D\*  
 Nationwide Electronics\*D  
 O.K. Industries, Inc.  
 Omnitron Electronics\*MD  
 P.K. Neuses\*D

Panasonic Services Co.\*  
 PanaVise Products\*  
 Parts Express International\*D\*  
 PDR Xytronic\*MD\*  
 Premium Parts+ Electrncs Co\*D  
 Print Products International\*D  
 Products International\*D\*  
 Radio Shack\*D  
 RF Industries\*  
 Ripley Company  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
 Sharp Electronics Corp\*  
 Smithy Co  
 Snap-On Incorporated  
 Specialized Prods. Co.\*D\*  
 Sun Equipment Corporation\*D\*  
 Tandy National Parts\*D  
 TechAmerica\*D  
 Techni-Tool Inc.\*D\*  
 The Eraser Company, Inc.\*  
 Time Motion Tools\*D  
 Tritronics, Inc.\*D  
 Tucker Electronics Co.\*D  
 Ungar, A Rubbermaid Co.  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 Virtual Industries  
 W.S. Jenks & Son\*D  
 Weller/Cooper Tools\*  
 Wholesale Electronics Inc.\*D  
 Wiha Tools\*  
 Xuron Corporation\*  
 Zack Electronics\*D

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**BUYERS' GUIDE & WEB DIRECTORY 2001**

**REPLACEMENT PARTS/ COMPONENTS DIRECTORY**

**ANTENNAS/ROTORS/  
 SATELLITE SYSTEMS**

Antenna Specialists\*  
 B-B&W Electronics\*D  
 Bursma Electronic Dist.\*D\*  
 Computer Component Source\*D  
 Cumberland Elect.\*D\*  
 Dalbani Corporation  
 East Coast Transistor\*D  
 Eiger Electronics Inc.\*D\*  
 Electro Dynamics, Inc.\*D  
 Electronic Parts Supply\*D  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D  
 Excel Distributing\*D\*  
 Fixer Corp.  
 Fox International LTD, INC  
 GC Electronics\*D  
 Joseph Electronics\*D\*  
 KVH Industries, Inc.\*  
 M.A.T. Electronics\*D\*  
 Nationwide Electronics\*D

Pacific Coast Parts\*D\*  
 Panasonic Services Co.\*  
 Parts Express International\*D\*  
**Philips Consumer Electronics\*D\***  
 Premium Parts+ Electrncs Co\*D  
 R.C. Distributing Co.\*D\*  
 Radio Shack\*D  
 Recoton Corporation  
 RNJ Electronics Inc.\*D\*  
 Sony Service Co.Parts Div  
 TechAmerica\*D  
 Tritronics, Inc.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 Wholesale Electronics Inc.\*D  
 Winegard Co.  
 Zack Electronics\*D

**AUDIO HEADS**

CRC Components\*D  
 Cumberland Elect.\*D\*  
 Dalbani Corporation

East Coast Transistor\*D  
 Eiger Electronics Inc.\*D\*  
 Electronic Parts Supply\*D  
 Electroservice Laboratories\*D  
 Excel Distributing\*D\*  
 Fox International LTD, INC  
 Herman Panson Electronics\*D\*  
 Joseph Electronics\*D\*  
 LG Electronics Service  
 M.A.T. Electronics\*D\*  
 M-Tronics\*D\*  
 Nationwide Electronics\*D  
 Pacific Coast Parts\*D\*  
 Panasonic Services Co.\*  
 Premium Parts+ Electrncs Co\*D  
 RNJ Electronics Inc.\*D\*  
 Sharp Electronics Corp\*  
 Sony Service Co.Parts Div  
 Sprague Magnetics, Inc.\*D  
 Technics  
 Tritronics, Inc.\*D  
 Union Electronics Distrib\*D\*

Vance Baldwin Electronics\*D\*  
 V-M Audio Enthusiasts\*D\*  
 Yamaha Electronics Corp, USA  
 Zack Electronics\*D

**BELTS/DRIVE WHEELS**

B-B&W Electronics\*D  
 Bursma Electronic Dist.\*D\*  
 Computer Component Source\*D  
 Compuvideo Test Instruments  
 Consolidated Electrncs, Inc.\*D  
 Cumberland Elect.\*D\*  
 Dalbani Corporation  
 East Coast Transistor\*D  
 Eiger Electronics Inc.\*D\*  
 Electro Dynamics, Inc.\*D  
 Electronic Parts Supply\*D  
 Electronica\*D\*  
**Electronix Corp.\*D**  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D

Excel Distributing\***D** \*  
 Fixer Corp.  
 Foley-Belsaw\***D**  
 Fox International LTD, INC  
 Herman Panson Electronics\***D** \*  
 Joseph Electronics \***D** \*  
 LG Electronics Service  
 M.A.T. Electronics\***D** \*  
 Mesa Systems, Inc.\***D**  
 M-Tronics\***D** \*  
 Nationwide Electronics\***D**  
 Pacific Coast Parts\***D** \*  
 Panasonic Services Co.\*  
 Parts Express International\***D** \*  
 Pfanstiehl Corp.\***D**  
 Premium Parts+ Electrncs Co\***D**  
 RNJ Electronics Inc.\***D** \*  
 Russell Industries\***D**  
 Sony Service Co.Parts Div  
 Sprague Magnetics, Inc.\***D**  
 Tandy National Parts\***D**  
 Technics  
 Tritronics, Inc.\***D**  
 Union Electronics Distrib\***D** \*  
 Vance Baldwin Electronics\***D** \*  
 V-M Audio Enthusiasts\***D** \*  
 Wholesale Electronics Inc.\***D**  
 Yamaha Electronics Corp, USA  
 Zack Electronics\***D**

**CAPACITORS**

**B&D Enterprises\***D**** \*  
 B-B&W Electronics\***D**  
 Bursma Electronic Dist.\***D** \*  
 Cascade Audio Eng.\*  
 Computer Component Source\***D**  
 Computer Svcs of America\***D**  
 Compuvideo Test Instruments  
 Consolidated Electrncs, Inc.\***D**  
 CRC Components\***D**  
 Cumberland Elect.\***D** \*  
 Curtis Mathes\***D**  
 Dalbani Corporation  
 Digi-Key\***D** \*  
 East Coast Transistor\***D**  
 Eiger Electronics Inc.\***D** \*  
 Electro Dynamics, Inc.\***D**  
 Electronic Parts Supply\***D**  
 Electronica\***D** \*  
**Electronix Corp.\***D****  
 Electronix Express\***D**  
 Electroservice Laboratories\***D**  
 Electrotex, Inc.\***D**  
 Excel Distributing\***D** \*  
 Fixer Corp.  
 Foley-Belsaw\***D**  
 Fox International LTD, INC  
 Galco Ind. Electronics\***D** \*  
 Global Micro-Parts Depot\***MD**  
 Herman Panson Electronics\***D** \*  
 Hosfelt Electronics, Inc.\***D**  
 JDR Microdevices\***D**  
 Joseph Electronics\***D** \*  
 Kelvin Electronics\***D**  
 L.J. Enterprises\***D**  
 LG Electronics Service  
 M.A.T. Electronics\***D** \*  
 Mouser Electronics\***D**  
 M-Tronics\***D** \*  
 Nationwide Electronics\***D**  
**NTE, Inc.\***D****  
 Pacific Coast Parts\***D** \*  
 Panasonic Industrial Co.

Panasonic Services Co.\*  
 Parts Express International\***D** \*  
**Philips Consumer Electronics\***D**** \*  
 Premium Parts+ Electrncs Co.\***D**  
 Q B Products\***D** \*  
 Radio Shack\***D**  
 RF Parts\***D** \*  
 RNJ Electronics Inc.\***D** \*  
 RS Electronics\***D**  
 Russell Industries\***D**  
 Sharp Electronics Corp\*  
 Sony Service Co.Parts Div  
 Tandy National Parts\***D**  
 TechAmerica\***D**  
 Technics  
 Tritronics, Inc.\***D**  
 Union Electronics Distrib\***D** \*  
 Vance Baldwin Electronics\***D** \*  
 Video Display Corporation  
 Wholesale Electronics Inc.\***D**  
 Yamaha Electronics Corp, USA  
 Zack Electronics\***D**

**CIRCUIT BREAKERS**

B-B&W Electronics\***D**  
 Bursma Electronic Dist.\***D** \*  
 Compuvideo Test Instruments  
 Cooper Bussman\*  
 Cumberland Elect.\***D** \*  
 Digi-Key\***D** \*  
 East Coast Transistor\***D**  
 Eiger Electronics Inc.\***D** \*  
 Electronic Parts Supply\***D**  
 Electroservice Laboratories\***D**  
 Electrotex, Inc.\***D**  
 Fox International LTD, INC  
 Galco Ind. Electronics\***D** \*  
 Hosfelt Electronics, Inc.\***D**  
 Joseph Electronics\***D** \*  
 LG Electronics Service  
 M.A.T. Electronics\***D** \*  
 MCM Electronics\***D** \*  
 Mouser Electronics\***D**  
**NTE, Inc.\***D****  
 Panasonic Industrial Co.  
 Parts Express International\***D** \*  
 Pfanstiehl Corp.\***D**  
 RNJ Electronics Inc.\***D** \*  
 RS Electronics\***D**  
 Schurter, Inc.  
 Sony Service Co.Parts Div  
 Technics  
 Tritronics, Inc.\***D**  
 Union Electronics Distrib\***D** \*  
 Vance Baldwin Electronics\***D** \*  
 Wholesale Electronics Inc.\***D**  
 Zack Electronics\***D**

**CONNECTORS/TERMINALS**

3M Electronic Prods Division  
 B-B&W Electronics\***D**  
 Bi-Tronics Inc.\***D**  
 Bursma Electronic Dist.\***D** \*  
 Calrad Electronics\*  
 Computer Component Source\***D**  
 Compuvideo Test Instruments  
 Consolidated Electrncs, Inc.\***D**  
 Cooper Bussman\*  
 Cumberland Elect.\***D** \*  
 Curtis Mathes\***D**  
 Dalbani Corporation  
 Digi-Key\***D** \*  
 East Coast Transistor\***D**

Eiger Electronics Inc.\***D** \*  
 Electro Dynamics, Inc.\***D**  
 Electronic Parts Supply\***D**  
**Electronix Corp.\***D****  
 Electroservice Laboratories\***D**  
 Electrotex, Inc.\***D**  
 Excel Distributing\***D** \*  
 Foley-Belsaw\***D**  
 Fox International LTD, INC  
 Galco Ind. Electronics\***D** \*  
 Hirschmann Electronics\*  
 Hosfelt Electronics, Inc.\***D**  
 Interconnect Devices, Inc.\*  
 International Components Corp.\***D**  
 JDR Microdevices\***D**  
 Joseph Electronics\***D** \*  
 Kelvin Electronics\***D**  
 Keystone Electronics Corp.\*  
 LG Electronics Service  
 Liberty Wire & Cable, Inc.\***D** \*  
 M.A.T. Electronics\***D** \*  
 Mouser Electronics\***D**  
 M-Tronics\***D** \*  
 Nationwide Electronics\***D**  
 Nelco\***D** \*  
 Netway 2000 Inc.\***D** \*  
**Neutrik USA**  
 Pacific Coast Parts\***D** \*  
 Parts Express International\***D** \*  
 Pfanstiehl Corp.\***D**  
 Radio Shack\***D**  
 RF Industries\*  
 RNJ Electronics Inc.\***D** \*  
 RS Electronics\***D**  
 Russell Industries\***D**  
 Schurter, Inc.  
 Shogyo International Corp\*  
 SMH Electronics Co., Inc.\***D** \*  
 Sony Service Co.Parts Div  
 Superior Electric\*  
 Synergetix\*  
 Tandy National Parts\***D**  
 TechAmerica\***D**  
 Technics  
 Tritronics, Inc.\***D**  
 Trompeter Electronics  
 Union Electronics Distrib\***D** \*  
 Vance Baldwin Electronics\***D** \*  
 Wholesale Electronics Inc.\***D**  
 Yamaha Electronics Corp, USA  
 Zack Electronics\***D**

**FLYBACKS**

B-B&W Electronics\***D**  
 Bursma Electronic Dist.\***D** \*  
 Computer Component Source\***D**  
 Computer Svcs of America\***D**  
 Consolidated Electrncs, Inc.\***D**  
 CRC Components\***D**  
 Cumberland Elect.\***D** \*  
 Curtis Mathes\***D**  
 Dalbani Corporation  
 East Coast Transistor\***D**  
 Eiger Electronics Inc.\***D** \*  
 Electro Dynamics, Inc.\***D**  
 Electronic Parts Supply\***D**  
 Electronica\***D** \*  
**Electronix Corp.\***D****  
 Electrotex, Inc.\***D**  
 Excel Distributing\***D** \*  
 Fixer Corp.  
 Fox International LTD, INC  
 Herman Panson Electronics\***D** \*

ICM Components\***D**  
 L.J. Enterprises\***D**  
 LG Electronics Service  
 M.A.T. Electronics\***D** \*  
 Module Exchange\*  
 M-Tronics\***D** \*  
 Nationwide Electronics\***D**  
**NTE, Inc.\***D****  
 Pacific Coast Parts\***D** \*  
 Panasonic Services Co.\*  
 Parts Port Ltd\***D**  
 Prelco Electronics\***D** \*  
 Premium Parts+ Electrncs Co\***D**  
 Richardson Electronics, Ltd.\***D**  
 RNJ Electronics Inc.\***D** \*  
 Russell Industries\***D**  
 Shogyo International Corp.\*  
 Sony Service Co.Parts Div  
 Technics  
 Tritronics, Inc.\***D**  
 Union Electronics Distrib\***D** \*  
 Vance Baldwin Electronics\***D** \*  
 Video Display Corporation  
 Vintage TV and Radio Supply\***D**  
 Wholesale Electronics Inc.\***D**  
 Zack Electronics\***D**

**FUSES**

B-B&W Electronics\***D**  
 Bursma Electronic Dist.\***D** \*  
 Computer Component Source\***D**  
 Compuvideo Test Instruments  
 Consolidated Electrncs, Inc.\***D**  
 Cooper Bussman\*  
 CRC Components\***D**  
 Cumberland Elect.\***D** \*  
 Dalbani Corporation  
 Digi-Key\***D** \*  
 East Coast Transistor\***D**  
 Eiger Electronics Inc.\***D** \*  
 Electro Dynamics, Inc.\***D**  
 Electronic Parts Supply\***D**  
 Electronica\***D** \*  
**Electronix Corp.\***D****  
 Electronix Express\***D**  
 Electroservice Laboratories\***D**  
 Electrotex, Inc.\***D**  
 Excel Distributing\***D** \*  
 Fixer Corp.  
 Foley-Belsaw\***D**  
 Fox International LTD, INC  
 Galco Ind. Electronics\***D** \*  
 GC Electronics\***D**  
 Global Micro-Parts Depot\***MD**  
 Hosfelt Electronics, Inc.\***D**  
 Internat'l Components Corp.\***D**  
 JDR Microdevices\***D**  
 Joseph Electronics \***D** \*  
 Kelvin Electronics\***D**  
 L.J. Enterprises\***D**  
 LG Electronics Service  
 M.A.T. Electronics\***D** \*  
 MCM Electronics\***D** \*  
 Mouser Electronics\***D**  
 M-Tronics\***D** \*  
 Nationwide Electronics\***D**  
 Pacific Coast Parts\***D** \*  
 Panasonic Services Co.\*  
 Parts Express International\***D** \*  
 Pfanstiehl Corp.\***D**  
 Philips ECG Company  
 Premium Parts+ Electrncs Co\***D**  
 Pre-Owned Electronics\***D** \*

Q B Products\*<sup>D</sup> \*  
 Radio Shack\*<sup>D</sup>  
 RNJ Electronics Inc.\*<sup>D</sup> \*  
 RS Electronics\*<sup>D</sup>  
 Russell Industries\*<sup>D</sup>  
 Schurter, Inc.  
 Sony Service Co.Parts Div  
 Tandy National Parts\*<sup>D</sup>  
 TechAmerica\*<sup>D</sup>  
 Technics  
 Tritronics, Inc.\*<sup>D</sup>  
 Union Electronics Distrib\*<sup>D</sup> \*  
 Vance Baldwin Electronics\*<sup>D</sup> \*  
 Video Display Corporation  
 Wholesale Electronics Inc.\*<sup>D</sup>  
 Yamaha Electronics Corp, USA  
 Zack Electronics\*<sup>D</sup>

## HARDWARE

B-B&W Electronics\*<sup>D</sup>  
 Bivar Inc  
 C. Hoelzle Associates, Inc.  
 Computer Parts Unlimited\*<sup>D</sup> \*  
 Cumberland Elect.\*<sup>D</sup> \*  
 Dalbani Corporation  
 Dalco Electronics\*<sup>D</sup>  
 Digi-Key\*<sup>D</sup> \*  
 East Coast Transistor\*<sup>D</sup>  
 Eiger Electronics Inc.\*<sup>D</sup> \*  
 Electronic Parts Supply\*<sup>D</sup>  
**Electronix Corp.\*<sup>D</sup>**  
 Electronix Express\*<sup>D</sup>  
 Electroservice Laboratories\*<sup>D</sup>  
 Electrotex, Inc.\*<sup>D</sup>  
 Excel Distributing\*<sup>D</sup> \*  
 Fox International LTD, INC  
 Galco Ind. Electronics\*<sup>D</sup> \*  
 Hosfelt Electronics, Inc.\*<sup>D</sup>  
 JDR Microdevices\*<sup>D</sup>  
 Joseph Electronics\*<sup>D</sup> \*  
 Kelvin Electronics\*<sup>D</sup>  
 Keystone Electronics Corp.\*  
 LG Electronics Service  
 M.A.T. Electronics\*<sup>D</sup> \*  
 Mesa Systems, Inc.\*<sup>D</sup>  
 Mouser Electronics\*<sup>D</sup>  
 M-Tronics\*<sup>D</sup> \*  
 Nationwide Electronics\*<sup>D</sup>  
 Netway 2000 Inc.\*<sup>D</sup> \*  
**Neutrik USA**  
 Panasonic Services Co.\*  
 Parts Express International\*<sup>D</sup> \*  
 Parts Port Ltd\*<sup>D</sup>  
 PC Service Source\*<sup>D</sup>  
**Philips Consumer Electronics\*<sup>D</sup> \***  
 Pre-Owned Electronics\*<sup>D</sup> \*  
 Radio Shack\*<sup>D</sup>  
 RNJ Electronics Inc.\*<sup>D</sup> \*  
 RS Electronics\*<sup>D</sup>  
 Russell Industries\*<sup>D</sup>  
 SMH Electronics Co., Inc.\*<sup>D</sup> \*  
 Sony Service Co.Parts Div  
 TechAmerica\*<sup>D</sup>  
 Technics  
 Tritronics, Inc.\*<sup>D</sup>  
 Union Electronics Distrib\*<sup>D</sup> \*  
 Vance Baldwin Electronics\*<sup>D</sup> \*  
 Vector Electronic Co.\*  
 V-M Audio Enthusiasts\*<sup>D</sup> \*  
 Wholesale Electronics Inc.\*<sup>D</sup>  
 Yamaha Electronics Corp, USA  
 Zack Electronics\*<sup>D</sup>

## HOLDERS/CLIPS

B-B&W Electronics\*<sup>D</sup>  
 Cooper Bussman\*  
 Cumberland Elect.\*<sup>D</sup> \*  
 Dalbani Corporation  
 Digi-Key\*<sup>D</sup> \*  
 East Coast Transistor\*<sup>D</sup>  
 Eiger Electronics Inc.\*<sup>D</sup> \*  
 Electro Dynamics, Inc.\*<sup>D</sup>  
 Electronic Parts Supply\*<sup>D</sup>  
**Electronix Corp.\*<sup>D</sup>**  
 Electronix Express\*<sup>D</sup>  
 Electroservice Laboratories\*<sup>D</sup>  
 Electrotex, Inc.\*<sup>D</sup>  
 Excel Distributing\*<sup>D</sup> \*  
 E-Z Hook  
 Fox International Ltd., Inc.  
 Galco Ind. Electronics\*<sup>D</sup> \*  
 Hosfelt Electronics, Inc.\*<sup>D</sup>  
 JDR Microdevices\*<sup>D</sup>  
 Joseph Electronics\*<sup>D</sup> \*  
 Kelvin Electronics\*<sup>D</sup>  
 Keystone Electronics Corp.\*  
 LG Electronics Service  
 M.A.T. Electronics\*<sup>D</sup> \*  
 Mesa Systems, Inc.\*<sup>D</sup>  
 Mouser Electronics\*<sup>D</sup>  
 Oldaker Corp.  
 Panasonic Services Co.\*  
**Philips Consumer Electronics\*<sup>D</sup> \***  
 Radio Shack\*<sup>D</sup>  
 RNJ Electronics Inc.\*<sup>D</sup> \*  
 RS Electronics\*<sup>D</sup>  
 Schurter, Inc.  
 Shogyo International Corp\*  
 Sony Service Co.Parts Div  
 Tandy National Parts\*<sup>D</sup>  
 TechAmerica\*<sup>D</sup>  
 Technics  
 Tritronics, Inc.\*<sup>D</sup>  
 Union Electronics Distrib\*<sup>D</sup> \*  
 Vance Baldwin Electronics\*<sup>D</sup> \*  
 Wholesale Electronics Inc.\*<sup>D</sup>  
 Yamaha Electronics Corp, USA  
 Zack Electronics\*<sup>D</sup>

## INDUCTORS

Computer Component Source\*<sup>D</sup>  
 Computer Svcs of America\*<sup>D</sup>  
 Cumberland Elect.\*<sup>D</sup> \*  
 Digi-Key\*<sup>D</sup> \*  
 Eiger Electronics Inc.\*<sup>D</sup> \*  
 Electro Dynamics, Inc.\*<sup>D</sup>  
**Electronix Corp.\*<sup>D</sup>**  
 Electronix Express\*<sup>D</sup>  
 Electroservice Laboratories\*<sup>D</sup>  
 Electrotex, Inc.\*<sup>D</sup>  
 Fox International LTD, INC  
 Hosfelt Electronics, Inc.\*<sup>D</sup>  
 Joseph Electronics \*<sup>D</sup> \*  
 LG Electronics Service  
 MCM Electronics\*<sup>D</sup> \*  
 Mouser Electronics\*<sup>D</sup>  
 Nationwide Electronics\*<sup>D</sup>  
 Panasonic Industrial Co.  
 Parts Express International\*<sup>D</sup> \*  
 Radio Shack\*<sup>D</sup>  
 RNJ Electronics Inc.\*<sup>D</sup> \*  
 RS Electronics\*<sup>D</sup>  
 Shogyo International Corp.\*  
 Sony Service Co.Parts Div  
 Tandy National Parts\*<sup>D</sup>  
 TechAmerica\*<sup>D</sup>  
 Technics

Tritronics, Inc.\*<sup>D</sup>  
 Union Electronics Distrib\*<sup>D</sup> \*  
 Vance Baldwin Electronics\*<sup>D</sup> \*  
 Yamaha Electronics Corp, USA  
 Zack Electronics\*<sup>D</sup>

## LAMPS/LEDs/INDICATORS

**B&D Enterprises\*<sup>D</sup> \***  
 B-B&W Electronics\*<sup>D</sup>  
 Bivar Inc  
 Bursma Electronic Dist.\*<sup>D</sup> \*  
 Chicago Miniature Lamp, Inc.  
 Computer Component Source\*<sup>D</sup>  
 Compuvideo Test Instruments  
 Consolidated Electrncs, Inc.\*<sup>D</sup>  
 Cumberland Elect.\*<sup>D</sup> \*  
 Dalbani Corporation  
 Dalco Electronics\*<sup>D</sup>  
 Dialight Corp.\*  
 Digi-Key \*<sup>D</sup> \*  
 East Coast Transistor\*<sup>D</sup>  
 Eiger Electronics Inc.\*<sup>D</sup> \*  
 Electro Dynamics, Inc.\*<sup>D</sup>  
 Electronic Parts Supply\*<sup>D</sup>  
**Electronix Corp.\*<sup>D</sup>**  
 Electronix Express\*<sup>D</sup>  
 Electroservice Laboratories\*<sup>D</sup>  
 Excel Distributing\*<sup>D</sup> \*  
 Foley-Belsaw\*<sup>D</sup>  
 Fox International LTD, INC  
 Galco Ind. Electronics\*<sup>D</sup> \*  
 GC Electronics\*<sup>D</sup>  
 JDR Microdevices\*<sup>D</sup>  
 Joseph Electronics\*<sup>D</sup> \*  
 Kelvin Electronics\*<sup>D</sup>  
 LG Electronics Service  
 M.A.T. Electronics\*<sup>D</sup> \*  
 MCD Electronics\*  
 MCG Surge Protection\*  
 MCM Electronics\*<sup>D</sup> \*  
 Mouser Electronics\*<sup>D</sup>  
 M-Tronics\*<sup>D</sup> \*  
**NTE, Inc.\*<sup>D</sup>**  
 Pacific Coast Parts\*<sup>D</sup> \*  
 Panasonic Industrial Co.  
 Panasonic Services Co.\*  
 Parts Express International\*<sup>D</sup> \*  
 Pfanstiehl Corp.\*<sup>D</sup>  
**Philips Consumer Electronics\*<sup>D</sup> \***  
 Premium Parts+ Electrncs Co\*<sup>D</sup>  
 Radio Shack\*<sup>D</sup>  
 RNJ Electronics Inc.\*<sup>D</sup> \*  
 Ronan Engineering\*  
 RS Electronics\*<sup>D</sup>  
 Schurter, Inc.  
 Sharp Electronics Corp\*  
 Shogyo International Corp.\*  
 Sony Service Co.Parts Div  
 Tandy National Parts\*<sup>D</sup>  
 TechAmerica\*<sup>D</sup>  
 Technics  
 Tritronics, Inc.\*<sup>D</sup>  
 Union Electronics Distrib\*<sup>D</sup> \*  
 Vance Baldwin Electronics\*<sup>D</sup> \*  
 Waldmann Lighting Company\*  
 Wholesale Electronics Inc.\*<sup>D</sup>  
 Yamaha Electronics Corp, USA  
 Zack Electronics\*<sup>D</sup>

## MAGNETRONS

B-B&W Electronics\*<sup>D</sup>  
 Computer Component Source\*<sup>D</sup>  
 Consolidated Electrncs, Inc.\*<sup>D</sup>  
 Dalbani Corporation

Eiger Electronics Inc.\*<sup>D</sup> \*  
 Electro Dynamics, Inc.\*<sup>D</sup>  
 Electronic Parts Supply\*<sup>D</sup>  
**Electronix Corp.\*<sup>D</sup>**  
 Electroservice Laboratories\*<sup>D</sup>  
 Fox International LTD, INC  
 Global Micro-Parts Depot\*<sup>D</sup> MD  
 Internat'l Components Corp.\*<sup>D</sup>  
 Joseph Electronics\*<sup>D</sup> \*  
 LG Electronics Service  
 M.A.T. Electronics\*<sup>D</sup> \*  
 MCM Electronics\*<sup>D</sup> \*  
 M-Tronics\*<sup>D</sup> \*  
 Nationwide Electronics\*<sup>D</sup>  
 Pacific Coast Parts\*<sup>D</sup> \*  
 Panasonic Services Co.\*  
 Prelco Electronics\*<sup>D</sup> \*  
 Premium Parts+ Electrncs Co\*<sup>D</sup>  
 Q B Products\*<sup>D</sup> \*  
 Richardson Electronics, Ltd.\*<sup>D</sup>  
 RNJ Electronics Inc.\*<sup>D</sup> \*  
 Sharp Electronics Corp\*  
 Tritronics, Inc.\*<sup>D</sup>  
 Union Electronics Distrib\*<sup>D</sup> \*  
 Vance Baldwin Electronics\*<sup>D</sup> \*  
 Zack Electronics\*<sup>D</sup>

## MODULES

**B&D Enterprises\*<sup>D</sup> \***  
 Bursma Electronic Dist.\*<sup>D</sup> \*  
 Computer Component Source\*<sup>D</sup>  
 Dalbani Corporation  
 East Coast Transistor\*<sup>D</sup>  
 Eiger Electronics Inc.\*<sup>D</sup> \*  
 Electronic Parts Supply\*<sup>D</sup>  
**Electronix Corp.\*<sup>D</sup>**  
 Electroservice Laboratories\*<sup>D</sup>  
 Electrotex, Inc.\*<sup>D</sup>  
 Excel Distributing\*<sup>D</sup> \*  
 Fixer Corp.  
 Fox International LTD, INC  
 JDR Microdevices\*<sup>D</sup>  
 Joseph Electronics \*<sup>D</sup> \*  
 LG Electronics Service  
 M.A.T. Electronics\*<sup>D</sup> \*  
 Module Exchange\*  
 M-Tronics\*<sup>D</sup> \*  
 Nationwide Electronics\*<sup>D</sup>  
 Pacific Coast Parts\*<sup>D</sup> \*  
 Panasonic Services Co.\*  
 Peripheral Parts Support\*<sup>D</sup>  
**Philips Consumer Electronics\*<sup>D</sup> \***  
 Premium Parts+ Electrncs Co\*<sup>D</sup>  
 RF Industries\*  
 RNJ Electronics Inc.\*<sup>D</sup> \*  
 Schurter, Inc.  
 Tritronics, Inc.\*<sup>D</sup>  
 Union Electronics Distrib\*<sup>D</sup> \*  
 Vance Baldwin Electronics\*<sup>D</sup> \*  
 Zack Electronics\*<sup>D</sup>

## MOTORS

Computer Component Source\*<sup>D</sup>  
 Computer Svcs of America\*<sup>D</sup>  
 Dalbani Corporation  
 Digi-Key\*<sup>D</sup> \*  
 East Coast Transistor\*<sup>D</sup>  
 Eiger Electronics Inc.\*<sup>D</sup> \*  
 Electro Dynamics, Inc.\*<sup>D</sup>  
 Electronic Parts Supply\*<sup>D</sup>  
**Electronix Corp.\*<sup>D</sup>**  
 Electroservice Laboratories\*<sup>D</sup>  
 Electrotex, Inc.\*<sup>D</sup>

Fixer Corp.  
 Fox International LTD, INC  
 Galco Ind. Electronics\***D** \*  
 Global Micro-Parts Depot\***MD**  
 Hosfelt Electronics, Inc.\***D**  
 JDR Microdevices\***D**  
 Joseph Electronics \***D** \*  
 Kelvin Electronics\***D**  
 LG Electronics Service  
 M.A.T. Electronics\***D** \*  
 M-Tronics\***D** \*  
 Nationwide Electronics\***D**  
 Pacific Coast Parts\***D** \*  
 Panasonic Industrial Co.  
 Panasonic Services Co.\*  
 Parts Express International\***D** \*  
 Peripheral Parts Support\***D**  
 Premium Parts+ Electrncs Co\***D**  
 Radio Shack\***D**  
 RNJ Electronics Inc.\***D** \*  
 RS Electronics\***D**  
 Russell Industries\***D**  
 Sharp Electronics Corp\*  
 Sony Service Co.Parts Div  
 Sprague Magnetics, Inc.\***D**  
 Technics  
 Tritronics, Inc.\***D**  
 Union Electronics Distrib\***D** \*  
 Vance Baldwin Electronics\***D** \*  
 V-M Audio Enthusiasts\***D** \*  
 Yamaha Electronics Corp, USA  
 Zack Electronics\***D**

**PHONO CARTRIDGES/STYLI**

B-B&W Electronics\***D**  
 Bursma Electronic Dist.\***D** \*  
 Consolidated Electrncs, Inc.\***D**  
 Cumberland Elect.\***D** \*  
 Dalbani Corporation  
 East Coast Transistor\***D**  
 Eiger Electronics Inc.\***D** \*  
 Electro Dynamics, Inc.\***D**  
 Electronic Parts Supply\***D**  
 Electroservice Laboratories\***D**  
 Electrotex, Inc.\***D**  
 Excel Distributing\***D** \*  
 Flat Earth Audio [ATC-Mana-Sme]\***D** \*  
 LG Electronics Service  
 M.A.T. Electronics\***D** \*  
 M-Tronics\***D** \*  
 Nationwide Electronics\***D**  
 Pacific Coast Parts\***D** \*  
 Panasonic Services Co.\*  
 Parts Express International\***D** \*  
 Pfanstiehl Corp.\***D**  
 RNJ Electronics Inc.\***D** \*  
 Russell Industries\***D**  
 Sony Service Co.Parts Div  
 Tritronics, Inc.\***D**  
 Union Electronics Distrib\***D** \*  
 Vance Baldwin Electronics\***D** \*  
 V-M Audio Enthusiasts\***D** \*  
 Wholesale Electronics Inc.\***D**  
 Zack Electronics\***D**

**PICTURE TUBES/CRTs**

B-B&W Electronics\***D**  
 Bursma Electronic Dist. \***D** \*  
 Computer Svcs of America\***D**  
 Compuvideo Test Instruments  
 Cumberland Elect.\***D** \*  
 Curtis Mathes\***D**  
 Dandy Mfg. \*

Eiger Electronics Inc.\***D** \*  
 Electronic Parts Supply\***D**  
 Electroservice Laboratories\***D**  
 Electrotex, Inc.\***D**  
 Elite Video\***D** \*  
 Excel Distributing\***D** \*  
 Fox International LTD, Inc.  
 Herman Panson Electronics\***D** \*  
 Joseph Electronics\***D** \*  
 LG Electronics Service  
 M.A.T. Electronics\***D** \*  
 M-Tronics\***D** \*  
 Nationwide Electronics\***D**  
 Pacific Coast Parts\***D** \*  
 Panasonic Industrial Co.  
 Panasonic Services Co.\*  
**Philips Consumer Electronics\***D** \***  
 Richardson Electronics, Ltd.\***D**  
 RNJ Electronics Inc.\***D** \*  
 Sharp Electronics Corp\*  
 Sony Service Co.Parts Div  
 Technics  
 Tritronics, Inc.\***D**  
 Tucker Electronics Co.\***D**  
 Union Electronics Distrib\***D** \*  
 Vance Baldwin Electronics\***D** \*  
 Video Display Corporation  
 Wholesale Electronics Inc.\***D**  
 Zack Electronics\***D**

**POTENTIOMETERS**

B-B&W Electronics\***D**  
 Bursma Electronic Dist.\***D** \*  
 Calrad Electronics\*  
 Computer Component Source\***D**  
 Consolidated Electrncs, Inc.\***D**  
 CRC Components\***D**  
 Cumberland Elect.\***D** \*  
 Dalbani Corporation  
 Digi-Key\***D** \*  
 East Coast Transistor\***D**  
 Electro Dynamics, Inc.\***D**  
 Electro Parts Supply\***D**  
**Electronix Corp.\***D****  
 Electronix Express\***D**  
 Electrotex, Inc.\***D**  
 Fox International LTD, INC  
 Galco Ind. Electronics\***D** \*  
 JDR Microdevices\***D**  
 Joseph Electronics\***D** \*  
 Kelvin Electronics\***D**  
 LG Electronics Service  
 M.A.T. Electronics\***D** \*  
 MCM Electronics\***D** \*  
 Mouser Electronics\***D**  
 M-Tronics\***D** \*  
 Nationwide Electronics\***D**  
 Pacific Coast Parts\***D** \*  
 Panasonic Industrial Co.  
 Panasonic Services Co.\*  
 Parts Express International\***D** \*  
 Radio Shack\***D**  
 RNJ Electronics Inc.\***D** \*  
 RS Electronics\***D**  
 Sharp Electronics Corp\*  
 Shogyo International Corp.\*  
 Tandy National Parts\***D**  
 TechAmerica\***D**  
 Technics  
 Tritronics, Inc.\***D**  
 Union Electronics Distrib\***D** \*  
 Vance Baldwin Electronics\***D** \*  
 Wholesale Electronics Inc.\***D**  
 Yamaha Electronics Corp, USA

Zack Electronics\***D**

**RECTIFIERS**

**B&D Enterprises\***D** \***  
 B-B&W Electronics\***D**  
 Bursma Electronic Dist. \***D** \*  
 Computer Component Source\***D**  
 Consolidated Electrncs, Inc.\***D**  
 Cumberland Elect.\***D** \*  
 Curtis Mathes\***D**  
 Dalbani Corporation  
 Data Business Publishing  
 Digi-Key\***D** \*  
 East Coast Transistor\***D**  
 Electro Dynamics, Inc.\***D**  
 Electronic Parts Supply\***D**  
**Electronix Corp.\***D****  
 Electronix Express\***D**  
 Electroservice Laboratories\***D**  
 Electrotex, Inc.\***D**  
 Excel Distributing\***D** \*  
 Fixer Corp.  
 Fox International LTD, INC  
 Galco Ind. Electronics\***D** \*  
 Global Micro-Parts Depot\***MD**  
 JDR Microdevices\***D**  
 Joseph Electronics\***D** \*  
 Kelvin Electronics\***D**  
 L.J. Enterprises\***D**  
 LG Electronics Service  
 M.A.T. Electronics\***D** \*  
 MCM Electronics\***D** \*  
 Mouser Electronics\***D**  
 M-Tronics\***D** \*  
 Nationwide Electronics\***D**  
**NTE, Inc.\***D****  
 Pacific Coast Parts\***D** \*  
 Panasonic Services Co.\*  
 Parts Express International\***D** \*  
**Philips Consumer Electronics\***D** \***  
 Prelco Electronics\***D** \*  
 Q B Products\***D** \*  
 Radio Shack\***D**  
 RNJ Electronics Inc.\***D** \*  
 RS Electronics\***D**  
 Russell Industries\***D**  
 Sharp Electronics Corp\*  
 Tandy National Parts\***D**  
 TechAmerica\***D**  
 Technics  
 Tritronics, Inc.\***D**  
 Union Electronics Distrib\***D** \*  
 Vance Baldwin Electronics\***D** \*  
 Wholesale Electronics Inc.\***D**  
 Yamaha Electronics Corp, USA  
 Zack Electronics\***D**

**RELAYS**

B-B&W Electronics\***D**  
 Bursma Electronic Dist. \***D** \*  
 Calrad Electronics\*  
 Computer Component Source\***D**  
 Computer Svcs of America\***D**  
 Compuvideo Test Instruments  
 Consolidated Electrncs, Inc.\***D**  
 Cumberland Elect.\***D** \*  
 Digi-Key \***D** \*  
 East Coast Transistor\***D**  
 Electro Dynamics, Inc.\***D**  
 Electronic Parts Supply\***D**  
**Electronix Corp.\***D****  
 Electronix Express\***D**  
 Electroservice Laboratories\***D**  
 Electrotex, Inc.\***D**

Excel Distributing\***D** \*  
 Fixer Corp.  
 Fox International LTD, INC  
 Galco Ind. Electronics\***D** \*  
 Global Micro-Parts Depot\***MD**  
 Hosfelt Electronics, Inc.\***D**  
 JDR Microdevices\***D**  
 Joseph Electronics\***D** \*  
 Kelvin Electronics\***D**  
 LG Electronics Service  
 M.A.T. Electronics\***D** \*  
 MCM Electronics\***D** \*  
 Mouser Electronics\***D**  
 M-Tronics\***D** \*  
 Nationwide Electronics\***D**  
**NTE, Inc.\***D****  
 Pacific Coast Parts\***D** \*  
 Parts Express International\***D** \*  
 Phoenix Contact\*  
 Prelco Electronics\***D** \*  
 Prime Technology, Inc.  
 Radio Shack\***D**  
 RNJ Electronics Inc.\***D** \*  
 RS Electronics\***D**  
 Sharp Electronics Corp\*  
 Sony Service Co.Parts Div  
 Tandy National Parts\***D**  
 TechAmerica\***D**  
 Technics  
 Tritronics, Inc.\***D**  
 Union Electronics Distrib\***D** \*  
 Vance Baldwin Electronics\***D** \*  
 Wholesale Electronics Inc.\***D**  
 Yamaha Electronics Corp, USA  
 Zack Electronics\***D**

**RESISTORS**

B-B&W Electronics\***D**  
 Bursma Electronic Dist. \***D** \*  
 Bursma Electronic Dist. \***D** \*  
 Computer Component Source\***D**  
 Compuvideo Test Instruments  
 Consolidated Electrncs, Inc.\***D**  
 Cumberland Elect.\***D** \*  
 Curtis Mathes\***D**  
 Dalbani Corporation  
 Data Business Publishing  
 Digi-Key\***D** \*  
 East Coast Transistor\***D**  
 Electro Dynamics, Inc.\***D**  
 Electronic Parts Supply\***D**  
**Electronix Corp.\***D****  
 Electronix Express\***D**  
 Electroservice Laboratories\***D**  
 Electrotex, Inc.\***D**  
 Excel Distributing\***D** \*  
 Fixer Corp.  
 Fox International LTD, INC  
 Galco Ind. Electronics\***D** \*  
 Global Micro-Parts Depot\***MD**  
 Herman Panson Electronics\***D** \*  
 Hosfelt Electronics, Inc.\***D**  
 JDR Microdevices\***D**  
 Joseph Electronics\***D** \*  
 Kelvin Electronics\***D**  
 L.J. Enterprises\***D**  
 LG Electronics Service  
 M.A.T. Electronics\***D** \*  
 MCM Electronics\***D** \*  
 Mouser Electronics\***D**  
 M-Tronics\***D** \*  
 Nationwide Electronics\***D**  
 NEC Technologies Inc.\***D**



**NTE, Inc.\*D**

Pacific Coast Parts\*D\*  
 Panasonic Industrial Co.  
 Panasonic Services Co.\*  
 Parts Express International\*D\*  
**Philips Consumer Electronics\*D\***  
 Premium Parts+ Electrncs Co\*D  
 Prime Technology, Inc.  
 Radio Shack\*D  
 RF Industries\*  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
 Russell Industries\*D  
 Sharp Electronics Corp\*  
 Sony Service Co.Parts Div  
 Tandy National Parts\*D  
 TechAmerica\*D  
 Technics  
 Tritronics, Inc.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D  
 Video Display Corporation  
 Wholesale Electronics Inc.\*D  
 Yamaha Electronics Corp, USA  
 Zack Electronics\*D

**SCs: DIODES**

**B&D Enterprises\*D\***  
 B-B&W Electronics\*D  
 Bursma Electronic Dist.\*D\*  
 Computer Component Source\*D  
 Compuvideo Test Instruments  
 Consolidated Electrncs, Inc.\*D  
 Cumberland Elect.\*D\*  
 Curtis Mathes\*D  
 Dalbani Corporation  
 Data Business Publishing  
 Digi-Key\*D\*  
 East Coast Transistor\*D  
 Electro Dynamics, Inc.\*D  
 Electronic Parts Supply\*D  
 Electronica\*D\*

**Electronix Corp.\*D**  
 Electronix Express\*D  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D  
 Excel Distributing\*D\*  
 Fixer Corp.  
 Foley-Belsaw\*D  
 Fox International Ltd., Inc.  
 Galco Ind. Electronics\*D\*  
 Global Micro-Parts Depot\*MD  
 Herman Panson Electronics\*D\*  
 Hosfelt Electronics, Inc.\*D  
 JDR Microdevices\*D  
 Joseph Electronics\*D\*  
 Kelvin Electronics\*D  
 LG Electronics Service  
 Linear Integrated Systems  
 M.A.T. Electronics\*D\*  
 MCM Electronics\*D\*  
 Mouser Electronics\*D  
 M-Tronics\*D\*  
 Nationwide Electronics\*D  
 NEC Technologies Inc.\*D

**NTE, Inc.\*D**  
 Pacific Coast Parts\*D\*  
 Panasonic Services Co.\*  
 Parts Express International\*D\*  
**Philips Consumer Electronics\*D\***

Preloco Electronics\*D\*  
 Premium Parts+ Electrncs Co\*D  
 Radio Shack\*D

RF Parts\*D\*  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
 Sony Service Co.Parts Div  
 Tandy National Parts\*D  
 TechAmerica\*D  
 Technics  
 Tritronics, Inc.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D  
 Wholesale Electronics Inc.\*D  
 Yamaha Electronics Corp, USA  
 Zack Electronics\*D

**SCs: ICs**

**B&D Enterprises\*D\***  
 B-B&W Electronics\*D  
 Bursma Electronic Dist.\*D\*  
 Computer Component Source\*D  
 Compuvideo Test Instruments  
 Consolidated Electrncs, Inc.\*D  
 CRC Components\*D  
 Cumberland Elect.\*D\*  
 Curtis Mathes\*D  
 Dalbani Corporation  
 Data Business Publishing  
 Digi-Key\*D\*  
 East Coast Transistor\*D  
 Electro Dynamics, Inc.\*D  
 Electronic Parts Supply\*D  
 Electronica\*D\*

**Electronix Corp.\*D**  
 Electronix Express\*D  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D  
 Excel Distributing\*D\*  
 Fixer Corp.  
 Foley-Belsaw\*D  
 Fox International LTD, INC  
 Galco Ind. Electronics\*D\*  
 Herman Panson Electronics\*D\*  
 Hosfelt Electronics, Inc.\*D  
 JDR Microdevices\*D  
 Joseph Electronics\*D\*  
 Kelvin Electronics\*D  
 L.J. Enterprises\*D  
 LG Electronics Service  
 M.A.T. Electronics\*D\*  
 MCM Electronics\*D\*  
 Mouser Electronics\*D  
 M-Tronics\*D\*  
 Nationwide Electronics\*D  
 NCM Electronics  
 NEC Technologies Inc.\*D  
 Netway 2000 Inc.\*D\*

**NTE, Inc.\*D**  
 Pacific Coast Parts\*D\*  
 Panasonic Industrial Co.  
 Panasonic Services Co.\*  
 Parts Express International\*D\*  
**Philips Consumer Electronics\*D\***

Preloco Electronics\*D\*  
 Premium Parts+ Electrncs Co\*D  
 Radio Shack\*D  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
 Sharp Electronics Corp\*  
 Sony Service Co.Parts Div  
 Tandy National Parts\*D  
 TechAmerica\*D  
 Technics  
 Tritronics, Inc.\*D  
 Union Electronics Distrib\*D\*

Vance Baldwin Electronics\*D\*  
 Wholesale Electronics Inc.\*D  
 Yamaha Electronics Corp, USA  
 Zack Electronics\*D

**SCs: SCRs/TRIACS**

**B&D Enterprises\*D\***  
 B-B&W Electronics\*D  
 Bursma Electronic Dist.\*D\*  
 Computer Component Source\*D  
 Consolidated Electrncs, Inc.\*D  
 Cumberland Elect.\*D\*  
 Dalbani Corporation  
 Digi-Key\*D\*  
 East Coast Transistor\*D  
 Eiger Electronics Inc.\*D\*  
 Electro Dynamics, Inc.\*D  
 Electronic Parts Supply\*D  
 Electronica\*D\*

**Electronix Corp.\*D**  
 Electronix Express\*D  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D  
 Excel Distributing\*D\*  
 Fixer Corp.  
 Fox International LTD, INC  
 Galco Ind. Electronics\*D\*  
 Global Micro-Parts Depot\*MD  
 Herman Panson Electronics\*D\*  
 Hosfelt Electronics, Inc.\*D  
 JDR Microdevices\*D  
 Joseph Electronics\*D\*  
 Kelvin Electronics\*D  
 LG Electronics Service  
 M.A.T. Electronics\*D\*  
 MCM Electronics\*D\*  
 Mouser Electronics\*D  
 M-Tronics\*D\*  
 Nationwide Electronics\*D  
 NEC Technologies Inc.\*D

**NTE, Inc.\*D**  
 Pacific Coast Parts\*D\*  
 Panasonic Services Co.\*  
 Parts Express International\*D\*  
**Philips Consumer Electronics\*D\***

Preloco Electronics\*D\*  
 Richardson Electronics, Ltd.\*D  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
 Sony Service Co.Parts Div  
 Tandy National Parts\*D  
 TechAmerica\*D  
 Technics  
 Tritronics, Inc.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 Wholesale Electronics Inc.\*D  
 Yamaha Electronics Corp, USA  
 Zack Electronics\*D

**SCs: TRANSISTORS**

**B&D Enterprises\*D\***  
 B-B&W Electronics\*D  
 Bursma Electronic Dist.\*D\*  
 Computer Component Source\*D  
 Computer Svcs of America\*D  
 Compuvideo Test Instruments  
 Consolidated Electrncs, Inc.\*D  
 CRC Components\*D  
 Cumberland Elect.\*D\*  
 Curtis Mathes\*D  
 Dalbani Corporation  
 Data Business Publishing

East Coast Transistor\*D  
 Eiger Electronics Inc.\*D\*  
 Electro Dynamics, Inc.\*D  
 Electronic Parts Supply\*D  
 Electronica\*D\*

**Electronix Corp.\*D**  
 Electronix Express\*D  
 Electroservice Laboratories\*D  
 Electrotex, Inc.\*D  
 Excel Distributing\*D\*  
 Fixer Corp.  
 Foley-Belsaw\*D  
 Fox International Ltd., Inc.  
 Galco Ind. Electronics\*D\*  
 Herman Panson Electronics\*D\*  
 Hosfelt Electronics, Inc.\*D  
 JDR Microdevices\*D  
 Joseph Electronics\*D\*  
 Kelvin Electronics\*D  
 L.J. Enterprises\*D  
 LG Electronics Service  
 Linear Integrated Systems  
 M.A.T. Electronics\*D\*  
 MCM Electronics\*D\*  
 Mouser Electronics\*D  
 M-Tronics\*D\*  
 Nationwide Electronics\*D  
 NEC Technologies Inc.\*D

**NTE, Inc.\*D**  
 Pacific Coast Parts\*D\*  
 Panasonic Services Co.\*  
 Parts Express International\*D\*  
**Philips Consumer Electronics\*D\***  
 Preloco Electronics\*D\*  
 Premium Parts+ Electrncs Co\*D  
 Radio Shack\*D  
 RF Parts\*D\*  
 RNJ Electronics Inc.\*D\*  
 RS Electronics\*D  
 Sharp Electronics Corp\*  
 Sony Service Co.Parts Div  
 Tandy National Parts\*D  
 TechAmerica\*D  
 Technics  
 Tritronics, Inc.\*D  
 Union Electronics Distrib\*D\*  
 Vance Baldwin Electronics\*D\*  
 Wholesale Electronics Inc.\*D  
 Yamaha Electronics Corp, USA  
 Zack Electronics\*D

**SOCKETS**

3M Electrnc Hndlg & Prot Div  
 B-B&W Electronics\*D  
 Bursma Electronic Dist.\*D\*  
 Computer Component Source\*D  
 Cumberland Elect.\*D\*  
 Dalbani Corporation  
 Dalco Electronics\*D  
 Digi-Key\*D\*  
 East Coast Transistor\*D  
 Eiger Electronics Inc.\*D\*  
 Electro Dynamics, Inc.\*D  
 Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
 Electronix Express\*D  
 Electrotex, Inc.\*D  
 Emulation Technology, Inc.  
 Fox International LTD, INC  
 Galco Ind. Electronics\*D\*  
 Hosfelt Electronics, Inc.\*D  
 JDR Microdevices\*D  
 Joseph Electronics\*D\*  
 Kelvin Electronics\*D

LG Electronics Service  
 M.A.T. Electronics\***D** \*  
 Mouser Electronics\***D**  
 Nationwide Electronics\***D**  
**NTE, Inc.\***D****  
 Pacific Coast Parts\***D** \*  
 Parts Express International\***D** \*  
 Radio Shack\***D**  
 RNJ Electronics Inc.\***D** \*  
 RS Electronics\***D**  
 Schurter, Inc.  
 Sharp Electronics Corp\*  
 Shogyo International Corp.\*  
 Snap-On Incorporated  
 Synergetix\*  
 TechAmerica\***D**  
 Technics  
 Tritronics, Inc.\***D**  
 Union Electronics Distrib\***D** \*  
 Vance Baldwin Electronics\***D** \*  
 Wholesale Electronics Inc.\***D**  
 Yamaha Electronics Corp, USA  
 Zack Electronics\***D**

**SPEAKERS**

B-B&W Electronics\***D**  
 Cinda Acoustic  
 Computer Component Source\***D**  
 Consolidated Elctnrns, Inc.\***D**  
 Cumberland Elect.\***D** \*  
 Curtis Mathes\***D**  
 Dalbani Corporation  
 Dalco Electronics\***D**  
 East Coast Transistor\***D**  
 Electro Dynamics, Inc.\***D**  
 Electronic Parts Supply\***D**  
 Electronix Express\***D**  
 Electroservice Laboratories\***D**  
 Flat Earth Audio [ATC-Mana-Sme]\***D** \*  
 GC Electronics\***D**  
 Hosfelt Electronics, Inc.\***D**  
 Induction Dynamics\*  
 Internat'l Components Corp.\***D**  
 JDR Microdevices\***D**  
 Kelvin Electronics\***D**  
 LG Electronics Service  
 M.A.T. Electronics\***D** \*  
 Mouser Electronics\***D**  
 M-Tronics\***D** \*  
 Nationwide Electronics\***D**  
 Panasonic Industrial Co.  
 Parts Express International\***D** \*  
 Pfanstiehl Corp.\***D**  
**Philips Consumer Electronics\***D** \***  
 Premium Parts+ Electrncs Co\***D**  
 Recoton Corporation  
 Sony Service Co.Parts Div  
 Tandy National Parts\***D**  
 TechAmerica\***D**  
 Tritronics, Inc.\***D**  
 Wholesale Electronics Inc.\***D**  
 Yamaha Electronics Corp, USA  
 Zack Electronics\***D**  
 Zenith Sales Co.

**SWITCHES**

B-B&W Electronics\***D**  
 Bursma Electronic Dist. \***D** \*  
 Calrad Electronics\*  
 Computer Component Source\***D** \*  
 Compuvideo Test Instruments

Consolidated Elctnrns, Inc.\***D**  
 Cumberland Elect.\***D** \*  
 Dalbani Corporation  
 Dalco Electronics\***D**  
 East Coast Transistor\***D**  
 Eiger Electronics Inc.\***D** \*  
 Electro Dynamics, Inc.\***D**  
 Electro-Mech Components\*  
 Electronic Parts Supply\***D**  
**Electronix Corp. \***D****  
 Electronix Express\***D**  
 Electroservice Laboratories\***D**  
 Electrotex, Inc.\***D**  
 Excel Distributing\***D** \*  
 Fox International LTD, INC  
 Galco Ind. Electronics\***D** \*  
 GC Electronics\***D**  
 Global Micro-Parts Depot\***D**  
 Hosfelt Electronics, Inc.\***D**  
 JDR Microdevices\***D**  
 Joseph Electronics\***D** \*  
 Kelvin Electronics\***D**  
 LG Electronics Service  
 Lightolier Controls  
 M.A.T. Electronics\***D** \*  
 MCM Electronics\***D** \*  
 Mouser Electronics\***D**  
 M-Tronics\***D** \*  
 Nationwide Electronics\***D**  
 Pacific Coast Parts\***D** \*  
 Panasonic Industrial Co.  
 Panasonic Services Co.\*  
 Parts Express International\***D** \*  
 Parts Port Ltd\***D**  
 Pfanstiehl Corp.\***D**  
 Premium Parts+ Electrncs Co\***D**  
 Q B Products\***D** \*  
 Recoton Corporation  
 RNJ Electronics Inc.\***D** \*  
 RS Electronics\***D**  
 Schurter, Inc.  
 Sharp Electronics Corp\*  
 Shogyo International Corp.\*  
 Tandy National Parts\***D**  
 TechAmerica\***D**  
 Tritronics, Inc.\***D**  
 Union Electronics Distrib\***D** \*  
 Vance Baldwin Electronics\***D** \*  
 Wholesale Electronics Inc.\***D**  
 Yamaha Electronics Corp, USA  
 Zack Electronics\***D**

**TRANSFORMERS**

B-B&W Electronics\***D**  
 Bi-Tronics Inc.\***D**  
 Bursma Electronic Dist. \***D** \*  
 Calrad Electronics\*  
 Computer Component Source\***D**  
 Compuvideo Test Instruments  
 Consolidated Elctnrns, Inc.\***D**  
 Cumberland Elect.\***D** \*  
 Dalbani Corporation  
 East Coast Transistor\***D**  
 Eiger Electronics Inc.\***D** \*  
 Electro Dynamics, Inc.\***D**  
 Electronic Parts Supply\***D**  
**Electronix Corp. \***D****  
 Electronix Express\***D**  
 Electroservice Laboratories\***D**  
 Electrotex, Inc.\***D**  
 Excel Distributing\***D** \*

Galco Ind. Electronics\***D** \*  
 Global Micro-Parts Depot\***D**  
 Hosfelt Electronics, Inc.\***D**  
 JDR Microdevices\***D**  
 Joseph Electronics \***D** \*  
 Kelvin Electronics\***D**  
 L.J. Enterprises\***D**  
 LG Electronics Service  
 M.A.T. Electronics\***D** \*  
 MCM Electronics\***D** \*  
 Mouser Electronics\***D**  
 M-Tronics\***D** \*  
 Nationwide Electronics\***D**  
**Neutrik USA**  
 Pacific Coast Parts\***D** \*  
 Panasonic Services Co.\*  
 Parts Express International\***D** \*  
 Premium Parts+ Electrncs Co\***D**  
 Radio Shack\***D**  
 Recoton Corporation  
 RNJ Electronics Inc.\***D** \*  
 RS Electronics\***D**  
 Sharp Electronics Corp\*  
 Shogyo International Corp.\*  
 Sony Service Co.Parts Div  
 Tandy National Parts\***D**  
 TechAmerica\***D**  
 Technics  
 Thordarson-Meissner  
 Tritronics, Inc.\***D**  
 Union Electronics Distrib\***D** \*  
 Vance Baldwin Electronics\***D** \*  
 Wholesale Electronics Inc.\***D**  
 Yamaha Electronics Corp, USA  
 Zack Electronics\***D**

**VACUUM TUBES**

B-B&W Electronics\***D**  
 Bursma Electronic Dist. \***D** \*  
 Consolidated Elctnrns, Inc.\***D**  
 Cumberland Elect.\***D** \*  
 Curtis Mathes\***D**  
 Eiger Electronics Inc.\***D** \*  
 Electronic Parts Supply\***D**  
 Excel Distributing\***D** \*  
 Fox International LTD, INC  
 Galco Ind. Electronics\***D** \*  
 Internat'l Components Corp.\***D**  
 Kelvin Electronics\***D**  
 Panasonic Services Co.\*  
 Parts Express International\***D** \*  
 RF Parts \***D** \*  
 Richardson Electronics, Ltd.\***D**  
 RNJ Electronics Inc.\***D** \*  
 RS Electronics\***D**  
 Sprague Magnetics, Inc.\***D**  
 Tritronics, Inc.\***D**  
 Tucker Electronics Co.\***D**  
 Union Electronics Distrib\***D** \*  
 Vance Baldwin Electronics\***D** \*  
 Video Display Corporation  
 Vintage TV and Radio Supply\***D**  
 Zack Electronics\***D**

**VIDEO HEADS**

B-B&W Electronics\***D**  
 Bursma Electronic Dist. \***D** \*  
 Computer Component Source\***D**  
 Consolidated Elctnrns, Inc.\***D**  
 CRC Components\***D**

Cumberland Elect.\***D** \*  
 Curtis Mathes\***D**  
 Dalbani Corporation  
 East Coast Transistor\***D**  
 Eiger Electronics Inc.\***D** \*  
 Electro Dynamics, Inc.\***D**  
 Electronic Parts Supply\***D**  
**Electronix Corp.\***D****  
 Electroservice Laboratories\***D**  
 Excel Distributing\***D** \*  
 Fixer Corp.  
 Foley-Belsaw\***D**  
 Fox International LTD, INC  
 Herman Panson Electronics\***D** \*  
 Joseph Electronics\***D** \*  
 LG Electronics Service  
 M.A.T. Electronics\***D** \*  
 MCM Electronics\***D** \*  
 M-Tronics\***D** \*  
 Nationwide Electronics\***D**  
 Pacific Coast Parts\***D** \*  
 Panasonic Services Co.\*  
 Pfanstiehl Corp.\***D**  
 Premium Parts+ Electrncs Co\***D**  
 RNJ Electronics Inc.\***D** \*  
 Sharp Electronics Corp\*  
 SMH Electronics Co., Inc.\***D** \*  
 Sony Service Co.Parts Div  
 Sprague Magnetics, Inc.\***D**  
 Technics  
 Tritronics, Inc.\***D**  
 Union Electronics Distrib\***D** \*  
 Vance Baldwin Electronics\***D** \*  
 Wholesale Electronics Inc.\***D**  
 Zack Electronics\***D**

**YOKES**

B-B&W Electronics\***D**  
 Bursma Electronic Dist. \***D** \*  
 Computer Component Source\***D**  
 CRC Components\***D**  
 Curtis Mathes\***D**  
 Dalbani Corporation  
 Eiger Electronics Inc.\***D** \*  
 Electronic Parts Supply\***D**  
**Electronix Corp. \***D****  
 Electrotex, Inc.\***D**  
 Excel Distributing\***D** \*  
 Fox International LTD, INC  
 Joseph Electronics \***D** \*  
 LG Electronics Service  
 M.A.T. Electronics\***D** \*  
 Nationwide Electronics\***D**  
 Pacific Coast Parts\***D** \*  
 Panasonic Industrial Co.  
 Panasonic Services Co.\*  
 Richardson Electronics, Ltd.\***D**  
 RNJ Electronics Inc.\***D** \*  
 Sharp Electronics Corp\*  
 Shogyo International Corp.\*  
 Sony Service Co.Parts Div  
 Technics  
 Tritronics, Inc.\***D**  
 Union Electronics Distrib\***D** \*  
 Vance Baldwin Electronics\***D** \*  
 Video Display Corporation  
 Vintage TV and Radio Supply\***D**  
 Wholesale Electronics Inc.\***D**  
 Zack Electronics\***D**

# 15TH ANNUAL ES&T BUYERS' GUIDE & WEB DIRECTORY 2001 SOFTWARE SERVICES

## COMPUTER DIAGNOSTIC SOFTWARE

Accurite Tech. Inc.\*  
Beige Bag Software  
Cleveland Inst. of Electronics\*  
Computer Svcs of America\*D  
CSTS Inc.  
Data Depot, Inc.\*D  
Eagan Technical Services, Inc.  
Electronic Software Developers  
**Electronix Corp.\*D**  
Electroservice Laboratories\*D  
EURAS USA, Inc.  
Fessenden Technologies, Inc.\*D  
Gibson Research Corp.  
Higher Intelligence Software  
JDR Microdevices\*D  
M.A.T. Electronics\*D\*  
Micro 2000, Inc.  
Ontrack Data Recovery, Inc.  
Panasonic Services Co.\*  
Protel Technology  
RG Software, Inc.  
Sony Service Co.Parts Div  
Specialized Prods. Co.\*D\*  
Tech Assist, Inc.\*  
Touchstone Software Corp.  
TV Man Tech Tips Inc.  
Ultra-X, Inc.\*  
Warrantech Corp.  
Windsor Technologies, Inc.

## CONSULTANTS

Computer Industry Almanac Inc.  
Coordinated Service, Inc.\*  
CSTS Inc.  
Data-Basics Inc.  
**Electronic Servicing & Technology\***  
InfoTech/Computer Doctors  
MaxServ, Inc.  
Micro 2000, Inc.  
Ontrack Data Recovery, Inc.  
Sharp Electronics Corp\*  
SMH Electronics Co., Inc.\*D\*  
The Peak Technologies Group\*D  
Wescorp

## DISC DRIVE/HEAD REFURBISHMENT

Computer Svcs of America\*D  
Electroservice Laboratories\*D  
Fessenden Technologies, Inc.\*D  
Gibson Research Corp  
Micro 2000, Inc.  
Netway 2000 Inc.\*D\*  
Peripheral Parts Support\*D  
Pre-Owned Electronics\*D\*  
Reset, Inc.\*D

SMH Electronics Co., Inc.\*D\*  
Valtron Technologies\*D  
Warrantech Corp.

## ONLINE SERVICES

AnaTek Corp\*  
Cleveland Inst. of Electronics\*  
**Electronic Servicing & Technology\***  
**Electronix Corp.\*D**  
Electroservice Laboratories\*D  
Electrotex, Inc.\*D  
EURAS USA, Inc.  
InfoTech/Computer Doctors  
MaxServ, Inc.  
Mesa Systems, Inc.\*D  
Parts Express International\*D\*  
Sharp Electronics Corp\*  
Sony Service Co.Parts Div  
Tech Assist, Inc.\*  
Vance Baldwin Electronics\*D\*

## PC BOARD REPAIR/REWORK

3E Corp.\*D  
Cablescan  
Chip Quik  
Cleveland Inst. of Electronics\*  
Computer Parts Unlimited \*D\*  
CSTS Inc.  
Datatech Depot, Inc.\*D  
Eagan Technical Services, Inc.  
Electroservice Laboratories\*D  
Fessenden Technologies, Inc.\*D  
Galco Ind. Electronics\*D\*  
Hosfelt Electronics, Inc.\*D  
Hy Tec Dealer Service  
InfoTech/Computer Doctors  
JDR Microdevices\*D  
KDM Associates  
Mesa Systems, Inc.\*D  
MG Chemicals  
Module Exchange\*  
Nationwide Electronics\*D  
PACE, Inc.  
Peripheral Parts Support\*D  
Pre-Owned Electronics\*D\*  
Products International\*D  
PTS Corporation\*D\*  
Service Electronics Inc.\*D  
Sharp Electronics Corp\*  
SMH Electronics Co., Inc.\*D\*  
Softdesk Retail Products\*  
Valtron Technologies\*D  
W.S. Jenks & Son\*D

## RENTAL/LEASING EQUIPMENT

Computer Parts Unlimited\*D\*  
Dymax Corp.\*

IFR Systems\*  
JDR Microdevices\*D  
PD Software\*  
PDR Xytronic\*MD\*  
Richardson Electronics, Ltd.\*D  
RS Electronics\*D  
SMH Electronics Co., Inc.\*D\*  
Test Equipment Connection Corp.\*D\*  
Test Equipment Depot\*D\*  
The Peak Technologies Group\*D

## SERVICE BULLETIN SOFTWARE

Cahill Electronics  
Electronic Software Developers  
**Electronix Corp.\*D**  
High Tech Electronic Services\*  
Higher Intelligence Software  
ICM Components\*D  
KDTV Software  
M.I. Technologies  
Panasonic Services Co.\*  
PD Software\*  
**Philips Consumer Electronics\*D\***  
Sharp Electronics Corp\*  
Sony Service Co.Parts Div  
Tech. Info. Procurement Serv.  
Tech-M  
TV Man Tech Tips Inc.

## SERVICE MANAGEMENT SOFTWARE

AnaTek Corp\*  
Automated Systems, Inc.  
BGI Company, Inc. AutoTech  
Cahill Electronics  
Computer Component Source\*D  
Computer Transaction Systems  
Core Software  
Creative Logics Corp.\*MD\*  
Custom Data Associates \*D  
Data-Basics Inc.  
DAYTA-CO  
DW Smith & Associates  
Electronic Parts Supply\*D  
**Electronix Corp.\*D**  
EURAS USA, Inc.  
Foley-Belsaw\*D  
Good-Lyddon Data Systems  
Higher Intelligence Software  
KDTV Software  
MaxServ, Inc.  
Metrix Inc.  
Nationwide Electronics\*D  
PD Software\*  
Plaza Distributing\*D  
RAM Enterprises  
Sage Data Systems  
**Sencore Electronics\***

Service Management Software  
ServiceWare Inc.  
Sharp Electronics Corp\*  
Sirius Software Inc.\*  
SyncPulse Systems\*  
TV Man Tech Tips Inc.  
Warrantech Corp.

## TEST EQUIPMENT REPAIR/CALIBRATION

AVO International\*  
Cablescan  
Cleveland Inst. of Electronics\*  
Computer Svcs of America\*D  
CSTS Inc.  
Cumberland Elect.\*D\*  
Electroservice Laboratories\*D  
Galco Ind. Electronics\*D\*  
IFR Systems\*  
InfoTech/Computer Doctors  
Jensen Tools\*D\*  
Marconi Instruments Inc.\*D  
Products International\*D\*  
Progressive Electronics\*D\*  
RS Electronics\*D  
**Sencore Electronics\***  
SMH Electronics Co., Inc.\*D\*  
Test Equipment Connection Corp.\*D\*  
Test Equipment Depot\*D\*  
W.S. Jenks & Son\*D

## TUNER/MODULE REPAIR

Computer Component Source\*D  
Computer Parts Unlimited\*D\*  
Eiger Electronics Inc.\*D\*  
Fixer Corp.  
Higher Intelligence Software  
Module Exchange\*  
M-Tronics\*D\*  
PTS Corporation\*D\*  
Sharp Electronics Corp\*

## WARRANTY ORGANIZATION

Aon  
Computer Parts Unlimited\*D\*  
National Electronics Warranty Corp\*  
ServiceBench.com\*  
Sharp Electronics Corp.\*  
SMH Electronics Co., Inc.\*D\*

# 15TH ANNUAL ES&T BUYERS' GUIDE & WEB DIRECTORY 2001 ASSOCIATION/EDUCATIONAL SOURCES

## BOOKS/MANUALS

A.G. Tannenbaum\*D  
Bibliodata  
Bursma Electronic Dist.\*D\*  
C&S Sales\*D  
CEDIA  
Cleveland Inst. of Electronics\*  
Computer Industry Almanac Inc.  
Computer Maintenance Training  
Computer Svcs of America\*D  
Consolidated Electrncs, Inc.\*D  
Cumberland Elect.\*D\*  
D.A.T.A.  
Dalco Electronics\*D  
Data Business Publishing  
East Coast Transistor\*D  
Eiger Electronics Inc.\*D\*  
Electro Dynamics, Inc.\*D  
Electronic Parts Supply\*D  
**Electronic Servicing & Technology\***  
**Electronix Corp.\*D**  
Electrotex, Inc.\*D  
ETA-I\*  
Fotec Inc  
Fox International LTD, INC  
Galco Ind. Electronics\*D\*  
Heath Company  
Herman H. Sticht Co., Inc.\*D  
**ISCET**  
JDR Microdevices\*D  
Jensen Tools \*D\*  
M.A.T. Electronics\*D\*  
MCM Electronics\*D\*  
Mike's Repair Service\*D\*  
Mouser Electronics\*D  
Nat'l Assoc. of Svc Dealers  
Newnes  
Noble Publishing Corp\*  
Old Colony Sound Laboratory  
Omnitron Electronics\*MD  
Pacific Coast Parts\*D\*  
Panasonic Services Co.\*  
Parts Express International\*D\*

PC Service Source\*D  
Philips Technical Training  
Premium Parts+ Electrncs Co\*D  
Products International\*D\*  
Radio Shack\*D  
RAM Enterprises  
RF Parts\*D\*  
**Sams Technical Publishing\***  
Satellite Dealers Association\*  
**Sencore Electronics\***  
Sharp Electronics Corp\*  
SMH Electronics Co., Inc.\*D\*  
Specialized Prods. Co.\*D\*  
Tab Books  
TechAmerica\*D  
Tritronics, Inc.\*D  
TV Man Tech Tips Inc.  
TVPRO  
Ucando VCR Educational Prod Co  
Underwriters Laboratories, Inc  
W.S. Jenks & Son\*D

## EDUCATIONAL/TRAINING SEMINARS/VIDEOS

AVO International\*  
Cable University\*  
CEDIA  
Cleveland Inst. of Electronics\*  
Computer Maintenance Training  
Curtis Mathes\*D  
Eagan Technical Services, Inc.  
East Coast Transistor\*D  
**Electro Horizons\***  
ETA-I\*  
Fotec Inc  
Galco Ind. Electronics\*D\*  
Herman H. Sticht Co., Inc.\*D  
**ISCET**  
JIT Resources, Inc.  
Learning Group International  
Micro 2000, Inc.  
Nat'l Assoc. of Svc Dealers  
O.K. Industries, Inc.  
PACE, Inc.

Philips Technical Training  
Satellite Dealers Association\*  
**Sencore Electronics\***  
Sharp Electronics Corp\*  
SMH Electronics Co., Inc.\*D\*  
Sun Equipment Corporation\*D\*  
W.S. Jenks & Son\*D  
Warrantech Corp..

## MANAGEMENT SOFTWARE SYSTEMS

Cleveland Inst. of Electronics\*  
East Coast Transistor\*D  
**Electronix Corp.\*D**  
Panasonic Services Co.\*  
RAM Enterprises  
**Sencore Electronics\***  
SMH Electronics Co., Inc.\*D\*  
TV Man Tech Tips Inc.

## SCHOOLS: CORRESPONDENCE/ RESIDENT

Cleveland Inst. of Electronics\*  
Cook's Inst. of Elec. Engrg.  
East Coast Transistor\*D  
ETA-I\*  
Foley-Belsaw\*D  
Philips Technical Training  
**Sencore Electronics\***  
Sharp Electronics Corp\*  
World College

## SERVICE LITERATURE/ SCHEMATICS

A.G. Tannenbaum\*D  
Bursma Electronic Dist. \*D\*  
Cleveland Inst. of Electronics\*  
Computer Component Source\*D  
Consolidated Electrncs, Inc.\*D  
Cumberland Elect.\*D\*  
Curtis Mathes\*D  
Eagan Technical Services, Inc.

East Coast Transistor\*D  
Eiger Electronics Inc.\*D\*  
Electro Dynamics, Inc.\*D  
Electronic Parts Supply\*D  
**Electronic Servicing & Technology\***  
Foley-Belsaw\*D  
Higher Intelligence Software  
ICM Components\*D  
**ISCET**  
JDR Microdevices\*D  
M.I. Technologies  
Nationwide Electronics\*D  
Omnitron Electronics\*MD  
Pacific Coast Parts\*D\*  
Panasonic Services Co.\*  
Philips Technical Training  
Premium Parts+ Electrncs Co.\*D  
**Sams Technical Publishing\***  
**Sencore Electronics\***  
Sharp Electronics Corp\*  
Technics  
Tritronics, Inc.\*D  
TV Man Tech Tips Inc.  
Vance Baldwin Electronics\*D\*  
V-M Audio Enthusiasts\*D\*

## SERVICE ASSOCIATIONS

Cable University\*  
CEA, Consumer Electronics Assoc.  
CEDIA  
ECA  
EIA, Electronic Industries Assoc.  
ERA, Electronic Representatives  
Assoc.\*  
ETA-I, Electronic Technicians Assoc\*  
**ISCET**  
NARDA  
NASD  
NESDA\*  
NSCA  
PSA  
Satellite Dealers Association\*  
United Services Association

(Continued from page 25)

TABLE 2.

**Cleaning and Lubrication**

Periodic cleaning is necessary to insure optimum performance of the tape mechanism. Use Kim Wipes and a solvent approved by the manufacturer to clean the tape transport mechanism. Use a head cleaning kit to clean the video heads, the flying erase head and the audio/ control (A/C) head.

Note: When cleaning the video heads, wipe the cleaning stick across the heads in the direction of head movement. Wiping in a vertical direction may damage the heads.

**Tape Mechanism Lubrication**

The tape transport mechanism is properly lubricated during assembly at the factory and additional lubrication should not be required during the first year of operation. Periodic lubrication (after every 1000 hours of operation) is recommended, however, more frequent lubrication may be required if the unit is subjected to extreme environmental conditions. Refer to the manufacturer's "Mechanism Exploded View" (not included here) for grease and oil locations. Refer to the manufacturer's "Replacement Parts List" (not included here) for the stock numbers of the recommended oil and grease. Note: Excessive lubricant may be transferred to other areas causing malfunction. Use the lubricants sparingly.

Camcorders require periodic cleaning and lubrication to keep operating properly.

ing to turn in the loading direction for four seconds or more.

There are a number of possible causes of this problem. One possibility is that the mechanism may have become locked during mode shift. Another possibility is that the mechanism is locked at the loading end because the encoder position was skipped during the mechanism's mode shift. A third possibility is that the loading MDA (Motor Drive Amplifier) is not receiving power.

Figure 7 provides clues to what might be the problem for several other error messages.

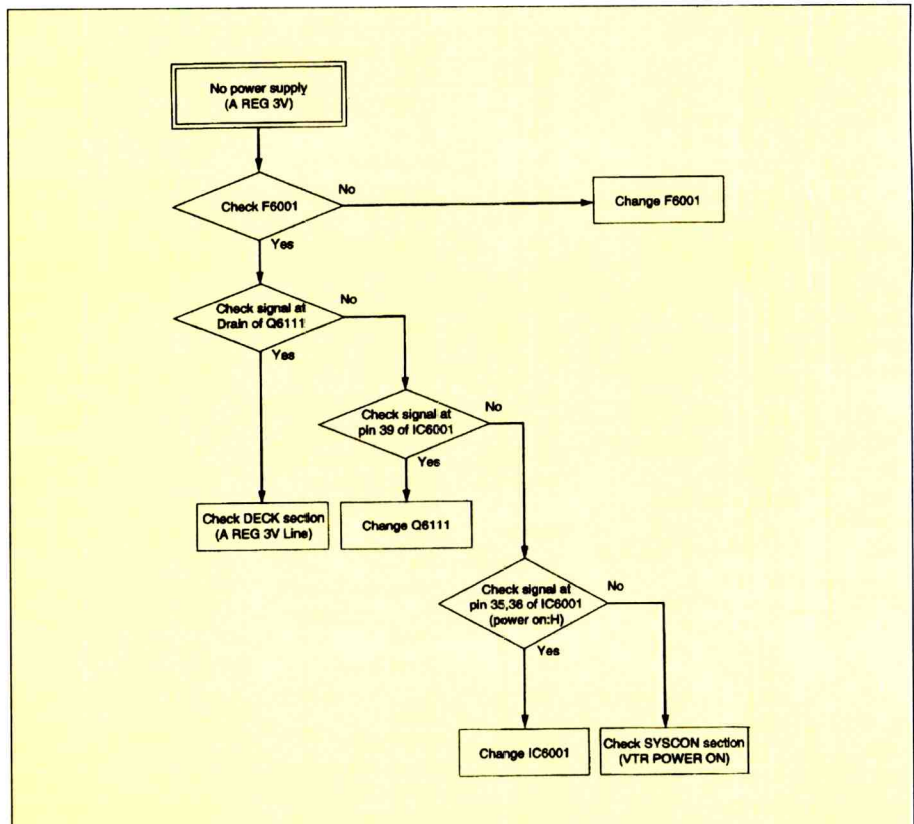


Figure 4. Absence of A reg 3V can be corrected by following these troubleshooting steps.

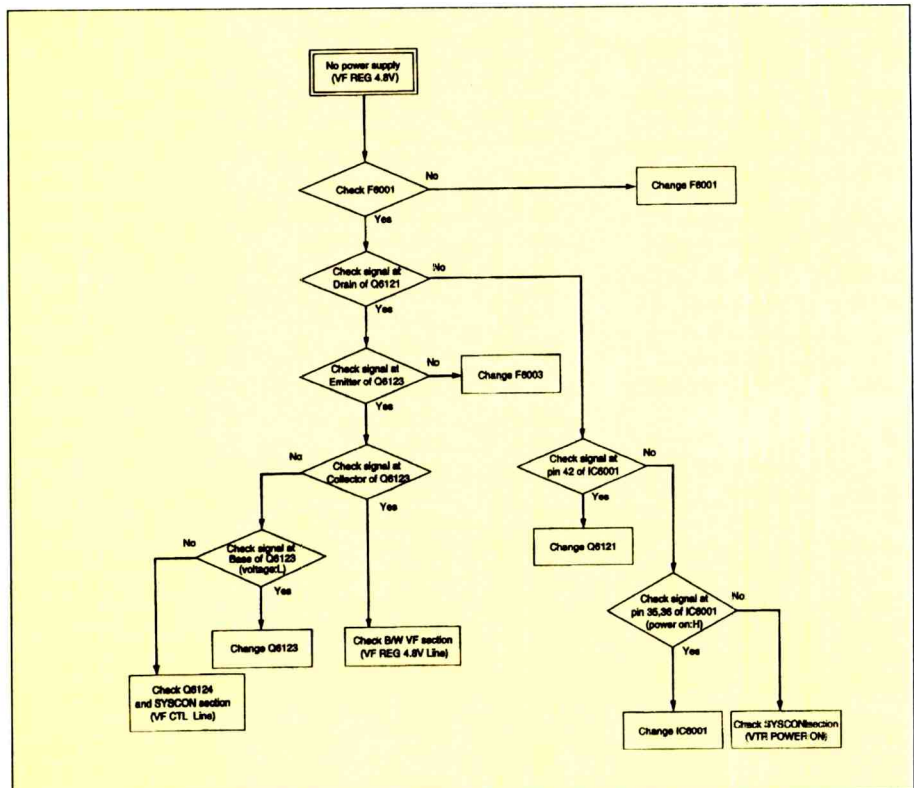


Figure 5. Follow this logical procedure when the symptom is no VF Reg 4.8V power supply.

**TABLE 1 ABBREVIATIONS** These abbreviations will help when referring to service literature on camcorders.

<b>A</b>			
A	Audio	BLK	Black, Blanking
ACC	Automatic Color Control	BLU	Blue
A CTL	Audio Control	BPF	Band Pass Filter
AD, A/D	Address Data, Analog to Digital	BRK	Brake
ADC	Analog to Digital Converter	BRT	Brightness
ADR	Address	BSMODE	Boundary Scan Mode
ADJ	Adjustment	BUF	Buffer
AE	Audio Erase, Automatic Effect, Auto Exposure	B/W	Black and White
AEI	Amp Y Edge Input	<b>C</b>	
AEO	Amp Y Edge Output	C	Capacitance, Color, Character, Camera
AF	Autofocus	CAL	Calibration
AGC	Automatic Gain Control	CAM	Camera, Encoder Cam
AGS	Anti-Ground Shooting	CAP	Capstan, Capacitor
AL	Always	CAPMD	Capstan Motor Drive
ALC	Automatic Light Compensation, Automatic level Control	CAPMFG	Capstan Motor Frequency Generator
ALE	Address Latch Enable	CARR	Carrier
ALM	Alarm	CAS, CASS-	Cassette
ALU	Arithmetic Logic Unit	CBLK	Composite Blanking
AM	Amplitude Modulation	CCD	Charged Coupled Device
AMP	Amplifier	CD	Count Down
A/M/S	Auto/Manual/Slow	CDS	Color Demodulation Signal
AMUTE	Audio Mute	CE	Chip Enable
AN	Analog	CF	Ceramic filter, Color Frame, Correct Focus
ANT	Antenna	CFMD	Color Frame Pulse Drive
AP, APT	Aperture	CH	Channel
APC	Automatic Pedestal Control	CHG	Charge
APC	Automatic Phase Control	CHK	Check
APL	Average Picture Level	CHROMA	Chrominance
APS	Analog Signal Processor	CLK	Clock
ASSY	Assembly	CLR	Clear
AT	Auto Tracking	CMD	Command
AUDEE	Audio EE	CMOS	Complementary Metal Oxide Semiconductor
AUTO	Automatic	CNM	Cinema Mode
AUX	Auxiliary	CNR	Color Noise Reduction
AW	Auto White	CNT	Count, Counter
AWB	Auto White Balance	COL	Color
<b>B</b>		COM	Common
B	Base, Blue	COMB	Comb Filter
BAL	Balance	COMP	Comparator, Composite, Compensation
BATT	Battery	CONN	Connector
BATDWN	Battery Down	CONV	Converter
BATSOFF	Battery Shut Off	CP	Circuit Protector, Clamp Pulse
BCP	Burst Clamp Pulse	CP1	Clamp Pulse Input
BEND	Block Data End	CSDATI	Chip Select Data In
BF	Behind Focus	CSDATO	Chip Select Data Out
BFIDP	Burst Flag Indentation Pulse	CSREDY	Chip Select Ready
BFP	Burst Flag Pulse	CT	Capacity Timing
BIT	Binary digit	CTL	Control
BL	Back Lamp, Back Light, Black Level	CTLERS	Control Erase
		CY	Cyan
		<b>D</b>	
		D	Drum, Digital, Diode, Drain
		DAC	Digital-to-Analog Converter
		dB	Decibel
		DC	Direct Current
		DEC	Decoder
		DEMODO	Demodulator
		DET	Detector
		DEV	Deviation
		DEWSNS	Dew Sensor
		DG	Differential Gain
		DI	Data Input
		DIF	Differential
		DISCR	Discriminator
		DL	Delay Line, Double Limiter
		DO	Data Output
		DOC	Drop-out Compensator
		DP	Differential Phase
		DPWCTL	Deck Power Control
		DRV	Drive
		DTC	Dead Time Control
		DUB	Dubbing
		<b>E</b>	
		E	Edit, Emitter
		EC	Emitter Clamp
		EE	Electric-to-Electric
		EF	Emitter Follower
		EIN Y	Edge Input
		EIS	Electrical Image Stabilizer
		EJCTSW	Eject Switch
		EMG	Emergency
		EMP	Emphasis
		EN	Enable
		ENAB	Enable
		ENC	Encoder
		ENCP	Encoder Pulse
		ENDSENS	End Sensor
		ENV	Envelope
		EP	Extended Play
		EQ	Equalizer
		ERR	Error
		ERS	Erase
		ERWP	Extent Window Pulse
		ES	Electronic Switch
		EVR	Electrical Volume Resistor
		EXP	Expander
		EXT	External
		<b>F</b>	
		F	Farad, Fuse, Focus
		FADCTL	Fader Control
		FADV	Frame Advance
		FATLED	Full Auto LED
		FCK	Flicker
		FCS	Focus
		FD	Field Index
		FE	Full Erase
		FEH	Flying Erase Head
		FET	Field Effect Transistor
		FF	Fast Forward, Front Focus, Flip-Flop
		FG	Frequency Generator
		FL	Fluorescent Light (Lamp)
		FLYEON	Flying Erase On
		FM	Frequency Modulation
		FMP	Frame Pulse
		FR	Fusible Resistor
		FRD	Forward
		FRING	Fringe
		FRP	Frame Pulse
		FREQ	Frequency
		FTHCP	Field Through Clamp Pulse
		FV CONV	Frequency-to-Voltage Converter
		FWD	Forward
		<b>G</b>	
		G	Green, Gate, Gnd
		GAM	Gamma
		GEN	Generator
		GRN	Green
		GRY	Gray
		<b>H</b>	
		H	High, Henry, Horizontal
		HAP	Horizontal Average Picture
		HBF	Horizontal Burst Flag
		HC	High Clip
		HCC	High Cut Capacitor
		HD	Horizontal Drive
		HP	Head Phone
		HPF	High-pass Filter
		HRECST	Hi-Fi Record Start
		HT	Horizontal Trap
		Hz	Hertz
		<b>I</b>	
		IC	Integrated Circuit
		ID	Identification
		IF	Intermediate Frequency
		IFR	Infrared
		IFT	Intermediate Frequency Transformer
		IND	Indicator
		INT	Internal, Interrupt
		INV	Inverter
		I/O	Input/Output
		IW	Iris Window
		<b>J</b>	
		JS	Jog/Shuttle
		<b>K</b>	
		K	Knee Pulse
		<b>L</b>	
		L	Low, Left, Lithium
		LCD	Liquid Crystal Display
		LD	Loading

**CONTINUED TABLE 1 ABBREVIATIONS**

These abbreviations will help when referring to service literature on camcorders.

**L (CON'D)**

LDMIN .....Loading Motor Minus  
 LDMPLS .....Loading Motor Plus  
 LDMUP .....Loading Motor Speed Up  
 LIM .....Limiter  
 LIT .....Lithium  
 LIN .....Linearity  
 LLD .....Low Light Detector  
 LP .....Long Play  
 LPF .....Low-pass Filter

**M**

M .....Motor  
 MAX .....Maximum  
 MDA .....Motor Drive Amplifier  
 MECHA-CON Mechanism Control  
 METC .....Main Emphasis Timing Control  
 MIC .....Microphone  
 MIN .....Minimum  
 MIX .....Mixer  
 MMV .....Monostable Multivibrator  
 MOD .....Modulation, Modulator  
 MON .....Monitor  
 MTX .....Matrix  
 MUT .....Muting

**N**

NA .....Normal Audio  
 NC .....Not Connected, Noise Canceler  
 ND .....Noise Detect  
 NL .....Non Linear  
 NMI .....Non Maskable Interrupt  
 NOR .....Normal  
 NR .....Noise Reduction

**O**

OP .....Operation  
 OPE .....Operation  
 OPAMP .....Operational Amplifier  
 ORG .....Orange  
 OSC .....Oscillator  
 OS .....On-screen  
 OSD .....On-screen Display

**P**

P .....Pint  
 PB .....Playback  
 PC .....Pulse Counter, Phase Compensation  
 PCM .....Pulse Code Modulation  
 P CTL .....Power Control  
 PG .....Pulse Generator  
 PGM .....Program  
 PLL .....Phase Locked Loop  
 PLS .....Pulse  
 POSI .....Position  
 P-P .....Peak-to-Peak  
 PRL .....Preroll  
 P/S .....Pause/Still  
 PU .....Pick-up  
 PWB .....Printed Wiring Board  
 PWM .....Pulse Width Modulation  
 PWR .....Power

**Q**

Q .....Quartz

**R**

R .....Red, Right  
 RA .....Resistor  
 RAE .....Random Access Edit  
 RCSFSW .....Record Safety Switch  
 RCU .....Remote Control Unit  
 RDY .....Ready  
 REC .....Record  
 REF .....Reference  
 REG .....Regulator  
 REMOCON .....Remote Control Unit  
 REV .....Reverse  
 REV S .....Reverse Search  
 REW .....Rewind  
 RF .....Radio Frequency  
 RGC .....Reverse Gamma Control  
 RNF .....Resistor Negative Feedback  
 RST .....Reset  
 RT .....Resistor Timing  
 ROT .....Rotation  
 RW O/I .....R Pulse Width Output/Input

**S**

S .....Servo, S-VHS  
 SAP .....Second Audio Program  
 SAT .....Saturation  
 SC .....Subcarrier  
 SCBK .....Subcarrier Blank  
 SCK .....Serial Clock  
 SCL .....Serial Clock  
 SDATA .....Serial Data  
 SEL .....Select  
 SENS .....Sensor  
 SEP .....Separation  
 SER .....Serial  
 S/H .....Sampling and Hold  
 SHCT .....Shutter Control  
 SHUTR .....Shutter  
 SIF .....Sound Intermediate Frequency  
 SLDSW .....Slide Switch  
 S/N .....Signal-to-Noise Ratio  
 SP .....Standard Play, Separate Pulse  
 SPO .....Separated Pulse Output  
 SPP .....Separated Pulse Phase  
 SR .....Serial  
 S/R/F .....Stand-by/Reverse/Forward  
 S/S .....Slow/Still  
 SSCLK .....Serial Clock  
 SSDATA .....Serial Data  
 SSTRB .....Serial Strobe  
 SSG .....Sync Signal Generator  
 STB .....Strobe  
 SUP .....Supply  
 SUPREL .....Supply Reel  
 SVLOCK .....Servo Lock  
 SW .....Switch  
 SWD .....Switched  
 SYNC .....Synchronization  
 SYS .....System Control

**T**

T .....Tele  
 TAL .....Tally  
 TARMON .....Trigger Alarm On  
 TF .....Thermal Fuse  
 TIM .....Timing  
 TK .....Tracking  
 TNR .....Tuner  
 TP .....Test Point  
 TRC .....Tracking  
 TRIG .....Trigger  
 TRG .....Trigger  
 TRANS .....Transformer  
 TU .....Take-up, Tuner  
 TUPREL .....Take-up Reel  
 TXD .....Text Data

**U**

UNREG .....Unregulated  
 UNSW .....Unswitched

**V**

V .....Volt, Video, Vertical  
 VAP .....Vertical Average Picture  
 VCO .....Voltage Controlled Oscillator  
 VD .....Vertical Drive  
 VDOREC .....Video Recording  
 VDOEE .....Video E-E  
 VCO .....Voltage Controlled Oscillator  
 VF .....Viewfinder  
 V FF .....Video Flip-Flop  
 VG .....Vertical Gate  
 VM .....Voltage for Motor Drive  
 VOL .....Volume  
 VP .....Vertical Pulse  
 VR .....Variable Resistor  
 VRCMUT .....Video Record Mute  
 VXO .....Variable Crystal Oscillator

**W**

W .....Wide, White  
 WAD .....Write Address  
 WB .....White Balance  
 W/D .....White/Dark  
 WND WIND .....Window

**X**

XCLKIN .....Crystal Clock In  
 XCLKOT .....Crystal Clock Out  
 XMAIN .....Crystal Main In  
 XTAL .....Crystal

**Y**

Y .....Luminance  
 YE, YEL .....Yellow  
 YNR .....Luminance Noise Reduction  
 YO .....Luminance Output

**Z**

Z .....Zoom

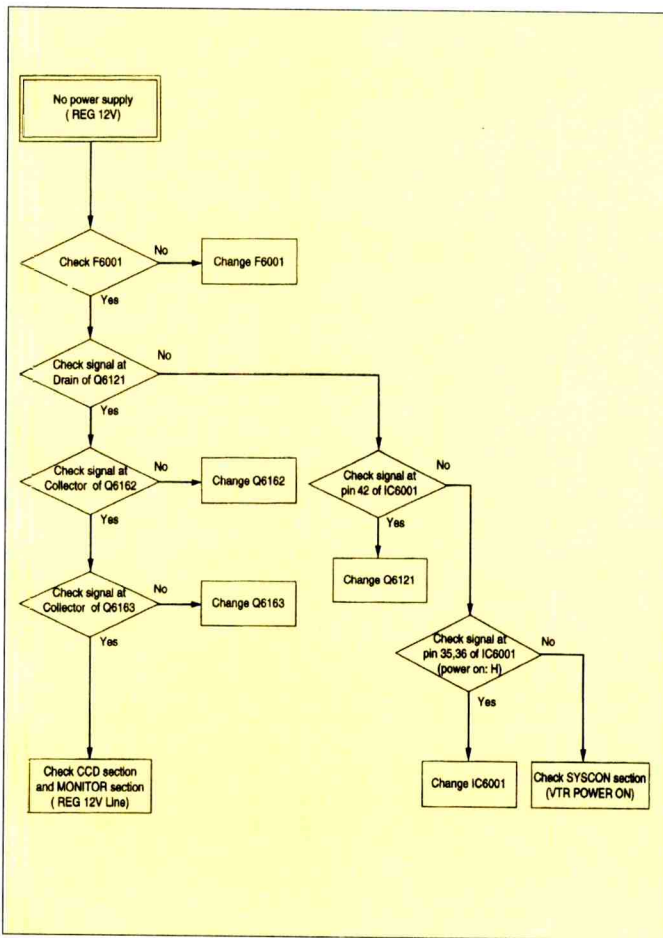


Figure 6. Absence of regulated 12V power can be attributed to one of these causes.

The following tools and test equipment are necessary when servicing the camcorders covered in this service publication.

**TEST EQUIPMENT**

Oscilloscope – dual trace, 25MHz bandwidth, delayed sweep, channel invert capability, 10:1 probe.

Digital Voltmeter

Frequency Counter

Vectorscope

Color Video Monitor

Tripod

3,100 Degrees Kelvin/3,000 lux Light Box — or

Rellective Charts (using 3,100 Degrees Quartz lighting/3000 lux)

Waveform Monitor (optional)

Light Meter

DC Power Supply (Variable from 0 to 12VDC/2.0 Amp)

1 Alignment tape MC-1	2 Torque driver YTU94008	3 INF YTU94008-003	4 CRIMP driver YTU94148A
5 Patch cord YTU94074-24/YTU94077-24	6 Jig connector cable YTU93082E	7 PC cable QAM0009-002	8 Service support system YTU94057-46
9 INF adjustment lens YTU92001C	10 INF adjustment lens holder YTU94007	11 Camera stand YTU93079	12 Light box assembly YTU93098A
13 Gray scale chart YTU94133A	14 Color bar chart YTU94133C	15 Soldering kit YTU95016B	16 Cleaning cloth K3048-01

Figure 8. Some sophisticated tools and test equipment, as listed here, are required to service a tiny camcorder. Don't attempt to repair one of these little jewels without the right equipment.

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## EMERGENCY DISPLAY

When an abnormal signal is supplied to the system control microprocessor, an error code is displayed on the EVF and the LCD screens. Use the following table to determine the likely cause of the error. When an error is displayed, all controls, except for the Power Switch, are inoperative.

LCD DISPLAY	EMERGENCY MODE	DETAILS	POSSIBLE CAUSES
E01	LOADING	In the case the encoder position is not shifted to the next point through the loading motor has rotated in the loading direction for 4 seconds or more. This error is defined as [E01].	<ol style="list-style-type: none"> <li>1. The mechanism is locked during mode shift.</li> <li>2. The mechanism is locked at the mechanism loading end, because the encoder position is skipped during mechanism mode shift.</li> <li>3. No power is supplied to the loading MDA.</li> </ol>
E02	UNLOADING	In the case the encoder position is not shifted to the next point through the loading motor has rotated in the unloading direction for 4 seconds or more. This error is defined as [E02].	<ol style="list-style-type: none"> <li>1. The mechanism is locked during mode shift.</li> <li>2. The mechanism is locked at the mechanism loading end, because the encoder position is skipped during mechanism mode shift.</li> </ol>
E03	TU & SUP REEL FG	In the case no REEL FG is produced for 4 seconds or more in the capstan rotation mode after loading was complete, the mechanism mode is shifted to STOP with the pinch roller set off. This error is defined as [E03]. However, no REEL EMG is detected in the SLOW/STILL mode.	<ol style="list-style-type: none"> <li>1. The idler gear does not engage with the reel disk well.</li> <li>2. Through the idler gear and reel are engaged with each other, the tape is not wound because of overload to the mechanism.</li> <li>3. No FG pulse is output from the reel sensor.</li> <li>4. No power is supplied to the reel sensor.</li> <li>5. Tape transport operation takes place with a cassette having no tape inside.</li> <li>6. The tape slackers and no pulse is produced until the slack is taken up and the tape comes into the normal status.</li> </ol>
E04	DRUM FG	In the case there is no DRUM FG input in the drum rotation mode for 4 seconds or more. This error is defined as [E04], and the mechanism mode is shifted to STOP with the pinch roller set off.	<ol style="list-style-type: none"> <li>1. The drum cannot be started or drum rotation is stopped because tape transport load is too high.               <ol style="list-style-type: none"> <li>1). Tape tension is extremely high</li> <li>2). The tape is damaged or soiled with grease, etc.</li> </ol> </li> <li>2. The DRUM FG signal is not received by the syscon CPU.               <ol style="list-style-type: none"> <li>1). Disconnection in the middle of the signal line.</li> <li>2). Failure of the DRUM FG pulse generator (hall element).</li> </ol> </li> <li>3. No drum control voltage is supplied to the MDA.</li> <li>4. No power is supplied to the DRUM MDA.</li> </ol>
E05		—	—
E06	CAPSTAN FG	In the case no Capstan FG is produced in the capstan rotation mode for 2 seconds or more. This error is defined as [E06], and the mechanism mode is shifted to STOP with the pinch roller set off. However, no CAPSTAN EMG is detected in the STILL/FF/REW mode.	<ol style="list-style-type: none"> <li>1. The CAPSTAN FD signal is not received by the syscon CPU.               <ol style="list-style-type: none"> <li>1). Disconnect in the middle of the signal line.</li> <li>2). Failure of the CAPSTAN FG pulse generator (MR element).</li> </ol> </li> <li>2. No capstan control voltage is supplies to the MDA.</li> <li>3. No power is supplied to the CAPSTAN MDA.</li> <li>4. The capstan cannot be started or capstan rotation is stopped because tape transport load is too high.               <ol style="list-style-type: none"> <li>1). Tape tension is extremely high. (Mechanical locking)</li> <li>2). The tape is damaged or soiled with grease, etc. (Tape tangling occurs, etc.)</li> </ol> </li> </ol>

**Figure 7.** When an abnormal signal is supplied to the system control microprocessor, a corresponding code will appear on the display. This describes what those codes mean.

## CERTIFICATION. WHO CARES?

by Dick Glass, CETsr,

From time to time ES&T provides key industry leaders an opportunity to address the professional industry. Dick Glass is President of the Electronics Technicians Association, Int'l. Greencastle, IN.

That title might shock someone who knows my background within the electronics industry. I organized the first national attempt at providing knowledge and skills assessments for electronics technicians a long time ago. In fact, it was in 1966 that the old National Electronics Associations, Inc. instituted the Certified Electronics Technicians (C.E.T.) program. Since then, I have spent my adult years promoting the concept of technician certification, in both ISCET and ETA. So, why would anyone suggest that no one cares about certification?

Some people do care about certification. The 60,000-plus individuals who have submitted their credentials and sat for the C.E.T. exam do care. Some service business owners are proud of the credentials of their technicians. Some owners have gone further and qualified themselves as Certified Service Managers. Other technicians and non-technician employees have taken the Customer Service Specialist (CSS) exams and qualified as a CSS. In the 1960s there were few certification programs other than in the health industry. The C.E.T. program set the example for others that came along later, some programs having become highly successful. Examples are: the SBE (Society of Broadcast Engineers); SCTE (Society of Cable Telecommunications Engineers); NARTE; PSA and BICSI. These certifications have captured the favor of the various segments of their industries. With wide industry support, employers demanded their technicians become certified, or at least offered incentives to do so. With wide industry support, getting a job often required showing a certification credential. For instance, today, if you intend to try for an electronics job in radio or TV broadcasting, you likely will have to show your

SBE certification. Many mass merchandisers now require A+ certification if you want a bench tech job in the computer service department. While the FCC Commercial Operators License is not mandatory for most communications industry technician jobs, it, for many years was THE certification credential you had to have to even apply for a job in that field. Certification, as a means of pre-qualifying or qualifying a technical worker, is no longer, just a good idea. It is becoming mandatory. State education departments are molding their technical courses towards the final goal of getting their student certified by a third party certification provider. You could say "Certification has come of age."

So what about the consumer electronics industry? That's where technician certification started. So we would expect that it would be leading the way in numbers and recognition, that all entry-level technicians would consider it the first requirement if they want to get a job; that employers would ask for proof of certification before even considering hiring you. Customers would have some assurance of quality service as they notice the C.E.T. certificates displayed in the service center. Product makers would be assured of a high level of technical expertise when they select a servicer to perform repairs for their products. Entry-level technicians would have a minimum level of knowledge and skills to strive for. There would be a distinction between the delivery person and the technician.

But this hasn't happened in the consumer electronics segment of the industry. In fact, outside of the dedicated association members and a very few suppliers in the industry, there is little recognition given to those certified technicians who now exist. Employers do have a difficult time finding skilled technicians and it is rare to find one with a C.E.T. behind his name. How could that be? The public dearly wants good product service; business owners dearly want to hire qualified technicians; product makers are having a most

difficult time trying to get their products serviced by competent technicians. Sharp young men would love to work as consumer product technicians if they could provide a living for their families. The educational system would gladly provide training in consumer electronic service, if there was an incentive for young men and women to pay for the training. But you will be hard pressed to find a single high school or technical college that offers a consumer electronics servicing course.

OK, we all know the problem: the public and the product makers are not willing to pay the cost of good consumer electronic service. The list of negatives is longer than this page: Low warranty service rates; throw-away products; unconscionable replacement picture tube and parts pricing; competition which keeps prices for service low by somehow using untrained workers to mangle the customer's products. The increased difficulty of performing bench service while realizing a severe reduction in parts sales. The intense efforts of product makers to eliminate any need for service after the sale.

### A PLAN

The concept of certifying the firm rather than only technical individuals working at that business is not an idea that popped up just last month. ETA and NESDA, USA, CEA and NASD have each studied the idea and some complete plans have been proposed in recent years. Each of these plans were good. They just needed support by the industry, rather than trying to make it work by going it alone.

But why do it anyway? Why go the trouble of implementing a shop certification program? Isn't everything going OK right now? Or, "Why worry about shop certification? Aren't we having enough difficulty convincing the workers in that shop that they should achieve at least the minimum technical knowledge and skills?" Or, how about this one: "Hey, I am doing OK. Certification is probably only a ploy to get some of my money." You can fill in the below space with plenty of excuses for

NOT raising the standards of our industry. Unfortunately, all of the tired old excuses issued by the untrained, or those who don't want technicians or their employers to have any reason to be compensated at a reasonable and competitive rate by the public or the suppliers, have only led to the worst conditions ever experienced by the electronics industry so far as service providers are concerned.

What if certification was touted by your boss? What if your shop was chosen first by suppliers who need competent service work and who are willing to pay for that service? What if the cost of annual certification for your shop was reduced as a greater percentage of your shop workers achieved individual technical or customer support certification? What if certified shops were encouraged to hire the most competent technicians, certified technicians, rather than encouraged to hire 'cheap help' so that warranty payments by suppliers might be held to a minimum? What if the public was exposed to the certified shop program and was convinced that the CSC business was the best place to take their electronics products for service? It could happen!

Right now, in 2001, the consumer electronics, (and to a lesser degree, the appliance service business), is about as close to being 'on the rocks' as you can get. We can only go up from here. One way to bring about an improved business climate is to put a little professionalism into it. Instead of competing with businesses which operate with the least test equipment, no insurance, no signage, the lowest cost technician they can find, service rates based on guessing rather than real costs, no professional association affiliation, no dress rules, no customer service training, no interest in keeping the technicians at the leading edge of the technology, therefore businesses which do not value their service very highly, why not compete with REAL businesses?

Why now? How can the CSC program work now, when it hasn't been promoted seriously in the past? The answer is that we

have a unique opportunity right now. For the first time ever, each of the national business and technical associations in consumer electronics have joined hands. That is somewhat of a miracle! Not only that, but USA, PSA, ETA-SDA, NESDA, ISCET, NARDA-NASD and the manufacturers association, CEA, are working closely together to bring this monumental change in the CE industry about. For once, the product makers have agreed to support this cause. The associations all know it is a win-win program. Everyone wins. Even the shade-tree mechanic type of servicer may come out into the sunshine when he sees the benefits.

What are the benefits: Probably number one is the understanding that by becoming a certified service center, you are on the list to be chosen first by product makers or the many other regional or even international communications companies who have a need for a network of proven good service companies. You can expect the cream of the crop of experienced service technicians to look first to your shop when they look for employment. You can expect the public to start looking for CSC shops. You can expect a new attitude from your technicians when they see the recognition they now have and the value that is placed on their knowledge and experience.

You may also see the educational systems beginning to offer training in consumer electronic service. They won't do that so long as the job of electronic or appliance service pays wages lower than much less difficult jobs and offers few, if any benefits.

You can conjure up plenty of reasons to downplay the raising of the standard for service technicians and service businesses, but that has already been done. Most of those who have defended poor training and poor facilities and mediocre management, old vehicles, no business planning, no retraining, pricing by undercutting the competition, even if it is pricing under your costs. . . . most of those are no longer in business. When you go out of business because you were trying to do business

under your costs, no one wins. The product makers, the distributors, the legitimate CE businesses in town who want to use your service, the public, the local, state, and federal governments who would rather you make money and pay taxes . . . all lose when you go out of business. So the answer right now is to get behind the CSC, Certified Service Center program. Support the idea. Don't balk at the certification fee, no matter what it is. Get behind the movement. Join in. Support professionalism. Raise the image and the spirit of the consumer electronics service and appliance service industry. Don't work for 90% of what it costs you to provide service. Work for a real profit each year in your business. Work towards paying your techs at the high end of electronics technician compensation, rather than at the lower end. The CE tech has the most difficult job of all and he should be well paid for keeping the high tech world turning.

Will the CSC program solve all of the problems? Of course not. There will still be unconscionable competition and there will still be product makers who will try to woe you into doing their service below your costs. Customers will still try to beat you down in price. Some problems will crop up which aren't the customer's fault, or any single product maker's, and which you will have to bite the bullet and absorb the loss. But that is only one more reason to provide a cushion in your service rates in order that you can absorb those unusual and perplexing problems that all service businesses have.

You will hear much more about the details of the CSC program. When you do find out the details, I think you will like it and your technicians will like it. Get behind the effort and help create a ground swell of support that can make consumer electronic and appliance service a great business to be a part of . . . . just like it was in the past. The details such as requirements, costs, etc. will be published on the various association web sites as well as in ES & T Magazine.

## **NESDA Board Appoints Industry Advisory Panel**

At its April 28 meeting in Fort Worth, Texas, the board of directors of the National Electronics Service Dealers Association appointed three industry representatives as the newest members of the board. These individuals will act in an advisory capacity to the board during the year and will attend the August and January board meetings.

Three advisory members will be selected each year: one from a manufacturer, one from a parts distributor, and one from a third-party administrator or other service support entity.

This year's advisory panel members are Walt Herrin, Hitachi; Kim Wagner, Tritronics; and Fay Wood, SatisFusion.

Walt Herrin is Director of National Service for Hitachi America Ltd./Home Electronics Division, located in San Diego, CA. He successfully led Hitachi (and the electronics industry) in paying top rates to servicers through its "Year 2000 Program," and was recognized by NESDA as the National Friend of Service at the 1999 National Professional Service Convention (NPSC). He was honored again as the Person of the Year at NPSC 2000. Known for his straightforward "thinking-outside-the-box" leadership style, he is also a published author and a conference speaker for service industry events.

Kim Wagner CSM is Vice President of Tritronics, Inc., located in Abingdon, Maryland. Tritronics is a family-owned and operated business that distributes consumer electronic parts and accessories throughout the country for several manufacturers. Wagner holds a Bachelor of Science in Mass Communication and Political Science from Towson State University, a Juris Doctor from the University of Baltimore School of Law, and a Master of Business Administration from Loyola College, Sellinger School of Business. She also earned a CSM, NESDA's Certified Service Manager designation, and is a long-time member of NESDA.

Fay Wood is President and Chief Executive Officer of SatisFusion, Inc., in Long Beach, CA. Considered a visionary, Wood is well-known for her creator role in the development of the American Express "Buyers Assurance Program" and in introducing electronic claims processing (ECP) for the industry. In 1996, she founded Wood Technologies International (WTI), special-

izing in claims processing services and managing online and offline service networks for large manufacturers, insurance companies and third-party administrators. A year later, she took the helm of Today's Merchandising, Inc., (TMI), a company that hosts and operates e-commerce-based storefronts for manufacturers that sell directly to end users. Wood merged WTI and TMI to create SatisFusion Inc., a leading provider of customer retention manage-

ment solutions. Wood was honored by NESDA at NPSC 2000 as National Friend of Service and received the prestigious "President's Award" for her creator role in launching a program that added over 800 NESDA members. In addition to leading SatisFusion, she currently serves as the chairperson for the Executive Advisory Council of the California Department of Consumer Affairs Bureau of Electronic and Appliance Repair (BEAR).

## **NESDA and ISCET to Hire New Executive Director**

Clyde Nabors, current Executive Director of the National Electronics Service Dealers Association (NESDA) and the International Society of Certified Electronics Technicians (ISCET), announced his intention to retire at the end of 2001 during a joint meeting of both association's boards in January.

A search committee, headed by Wayne Markman (Connecticut), NESDA Immediate Past President, was established by NESDA President Mike Webber (Texas).

Following the evaluation of several resumes received for the position, leading

candidates were notified that they will be interviewed by both boards on Tuesday, July 31, 2001, during the National Professional Service Convention. The interviews will be held at the convention host hotel, the Riviera Hotel and Casino in Las Vegas.

The goal of NESDA and ISCET is to collaboratively select a candidate after interviews are completed, and to initiate an employment agreement with the candidate during convention week. The candidate selected during the process is expected to begin a transition training period December 1, 2001, and officially take office on January 1, 2002.

## **NYESDA Weighs in on CRT Disposal**

Rather than wait and see what happens, the NY Electronic Service Dealers Association has initiated recommendations and communications with State Senator Carl Marcellino on the subject of CRT, VCR, etc. disposal.

At the April 21 NYESDA Board Meeting it was agreed to send the following letter to Senator Marcellino, who has proposed that the NY EPA and State Legislature consider what actions are needed to protect the environment from the lead content of these and other electronic products.

According to NYESDA President, Scott "Scotty" M. Phillips "We wanted to be proactive in this process and insure, as best we can, that New York does not put an unfair burden on the independent servicers, as has happened in other states."

Senator Carl Marcellino  
RM 812 LOB  
Albany, NY 12247

Dear Senator Marcellino,

The New York Electronics Service Dealers Association ( NYESDA ) has been observing closely Senate bill S782.

Our regions in the Buffalo, Syracuse, Binghamton, and New York City/Long Island area are obligated to protect the interests of our customers as well as our own interests. We are concerned that the County, State and National efforts to regulate the disposal of electronic equipment may have restrictive legislation concerning the final disposition of electronics equipment.

Many of our customers leave their electronic equipment with us (sometimes without permission) for final disposition. This puts the burden of disposal on our members and trade. Please consider the hardships that this legislation might create, or be unfair, in the disposal of any electronic equipment within our industry.

I would appreciate your time to keep me informed of all legislation that concerns the disposal of consumer and commercial electronics in New York State.

Yours truly,  
Scott M. Phillips, Sr  
SMP/vsp

# ProService

## Review

Second Quarter 2001

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

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

— National Professional Service Convention —

## “Diversify to Profitability” in Las Vegas

The National Professional Service Convention July 30-August 4 in Las Vegas will feature management and industry-specific training.

### PURPOSE

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

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

Unless otherwise clearly indicated, neither NESDA nor IS CET endorses any company, product or service appearing in any article in this publication.

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by Sheila Fredrickson

This year's National Professional Service Convention will be held in Las Vegas July 30-August 4 at the beautiful Riviera Hotel. NPSC is not just another convention and there are many things that cannot be noticed at first glance.

Outstanding meals and social events, a great two-day trade show, association meetings, and many opportunities to have a good time are being showcased. For first-time attendees, there are sessions to help get the maximum benefit out of the week. There are activities available to keep everyone entertained, even for non-gamblers. There are chances to meet new people and exchange ideas and solutions. People often come home recharged and re-energized.



*A dining mecca in the desert, Las Vegas offers visitors a variety of restaurants to choose from.*



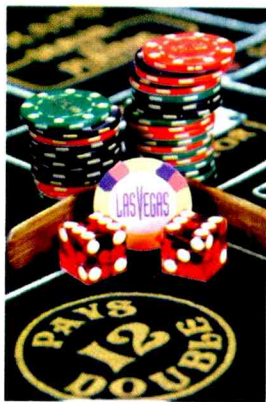
But the real strength of NPSC is training ... lots of it! This year's theme is “Diversify to Profitability” and the schedule is packed with management and industry-specific technical training. Featured topics include: home theatre, DVD technology, digital television convergence, technology trends, digital light processing, plasma displays, building a service center website, an updated “Cajun Clicker Class,” structured wiring, customer relations, improving cash flow with electronic filing, recruiting and employee retention, legal employment issues, the cost of doing business, investing, soldering/desoldering techniques and more. For people wanting to make their business grow, this is an opportunity that can't be found anywhere else.

How do we know that training is the strength of NPSC? Because every year, convention attendees tell us that they almost didn't come because they didn't

*(Las Vegas, continued)*

**National Electronics Service**  
**NESDA**  
**Dealers Association, Inc.**

(Las Vegas, continued)



feel they could afford to take the time off.

After one NPSC, most feel they can't afford NOT to be there. If you can't attend the entire week, come

for any 3 consecutive days, or for one day. Want to see what's scheduled (and when) to help you decide? Visit the NPSC section of [www.nesda.com](http://www.nesda.com) periodically to stay up-to-date on the training schedule as it develops.

If you have not already registered, do it now to get the best available rate. You can register online, or print and fax your registration. Call the office at 817/921-9061 ext. 16 to get your questions answered or to get help with registration.

MasterCard and Visa are accepted as well as a personal or business check. Registration for the full week is \$220; 3-day is \$180; and the daily rate is \$85.

See you in Las Vegas! §



The desert surrounding Las Vegas is barren, yet alive with plants and animals. Red Rock Canyon located west of Las Vegas, named for its brilliant colors, is a favorite destination for hikers and riding enthusiasts.

## Highlights:

### NPSC

## Schedule of Events

Current schedule information can be found at [www.nesda.com](http://www.nesda.com).

### Monday, July 30

- ☆ Maximizing Home Theater Performance—Sencore
- ☆ Servicing Sony DVDs—Sony
- ☆ CET Review Course—Dan Mundy CET/CSM and Jim Fellows CET/CSM
- ☆ Reception—KeyPrestige

### Tuesday, July 31

- ☆ Soldering & DeSoldering 2001—Howard Electronic Instruments
- ☆ "Digital TV Convergence Training"—Panasonic
- ☆ The Internet—Connecting To Your Customer—CEA
- ☆ Lunch—ECI
- ☆ RCA Commercial Product Training—Thomson/RCA
- ☆ Trends in Technology—CEA
- ☆ Hitachi HDTV Servicing Update—Hitachi
- ☆ Cocktails—Sharp
- ☆ Dinner—Sharp

### Wednesday, August 1

- ☆ Breakfast—Pioneer
- ☆ Service Information Symposiums—Day 1
- ☆ Trade Show Open—Day 1
- ☆ Basics of Digital Light Processing—Mitsubishi
- ☆ Keynote Speaker, "Living Life Large—Getting the Most Out of Your Life!"—Jim Jacobus, Champion Education Resources
- ☆ Dinner & Entertainment—Sony

### Thursday, August 2

- ☆ Breakfast—Panasonic
- ☆ Service Information Symposiums—Day 2
- ☆ Introduction to Plasma Display—LG-Zenith
- ☆ Trade Show Open—Day 2

- ☆ Home Theater Boot Camp—Fred Paradis & Brian Gibson CET
- ☆ Reception, Open Bar—Philips

### Friday, August 3

- ☆ Breakfast—Toshiba
- ☆ CSM Prep Course—Randy Whitehead CSM
- ☆ RCA Digital Projection Design—Thomson/RCA
- ☆ Web Training—Thomson/RCA
- ☆ Improving Your Customer Service—Hitachi
- ☆ Lunch—Thomson/RCA
- ☆ Cajun Clicker 101—Gerry McCann CET/CSM
- ☆ Taking Advantage Of The Markets In 2001—Merrill Lynch
- ☆ Building a Service Center Website—NESDA/ISCET
- ☆ Cocktails—LG-Zenith Service
- ☆ Dinner—LG-Zenith Service

### Saturday, August 4

- ☆ Breakfast—Hitachi
- ☆ Servicing TFT/Flat Panel Monitors—Samsung
- ☆ "Recruiting/Rewarding/Retaining-The Three Rs to Successful Employment Practices"—Bob Goldberg, Attorney
- ☆ Lunch—Samsung
- ☆ "The Legal Message"—Bob Goldberg, Attorney
- ☆ Business 101—Bill Warren CET/CSM
- ☆ Dinner—NESDA & 3M §



Convention attendees can enjoy the view of the Las Vegas Strip, one of the most recognizable streets in the world. All photos are courtesy of the Las Vegas News Bureau.

## NPSC – Past Attendees Share Experiences and Break Through Myths

*People who have attended past NSPA conferences are sometimes the best source of information. Here past attendees share what the convention was like for them, and break through some pre-conceived notions.*

For me, it has been a great opportunity to meet each year with people that I now consider friends. NPSC 2000 should have been my 16th convention, but I missed two so it was actually our 14th. It was with a great reluctance that we went to our first in Memphis. We had never before closed for an entire week to do this. But after the week was half over, we were “hooked.” The opportunity to meet and talk to manufacturers was unbelievable. Before this, we assumed they were in some “ivory tower” that you could not get through to. What a surprise! They were there, and actually talked to you, and we were not even authorized for them. The trade show, as they say, “blew our minds away.”

Over the years, our participation in NESDA has grown as our business has grown. Mike never fails to take advantage of some of the training seminars and I try to squeeze in some of the business seminars when I have a free hour or so.

The friendships that have been formed and the knowledge that we have gained from these conventions cannot be measured in dollars and cents. It is important for me to volunteer on the committees and give back to NESDA just a little of what they have given to us over the years.

— **Pat Viscardi**  
**Electronic Software Developers**  
**Farmingdale, New York**

I thought closing for a week to go to the NESDA convention might hurt business, but it didn't. We were very busy after we came back, thanks to loyal customers and thunderstorms.

NPSC 2000 was our first NESDA convention, but it won't be our last. We signed up for 2001 while we were at the 2000 convention. It was nothing like we expected. We thought we would go to a few seminars, and the trade show, and have lots of time to sightsee and gamble. Were we wrong!

“Over the years, our participation in NESDA has grown as our business has grown.”

Once we got there and saw what was available to us, we decided to forego the sightseeing and take advantage of everything we could.

The [first-timer] orientation meetings in the morning were well worth attending. Pat Viscardi would explain the happenings of the day in detail and make some recommendations.

We both attended the two days of the trade show. We walked away with a bunch of free stuff, but the real value were the contacts (manufacturers,

distributors, and warranty process companies).

The manufacturer's representatives were very courteous and made some announcements that should really benefit the service centers.

Clay attended as many technical seminars as he could. (FREE TRAINING—WHAT A PLUS!) They were very informative and have helped a great deal.

The meals were mostly buffet style. They were all grand. I think I gained five pounds.

Everyone was friendly and helpful. We made a lot of new friends, including manufacturer's reps. We also got some ideas that will help business. A lot can be learned from other's experiences. It was great to put faces with e-mail addresses. It makes it more personal.

We both attended Bob Goldberg's classes which were outstanding. We learned quite a bit about what not to do in certain situations. This will come in handy and I recommend these courses to everyone.

Randy Whitehead's Certified Service Manager course was outstanding. I didn't go to the convention with thoughts about getting certified. When we were at the trade show on Wednesday, Clay said, “Why don't you buy the Study Guide, and go to the class for the Certified Service Center Manager on Friday morning?” I said, “Sure, what have I got to lose?” After attending the class, I got excited, studied through lunch and decided to take the test Friday afternoon. They announced who passed the test at breakfast on Saturday. I am now a Certified Service Manager and I owe it all to Randy. Take this class if you want to be certified.

This was a week well-spent, and we're glad we were able to attend.

— **Linda Cornell, CSM**  
**Prefontaine's TV Sales & Service**  
**New Bedford, Massachusetts**

*(NPSC Forum, continued)*

*(NPSC Forum, continued)*

When I signed up for the NESDA Reno Convention last year I did so with a lot of skepticism. My main concern was how to survive with the loss of five days of productivity. Then there was the thought of life in a casino for a week. And of all things, a trade show! Imagine submitting yourself to 10 hours of high-pressure salesmen!

Well, my perceptions could not have been further from the truth. My wife Nancy and I found ourselves in a very hospitable environment. Between the employees of the Nugget Hotel, and fellow NESDA members, we were treated like royalty. I understand there were about 700 registered in attendance during the week. The meals were utterly fantastic—imagine six days of all you can eat of the best beef, seafood, salads, etc. We attended

valuable training in electronics theory, updates on high definition TV, customer relations skills and positive motivation.

And that trade show? It was a fantastically valuable resource! Imagine talking one-on-one with

the heads of every major manufacturer, many suppliers, and numerous support companies from every area of the consumer electronics industry. Two companies we chose to stop dealing with took great concern to our past problems, and assured us we'd get priority attention.

Each morning started out with an orientation meeting detailing the day's events and how to negotiate the convention for maximum benefit. Between the trade show and classes offered at the convention I met key

personnel at Hitachi, JVC, LG Zenith, Mitsubishi, Panasonic, Philips, Pioneer, Samsung, Sharp, Sony, Thomson, and Toshiba. My problems dealing with companies I am not authorized for are a thing of the past. (I received six offers for warranty authorization.)

And we came home winners! Nancy won a 27" RCA color TV, Sony sports tape/radio, Hitachi hat and backpack, and two stuffed animals. I won an HP color printer, CEA training tape, umbrella, and a bag full of service literature. I bought a service tips program, a hot air soldering system, and more to come from all of the contacts I made. We even had a net gain of \$200 that we brought home from those slots. Needless to say we're signed up for the 2001 convention! And to my surprise, those extra calls I ran prior to the convention

Although I am not quite a "newbie"—this was actually my second convention — I am not yet a seasoned conventionaire. As others have said, the food was wonderful and the giveaways were great; although I was not a "big item" winner this year (last year we won a 36" TV), I did win 1200 minutes of long distance service FREE, a \$50 coupon off a good service tips program, one of the Sams technical publications, and many t-shirts, hats, pens, etc. However, I think we were all BIG winners because of the wonderful networking opportunities available to everyone who was there.

Getting to know and visiting with others from across the country was like a "live" extension of NESDAnet. I can't tell you how many things I learned just by talking with others

between meetings and during meals. And the same goes for the reps from the manufacturers. It was so nice to be able to discuss, in open meeting forum, or one-on-one, the concerns and problems that we all enc-

"We attended valuable training in electronics theory, updates on high definition TV, customer relations skills and positive motivation."

paid off. We were financially right where we should have been this mid-August.

Lastly, I had a rare week to get reacquainted with my lovely bride. We shared lots of special time together. Surprisingly, as I left I had memories of the sadness I felt in my youth when summer camp ended and it was time to go home! The summer of 2000 will truly be a special memory for Nancy and me, thanks to NESDA.

— Sam Sieben  
In-Home TV Repair  
Snohomish, Washington

ounter. And to witness the genuine caring attitude shown by all of them. I was impressed with the overall smoothness of the convention—quite a feat considering there were some 700 of us there.

Thanks to each of you who took time away from work to attend and helped to make NPSC 2000 a very successful convention. To those of you that I did not get to meet in 2000, I look forward to seeing you in 2001.

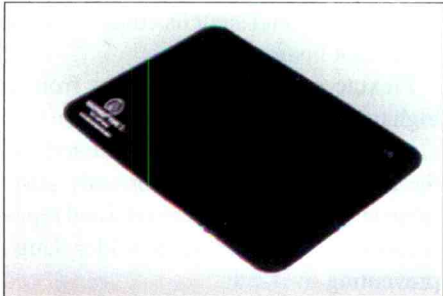
— Ken Stolpman, CET/CSM  
Delta Plaza Electronics  
Spring, Texas §



# New Products

## Desco Type J Mats

The Desco Type HJ Mat is made of dissipative shock resistant foam rubber and is 0.125" thick. This mat can be purchased



either as a roll (Item 45000) or as a mat (Item 45010). The roll is 24" x 40' and the mat is 16" x 24". It features a resilient non-skid natural foam rubber that makes it useful for cafeteria tray and cart shelves because its cushioning protects fragile components from hard surfaces. A factory-installed double-sided tape (on mat only) prevents the mat from bunching up and allows for tray-tray storage on sides. RTT and RTG are in the 105 to 107 Ohms range. The Type J Mat is available in custom sizes.

Desco  
Circle (19) on Reply Card

## BK Precision Introduces Low-Cost Remote Network Cable Tester

BK Precision announces the addition of Model 230 low-cost Remote Network Cable Tester. This lightweight, portable, battery powered unit is an easy and effective cable tester which can test all of the wiring faults of 10Base2 (coax), 10BaseTx, RJ45, TIA-568A, and Token Ring cables.

The model 235 Remote Network cable tester can be used to identify wiring faults such as open pairs, shorted pairs, reversed



pairs, crossed pairs and split pairs, as well as up to four different cables at one end by provided remote identifiers. It can be used to test cables from 4ft. (1.2m) to 492ft. (150m) in length.

A large flashing LED displays the fault code, and the 4 pairs' individual LEDs identifies which pairs are tested. The remote identifiers are provided to make a remote test. Just push the "TEST" switch. The tester will automatically run all tests within a few seconds and identify which faults are present, if any. It is very simple and easy to use.

BK Precision  
Circle (20) on Reply Card

## Permanent Static Dissipative Coating

Techspray's Licron is a revolutionary and innovative concept in permanent static dissipative coatings, providing excel-



lent adhesion to metal, plastics, paints and most other surfaces. The substance operates from 0% to 100% humidity. Cured coating is durable, will not chip and maintains 106 - 108 conductivity. The coating is translucent, and can be used on any surfaces requiring

a translucent coating.

Utilizing finely milled Electro Conductive Powder (ECP) as the conductive pigment, the product achieves translucence without sacrificing on performances. The ECP provided true metallic conduction rendering the cured coating totally humidity independent. The solvent based, acrylic matrix is very durable exhibiting superior adhesion and durability characteristics as compared with water borne coatings.

Techspray  
Circle (21) on Reply Card

## Circuit Board Repair Pens

Trace Technologies compete line of circuit board repair pens delivers ease-of-use, quality and performance for board



repair and rework.

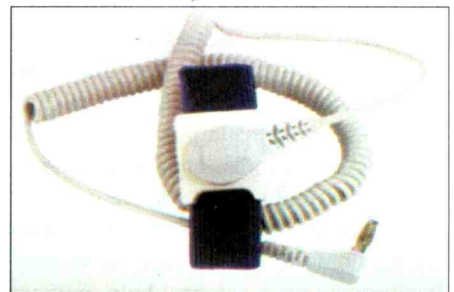
This broad product offering meets each technician's needs for all types of circuit board repair including cleaning, protecting and

restoring electrical connections. Each Trace Technologies pen comes with an instruction manual and step-by-step directions for each application, allowing any level of technician to perform quality repairs.

Techspray  
Circle (22) on Reply Card

## Wrist Strap Kits With Right Angle Cord

The ESDSystem.com Wrist Strap Kit with Right Angle Cord (Item 22110) is a kit



containing a blue adjustable strap and a right angle banana cord. The adjustable wristband has an extra wide, soft, elastic fabric that provides comfort and flexibility, as well as a snug fit. It provides super conductivity with its silver impregnated nylon fabric interior. The non-sloughing band material makes this wrist strap safe for microelectronics. The band also features a 4mm stainless steel stud that improves the mechanical connection with the coil cord. The cord features a superior banana plug that fits into all standard banana jacks. It has a 4mm spring loaded medical instrument snap that is designed to have stronger strain relief and snap retention, thus providing for long life. The Wrist Strap Kit with Right Angle Cord is UL listed.

ESDSYSTEMS.COM  
Circle (23) on Reply Card

# New Products

## Tool Boxes

Klein Tools' line of Hi-Viz tool boxes provide maximum space and organization in a compact, lightweight, yet durable unit. The orange color enables the tool boxes to easily be spotted on job sites.



Available in three styles, a three-tier tool box, a sit/stand three-tier tool box and a slide-top tool box, the tool box line features a resin construction that is lightweight, but strong to offer impact and weather resistance, and withstand the rigors of on-the-job wear and tear.

The three-tier tool box measures 16-1/4"W x 9"D x 12-1/2"H, and has a capacity of 1,165 cu. in. The tool box's top tray has storage compartments for small tools and parts; a tote tray holds larger tools and accessories; and the large tub easily contains big power tools. The compartments nest for maximum storage in one compact unit. A large V-groove in the lid conveniently holds conduit or pipe for sawing. Positive locking latches help prevent

accidental opening.

Designed to also be used as a handy step stool and seat, the sit/stand three tier tool box measures 20-3/4"W x 13-1/2"D x 16-3/4"H, and has a large capacity of 4,095 cu. in. The strong and durable lid features a no-slip surface. An adjustable shoulder strap and top handle provide for convenient and easy carrying.

Measuring 15"W x 10"D x 10"H, the 1,269 cu. in. slide-top tool box delivers quick access to its large bottom compartment through the slide-top drawers which stay attached. The slide-top provides a variety of compartments for small tools and parts, and the tool box is large enough to hold drills and hacksaws.

**Klein Tools**  
Circle (24) on Reply Card

## Self-Adhesive Stencils For BGA Rework

Self-sticking laser cut, polymer solder paste stencils from Circuit and Technology Center use a residue-free adhesive similar to Post-it Notes to seal around BGA pads to ensure that solder paste will not bleed under the stencil when the paste is applied. These stencils are easy to use and will not leave residue on the board surface. Currently, BGA rework stencils are fabricated from metal and require fixturing or taping to position them and hold them in place. They warp easily, and if the circuit board has undulations in the board surface, a metal stencil

will not sit flat against the surfaces. Since there is not gasket-like seal, solder paste can easily bleed under metal stencils when paste is applied with a squeegee. Solder paste can also spill out over the sides of flat metal stencils contaminating the circuit board surface.

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

**Circuit Technology Center**  
Circle (25) on Reply Card

## Power Monitor

The PQR D52 (Power Quality Recorder) from Powertronics provides proof that power problems exist and helps you to choose the correct power protection to protect valuable equipment. The records all types of power problems that affect sensitive equipment and comes



THE MAGAZINE FOR PROFESSIONAL ELECTRONIC AND COMPUTER SERVICERS

**ELECTRONIC**  
Servicing & Technology

**50**  
**ES&T**  
YEARS  
of  
Service

## WATCH FOR THESE FEATURES...

### AUGUST, 2001

**Ad Space Closing: July 25, 2001**  
**Materials Due: July 27, 2001**

NPSC Show Wrap Up  
CEDIA Preview  
Firewire  
Digital TV  
Multimeter Update  
Lighting — Home Theater  
Complying with Environmental Considerations  
**Replacement Parts Showcase and Directory**

### SEPTEMBER, 2001

**Ad Space Closing: August 20, 2001**  
**Materials Due: August 24, 2001**

CEDIA Show Issue  
Network+Interop Show Issue  
Telecom Test Equipment  
HDTV  
Transformers  
Power Management  
Home Theater Opportunities  
**Home Theatre Showcase and Review**

**For Advertising Information Rates and Reservations:** Contact Joni Jones at 515-944-8068, [jmjones@ix.netcom.com](mailto:jmjones@ix.netcom.com), Barbara Arnold at 781-259-9207, [bhacat@tiac.net](mailto:bhacat@tiac.net) or Dave Allen at 516-883-3382, [dallen@mainlymarketing.com](mailto:dallen@mainlymarketing.com)

**Editorial Contact:** Nils Conrad Persson at 913-492-4857, [cpersedit@aol.com](mailto:cpersedit@aol.com).

Circle (26) on Reply Card

# New Products

complete with the software that allows you to generate reports showing the power problems and their impact on equipment.

To monitor power, simply plug the recorder directly into the wall outlet for a few hours or days. The unit stores the information about each problem in a nonvolatile RAM chip. Up to 6000 Events are recorded so that you can relate system problems to actual power problems.

Events include spikes, sags, surges, noise, voltage and frequency changes, half cycle dropouts, power failures, and data logging.

After monitoring is complete, connect the recorder to a computer for a complete analysis of the site. Reports include Disturbance Events, Summary Report and a Data Log of readings.

Operating voltage 80-260 volts, frequencies of 40 - 400 hertz.

**PowerTronics**  
Circle (27) on Reply Card

## Digital Multimeters

Fluke Corporation has introduced the Models 187 and 189 digital multimeters designed with advanced feature set to meet the needs of plant maintenance, electrical, control and process technicians.

The meters boast 0.025% accuracy and 50,000 counts of resolution on a multiple reading display that includes a real-time clock, enhancing troubleshooting with the ability to correlate time of day with events. Place the leads on the circuit and a stable reading is instantly displayed.

The model 189 can be set up to capture and store measurement data while unattended, allowing a user to collect information about a measurement over time for later

analysis. In the logging mode, the meter monitors all change in the input signal and then stores a summary of those changes based on a timed interval as well as the stability of the measured signal. Once the logging session is complete (up to three days), the stored information is downloaded to a PC using the optional Fluke View Forms software. This industry-leading software enables users to maximize the meter logging capability through template-driven custom reporting. Fluke View Forms software is ideal for documenting test procedures for new equipment installation, meeting regulatory guidelines, and for tracking maintenance histories.

The 180 Series digital multimeters measure volts, ohms, amps and capacitance, as well as temperature in . . .C and . . .F, continuity, and also offer a diode test function. The ergonomics case design houses a multiple reading display for simultaneous readouts, such as true-rms ac + dc and Hertz, dB and mVdc, and more. In addition to relative mode and Min/Max/Average, the 187 and 189 offer a Fast Min Max mode for capturing transients as short as 250 s.

### New Accessories for the 180 Series

The optional "TookPak" accessory provides strap and magnet hangers for maximum versatility, freeing hands for safe and effective use of the meter. Technicians needing to conduct measurements over many hours or days can be assured of the meters security by locking it up using the new "LockPak" accessory.

### Designed for Safety

The new 180 Series DMMs meet the IEC-61010 Cat III 1000V and Cat IV 600 V safety ratings and carry a dust-proof and drip-proof environmental rating. The overmolding technology in the case design disperses shock loads over more of the case than a traditional holster design, resulting in a more rugged meter. The meters come complete with probe holder, test leads, alligator clips, and a getting started manual available in 16 languages. A multi-language CD-ROM containing the users' manual is also included with the meter.

The Fluke 187 and 189 digital multi-

meters offer a lifetime warranty and are now available from Fluke distributors and representatives worldwide. The U.S list price for the Model 187 is \$379 and \$399 for the Model 189.

**Fluke Corporation**  
Circle (28) on Reply Card

## Portable Fiber Optic Power Meter

Fotec's new DM3000 is a dual channel, high performance fiber optic power meter that offers user customization, datalogging, and more, in a portable, handheld package. The meter offers features that equal or surpass many expensive laboratory instruments, but at a hand-



held meter price, says the manufacturer.

The two detectors can be used to measure the loss of two fibers for link testing or simultaneously monitoring reference and measurement power. The meter can also be specified with two different detectors to extend the measurement range in power to +20dBm to 70dBm or in wavelength from 400 nm to 1800 nm.

The unit allows the user to custom program the meter for their testing. Using the menu-based operating system and soft keys, the user can program the instrument for calibration.

Internal memory is provided for data storage in a cable/fiber database for up to 500 measurements. The meter includes a data-logging feature with a real-time clock so that the user can program the unit to sample and store data on present intervals.

**Fotec**  
Circle (29) on Reply Card

## Spectrum Analyzer with RS-232 Interface

B&K Precision announces the addition of the Model 2635 150 kHz to 1.05GHz spectrum analyzer. This compact, versatile, easy to use, PC compati-



# New Products

ble benchtop unit is useful in the cable TV and telecommunication industry.

The Model 2635 can be utilized for pre-compliance testing during development prior to third party testing. It is extremely flexible and can be put to work testing cable TV levels and frequency responses, testing master antenna TV systems, measuring communications transmitter spurious radiation, locating sources of EMI or to measure unwanted RF radiation.

An optional PR-261 near-field sniffer probe set can be used to locate cable and PC board emission "hot spots" and evaluate EMC problems at the breadboard and prototype levels. The Spectrum Analyzer/sniffer probe combination is an excellent solution for RF leakage/radiation investigation, CATV/MATV systems troubleshooting, cellular telephone/pocket pager test and EMI diagnostics.



The front panel display provides many measurement parameters such as Center Frequency, Marker Frequency and Attenuation Levels. Other features include Save/Recall, Frequency and level marker, and an RS-232 PC interface with Windows-based software. Outstanding performance characteristics include measurement of frequency signals from 150kHz to 1.05GHz (1050MHz), Dynamic range of 80dB (113dB with attenuation), AM and FM demodulator, 20 and 400 kHz resolution bandwidth, 150kHz/hour stability, and built-in tracking generator.

**B&K Precision**  
Circle (30) on Reply Card

## Pneumatic Wire Cutters

A line of air-powered flush cutters that are comfortable to hold, easy to use, and eliminate repetitive manual squeezing for PC board production and repair operations is available from Xuron.

The company's 590 Micro-Pneumatic Series Cutters feature Micro-Shear cutter blades with patented by-pass edges that produce a clean, flush cut, and come in three models: Standard Model 590 for soft wires up to 16 AWG, the Model 590F with a lead retainer, and the Model 590LP low-profile version for soft wires up to 20 AWG and superior access in tight spaces.

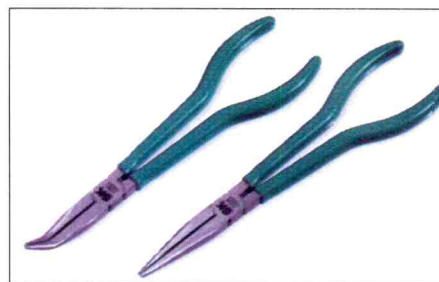


Ergonomically designed to fit into the palm of any size hand, the Cutters can be actuated by either the thumb or forefinger. Producing no recoil and <60 dbA noise, these quiet running cutters are only 5.5" L x 1.5" W x 0.6" thick and weigh under 6 oz. They use internal bellows to close the blades and only require 50 psi air.

**Xuron Corporation**  
Circle (31) on Reply Card

## Extra Long Needle Nose Pliers

S•K Hand Tool's Extra Long Reach Needle Nose Pliers provide added reach when access is limited. Now available in a two-piece set with straight and 45-



degree tips for better access in nearly any application. Extra long reach needle nose pliers offer a generous 11-inch reach. In addition, serrated jaws offer maximum gripping strength while padded handles provide comfort and sure handling in the harshest of work environments.

Two-Piece Extra Long Needle Nose Pliers Set (#17832)

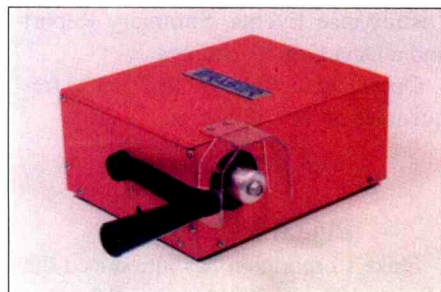
- 11" Extra Long Straight
- 11" Extra Long 45-degree angle
- Packaged in carry pouch

**S•K Tools**  
Circle (33) on Reply Card

## Operating Wire & Tubing Cutter

The WC10 hand-operated wiring and tubing cutter from Eraser is useful for producing short runs of cut pieces of wire, tubing, or sleeving, at an economical price.

The unit can cut wires from 14 AWG to 28 AWG into lengths from 0.100" (2.54mm) to 8 1/8" (206mm). Flexible tubing or sleeves up to 1/4" (6.35mm $\phi$ ) diameter may be cut in lengths from 0.100" - 8.125" (2.54 - 206mm) depending on material construction.



Two quick adjustments are needed to set the machine up for the desired length. Then the wire or tubing is fed in and the handle turned. The machine produces one cut per turn of the handle. If cutting very small lengths, from 0.100 to 0.600" (2.54mm to 15.2mm), an optional four-cut blade can be installed to give four cut pieces for each turn of the handle. The tolerance on cut pieces is  $\pm 1/32$ " (0.79mm), dependent on material construction.

**Eraser**  
Circle (34) on Reply Card

## Compact, High-Current, Variable Frequency AC Power Sources

Global Specialities has introduced two Ultra-Compact, Variable Frequency AC Power Sources.

Designated the Model 1510 (10A output) and the 1515 (15A output), these twin AC power sources offer: Ultra-compact and rugged design with adjustable handle, continuously variable output 0vac to 130vac, wide operating frequency range, from 47Hz to 450Hz, built-in analog current meter (2% accuracy) for quick monitoring, power

# New Products

on/off lighted switch, two output connectors (located on the back) give dual output potential, and input fusing.

These products, with their wide frequency range, are useful for applications involving the testing and monitoring of avionics equipment, service and repair, and industries where a high current must be monitored, tested, or repaired.



Global Specialties  
Circle (35) on Reply Card

## Communications Kit

The JTK-53 is Jensen's most versatile tool kit for the installation and maintenance of communications equipment. Service voice and data equipment including phone switches and data networks. The



kit offers 114 tools in all, including a cable stripper for coax/twisted pair, a 3/8" corded drill and drill bit set, fish tape, a hex blade set, a nut-driver set, seven pairs of pliers, full-size and miniature screwdrivers, a soldering iron, a 14-piece sock-

et set, a staple gun, three wire-stripper/crimper/cutter tools, a punch down tool with 66 and 110 blades, and adjustable and ignition wrenches.

Jensen  
Circle (36) on Reply Card

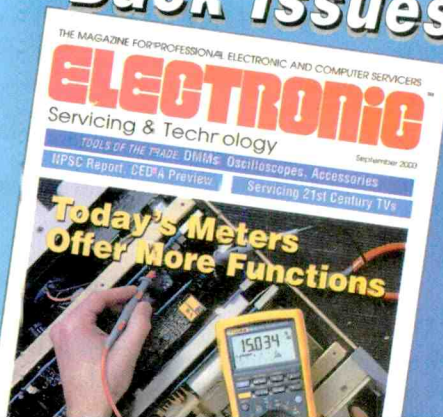
## Tenma Introduced New 100MHz Oscilloscope With Cursor Readout

Tenma Test Equipment announces the introduction of their new Model 72-6820 100MHz Oscilloscope with Cursor Readout.

Features: 100MHz bandwidth with dual channel, dual trace and dual time base operation. Delayed sweep mode with delay time from 1 $\mu$ s to 5s. Cursor readout with 7 measurement functions ( $\Delta V$ ,  $\Delta V\%$ ,  $\Delta dB$ ,  $\Delta T$ ,  $1/\Delta$ ,  $\Delta T\%$ ,  $\Delta q$ ). 10 memory front panel settings for save and recall. 6" rectangular



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Circle (57) on Reply Card

# New Products

lar CRT with internal graticule and 16KV acceleration voltage. Trigger hold off with special TV synchronization and trigger lock.

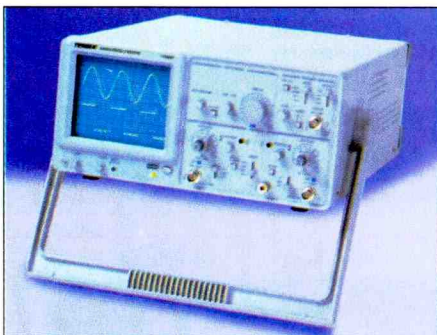
The new model 72-6820 at only \$995.00 also includes two 10:1 oscilloscope probes and owner's manual.

**MCM Tenma**  
Circle (37) on Reply Card

## 20MHz Oscilloscope

Tenma Test Equipment announces the introduction of their new Model 72-6800 20MHz Oscilloscope.

The scope features 20MHz bandwidth with dual channel and dual trace operation. 6" rectangular CRT with internal graticule,



high sensitivity of 1mV/division, automatic and external triggering, special TV vertical and horizontal triggering modes

for stable TV signal observations.

The unit also includes two 10:1 oscilloscope probes and owner's manual.

**MCM Tenma**  
Circle (38) on Reply Card

## Interactive Home Theater Audio Training CD

Sencore Electronics, manufacturer of test and calibration equipment for the Home Theater industry announces the release of their Installer's Guide to Home Theater Audio training CD-ROM. This interactive training tool is designed to provide professional Home Theater installers with the practical information they need to optimize the sound in every installation.

The CD-ROM training course is divided into three main sections: 1) Concepts and Theory, 2) Step-by-step Home Theater Setup & Calibration, and 3) Operation and Application of Sencore's SP295 SoundPro Audio Analyzer.

The Concepts and Theory section provides practical, down-to-earth information that will help new comers to audio as well as seasoned installers better understand the theory and concepts of audio, how audio behaves in a home theater room and the equipment in home theater systems.

The Step-by-step Home Theater Setup

& Calibration guide provides a complete guide for setting up and calibrating any home theater system to achieve optimum sound performance. Detailed procedures include component placement and installation, calibrating speaker level balance, calibrating time delay, optimizing subwoofer S/N, identifying and controlling reflections, and equalizing low frequency response. Each step includes detailed information and photos showing how to perform the test or alignment.

The CD-based format allows the learner to fully experience multimedia training. It contains over 350 photos, illustrations and animations that clearly illustrate each concept, test procedure and calibration step. Audio segments illustrate important acoustic and audio principles such as critical bands, reverberation, reflections, decibels, timbre, phase, octaves, harmonics, room resonance, and many others.

Several interactive calculators are included throughout the training. These calculators will help you better understand such things as decibels, octave bands, the effects of room size, speaker placement and room treatment. Each calculator can be quickly accessed and used as a tool while performing an installation.

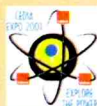
**Sencore, Inc.**  
Circle (39) on Reply Card

## ES&T Calendar of Industry Events

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



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



**NETWORLD+INTEROP**  
SEPTEMBER 9 — 14, 2001  
Georgia World Congress Center  
Atlanta, GA  
Key 3 Media Group  
781-433-1500  
[www.key3media.com](http://www.key3media.com)



**WESCON 2001 FALL**  
OCTOBER 16 — 18, 2001  
San Jose Convention Center  
San Jose, CA  
800-877-2668  
[www.wescon.com](http://www.wescon.com)



**EH EXPO FALL**  
OCTOBER 24 — 27, 2001  
Long Beach Convention Center  
Long Beach, CA  
925-284-5750  
[www.electronicshome.com](http://www.electronicshome.com)



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## Test Equipment Product Guide

Global Specialties has released a new four-color Test Equipment Product Guide.



This new, easy to read tri-fold product guide features over thirty innovative state-of-the-art test equipment models. It includes three new products

Some of the product groupings offered include:

- Model 9004 Four-In-One Test System
- Four models of "Pure Water" Function Generators, with 40Mhz frequency counters and RS232 built in
- Six DC Power Supply models, many offering a special and unique heat compensation system
- Six AC Power Source models, three of which are new

- Unique, Auto Scan, True RMS Line Power Meter, with RS232
  - Two special frequency counters, one hand held and one bench
  - Two hard to find pulse generators, one 5MHz and the other new 10MHz
  - One each low cost, spectrum and logic analyzer
  - Prototyping design breadboard workstations
  - New, Protolab 5.0 circuit design and simulation software package
- Global Specialties**  
Circle (40) on Reply Card

## CMOS IC Catalog On CD-ROM

Seiko Instruments announces that its 2000/2001 CMOS IC Catalog is available now on CD-ROM. The free CD catalog covers and illustrates the features and benefits of all current CMOS ICs available from the Company's Electronic Component Division.



With the interactive menu, you can navigate around the catalog simply with clicks of the mouse. Information provided for each CMOS IC includes features, pin assignments, block diagrams, operation specifications, dimensions and maximum ratings. Some CMOS ICs even have application examples available. Also included is software that simulates the operation of the manufacturer's switching regulators.

**Seiko Instruments**  
Circle (41) on Reply Card

## Test Catalog

Fluke has introduced a new catalog bringing together the combined lines of Fluke and Wavetek-Datron general purpose test products in one unified source. Fluke acquired Wavetek-Datron last year.

The Catalog includes a comprehensive selection of benchtop programmable function pulse/function and universal/arbitrary waveform generators; counters and frequency standards; portable, networked and wireless data acquisition systems and a variety of plug&play VXI products.

**Fluke Corporation**  
Circle (42) on Reply Card

## New Web Sites

### Cooper Electronics Technologies Updates Web Site With Broad Array of Specifying Tools

If you're looking for the latest product information about magnetics, overvoltage protection, overcurrent, and super capacitors, the new Cooper Electronic Technologies web site, [www.cooperET.com](http://www.cooperET.com), has an abundance of company and product information. In addition, new content and product searches help you easily locate marketing and technical information.

**Cooper Electronics Technologies**  
Circle (56) on Reply Card



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**LLH Technology Publications**  
Circle (43) on Reply Card

## Introduction to Fiber Optics

By John Crisp  
2001: 240 pages  
ISBN: 0-7506-5030-3  
Price: \$32.95

John Crisp's Introduction to Fiber Optics is well established as an introductory text for engineers, managers and students. It meets the needs of systems designers, installation engineers, electronic engineers and

anyone else who wants to gain a working knowledge of fiber optics with a minimum of maths. Review questions are included to check understanding. This edition includes new chapters on LAN's, installation techniques, and the international BICSI standards. Whether you are looking for a complete self-study course in fiber optics, a concise reference text to dip into or a course text that is readable and straightforward, John Crisp has the solution.

Contents: Preface; Introduction; The physics of light refraction and reflection; Propagation of light along the fibre; Decibels; Some losses on an optic fibre; Real cables; Principles and problems in joining optic fibers; Fusion splicing; Mechanical splices; Connectors; Couplers; Light sources and detectors; Testing systems; Designing systems; Introduction to transmission systems; Next steps; Glossary; Answers to problems; Index.

**Newnes**  
Circle (44) on Reply Card

## Exploring Programmable ICs

By Clement C. Pepper  
ISBN: 0-7906-1208-9  
December, 2000: 368 pages  
Price: \$34.95

Exploring Programmable ICs covers all aspects of this versatile and functional component. Programmable ICs are devices designed for operation under program control from a computer or microcontroller. Exploring Programmable ICs along with selected applications with relevance to projects you would like to develop. Pepper will take you through the creation of a component to measure the performance of ICs, utilizing affordable breadboarding materials and circuits.

### Key Features:

- Address test set-ups for a variety of programmable devices.
- Approached Programmable ICs without the need for a computer, but rather employs readily available, affordable, breadboarding material and circuits to utilize the ICs.
- Includes a stand-alone instrumentation application: the 8254 Programmable Interval Timer.

### Author Information:

Clement Pepper started his career in the US Navy and had experience with gun-

fire control systems, nuclear events, and gamma ray engineering. With a BS in Physics, he was Manager of Engineering and Manufacturing at IntelcomRad Tech and has enjoyed writing for electronics magazines for a number of years. Clement resides in Wisconsin.

**Sams Technical Publishing**  
Circle (45) on Reply Card

## PIC: Your Personal Introductory Course, Second Edition

By John Morton  
ISBN: 0-7506-5038-9  
2001: 288 pages  
Price: \$26.95

John Morton offers a uniquely concise and practical guide to getting up and running with the PIC Microcontroller. The PIC is one of the most popular of the microcontrollers that are transforming electronic project work and product design, and this book is the ideal introduction for students, teachers, technicians and electronics enthusiasts.

Assuming no prior knowledge of microcontrollers and introducing the PICs capabilities through simple projects, this book is ideal for use in school and colleges. The step-by-step explanation make it ideal for self-study too: this is not a reference book - you start work with the PIC straight away.

Contents: Introduction; Exploring the PIC5x series; Exploring the P16C71; The P12C50x series; The P16C84 series; Looking to the future; Sample programs' Index.

**Newnes**  
Circle (46) on Reply Card

## Guide to PIC Microcontrollers

By Carl Bergquist  
ISBN: 0-7906-1217-8  
December, 2000: 336 pages  
Price: \$39.95

Aimed at both students and seasoned users, this book will take the reader through the peripheral interface controller (PIC). PICs have been described as the hobby chip of the '90s due to their ease of use. Tips on programming and design are included. Hardware and software are also discussed in detail. Topics included: physical appearance, electrical structure, software requirements, hardware requirements, prototype layout boards, simple PIC programmers, PIC instruction set, use of the Microchip tools including MPLAB and Technical Library, software



applications, software codes, and 8-10 PIC projects.

#### Author Information:

Carl Bergquist had a successful career as a photojournalist for AP, UPI, The New York Times, and other publications. Bergquist has now turned his efforts toward his lifelong hobby of electronics, publishing articles in popular electronics and hobby publications.

Sams Technical Publishing  
Circle (47) on Reply Card

### Computer Networking for Small Business

By John Ross

ISBN: 0-7906-1221-6

May, 2001: 368 pages

Price: \$39.95

Small businesses, home offices and satellite offices with unique networks of 2 or more PCs can be a challenge for any technician. This book provides information so that technicians can install, maintain and service computer networks typically used in a small business setting. Schematics, graphics and photographs will aid the "everyday" text in outlining how computer network technology operates, the difference between various network solutions, hardware applications, and more. Methods for installing networks as well as common troubleshooting techniques are also covered.

#### Key Features:

- Assist technicians with installation, maintenance and repair of networks used in small businesses.
- Utilization of a step-by-step approach to aid in the installation of the network.
- Includes a comprehensive discussion regarding the Windows NT/2000 Server.
- Overviews common problems and their solutions.

Sams Technical Publishing  
Circle (48) on Reply Card

### Exploring Office XP

By John Breeden and Michael Cheek

ISBN: 0-7906-1233-X

May, 2001: 304 pages

Price: \$29.95

Breeden and Cheek provide an insight into the newest product from Microsoft Office XP. Office XP is the replacement for Microsoft Office, designed to take

users into the 21st century. Breeden and Cheek provide tips and tricks for the experienced office user, to help them find maximum value in this new software.

#### Special Note:

The release date of this book is entirely dependent of the release date of Office XP from Microsoft, which is subject to change at any time. Exploring Office XP will be released in conjunction with Microsoft's release of the software.

#### Key Features:

- Custom installation instructions.
- Full coverage of Excel, Word, Powerpoint, Outlook, and more.
- Covers new features not found in previous versions of Office.

#### Author Information:

Breeden and Cheek are editors at Government Computer News and are experts in the field of computer hardware and software and have detailed knowledge of emerging technologies including application software, operating systems, and various hardware devices. Both reside in Sliver Spring, MD.

Sams Technical Publishing  
Circle (49) on Reply Card

### Servicing Digital Televisions

By Robert Goodman

ISBN: 0-7906-1223-2

April, 2001: 296 pages

Price: \$34.95

Part of Sams Servicing Series, Servicing Digital Televisions covers the servicing issues surrounding this popular electronic device. All aspects of this new technology are covered in this servicing text. The growing popularity of digital televisions as well as the increasing number of television stations broadcasting digitally have brought this new technology into homes.

#### Key Features:

- Little to no service data is available on digital televisions.
- Provides "tips and tricks" related to the equipment vs specific models.
- Goes into detail regarding popular models, with advice on how to apply the repair techniques to other manufacturer's sets.
- Covers a sparsely written about component that is growing in popularity.

#### Author Information:

Bob Goodman, CET, has devoted much of his career to developing and writing about more effective, efficient ways to troubleshoot electronics equipment. An author of more than 62 technical books and 150 technical articles, Goodman spends his time as a consultant and lecturer in Western Arkansas.

Sams Technical Publishing  
Circle (50) on Reply Card

### Business Skills for Engineers and Technologists

ISBN: 0-7506-5210-1

368 pages

Price: \$39.99

Business Skills for Engineers and Technologists provides all the essential information an engineering student needs preparing to work in a business environment. The authors take a uniquely student-centered approach to the subject, with easily accessible material introduced through case studies, assignments and knowledge-check questions.

The scope of this text is wider than many traditional businesses texts, including hot topics such as e-commerce and business ethics as well as fully up-to-date coverage of management issues and finance. Key numerical and statistical techniques are introduced through Math in Action panels located within the main text.

The interactive style of the book is ideally suited for the study of business and management topics, bringing the subjects to life with activities and case studies rather than devoting hundreds of pages to management theory. Lectures will find the breadth of material covered gears the book towards a flexible style of use, which can be tailored to their syllabus.

Forthcoming lecturer support materials and the IIE textbook series website will provide additional material for handouts and assessment, plus the latest web links to support, and update case studies in the book.

Contents: Preface; Foreword; The Company; Human Resource Management; Management; Law and Ethics; Project Planning; Money in the Organization; IT in the Organization; Strategy; Index.

Newnes  
Circle (51) on Reply Card

# ES&T Readers Speakout

## READER OPINION SURVEY/COMMENTS

### HELP LINE

Help! Need source. Looking for old type radio filter capacitors electrolytic 50-50 MFD 150Vdc paper tube 50-50 MFD 150dc alum can.

Sal Carozza,  
Sacarozza Elect.  
1844 Herring Ave.  
Bronx, NY 10461

Dear ES&T. This probably is inconsistent with your magazine purpose but I would like to know if anyone knows who to contact regarding electronic material sold by the defunct Montgomery Ward Company. I need schematics on some old radios.

Also, I appreciate such informative and interesting articles as "product File: Capacitors" appearing in your February 2001 Issue.

Fred H. Collins.  
123 Watson St.  
Enfield, NC 27823

Have Lafayette stereo #LR1000T with no stereo sound separation and cannot locate the schematic. Would appreciate advice or schematic

David Conover,  
609-894-4321

We have been looking for a simple FET Tester. Does anyone manufacture one or has anyone built a home made tester? We have found a number of instruments that purport to test a variety of products including FETs, but none designed to effectively test FETs exclusively.

Respond to ES&T 516-883-3382  
dallen@mainlymarketing.com

What's a good way to download OEM service manuals and store and print them? This has become a problem.

Walt Schumal  
Grass Valley, CA  
(530) 272-5458.

you tech support unless you are a dealer.  
E.O. - Ortiz Radio - Ponce, PR

Very good coverage on all articles.

E.S. - Friendly Community TV  
Service - Cuero, TX

Support for GM Delco/auto stereo unit is almost non-existent.

M.A.M. - Fairview, KS

### FEBRUARY & MARCH 2001

Survey card asked you which associations you belong to and which shows you attend. The full tabulation will be published when completed. Following are the additional comments on the questions and ES&T.

The phone system, troubleshooting combos, troubleshooting vert, scanners.  
G.W. - Texarkana, TX

Great Issue. J.L. - Glendale, AZ

Great to see article on repairing TV/VCR combos, More please.

B.J. - Winnipeg - Montreal

I question the information written by Bob Rose. S.G. - San Leandro, CA

You are looking good! Please more computer service articles.

B.R.M. - Synder, TX

More information on T.V. VCR repair.

J.A.S. - Brooklyn, NY

Glad to see that Profax is once again legible and on durable paper. Schematics get abused on the technician's bench.

T.G. - Sunnyvale, CA

Repairing VCR - TV combo's - troubleshooting vertical problems.

S.J.C.jr. - New Orleans, LA

Excellent article on servicing TV/VCR combos.

J & S Electronic Service - Jackson, NJ

Good articles, poor proof reading.

T.S. - Only, TN

Articles by Bob Rose have really been of great help, I keep all his articles filed.

ANON - San Jose, CA

Very good. J.J. - Phila, PA

Very good articles on HDTV, TV/VCR Combos.

Troy Electron - Frankville, PA

I like all concerning TV's, VCR, CD, Computer Service.

J.H. - St.Zenon, Quebec Canada

TV/VCR combos article very good.

D.C. - Miami, FL

Need good PC service literature

B.G. - Gilbert Electronics  
Lincoln, NE

The problem with "pull parts" is brought on by the manufactures themselves who flat out refuse to sell replacement parts or service data.

Repair of electronic office equipment could be a good source of income if it weren't for the manufacturers refusal to sell parts and service manuals.

There is no technical reason for a 2 or 3 year old product to be in the landfill.

M.A. - Ouido, FL

Combo information helpful. More!!

B.D. - Torrance, CA

### APRIL 2001

ES&T would like your opinion regarding warranty service.

This year I have made long trips (100m, 1 way) for Hitachi, and they have paid what I asked for these trips.

J.S. - South Side Service  
S. Williamsport, PA

Manufactures will not establish you as an authorized service center if your service company is in your home. Don't like it!

Ken's VCR-DVD Service -  
Hutchinson, KS

More TV-VCR articles. Forget about Las Vegas and all that nonsense!!  
More DVD articles!!

S.C. - Mentone, CA

(Regarding Warranty Work) Tried it, didn't like it. Too much paper work. Some customers you don't want at any price.

Anon - Kansas City

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

ES&T Readers Speakout  
403 Main Street, 2nd Floor  
Port Washington, NY 11050  
Fax: 516-883-2162  
Email: dallen@mainlymarketing.com.

**E-MAIL:** I decided to e-mail this opinion, as my comment is a little too long for the space provided. I have requested information on becoming an authorized service center from several companies. Most of them wanted to know too much information that I felt was really none of their business. The only thing that they should be concerned with is 1) Did the product get fixed, and 2) Is the customer satisfied with the service. Instead I was asked for things such as pictures of my shop, inside and out. Pictures of my test equipment. Pictures of my service vehicle. Profit/Loss statements for the past 3 years, etc. I don't see why a company would need to know how much my business made in this year or any year in order for me to fix a TV, stereo, or some other electronic product. It has nothing to do with the price of beans in China. (Metaphorically speaking). Thanks.

Christopher West, Owner, West Electronic Services - Pine Knot, KY  
**ES&T: Let's hear other opinions...Should there be a standard form for use by all servicers, with all manufacturers?**

### DECEMBER, 2000

ES&T asked readers for the names of vendors and products they felt should

be advertised in ES&T. The results of that part of the questionnaire will be printed upon completion. Following are additional comments on the issue or other topics.

Great issue! "Cap Analyzer" article by Bob Rose was excellent!! Just what I wanted to know.

S.R.C. - Mentone, CA

Bring more articles like the on page 21 by Mr. Bob Rose.

G.H. - Bayamon, PR

(PO Lost two issues) No matter what you are No. 1 to me.

M.D. - Hot Springs, AR

### JANUARY, 2001

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

PTS, when they send you a defective part, they make you pay for shipping charges when you return to them the item that was bad for replacement. Sears, Aiwa, GE and Sharp will not give

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**SC61 Sencore Waveform Analyzer** for sale \$1500.00. 517-676-1216.

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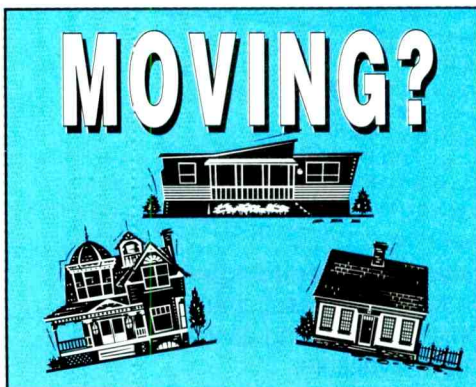
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want to offer for sale, the appropriate place for your message is in a paid advertisement, not Readers' Exchange.

- Readers' Exchange items must be restricted to no more than three items each for wanted and for sale.
- All submissions must be typed or printed clearly!

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VA62A Universal Analyzer, CVA94 Camera Video Analyzer, VR940 Video Reference. All equipment includes original manuals, test leads, service data, & shipping cartons. Will sell altogether or separately. Best reasonable offer accepted. Call Wade @ (909) 825-2287 or e-mail Wade\_Nelson@MSN.COM

Sencore TVA92 \$700, Sencore VG-91 \$900. With cables and manuals in original boxes. Like new condition. Best offer for Sams literature, and 1000 plus receiving tubes in original boxes. Retired after 43 years. Contact: Warren @ (336) 670-3689.

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Sencore VA62A Universal Video Analyzer with all manuals & probes. Excellent condition \$800.00 plus shipping. Hickok Tube Tester. Model #533A with manuals \$30.00 plus shipping. Sams Photofact Sets #1095 to #1366. All 84 sets for \$50.00 plus shipping. John Brouzakis, 247 Valley Circle, Charleroi, PA 15022. 724-483-3072.

Sencore equipment for sale. SC3100 Oscilloscope, new, never used, still in box, \$2000.00. -CR7000 Picture tube tester/restorer, new, never used, still in box, \$1750.00. -LC103z-Meter, very new condition, used little \$1750.00. LC102 Capacitor/Inductor tester, new condition, used \$1250.00. -VG91 Video Generator, used little, new condition, \$1750.00. -TVA92 TV Accessory, used little, new condition, \$1500.00. PR570 Isolation Transformer, used, new condition, \$500.00. -SCR250 Triac Accessory, used, new condition, free with LC102. All probes and attachments go with corresponding instrument. James Scanlan, 45 21st Street North, RR1 Box 674 A Edgartown, MA 02539.

Sencore VA62, NT64, VC63 with HV probes \$500.00, HP 1740A Dual Trace 100mHz oscilloscope \$450.00, B&K 467 picture tube restorer \$150.00. ES magazines 1975 to present \$150.00. Frank Wolff (207) 872-2504.

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

a large amount. Donald K. Schlueter 816-330-3341.

## WANTED

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RCA 27" TV model F27171CP - need front mask P/N MK1011. Contact George, 570-467-0562

Used TV-Audio-Electronics Repair Training Video needed. Will purchase at a reasonable price. Contact Al @ (718) 854-9857 or abay97@aol.com.

Schematic or operation manual for Raycon Model 901LF, 900 MHZ, wireless, transmit and receive units, PN10105-100-01 and 10105-101-01. Schematic for Hitachi SR2004 stereo receiver, Contact C. Ellis, J&K Repair, 9419 Waller Rd.E., Tacoma, WA 98446; (253) 531-8142(H) (253) 475-7711(W) E-mail: cellis@robinson-noble.com

AKAI VCR Model VS-525U-needed bad or good, Head Motor PN 8BM-M3223A020B, Part # on part 357699B 7B M3223C5011 SM-230 service manual needed will copy & return, JVC model RX-517V & JVC model KD-A5J. GE camcorder model CG-9805 needed for parts, Harmon Kardon stereo cassette deck Model hk 300XM need a cassette deck ASSY for parts. Video & VCR Repairs, 21 Lombardy Drive, Baltimore, MD 21222.

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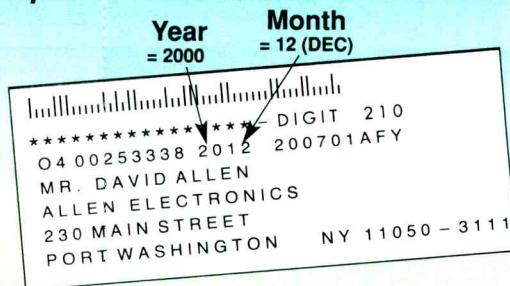
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## It's "Lead Follow or Get Out of the Way" Time

The fact is, and this is not news, Consumer Electronic Service Professionals face a daunting variety of difficulties... some which have, or will, change the nature of the business dramatically.

Obviously, these difficulties need to be addressed...at the manufacturer, consumer, servicer, warranty and consumer levels. It is past time for action.

Yet, since joining the business we have heard little from any single segment that seemed important to, or was seriously addressed by any other segment.

Servicers tend to complain, while not addressing real issues that can make a difference. When the various organizations provide forums with manufacturers the issues raised appear to be less than earthshaking.

At the same time, the manufacturers work to avoid real conversation with the service community...and response from warranty organizations is almost non-existent. Speaking of non-existent, the consumer has no idea of the service ramifications of cut-rate prices, extended warranties, etc.

Yes, there are obvious exceptions to these generalizations, but they are just that, exceptions. We also realize that being new to the business we may not understand all its nuances.

However, when all is said and done, there is a crying need to begin changing the face, attitude and financials of the community.

Step one... Let's begin by sticking our necks out and suggesting a few items that might begin the process.

1. Development of a standard list of codes for the variety of services performed. Servicers have enough paperwork without learning every manufacturers or warranty organizations' code system.
2. Gain commitments from manufacturers to make basic schematics and replacement products available to all certified servicers.
3. Develop a Cost of Doing Business profile by geography. This need not have specific dollars for services but an indexed system could be employed indicating the relative CODB between regions.
4. A survey on salaries paid to technicians and managers, by region and/or by level of certification, or even size of shop.
5. Work for a commitment from manufacturers, or truth in advertising legislation, that when consumer electronics products are sold to retailers at "net" without factory warranty, this information is prominently marked on the product or carton.
6. Embark on major research to ascertain the effect service and servicers' recommendations have on the sale of consumer electronics products.
7. Develop a consumer advertising and/or Public Relations campaign designed to acquaint the public with the role of the Consumer Electronic Service Professionals... how servicers can help, what the consumer should look for when buying consumer electronic items, what extended warranties really mean, etc.

The bottom line...let's determine what we really need, what will make a difference. Then let's see who can, or will, take on the coordination and responsibility for implementation. IE: NESDA, ETA-I, PSA, or some other new or established group.

Send us your comments and ideas. We will publish them for everyone to see. And, while we believe most projects of this type should be coordinated NESDA, ETA-I, PSA or a combination of industry associations, ES&T will also commit to implementing one or more of these projects based on your input.

You can respond via the comment card in this issue, email, fax or USPS.

*Marce Marcellino*

*Paul Allen*

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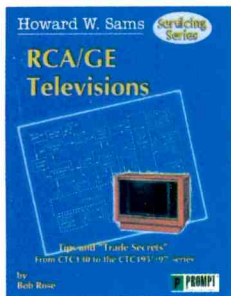
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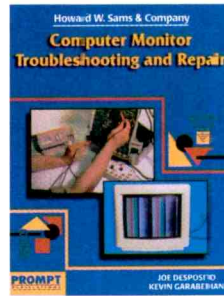


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**As mentioned in this issue, page 16**

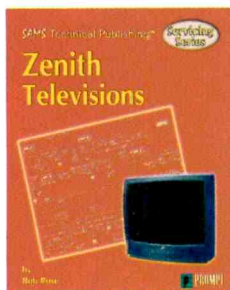
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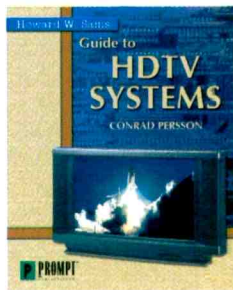


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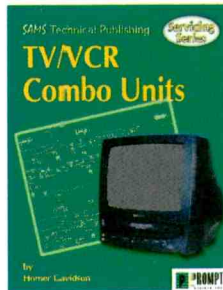


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