

THE PROFESSIONAL MAGAZINE FOR ELECTRONICS AND COMPUTER SERVICING

ELECTRONic^{T.M.}

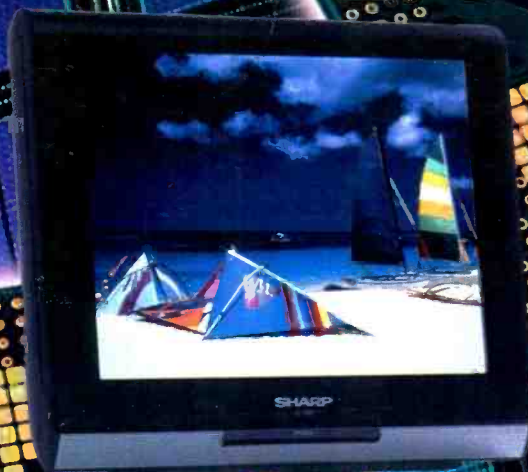
Servicing & Technology

March 2000

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contents

FEATURES

- 6 Selling service via the internet** by Conrad Persson
The internet has proven to be a very good place for all kinds of companies to promote their business. A number of consumer service companies have generated significant amounts of business via their website. But the internet should be considered only one facet of a balanced marketing approach.
- 8 Consumer electronics product handling: Coping with ESD** by John Ross
As circuit fabrication and packaging technology produces smaller and smaller components and integrated circuits, simply handling them: soldering, desoldering, picking them up, placing them correctly, becomes more difficult. And ESD becomes a bigger problem. This article provides some tips on handling these delicate devices safely.

2000 BUYERS' GUIDE

What a difference a year makes. Some companies may go out of business, new companies start in business, move, their area codes change, companies establish a presence on the internet. All this change means that when a service center is looking for a tool, or a piece of test equipment, they might not find the right source. **ES&T** published this annual Buyers' Guide to provide service centers with the most up-to-date information possible.

- 16 Product Directory**
- 34 Software/Services Directory**
- 47 Replacement Parts Directory**
- 54 Association/Educational Sources Directory**
- 55 Company mailing addresses**

DEPARTMENTS

- 2 Editorial
- 4 News
- 12 What Do You Know About Electronics?
- 37 Profax
- 75 Photofacts
- 76 Calendar
- 77 Books
- 78 Classified
- 79 Reader's Exchange
- 80 Advertisers' Index

ON THE COVER

The scope of consumer electronics continues to grow and change, as does the technology on which it's based. Service technicians are constantly learning new technology and new products and buying new tools, test equipment, supplies and replacement components to stay abreast of all of those changes. The annual **ES&T** Buyers' Guide provides the most up-to-date names and addresses of the companies who market the products needed for consumer electronics service.

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16

Editorial

by Nils Conrad Persson

The Buyers' Guide

It's time for the annual Buyer's Guide issue again. We hope you find it useful. As usual, it was a struggle to get it going, and it took quite a bit of time to produce, but at last it's finished. With every passing year, it gets a little easier. As with any venture, what is new, and therefore daunting, one year becomes routine after a few years of doing the same thing.

It is amazing, though, how many changes have taken place that we tend to take for granted. As an example, as you page through the company listings, notice all those fax numbers. Of all the 689 companies listed, we have fax numbers for 582. No doubt all of them have fax machines, but some either didn't tell us about them, or just haven't returned questionnaires lately. How long ago was it that these listings didn't contain fax numbers, because no one had faxes?

Another phenomenon has been the growth of use of e-mail and internet web sites by companies. Just a few years ago, we didn't list e-mail or web site information for companies in our listing because no one had that type of communication capability. Today, 298 of our company listings include e-mail addresses, 324 listings include a website address, while 356 of the entries include one or the other. Both an e-mail address, and a web site address are included in 266 entries.

This year we once again took a look at the geographic distribution of companies in the listings. Interestingly, there is at least one company in 47 of the 48 contiguous states of the United States. Of course, there are more companies in some states than there are in other states.

California is the winner again with 140 entries. For a number of reasons, this makes a lot of sense. For starters, California is a big, and populous state. This makes sense since California is on the Pacific Coast, and so much of the bulk of products and materials of interest to consumer electronic service, from the finished products to replacement components, is imported from the other side of the Pacific.

The state where the next largest segment of the companies in our listings is located is New York, with 59. Illinois comes next with 54, then Massachusetts with 50, New Jersey with 45, Ohio and Texas with 31, and Florida with 30. Pennsylvania accounts for 21 of our entries. All the rest of the states represent fewer than 20 of our listings. Six of the states have only one entry. We don't have any listings in Montana.

On the other side of the coin is the product listings, and we found some interesting things there as well. Of the 689 company listings, we have listings of products for 529. That's an improved situation over last year, and we plan to continue to refine the listings.

There are 6,584 entries in the product listings. That means that whatever a service center is looking for, it's likely that they'll find a place to obtain it in these listings.

You can help us make the 2001 Buyers' Guide better

As anyone who has ever tried to take a survey by mail knows,

not everyone who receives the survey form fills it out. That makes it difficult to have listings that are totally accurate. For example, of the 689 companies in the company listings, 338 companies have returned the questionnaires in at least one of the past three years. A number of companies, 88, to be exact, have sent back the questionnaires every year. Obviously they recognize the value of being listed in this magazine.

But that means that 351 companies have not returned questionnaires in the past three years. Since we know many of those companies, we know that the data for them is accurate, even if they haven't returned forms lately. And we have delisted companies whose mail was returned as undeliverable, since they are obviously not there anymore.

During the coming months, the staff of this magazine are planning to continue to try to improve the accuracy of the Buyers' Guide. We'll be contacting those companies that haven't responded to questionnaires recently, in an attempt to get up-to-date information. If we can't confirm their listings that way, or in some other fashion, we'll delete those entries.

It would be a great help in this effort if readers could let us know when they call a number in this listing and are told that it's a wrong number, or if they write to an address in this listing and get either a notation that the address is wrong, or no response, or if they contact a company to buy a product that our listing says they have, but the company says that they don't sell that product.

And you can help us make the listing more complete. If you notice that there's a company that we don't have listed that you think should be here, please let us know.

The more accurate we can make the Buyers' Guide listing, the better for all concerned.

And finally, if you have any comments: positive or negative about the Buyers' Guide, we'd like to hear it.

Help us update the product listings

Another major effort we plan to make over the next several months is to update the product listings to reflect some of the new technology. The list of products that we carry in the product listings was established a number of years ago. We have updated it from time to time, and think it still adequately represents the product requirements of most consumer electronic service centers. However, the revolution in consumer electronics products has continued at a rapid pace, and things such as direct-by-satellite TV, HDTV, DVD, home networks, wireless communication, internet access and a lot more, have entered the market in the last few years.

That means that the arsenal of tools, test equipment, replacement parts, and supplies, has had to expand to accommodate that growth. We'd like to make sure that we're keeping up with all of the needs of service centers. So, if you're looking for a product for service, and don't find the item in these listings, let us know so that we can add it for next year. ■

ELECTRONIC

Servicing & Technology

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

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CEA endorses MobileToys.com

As part of an ongoing effort to educate consumers about the mobile electronics industry, the Consumer Electronics Association (CEA) Mobile Electronics Division announced its endorsement of MobileToys.com, a website dedicated to providing information on automotive electronics.

"The mobile electronics industry is expanding rapidly in scope and scale," said Gary Shapiro, CEA President and CEO. "The educational content on MobileToys.com is in keeping with our efforts to provide consumers and industry professionals with information about this growing category of products. Like our TechHome.org site dedicated to home systems, MobileToys.com is a resource for everyone interested in automotive electronics products."

Headquartered in Danvers, MA, MobileToys.com is based on an e-commerce model that gives consumers access to an extensive database of local retailers, mobile electronics products, and vehicle specifications. Visitors to the site are led through a selection process based on their mobile electronics needs and their vehicle's specifications. After making their selections, consumers are invited to have their purchase installed by a local retailer who participates in the Mobile Electronics Certification Program (MECP). Founded in 1991, MECP is the only nationally-recognized program that certifies 12-volt installers on electronics, installation knowledge/technique, and tools/shop safety. Owned and managed by CEA, the program is the benchmark of professionalism in the mobile electronics installation industry.

"Our Internet strategy provides consumers with the best of both worlds," explained MobileToys.com Vice President and COO Bob Fields. "The power and convenience of the Web, combined with the expertise and service of local MECP certified installing retailers, ensures product performance and customer satisfaction."

MobileToys.com serves as a vital resource for consumers, technicians, and industry professionals. In addition to product information, the website offers an expansive variety of services necessary to become the industry's search engine. Via the Internet, consumers nationwide and globally have access to the latest product and automotive fit information, in addition to referrals to local professional dealers and acknowledgment of industry associations.

MobileToys.com resulted from the collaboration of industry professionals and their organizations to provide information pertaining to all areas of mobile electronics. CEA's Mobile Electronics Division became involved in the project after Fields presented the idea at the CEA Fall Conference on October 17, 1998. The initial response from the manufacturers, retailers, and association leaders, who make up the Mobile Electronics Division board, was very positive, and CEA members have been actively involved in developing the site ever since.

December Caps Strong Year in Video Sales

Manufacturer-to-dealer sales of video products grew by 28.6 percent in December, totaling just under 5.6 million units and rounding out a year of strong growth in the category, according to figures issued by the Consumer Electronics Association (CEA). Total sales of video products in 1999 topped 60 million units, increasing by 22 percent over 1998. In addition, virtually every category (with the exception of direct view color TVs) experienced double-digit increases for the year.

The sales gains made in individual categories were even more impressive. Sales of direct view color TVs in 1999 rose by 5 percent, to a year-end total of 23.2 million units, the sub-category's best shipment year since 1995. In addition, VCR sales increased by 26 percent on the year to 22.8 million units — the best year for VCRs ever, and by a tremendous margin. Sales of TV/VCR combinations reached 366,170 units in the month, a 30 percent increase over last December, bringing total year sales more than 40 percent ahead of 1998. Finally, camcorders had a particularly strong month, with sales increasing by 72 percent over last December.

One of the more significant aspects of video sales in 1999 was the growth of home theater-related products. Sales of projection TVs increased by more than 15 percent for the year, and sales of direct view TVs 29 inches and higher grew by 11 percent. These figures, as well as the fact that sales of stereo VCRs (more than half of all VCRs) increased by 27 percent, all point to consumers' fast-growing interest in the home theater experience.

Another factor that contributed to the home theater trend was the product that realized the most explosive growth by far in the video category — DVD players. During 1999, DVD players became the fastest selling product in the history of consumer electronics (based on sales during the first three years of a product's introduction), with sales topping 4 million units.

Gary Shapiro, president and CEO of CEA, commented, "1999 was a tremendous year for video sales. Consumers' increasing interest in digital technologies and the home theater experience have made for an explosive video marketplace. We expect 2000 to continue this trend, with tremendous increases in the sales of new and exciting digital products such as DVD players, personal video recorders, and digital television."

1999 good year for DTV sales

Factory-to-dealer sales of digital television (DTV) products closed out the year by posting a fifth consecutive month of growth in December. DTV sales last month surpassed 23,000 units, according to numbers released by the Consumer Electronics Association (CEA). The December sales figure brought total 1999 sales to 121,226 and total sales since the introduction of DTV (in August of 1998) to 134,402.

DTV sales in December increased by five percent over November's sales, to a one-month record of 23,745 units. Total

fourth quarter DTV sales equaled 67,811 units, representing a 157 percent increase over third quarter sales, and 467 percent increase over second quarter sales.

"There can be no denying that DTV is the future of television. These sales figures show that consumer interest in DTV is growing everyday," said Gary Shapiro, President and CEO of CEA. "In 1999, DTV became a retail reality. In 2000, expanded programming will be necessary to exponentially grow sales. We are thrilled at this prospect, and encourage everyone in this industry, from manufacturers to broadcasters, to help us continue the DTV momentum."

CEA projects that the first 10 million DTV units will be sold by 2003, the next 10 million in 2004 and 2005, and 10.8 million to be sold in 2006.

Pentagon is not seeking to reopen DTV transmission standard, says CEA

The following statement was issued by Consumer Electronics Association (CEA) President and CEO Gary Shapiro regarding a meeting between CEA, consumer electronics manufacturers, broadcasters, and senior officials of the U.S. Department of Defense to discuss issues related to the transmission and reception of digital content.

"The Consumer Electronics Association joined representatives of the National Association of Broadcasters, consumer electronics manufacturers, and other parties involved in the transition to digital television (DTV) to meet with U.S. Department of Defense officials. The purpose of the meeting was to discuss the unique needs of the U.S. military regarding the transmission

and reception of digital video, audio, and data. Specifically, we met to discuss how the current U.S. transmission standard for digital television (DTV) — 8VSB — can meet these needs.

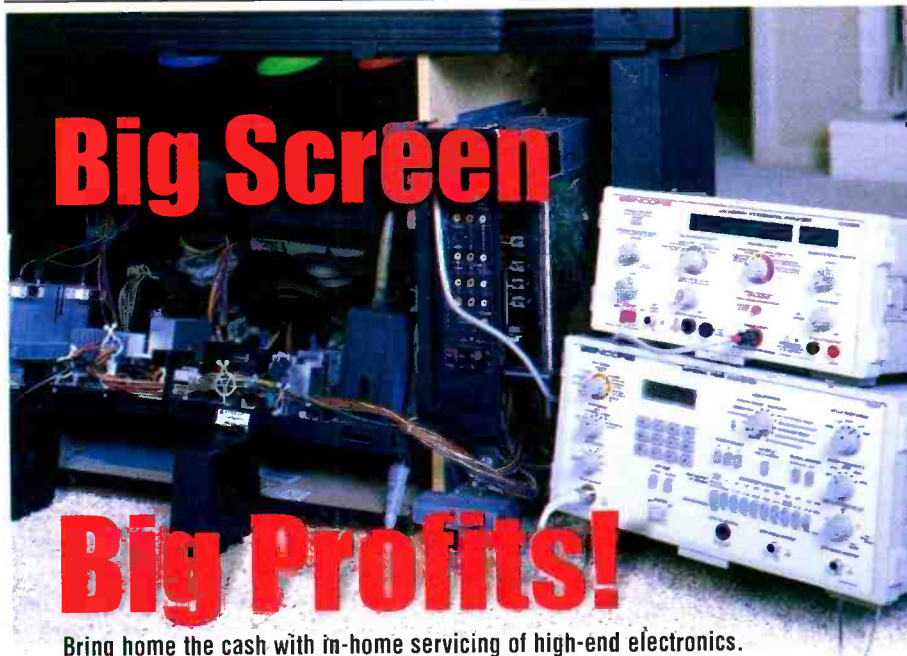
"During our discussions, the Pentagon made it clear that it has no desire to revisit the 8VSB transmission standard adopted by the Federal Communications Commission (FCC) and that it is not calling on the FCC to reopen the transmission standard debate.

"We look forward to continuing to work with the Department of Defense to ensure that the unique needs of the military are considered as the U.S. transition to DTV continues and as the consumer electronics industry develops new technologies. We strongly believe that VSB can meet the Pentagon's requirements for digital transmissions. The consumer electronics industry remains committed to helping the Department of Defense meet its needs through commercial products to the greatest extent possible."

CES panel predicts dramatic wireless growth & Internet convergence

Wireless technology fueled by the Internet and increasing consumer demand for many forms of data will have dramatic growth in the U.S. in the coming years, according to the Wireless Supersession industry panel at the 2000 International CES — Your Source for Workstyle and Lifestyle Technology. According to the panelists, there will be one billion wireless users by 2003 and as many as 400 million using wireless devices to access the Internet by 2004.

(Continued on page 76)



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Selling service via the internet

by Conrad Persson

An article in the Kansas City Star on February 1, quoting a survey by Inktomi and NEC Research Institute, described the amazing growth of the internet. The Web contained about 60 million pages of information in late 1996. In 1997, information content of the Web was at 320 million pages. In 1999, that had increased to 600 million pages. Currently, the web has more than 1 billion pages.

I just played with that information on the calculator. A ream of paper (500 pages) is about two inches thick. Dividing one billion pages by 500 pages per reams calculates out to about 2 million reams. Multiplying by two inches thick per ream, a stack of a billion pages, on paper, would be four million inches thick. At 12 inches to the foot, that stack would be about 333,000 feet high. Or, translating that into miles (dividing by 5,280 feet per mile) the information on the internet, printed on paper and piled into one pile would be about 60 miles high. That's a lot of information.

Selling via the internet

Of course, a lot of the information on the internet isn't commercial in nature. There are a lot of sites run by colleges and universities, governments, associations, etc., that are there to disseminate information. And there's a lot of good information available. And, as is true with any large information repository, there's a vast amount of junk too.

But a lot of companies do use the internet to promote sales of their products. In fact, anyone who watched the Super Bowl game was assaulted by a number of commercials about various web sites: AutoTrader.com, Britannica.com, Computer.com, The E*Trade Group, HotJobs.com, Kforce.com, LifeMinders.com, Monster.com, Netpliance.com, OnMoney.com, Pets.com, Wall Street Journal Interactive Edition, LastMinuteTravel.com.

There is no doubt that the internet has become an important place for people to do business, or to make people aware of their businesses.

Selling service via the internet

Many consumer electronics service centers have begun promoting their businesses on the internet, with varying results. Some service centers are receiving a steady stream of inquiries from people who have found their websites, while some are receiving almost no "hits," and some feel that the attention they receive as a result of being on the web about offsets the cost of having a website.

In short, whether or not any given service center should have a presence on the web depends on a number of factors. To get some ideas, we interviewed several people whose com-

panies have websites in preparing this article. None of the people interviewed used any superlatives in describing their experiences with promoting their businesses via the internet, but the responses were generally positive.

Some of the details

Two of the interviewees approached the idea of a web page as a do-it-yourself project. They were interested in learning the internet scripting language, HTML (hypertext markup language), and thought that designing a web page for their own

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Motherboards	Power Supplies
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Floppy Drives	Operating Software
Hard Drives	Expansion Cards
Drive Controller Cards	Tape Backup Systems

business would be a useful project for the experiment. A third interviewee has engaged a local web site designer to create and maintain his company's website.

One do-it-yourself website

Jack Frost at Jack's Electronic Repair in Urbana, IL, not only wanted to learn about HTML, but he also wanted to support his local community internet service provider, Prairienet. Frost's site doesn't have a lot of frills: it's text only, in keeping with the prairienet philosophy of making the information on that system accessible to everyone regardless of the sophistication of their computer system.

In spite of the fact that it's text only, Frost manages to make it look quite attractive, and to impart some useful information to people visiting the site, as well as to do a nice job of promoting his business (<http://www.prairienet.org/vcr-repair/>).

Frost has not spent any time trying to get his website registered with any of the large search engines, so the number of visitors is limited. He figures that the business he receives from the site about pays for the cost of keeping it in operation.

A professionally designed site

McCann Electronics of Metairie, LA, one of the larger and more successful service centers in the country chose to go a different route and have a professional website designer design their website (www.mccann1.com). In contrast to the simple, text-based, website of Jack's Electronic Repair, this website includes animation, graphics, and other effects. Moreover, this web operator has gotten the address of the site registered with many of the large search engines, such as Yahoo, Lycos, Hotbot, so the site is visited quite often.

McCann Electronics is not a typical consumer electronics service center. The types of products serviced by this center is broader than most. For example, McCann does such things as speaker reconing, and repair of Peg Prego toy automobiles. According to Gerry McCann, owner of McCann Electronics, they receive approximately one inquiry per day via their website from people all over the country interested in having speakers reconed. Another frequent source of hits is people asking questions about computer problems.

McCann feels that his website is definitely worthwhile, but it's only a part of his overall advertising/promotion program. Other aspects of that program include an answer desk, newsletters, yellow pages advertising, and his Saturday morning radio show: Living with Consumer Electronics. In fact, McCann says that, today, if he had to choose between his website and yellow pages advertising, he would drop the website and stick with the yellow pages. However, he adds, that could change in the future.

How to get started

If you want to have a web presence, but don't want to do it yourself, a good place to start is to contact several web page designers and get quotes. Ask them to see copies of their work. Or ask them to direct you to web sites that they've designed. If you like the look, and it seems to be easy to get the information you need, that designer might be a candidate for you. It might

be best to start simple (inexpensive) and work your way to a more involved site as you determine the usefulness of the page to you and the amount of business it generates.

If you want to do it yourself, there are a number of ways to go. For one thing, you can start from scratch. Get some kind of reference material: a book, or information on the internet to see how to apply HTML to documents. Simple HTML, documents that don't have animation, or a lot of graphics, or other fancy effects, is fairly simple. It is not programming.

One of the easiest ways to get started is to use a web page builder from your internet provider (if they have one). For example, AOL offers a system called 123Publish. Using this approach, there's no need to download software or learn HTML. You simply answer questions about what you want on your page and in minutes your page is published on the web.

123Publish offers lots of "fill in the blank" templates from Resumes to recipes to get you started. 123Publish is available for anyone using AOL 4.0 for Windows or Macintosh systems. 123Publish pages can include text, dividers, pictures, and hyperlinks to other pages or to your mailbox. 123Publish pages can't include background sounds, counters, forms, frames, guestbooks, raw HTML, or JavaScript.

A little more complicated, but more flexible

AOL offers another approach for someone who has mastered the basics and wants to do some things that 123Publisher won't let them do. This is called Easy Designer. You don't have to learn any HTML, but you have greater control over your page design. Using it, you can use your mouse to point, click, drag, and drop and you'll find this program easy to use. This system offers many ready-made templates. Or you can start with a blank page. Easy Designer includes the ability for advanced users to directly edit HTML, plus:

- Drag and drop objects on your page as you build it
- Add multiple pictures to your page and resize them as you go
- Instant access to thousand of pieces of clip art

Add your own personal chat room and counter with a click of your mouse.

Another way to build a web page is to use commercial HTML editing software. This is probably the easiest and best way to build an attractive, informative, page.

Something to think about

Based on the experiences of the few service centers we've spoken to so far, a reasonable conclusion, at this point, seems to be that the internet should not be dismissed by any service center as not useful in promoting their business, but on the other hand, it's not necessarily the best, nor should it be the only, way a service center should go about promoting its business. Rather, the internet should be considered by any service center as one possible segment in a well- designed program of advertising and promotion.

If any readers have had any significant positive, or negative, experiences in using the internet as a tool in advertising and promotion, we'd like to hear about it. ■

Consumer electronics product handling: Coping with ESD

by John A. Ross

During the earliest days of the Apollo space program, a fire in the Apollo command module killed the three astronauts manning the spacecraft. The fire did not occur in orbit but rather while the spacecraft sat atop the Saturn 5 rocket during a "power-up" test several days before the scheduled launch. Subsequent investigations of the cause of the accident revealed that static electricity in a 100% oxygen environment triggered the blaze. Combustible materials ignited in seconds and created the smoke that suffocated the astronauts.

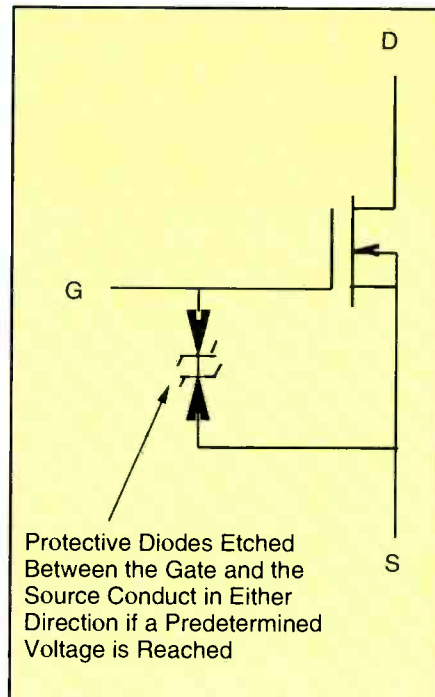
This brief look back at the Apollo 1 disaster illustrates several issues for this article. First, static electricity occurs because of consistent environmental conditions. Second, even the slightest static discharge can cause great damage. Finally, materials used in the workplace can either generate or prevent static discharge.

Electrical overstress vs. electrostatic discharge

Given our profession, we work with both electrical overstress (EOS) and electrostatic discharge (ESD). Each can cause significant damage to semiconductor devices in the blink of an eye. However, a major difference exists between EOS and ESD. That is, EOS and ESD have different causes and damage semiconductor devices in different ways.

Electrical overstress

Electrical overstress occurs when overvoltage or overcurrent conditions damage a device. Those conditions may exist during normal operation or while a technician tests a device. As an example, electrical overstress can result from a current surge that follows the turning of power on or off and measuring instruments on or off, the short-circuiting of



the load, solder chips, and circuit board patterns short-circuited by metallic foreign objects. Generally, we can track large-scale EOS problems through symptoms such as breaks in wiring on the chip due to melting, discoloration, and burning of the package.

Electrostatic discharge

In comparison to EOS, electrostatic discharge may have greater chances of occurring because of seasonal changes or because of environmental conditions. As an example, the decrease in humidity during winter establishes optimum conditions for ESD. In brief, ESD damages the IC chip of a semiconductor device when it discharges through the device.

Most of the time, electrostatic discharge occurs because of the contact of a charged body with the pins of a semiconductor device or because of the discharge of an electric charge that takes

place in the device itself. As opposed to the mostly noticeable symptoms of EOS, ESD problems usually affect smaller areas of a semiconductor device. Consequently, technicians have a more difficult task in locating the effect and source of the electrical discharge.

Generation of static electricity

Table 1 lists some of the prime causes of static electricity and the amount of charge that may occur in different environmental conditions. The phenomenon occurs as a result of the positive and negative charging of two objects rubbed against one another. Static electricity exists as the excessive electric charge existing on the objects. When the conductive objects contact each other, electric charge moves. If the speed of movement is fast, a high pulsating current flows. The characteristics and size of the objects, along with the relative humidity in the atmosphere, affect the quantity of the generated charge.

The table illustrates that a charge built up on the human body can cause extensive damage to a semiconductor device. The built-up charge discharges when a part of the body touches a pin of the device. Static induction takes place on the conductive part of the device. With the charge on the conductive part of the device immediately discharging, damage occurs if a pin of the device is grounded or if a pin touches a metal portion of attached test equipment, a test jig, or a tool.

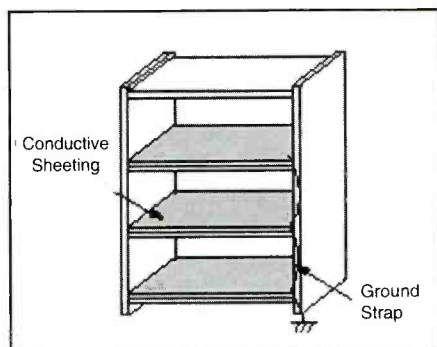
Electronic components and static electricity

Early electronic components, such as vacuum tube devices and early transistors, had little or no need for static control. The first transistors had enough size and bulk to remain relatively insensitive to static charges. However, as the size of semiconductor devices decreased and speed became an operational factor, stat-

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Table 1 — Causes of Static Electricity

CAUSE	QUANTITY OF ELECTROSTATIC VOLTAGE (V)	
	10 to 20% Relative humidity	65 to 90% Relative humidity
Walking on a carpet	35,000	1,500
Walking on a vinyl floor	12,000	250
Worker at a bench	6,000	100
Vinyl cover of work specifications	7,000	600
Polyethylene bag picked up from bench	20,000	1,200
Work chair with polyurethane forming agent	18,000	1,500



to ESD problems. The effect of the protection circuit may differ from one device to another because of the characteristics, configuration, and dimensions of the protection circuit.

Examples of ESD Damage

Electrostatic discharge may occur because of different factors found at the workbench. As an example, a technician handling sensitive components while not wearing a wrist strap and conductive shoes risks damaging the product. In addition, certain types of clothing readily generates static electricity. Poor service practices such as directly touching the pins of an IC with the hand or using equipment that has an insufficient ground can also cause ESD damage. ESD problems may also occur if a technician touches a charged device with a metallic object or if a soldering tool produces leakage current.

Damage to oxide film

With MOS LSIs, the input pins of MOS devices connect to the silicon substrate with gate electrodes. In turn, the gate electrodes remain electrically isolated from the input pins by a very thin oxide film. ESD damage to the oxide film occurs because of overvoltage conditions that exceed 10^6 V/cm. Although this voltage quantity may seem excessively inflated, we should remember that the oxide film is approximately 10nm thick. As a result, a MOS LSI can withstand only several tens of volts. A static discharge that exceeds this level ruptures the insulation of the film. With newer and smaller MOS LSI technologies, the oxide film has become increas-

ingly thinner and can withstand only several volts without a protection circuit.

Thermal destruction

When static discharge generates excessive current and the current concentrates at the PN junction of a semiconductor device, thermal destruction occurs. Reverse bias conditions occur within the device and power is consumed at the junction and causes an increase of the temperature on the edge of the junction. As current concentrates at and flows through the edge of the junction, the temperature continues to increase and eventually damages the junction.

Preventing ESD problems

Several easy methods exist for preventing ESD problems. Those methods include maintaining a relative humidity of approximately 40 to 60 percent. With a low humidity, the dissipation of charge decreases and increases the possibility of the generation of static electricity. Maintaining a humidity level at 40 to 60% increases the dissipation of the static electric charge.

The use of an ionizer also prevents the build-up of static electricity through the generation of ions. As the ionizer generates ions, static electricity remains neutralized. Another method involves laying conductive sheet on the floor and the desk. The conductive sheet prevents the build-up of charges on the body when a technician walks past sensitive devices or during the transportation of devices. Moving to Figure 2, a metallic desk and metallic shelves also need covering with a conductive sheet to prevent the abrupt discharge of static electricity. If a conductive sheet is not available, technicians may also wear conductive shoes.

When working with test equipment, test jigs, or metallic tools, ground the equipment, jigs, or tools to prevent current leakage. In addition, always use a grounded soldering iron. With a device under test, always attach a conductive material to any metal part or chassis that may touch the pins of the device. Use a conductive container or conductive bag when storing or transporting static sensitive printed circuit boards.

The proper method for handling semiconductor devices and printed circuit boards is not to touch the pins of semiconductor devices and printed wiring

ic sensitivity became more of a concern. The technological evolution that progressed from transistors to MOSFET's and then to large scale integration also introduced components that have greater sensitivity to static charges.

ESD and semiconductor devices

Generally, MOSFETs, ICs, and other high-frequency semiconductor devices have a greater sensitivity and become easily damaged by electrostatic discharges. Table 2 describes the sensitivity of popular semiconductor devices.

Manufacturers attempt to protect these devices from damage by including an internal protection circuit in the power block or input/output block. Figure 1 shows the schematic diagram of a MOSFET that includes static protection. The configuration of the diodes allows the devices to conduct in either direction if the MOSFET reaches a predetermined voltage that has a higher value than any working voltage. This protects the MOSFET from excessive static buildup.

However, an internal protection circuit does not provide a complete answer

boards. To remove static electric charges from the body as it builds up, wear a wrist strap. A wrist strap must have a resistance of 1 MΩ to prevent the worker from electric shock. In addition, technicians must wear the wrist strap directly on the skin rather than on top of clothing, and check the conductivity of the wrist strap at least once a day to make sure the cable is not broken.

Anti-stat packages

As with semiconductor technologies, the ESD packaging industry has also evolved and grown with its support of the electronics industry. Traditionally, the industry has produced flat films, bags, and boxes. While early bags consisted of black carbon loaded polyethylene, newer methods of static control utilize pink polyethylene and other static dissipative films. Shielding bags utilize foil laminates that form a moisture barrier and metallized polyester laminates for static protection.

New types of static protective packaging

Shrink film packaging consists of thin biaxially-oriented films that shrink back



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Table 2 — Sensitivity to ESD by Different Semiconductor Device Types

RESISTANCE	VOLTAGE AMOUNT	DEVICE TYPE
<i>Very Sensitive</i> Super high-frequency switching devices MOS devices Bipolar ICs (LSIs)	150 V Maximum	High-frequency devices
<i>Moderately Sensitive</i> Small-signal transistors Diodes	150 to 1000 V	Bipolar ICs (SSI, MSI)
<i>Little Sensitivity</i> Power transistors Power diodes	1000 V Minimum	Power components

Source: "Handling Guidelines for Semiconductor Devices" (EIAJ EDR-4701A)

to the original size when exposed to relatively high temperatures. Most shrink film packaging produces 40% to 50% shrink characteristics. Anti-static shrink packaging provides several unique advantages for packaging electronics parts, subassemblies, and finished goods. Those advantages include overall package cost effectiveness, tamper-proofing, and the immobilization of the packaged parts.

Dissipative shrink film utilizes a three layer co-extruded film that has clean surfaces constructed from unloaded and uncoated Ethylene Propylene Copolymer. This type of film relies on a dissipative core that combines excellent surface cleanliness and shrink properties with suitable ESD properties.

When someone handles the product, static discharges occur against the shrink film which serves as an ESD event wall. In addition to the film, the packaging also includes an air gap that provides shielding attenuation. Increasing the effective distance between a packaged product and the point of an ESD event also increases the protection by the square of the distance.

Another type of static protection uses air channels surrounding the product to cushion and protect while providing

electrostatic shielding and a moisture barrier. The air channels surrounding the product provide physical cushioning. Multi-layer materials combine with the dry air found in the channels to establish a moisture barrier.

Conclusion

Modern semiconductor devices have become increasingly smaller because of market demands for multi-function, high-density, high-speed devices. The market demands combine with progress in the design and production technologies used during the manufacture of semiconductor devices. Unfortunately, increasing the density of a semiconductor device while decreasing the device size also lowers the resistance of the device to electrostatic discharge.

As the article has shown, technicians and manufacturers attempt to take the best possible measures for preventing damage due to ESD. Unlike other causes of failure, such as EOS, the damage to semiconductor devices from ESD remains difficult to recognize. The article has provided an overview of ESD symptoms that should help with fault analysis and a listing of methods that can prevent the build-up of static charges. ■

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What Do You Know About Electronics?

by J.A. "Sam" Wilson

Vocabulary and Statistics

In a past issue, I pointed out that you can raise your IQ (intelligence quotient) by as much as 10 points by studying vocabulary. I'm sure that that was a surprise to some readers, but it is true. That fact has been used as a criticism of IQ testing. A child raised by professionals is exposed to a broader range of vocabulary words than is a child raised by parents who are less educated.

The argument against IQ tests is that intelligence should not be dependent only on vocabulary. For example, a young college graduate is moved next door to an Eskimo in the bitter cold north. The Eskimo can use techniques he was taught by his parents, and is able to survive, but the college graduate would soon die. The college graduate would score higher on an IQ test, but the Eskimo is more able to use his mental ability to survive. So, "intelligence" should not be so dependent on vocabulary.

Remember that the IQ test does not measure intelligence. It has never been possible to do that. The IQ test merely compares the ability of an individual in a group. That explains why it is called a quotient.

Knowing this, why am I so sure that vocabulary words are so important when you are studying a new technology? The reason is that you cannot understand the writings about the new technology if you don't even know what the words mean.

Understanding basic statistics

Let me start with an example of how statistics might be used in electronics. Suppose that you are working for a large company that has an incoming inspection department. Its job is to assure that components the company has ordered meet the quality standards of the component.

Assume that the company has ordered 2000 resistors with a value of 500Ω , that will eventually be used in the manufacturing of radar receivers. The shipment arrives with an AQL of 980 resistors. That means that if 980 resistors are tested randomly and found to be $500\Omega \pm 20\%$, the complete family of resistors will be accepted. The AQL is calculated by statistics.

A technician calibrates the test equipment (actually an ohmmeter) so that resistors in the $500\Omega \pm 20\%$ range cause a green light to come on, meaning that it is acceptable. Resistors tested to be outside the $500\Omega \pm 20\%$ range will cause the red light to come on. Obviously, the tester is not a highly-trained technician. Also, some products outside of the range of acceptance can get by this station.

The point here is that it is not necessary to pay the cost of testing every resistor. If a bad resistor gets past this station, it will cause some kind of trouble that will cause the receiver to malfunction in some way.

You may feel that this is a rather slipshod way to test the resistors, but it saves a lot of money from unnecessary testing. As far as the company is concerned, labor is never cheap.

Is the AQL calculated by a technician? It might be, since the AQL levels are given on charts. The point here is that the whole procedure ultimately is based on statistics. Top level technicians (usually) like to know what is going on in their jobs.

Most statistics are based on probability. That is, the probability is that if 980 resistors, randomly selected, test "good," it is highly probable that they are all good.

Statistical calculations

If you toss a penny, the probability of getting a head is $1/2$. The probability of one type of happening of one occurrence of one type in a population of all types is given by:

$$P = N_a/N$$

This is a very important equation.

In this equation, P is the probability of occurrence of one type (a head) divided by the total number of possibilities (2) head or tail. Applying the above equation to this situation, you get $P = 1/2$, where 1 is the type of possibility of a head, divided by the number of possibilities; 2 (head or tail) (this is a very important application).

A sample problem

Use the above equation to calculate the possibility of throwing a 4 with one die ("die" is the singular of "dice").

The answer is that there is only one possibility of this occurrence ($N_a = 1$) out of six possibilities (N — a die has six sides, any one of which may come up on top).

So the probability (P) of throwing a 4 with one die is: $P = 1/6$.

Another problem

Now calculate the probability of throwing either a 3 or a 4 with one toss of a die. In this case, the number of possibilities, N_a , is 2 (either a 3 or a 4). The total number of possibilities is 6 (any one of six sides may come up on the top of the die). The probability (P) of throwing a 3 or 4 with a single die is: $P = 2/6 = 1/3$.

Since $1/3$ is a larger number than $1/6$, this problem shows that there is a greater possibility of throwing one of two numbers than there is of throwing any one number.

Still another problem

Calculate the probability of throwing a 1, 3, or 5 with one die.

There are now three possible desired outcomes, so $N_a = 3$. In this case, $P = 3/6$, or $1/2$. It is easier still to throw one of three numbers on a die.

Some memory cards

This is a good time to make some memory cards for what we have learned so far. Remember the new term is put on the Q side of the card, and the correct definition of the term is put on the other (A) side of the card.

Q — Does an IQ test measure intelligence?

A — No. At best, it compares the intelligence of one individual to the intelligence of a number of people in a group of similar people.

Q — You can raise your IQ score as much as _____ points by studying vocabulary words.

A — Ten points. One way to do this is to study a book called "30 days to a more powerful vocabulary."

Q — Define probability.

A — It is a measure of the likelihood of an occurrence. A probability is stronger than a possibility, but it falls short of certainty (dictionary definition: Webster 20th Century — 2nd Edition — Unabridged Dictionary).

Q — Give the important equation for probability.

A — P (probability) = N_a (ways to succeed)/ N (all possibilities).

Note: N includes all possible outcomes, those that are sought, and those that are not sought.

This is a good place to stop the introduction of statistics. This subject can get very deep in a short period of time. Engineers

sometimes feel that it is made unnecessarily deep, but that is an opinion. It should be mentioned here that a probability of 1 means that an occurrence is certain. That would occur if the number of occurrence equals the number of trials.

Reviewing your knowledge

People who study how we remember are usually in agreement about the value of reviewing; especially in the case of technical and scientific terminology. That is why I have introduced the idea of memory cards in this column. I am guessing that super technicians can identify every one of the abbreviations that follow. Check your answer with those given at the end. If you do miss any of these, put it on a memory card for review. These abbreviations have been taken from actual CET tests and licensing exams.

1. PPM _____
2. RISC _____
3. SINAD _____
4. EPIRB _____
5. FSK _____
6. IT _____
7. PCM _____
8. PAM _____
9. SAW Filter _____
10. TDM _____
11. A/D _____
12. ASCII _____
13. CODEC _____
14. EIRP _____

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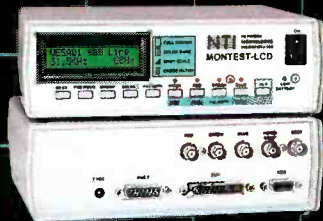
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15. DSC _____
16. DME _____
17. ECL _____
18. TRF (Receiver) _____
19. TM (Waveguide Mode) _____
20. VCO _____
21. VIRS _____
22. PWM _____
23. SSSC _____
24. TE (Waveguide Mode) _____
25. LORAN (Navigation System) _____
26. MOSFET _____
27. PEP _____
28. WVDC _____
29. XNOR _____
30. AFC _____
31. BFO _____
32. LSB _____
33. RADAR _____
34. VSWR _____
35. STC _____

Answers to review questions

1. Pulse position modulation
2. Reduced instruction set computer
3. Signal and noise distortion
4. Emergency position indicating radio beacon
5. Frequency shift keying
6. International Telecommunication Commission
7. Pulse code modulation
8. Pulse amplitude modulation
9. Surface acoustic wave filter
10. Time division multiplexer
11. Analog/digital
12. American standard code for information interchange
13. Coder decoder
14. Effective isotropic radiated power
15. Double sideband with carrier
16. Distance measuring equipment
17. Emitter coupled logic
18. Tuned radio frequency (receiver)
19. Transverse magnetic
20. Voltage controlled oscillator
21. Vertical interval test signal
22. Pulse width modulation
23. Single sideband suppressed carrier
24. Transverse electric
25. Long Range
26. Metal oxide semiconductor field effect transistor or
27. Peak envelope power
28. Working volts dc
29. Exclusive NOR
30. Automatic frequency control
31. Beat frequency oscillator
32. Lower sideband
33. Radio detection and ranging
34. Voltage standing wave ratio
35. Sensitivity time control

2000 Buyers' Guide

Owners of consumer electronics service centers know better than most that to stay in business they constantly have to be prospecting for new clients through word of mouth, ads in the local newspapers, yellow pages advertising, direct mail, etc. Part of the reason they have to be constantly finding new clients is that some of their old clients move away, or die, or are wooed away by some other company that provides the same service.

The same type of change is true of companies such as the companies that supply products for the consumer electronics service industry. All types of companies are formed and mature. Some of them thrive. Sometimes for a very long time. Sometimes, because of poor management, changing economic conditions, or other factors, companies fail very early.

But even those companies that remain in business year after year change locations for any of a number of reasons. Companies make other types of changes. For example, sometimes they change the products they sell, discontinuing some items, adding others, and improving yet others.

So much change sometimes makes it difficult for customers that buy products from these companies to locate them. It's certainly true in the consumer electronics service industry. And the pace of these changes seems to be accelerating rather than abating.

The ES&T Buyers' Guide

In order to help consumer electronics keep track of the companies that supply them, every year ES&T updates the Annual Buyers' Guide. Every year we send questionnaires to hundreds of manufacturers, distributors, publishers, software publishers; every type of company that might possibly have a piece of test equipment, a replacement part, a schematic diagram, a book, or a piece of software that one of our readers might find useful. The questionnaire asks the recipient to update all of the vital information that makes it easy for a service center to contact them: name, address, telephone, toll-free and fax numbers, and whether the company is a manufacturer or a distributor. Now, we even ask them for e-mail and website information.

The questionnaire also includes a list of over one hundred products, services, documents, information products, software products, and more, that service centers use. The recipients check off those products that apply to them, and when we receive that information, we enter it into our database.

So what you see in this Buyers' Guide is current, up-to-date as of the fourth quarter of 1999, or possibly even January of 2000.

Except. Well there are always exceptions. We don't understand it, but many of the companies to whom we send questionnaires don't send them back.

So please keep in mind as you use this Buyers' Guide that it is as current, up-to-date, and useful as we could make it. If you call one of the listees and find that the information that you found in this guide was out-of-date, it may not have been our fault. Of course, the way companies move around these days, it's entirely possible that the information was up-to-date when we published it, but has since gone out-of-date.

And one other word of caution. These days telephone area codes are changing constantly, so that the area code for any of the companies listed here may have changed since the publication date.

We welcome you to this new Buyers' Guide, and we hope you find it useful in finding companies that provide just the product or service you need. If you find it helpful, please let us know. Or if you think it could be improved, please contact us with any suggestions you may have.



Using the Buyers' Guide

We've broken down information in the Buyers' Guide into five categories:

- Product Directory..... page 16.
- Replacement Parts/Components Directory..... page 47.
- Software/Services Directory.....page 34.
- Association/Educational Sources Directory.....page 54.
- Company Address Directory.....page 44.

We have subdivided the product directory according to certain types of products:

- Test equipment.
- Test equipment accessories.
- Circuit damage protective equipment and supplies.
- Supplies/accessories equipment.
- Audio and video accessories.
- Tools.

For example, if you are looking for a VCR test jig kit, turn to the test equipment accessories section of the Product Directory. The companies listed there all say they offer test jig kits. If the company name is followed by a *D, that tells you this company is a distributor, not a manufacturer, of that product.

You will notice that certain company names are in color. Those companies have advertised in this issue. If you want to learn a little more about that company, turn to the page number listed to the far right. The ad alone might give you enough information to help you decide if they carry a product you need.

Once you know who you want to contact for more information, turn to the Company Address Directory. The address, telephone number and fax number for each company are listed there. (Of course, if the company you are interested in has advertised in this issue, you can just pull out your Reader Service card on page 35 and circle the reply number listed under the advertisement.)

The Replacement Parts/Components Directory works the same way. Just look up the type of component you need, then turn to the Company Address Directory to find out how to contact a company that supplies that product. The Company Address Directory lists information on over 600 companies and associations that offer products or services for the electronics servicer.

Checking out services

Consult the Services Directory if you need to contact a consultant, get a disk drive or head refurbished, plug into an on-line service, find a company to repair or rework a PC board, rent or lease equipment, calibrate your older test equipment, or repair a tuner.

Your source for continuing education

The Association/Educational Sources Directory helps you find books, schools and training seminars for continuing your electronics servicing education. It also points you toward sources for service literature and schematics for the products you service. Finally, it lists those companies that produce management software systems that can help you run your business.

Product Directory

Note: An entry followed by *D means that this company is a distributor, not a manufacturer. An entry followed by a *MD means that this company is both a manufacturer and a distributor.

A line listing that is in color indicates that the company has an ad in this issue. The number following the listing is the number of the page on which the ad is located. BC means Back Cover; IBC means Inside Back Cover; IFC means Inside Front Cover.

See Adv. Page

See Adv. Page

See Adv. Page

See Adv. Page

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Alfa Electronics*D
Amprobe
AVO International
Brunelle Instruments, Inc.
Consolidated Electronics, Inc.*D
Contact East, Inc.*D
CSTS Inc.
The Current Source*D
East Coast Transistor*D
[Electronix Corporation*D](#).....80
Electronix Express*D
Fotronic Corporation*D
Fox International*D
Herman Electronics*D
Marshall Industries*D
M.A.T. Electronics*D
MCM Electronics*D
Metric Supply*D
Mouser Electronics*D
Omnitron Electronics*MD
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Zack/Joseph Electronics*D

AUTOMATED TEST EQUIPMENT

American Reliance
Analogic Corporation
[Vance Baldwin Inc.*D](#).....80
BK Precision
Computer Services of America*D
CSTS Inc.
The Current Source*D
East Coast Transistor*D
E.I.L. Instruments, Inc.*D
Electronic Prod. Specialties*D
Electronix Express*D
Electroservice Laboratories
Fotronic Corporation*D
Fox International*D

Hi-Techniques, Inc.
Hy-Tronix Instruments, Inc.
Keithley Instruments
Kelvin Electronics*D
LaserImpact
Marshall Industries*D
National Instruments Corporation
Omega-Vanzetti, Inc.
PC Instruments Incorporated
Print Products International*D
H.C. Protek
QuadTech, Inc.
Racal Instruments Inc.
RNJ Electronics Inc.*D
RS Electronics*D
Schlumberger Technologies
Snap-On Incorporated
Sorensen
Specialized Prods Company*D
Sun Equipment Corporation
Techni-Tool Inc.*D
Tektronix, Inc.
Telogy*D
Telulux, Inc.
Test Equipment Depot*D
Time Motion Tools*D
[Tritronics, Inc.*D](#).....80
Tucker Electronics Company
UBM Corp
Ultra-X, Inc.
Zack Electronics
Zack/Joseph Electronics*D

BREAKOUT BOXES

Arrow Electronics
B&B Electronics Manufacturing
[Vance Baldwin Inc.*D](#).....80
B-B&W Electronics*D
Computer Services of America*D
Contact East, Inc.*D
The Current Source*D
Dalco Electronics*D
E.I.L. Instruments, Inc.*D
Electro Standards Lab, Inc.
[Electronix Corporation*D](#).....80
Electronix Express*D
Fotronic Corporation*D
Harco Electronics*D
Heath Company
HMC — Hub Material Company*D
Hosfelt Electronics, Inc.*D
International Disk Services, Inc.
Jameco Electronic Components*D
JDR Microdevices*D
W.S. Jenks & Son*D
Jensen Tools, Inc.*D
Kasco Distributing*D
Kelvin Electronics*D
L-Com Inc.
Marshall Industries*D
MCM Electronics*D
Nationwide Electronics
Omnitron Electronics*MD
Print Products International*D

RNJ Electronics Inc.*D
RS Electronics*D
Specialized Prods Company*D
Techni-Tool Inc.*D
Tenma Test Equipment
Test Equipment Depot*D
Time Motion Tools*D
[Tritronics, Inc.*D](#).....80
Union Electronics Distrib*D
Wavetek Corporation
Wholesale Electronics Inc.*D
Zack Electronics
Zack/Joseph Electronics*D

CELLULAR TELEPHONE TEST EQUIPMENT

Bird Electronics Corporations
The Current Source*D
Electronix Express*D
Fotronic Corporation*D
Harco Electronics*D
Keithley Instruments
Marconi Instruments Inc.
MCM Electronics*D
Omnitron Electronics*MD
Print Products International*D
Racal Instruments Inc.
RNJ Electronics Inc.*D
Schlumberger Technologies
Sun Equipment Corporation
Techni-Tool Inc.*D
Tektronix, Inc.
Tektronix
Telogy*D
Telulux, Inc.
Test Equipment Depot*D
[Tritronics, Inc.*D](#).....80
Union Electronics Distrib*D
Wavetek Corporation
Zack Electronics
Zack/Joseph Electronics*D

CONTINUITY TESTERS

Accutest Instruments, Inc.*D
Alfa Electronics*D
American Reliance
Ames Supply Company*D
Amprobe
AVO International
[Vance Baldwin Inc.*D](#).....80
B-B&W Electronics*D
Bel Merit Corporation
BK Precision
Brunelle Instruments, Inc.
Bursma Electronic Distrib.*D
Cablescan
Consolidated Electronics, Inc.*D
Contact East, Inc.*D
CSTS Inc.
The Current Source*D
Dalbani Corporation*D
East Coast Transistor*D
Eiger Electronics*D
E.I.L. Instruments, Inc.*D

Electro Tool, Inc.
[Electronic Design Specialists](#).....13
[Electronix Corporation*D](#).....80
Electronix Express*D
Fieldpiece Instruments
Foley-Belsaw*D
Fotronic Corporation*D
Fox International*D
GC Electronics*D
Harco Electronics*D
HMC — Hub Material Company*D
Hy Tec Dealer Service
JDR Microdevices*D
W.S. Jenks & Son*D
Jensen Tools, Inc.*D
Kelvin Electronics*D
Klein Tools, Inc.
L-Com Inc.
Marshall Industries*D
MCM Electronics*D
Omega Engineering, Inc.
Omnitron Electronics*MD
Paladin Tools
Parts Express International*D
Print Products International*D
Progressive Electronics
QuadTech, Inc.
RAG Electronics Inc.*D
RNJ Electronics Inc.*D
RS Electronics*D
Simpson Electronic Company
A.W. Sperry Instruments, Inc.
Sun Equipment Corporation
TechAmerica*D
Techni-Tool Inc.*D
Tenma Test Equipment
Test Equipment Depot*D
Time Motion Tools*D
[Tritronics, Inc.*D](#).....80
Union Electronics Distrib*D
Universal Enterprises (UEI)
Wholesale Electronics Inc.*D
Zack Electronics
Zack/Joseph Electronics*D

CRT TESTERS/RESTORERS

Accutest Instruments, Inc.*D
AnaTek Corporation
[Vance Baldwin Inc.*D](#).....80
BK Precision
Bursma Electronic Distrib.*D
C&S Sales*D
Computer Services of America*D
Connector Corporation
Consolidated Electronics, Inc.*D
Conway Engineering, Inc.
The Current Source*D
Dandy Manufacturing Company
East Coast Transistor*D
Eiger Electronics*D
Electronic Parts Supply*D
[Electronix Corporation*D](#).....80
Electronix Express*D

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Fotronic Corporation* ^D	East Coast Transistor* ^D	Omnitron Electronics* ^{MD}	H.C. Protek
Herman Electronics* ^D	E.I.L. Instruments, Inc.* ^D	Print Products International* ^D	RAG Electronics Inc.* ^D
W.S. Jenks & Son* ^D	Electro Standards Lab. Inc.	RAG Electronics Inc.* ^D	RNJ Electronics Inc.* ^D
M.A.T. Electronics* ^D	Electroservice Laboratories	R.C. Distributing Company	RS Electronics* ^D
MCM Electronics* ^D	Elenco Electronics, Inc.	RNJ Electronics Inc.* ^D	Salen Enterprises* ^D
Metric Supply* ^D	Fluke Corporation	Schlumberger Technologies	Sibex, Inc.
Omnitron Electronics* ^{MD}	Fotec Inc	Herman H. Sticht Company, Inc.* ^D	Simpson Electronic Company
Print Products International* ^D	Fotronic Corporation* ^D	Sun Equipment Corporation	Herman H. Sticht Company, Inc.* ^D
RNJ Electronics Inc.* ^D	Gould Instrument Systems Inc.	Techni-Tool Inc.* ^D	Sun Equipment Corporation
RS Electronics* ^D	Harco Electronics* ^D	Telogy* ^D	TechAmerica* ^D
Sencore Electronics5	International Disk Services, Inc.	Test Equipment Depot* ^D	Techni-Tool Inc.* ^D
Specialized Products Company* ^D	W.S. Jenks & Son* ^D	Time Motion Tools* ^D	Tektronix
Sun Equipment Corporation	Kasco Distributing* ^D	Tritronics, Inc.*^D80	Telogy* ^D
Techni-Tool Inc.* ^D	Marconi Instruments Inc.	Tucker Electronics Company	Tenma Test Equipment
Telematic	Marshall Industries* ^D	Union Electronics Distrib.* ^D	Test Equipment Depot* ^D
Tenma Test Equipment	MCM Electronics* ^D	Zack Electronics	TIF Instruments, Inc.
Test Equipment Depot* ^D	Omega-Vanzetti, Inc.	Zack/Joseph Electronics* ^D	Time Motion Tools* ^D
Time Motion Tools* ^D	Omnitron Electronics* ^{MD}	FREQUENCY COUNTERS	Tritronics, Inc.*^D80
Tritronics, Inc.*^D80	Print Products International* ^D	Accutest Instruments, Inc.* ^D	Tucker Electronics Company
Tucker Electronics Company	Racal Instruments Inc.	Alfa Electronics* ^D	Union Electronics Distrib.* ^D
Union Electronics Distrib.* ^D	RNJ Electronics Inc.* ^D	American Reliance	Wavetek Corporation
Wholesale Electronics Inc.* ^D	RS Electronics* ^D	Arrow Electronics	Wholesale Electronics Inc.* ^D
Zack Electronics	Schlumberger Technologies	Vance Baldwin Inc.*^D80	Zack Electronics
Zack/Joseph Electronics* ^D	Sencore Electronics5	B-B&W Electronics* ^D	Zack/Joseph Electronics* ^D
	Simpson Electronic Company	Bel Merit Corporation	
	Sun Equipment Corporation	BK Precision	FUNCTION GENERATORS
CURVE TRACERS	Tektronix, Inc.	Brunelle Instruments, Inc.	Accutest Instruments, Inc.* ^D
Accutest Instruments, Inc.* ^D	Telematic	Bursma Electronic Distrib.* ^D	Alfa Electronics* ^D
Antique Electronic Supply* ^D	Telogy* ^D	C&S Sales* ^D	American Reliance
Bursma Electronic Distrib.* ^D	Telulex, Inc.	Computer Services of America* ^D	Arrow Electronics
Computer Services of America* ^D	Tenma Test Equipment	Consolidated Electronics, Inc.* ^D	Vance Baldwin Inc.*^D80
The Current Source* ^D	Test Equipment Connection Corp.	Contact East, Inc.* ^D	B-B&W Electronics* ^D
East Coast Transistor* ^D	Test Equipment Depot* ^D	The Current Source* ^D	Bel Merit Corporation
Fotronic Corporation* ^D	Time Motion Tools* ^D	Dalbani Corporation* ^D	BK Precision
Hameg Instruments, Inc.	Tritronics, Inc.*^D80	East Coast Transistor* ^D	Brunelle Instruments, Inc.
Huntron Instruments, Inc.	Tucker Electronics Company	E.I.L. Instruments, Inc.* ^D	Bursma Electronic Distrib.* ^D
IET Labs, Inc.	Ultra-X, Inc.	Electro Tool, Inc.	C&S Sales* ^D
LaserImpact	Wavetek Corporation	Electronic Parts Supply* ^D	Consolidated Electronics, Inc.* ^D
Marshall Industries* ^D	Zack Electronics	Electronix Corporation*^D80	Contact East, Inc.* ^D
MCM Electronics* ^D	Zack/Joseph Electronics* ^D	Electronix Express* ^D	The Current Source* ^D
Omnitron Electronics* ^{MD}		Electroservice Laboratories	Dalbani Corporation* ^D
Print Products International* ^D	DISC DRIVE ANALYZERS/	Elenco Electronics, Inc.	East Coast Transistor* ^D
RAG Electronics Inc.* ^D	TESTERS	Exttech Instruments Corporation* ^D	E.I.L. Instruments, Inc.* ^D
RNJ Electronics Inc.* ^D	Accutest Technologies Inc.	Fluke Corporation	Electro Tool, Inc.
RS Electronics* ^D	Computer Services of America* ^D	Fotronic Corporation* ^D	Electronic Parts Supply* ^D
Sencore Electronics	CSTS Inc.	Fox International* ^D	Electronix Corporation*^D80
Herman H. Sticht Company, Inc.* ^D	The Current Source* ^D	Galco Industrial Electronics* ^D	Electronix Express* ^D
Sun Equipment Corporation	Data Depot, Inc.	Global Specialties	Electroservice Laboratories
Tektronix	Fotronic Corporation* ^D	Hameg Instruments, Inc.	Elenco Electronics, Inc.
Tenma Test Equipment	HMC — Hub Material Company* ^D	Harco Electronics* ^D	Fluke Corporation
Test Equipment Connection Corp.	W.S. Jenks & Son* ^D	Heath Company	Fotronic Corporation* ^D
Test Equipment Depot* ^D	Kenwood U.S.A. Corporation	Herman Electronics* ^D	Fox International* ^D
Time Motion Tools* ^D	Marshall Industries* ^D	HMC — Hub Material Company* ^D	Global Specialties
Tritronics, Inc.*^D80	Omnitron Electronics* ^{MD}	Instek Corporation* ^D	Hameg Instruments, Inc.
Tucker Electronics Company	Pioneer Research	Jameco Electronic Components* ^D	Harco Electronics* ^D
Union Electronics Distrib.* ^D	RAG Electronics Inc.* ^D	JDR Microdevices* ^D	Heath Company
Wholesale Electronics Inc.* ^D	RNJ Electronics Inc.* ^D	W.S. Jenks & Son* ^D	Herman Electronics* ^D
Zack Electronics	Test Equipment Depot* ^D	Jensen Tools, Inc.* ^D	HMC — Hub Material Company* ^D
Zack/Joseph Electronics* ^D	Time Motion Tools* ^D	Keithley Instruments	Instek Corporation* ^D
	Tritronics, Inc.*^D80	Kelvin Electronics* ^D	Jameco Electronic Components* ^D
	Ultra-X, Inc.	Kenwood U.S.A. Corporation	JDR Microdevices* ^D
	Zack/Joseph Electronics* ^D	Leader Instruments Corporation	W.S. Jenks & Son* ^D
DATA COMMUNICATION		Morrow Wave Inc.	Jensen Tools, Inc.* ^D
ANALYZERS/MONITORS/	DISTORTION ANALYZERS	Marconi Instruments Inc.	Kelvin Electronics* ^D
TESTERS	Accutest Instruments, Inc.* ^D	Marshall Industries* ^D	Kenwood U.S.A. Corporation
Accutest Instruments, Inc.* ^D	Alfa Electronics* ^D	M.A.T. Electronics* ^D	Leader Instruments Corporation
Allison Technology Corporation	The Current Source* ^D	MCM Electronics* ^D	Morrow Wave Inc.
American Reliance	East Coast Transistor* ^D	Metric Supply* ^D	Marshall Industries* ^D
Ames Supply Company* ^D	Electronix Express* ^D	Mouser Electronics* ^D	M.A.T. Electronics* ^D
Analogic Corporation	Fotronic Corporation* ^D	Newport Electronics, Inc.	MCM Electronics* ^D
B&B Electronics Manufacturing	Galco Industrial Electronics* ^D	Omnitron Electronics* ^{MD}	Metric Supply* ^D
Vance Baldwin Inc.*^D80	Keithley Instruments	Parts Express International* ^D	Mouser Electronics* ^D
Benedict Computer	MCM Electronics* ^D	Print Products International* ^D	National Instruments Corporation
Cleveland Institute of Electronics	Metric Supply* ^D		Omnitron Electronics* ^{MD}
Conway Engineering, Inc.			
The Current Source* ^D			
Dalco Electronics* ^D			

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Parts Express International*D PC Instruments Incorporated Print Products International*D RAG Electronics Inc.*D RNJ Electronics Inc.*D RS Electronics*D Salen Enterprises*D Sibex, Inc. Specialized Prods Company*D Herman H. Sticht Company, Inc.*D Sun Equipment Corporation TechAmerica*D Techni-Tool Inc.*D Tektronix Teledata Systems Telogy*D Telulex, Inc. Tenma Test Equipment Test Equipment Connection Corp. Test Equipment Depot*D Tritronics, Inc.*D80 Tucker Electronics Company Union Electronics Distrib.*D Vector-VID Inc. Wavetek Corporation Wholesale Electronics Inc.*D Zack Electronics Zack/Joseph Electronics*D	Fotronic Corporation*D Global Specialties Heath Company Herman Electronics*D Instek Corporation*D W.S. Jenks & Son*D Kelvin Electronics*D Kenwood U.S.A. Corporation Morrow Wave Inc. Marshall Industries*D M.A.T. Electronics*D Mouser Electronics*D Multidyne Inc. Parts Express International*D Print Products International*D H.C. Protek RAG Electronics Inc.*D RNJ Electronics Inc.*D RS Electronics*D Salen Enterprises*D Herman H. Sticht Company, Inc.*D Sun Equipment Corporation A.G. Tannenbaum*D TechAmerica*D Techni-Tool Inc.*D Tektronix, Inc. Tektronix Telulex, Inc. Tenma Test Equipment Test Equipment Depot*D Tritronics, Inc.*D80 Tucker Electronics Company Union Electronics Distrib.*D Vector-VID Inc. Wholesale Electronics Inc.*D Zack Electronics Zack/Joseph Electronics*D GAUGES; HEAD PROTRUSION/SPRING TENSION/STYLUS FORCE/OTHER Accutest Instruments, Inc.*D Alfa Electronics*D The Current Source*D Dalbani Corporation*D Electronic Parts Supply*D Electronix Corporation*D80 Fotronic Corporation*D HMC — Hub Material Company*D Hunter Products, Inc. Omega Engineering, Inc. Omega-Vanzetti, Inc. RNJ Electronics Inc.*D Sun Equipment Corporation Techni-Tool Inc.*D Tentel Test Equipment Depot*D TIF Instruments, Inc. Tritronics, Inc.*D80 Wavetek Corporation Zack/Joseph Electronics*D GENERATORS, AUDIO Accutest Instruments, Inc.*D Alfa Electronics*D Antique Electronic Supply*D AudioVisual Inc.*D Vance Baldwin Inc.*D80 B-B&W Electronics*D Bel Merit Corporation BK Precision Brunelle Instruments, Inc. Bursma Electronic Distrib.*D C&S Sales*D Compuvideo Test Instruments Consolidated Electronics, Inc.*D Contact East, Inc.*D Conway Engineering, Inc. CSI/SPCCO The Current Source*D Dalbani Corporation*D East Coast Transistor*D Eiger Electronics*D Electro Tool, Inc. Electronic Parts Supply*D Electronix Corporation*D80 Electronix Express*D Elenco Electronics, Inc. Fluke Corporation Fotronic Corporation*D Global Specialties Harco Electronics*D Heath Company Herman Electronics*D ICM Components*D Instek Corporation*D	W.S. Jenks & Son*D Jensen Tools, Inc.*D Keithley Instruments Kelvin Electronics*D Leader Instruments Corporation Marconi Instruments Inc. Marshall Industries*D M.A.T. Electronics*D MCM Electronics*D Metric Supply*D Morrow Wave Inc. Multidyne Inc. NCM Electronics Omnitron Electronics*MD PC Instruments Incorporated Print Products International*D H.C. Protek RAG Electronics Inc.*D Richardson Electronics, Ltd.*D RNJ Electronics Inc.*D RS Electronics*D Salen Enterprises*D Sencore Electronics5 Sibex, Inc. Specialized Prods Company*D Herman H. Sticht Company, Inc.*D Sun Equipment Corporation A.G. Tannenbaum*D TEAM Systems, Inc. Techni-Tool Inc.*D Tektronix, Inc. Tektronix Telulex, Inc. Ten-Lab Tenma Test Equipment Test Equipment Depot*D Tritronics, Inc.*D80 Tucker Electronics Company Ultech Corp. Union Electronics Distrib.*D Video Products Inc.14 Wholesale Electronics Inc.*D Zack Electronics Zack/Joseph Electronics*D GENERATORS, VIDEO Accutest Instruments, Inc.*D ACM Company AnaTek Corporation AudioVisual Inc.*D Vance Baldwin Inc.*D80 B-B&W Electronics*D BK Precision Computer & Monitor Maintenance Computer Services of America*D Compuvideo Test Instruments Consolidated Electronics, Inc.*D The Current Source*D East Coast Transistor*D Eiger Electronics*D Electronix Corporation*D80 Electronix Express*D Elenco Electronics, Inc. Fluke Corporation Fotronic Corporation*D Heath Company Herman Electronics*D W.S. Jenks & Son*D Jensen Tools, Inc.*D Kelvin Electronics*D Leader Instruments Corporation Marshall Industries*D	M.A.T. Electronics*D MCM Electronics*D Metric Supply*D Morrow Wave Inc. Multidyne Inc. NCM Electronics Omnitron Electronics*MD PC Instruments Incorporated Print Products International*D H.C. Protek Quantum Data RAG Electronics Inc.*D R.C. Distributing Co Richardson Electronics, Ltd.*D RNJ Electronics Inc.*D RS Electronics*D Salen Enterprises*D Sencore Electronics5 Sirius Technologies Sun Equipment Corporation A.G. Tannenbaum*D TEAM Systems, Inc. Techni-Tool Inc.*D Tektronix, Inc. Tektronix Telulex, Inc. Ten-Lab Tenma Test Equipment Test Equipment Depot*D Tritronics, Inc.*D80 Tucker Electronics Company Ultech Corp. Union Electronics Distrib.*D Video Products Inc.14 Wholesale Electronics Inc.*D Zack Electronics Zack/Joseph Electronics*D HV PROBES Accutest Instruments, Inc.*D Alfa Electronics*D Allison Technology Corporation AnaTek Corporation Vance Baldwin Inc.*D80 B-B&W Electronics*D BK Precision Brunelle Instruments, Inc. Bursma Electronic Distrib.*D C&S Sales*D Consolidated Electronics, Inc.*D The Current Source*D East Coast Transistor*D Eiger Electronics*D Electronic Parts Supply*D Electronix Express*D Fieldpiece Instruments Fotronic Corporation*D Harco Electronics*D Herman Electronics*D HMC — Hub Material Company*D W.S. Jenks & Son*D Kelvin Electronics*D Marshall Industries*D M.A.T. Electronics*D MCM Electronics*D Metric Supply*D Nationwide Electronics Omnitron Electronics*MD Print Products International*D RAG Electronics Inc.*D RNJ Electronics Inc.*D RS Electronics*D Sencore Electronics5 Simpson Electronic Company

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Specialized Prods Company*D	Digi-Key D*	Sun Equipment Corporation	Marshall Industries*D
Sun Equipment Corporation	East Coast Transistor*D	Tenma Test Equipment	M.A.T. Electronics*D
Techni-Tool Inc.*D	E.I.L. Instruments, Inc.*D	Test Equipment Depot*D	MCM Electronics*D
Tektronix	Electronic Parts Supply*D	Tritronics, Inc.*D80	Metric Supply*D
Telematic	Electronix Express*D	Tucker Electronics Company	Mouser Electronics*D
Tenma Test Equipment	Elenco Electronics, Inc.	Union Electronics Distrib.*D	Omega Engineering, Inc.
Test Equipment Depot*D	Emulation Technology, Inc.	Wholesale Electronics Inc.*D	Omnitron Electronics*MD
Tritronics, Inc.*D80	Foley-Belsaw*D	Zack Electronics	Pacer Industries, Inc.
Tucker Electronics Company	Fotronic Corporation*D	Zack/Joseph Electronics*D	Parts Express International*D
Union Electronics Distrib.*D	Global Specialties		Philips ECG Company*D
Wholesale Electronics Inc.*D	Harco Electronics*D		Philips ECG
Zack Electronics	Heath Company		Print Products International*D
Zack/Joseph Electronics*D	HMC — Hub Material Company*D		QuadTech, Inc.
	Hy Tec Dealer Service		RAG Electronics Inc.*D
LOGIC ANALYZERS:	Jameco Electric Components*D		RNJ Electronics Inc.*D
SIGNATURE/STATE	JDR Microdevices*D		RS Electronics*D
Accutest Instruments, Inc.*D	W.S. Jenks & Son*D		Sencore Electronics5
Consolidated Electronics, Inc.*D	Kelvin Electronics*D		Simpson Electronic Company
Contact East, Inc.*D	Kenwood U.S.A. Corporation		Herman H. Sticht Company, Inc.*D
CSI/SPCCO	Marshall Industries*D		Sun Equipment Corporation
The Current Source*D	MCM Electronics*D		A.G. Tannenbaum*D
Dalbani Corporation*D	Metric Supply*D		TechAmerica*D
East Coast Transistor*D	Micro 2000, Inc.		Techni-Tool Inc.*D
E.I.L. Instruments, Inc.*D	Mouser Electronics*D		Telogy*D
Electronix Express*D	Omnitron Electronics*MD		Tenma Test Equipment
Electroservice Laboratories	Philips ECG Company*D		Test Equipment Depot*D
Emulation Technology, Inc.	Print Products International*D		TIF Instruments, Inc.
Fotronic Corporation*D	RAG Electronics Inc.*D		Time Motion Tools*D
Global Specialties	RNJ Electronics Inc.*D		Triplett Corporation
Harco Electronics*D	RS Electronics*D		Tritronics, Inc.*D80
Heath Company	Salen Enterprises*D		Tucker Electronics Company
Hy-Tronix Instruments, Inc.	Sun Equipment Corporation		Union Electronics Distrib.*D
W.S. Jenks & Son*D	TechAmerica*D		Universal Enterprises (UEI)
Jensen Tools, Inc.*D	Techni-Tool Inc.*D		Wavetek Corporation
LaserImpact	Tektronix, Inc.		Wholesale Electronics Inc.*D
Marshall Industries*D	Tektronix		Zack Electronics
MCM Electronics*D	Tenma Test Equipment		Zack/Joseph Electronics*D
Metric Supply*D	Test Equipment Depot*D		
Omnitron Electronics*MD	Tritronics, Inc.*D80		METERS, CLAMP ON
Orion Instruments, Inc.	Tucker Electronics Company		Accutest Instruments, Inc.*D
Print Products International*D	Union Electronics Distrib.*D		Alfa Electronics*D
RAG Electronics Inc.*D	Wavetek Corporation		American Reliance
RNJ Electronics Inc.*D	Wholesale Electronics Inc.*D		AVO International
RS Electronics*D	Zack Electronics		Vance Baldwin Inc.*D80
Schlumberger Technologies	Zack/Joseph Electronics*D		B-B&W Electronics*D
Sencore Electronics5			Bel Merit Corporation
Specialized Products Company*D	LOGIC PULSERS		BK Precision
Techni-Tool Inc.*D	Accutest Instruments, Inc.*D		Brunelle Instruments, Inc.
Tektronix, Inc.	Alfa Electronics*D		Bursma Electronic Distrib.*D
Tektronix	B-B&W Electronics*D		C&S Sales*D
Telogy*D	BK Precision		Computer Component Source*D
Tenma Test Equipment	Brunelle Instruments, Inc.		Consolidated Electronics, Inc.*D
Test Equipment Connection Corp.	C&S Sales*D		Contact East, Inc.*D
Test Equipment Depot*D	Consolidated Electronics, Inc.*D		CSI/SPCCO
Tritronics, Inc.*D80	The Current Source*D		The Current Source*D
Tucker Electronics Company	Digi-Key D*		Dalbani Corporation*D
Zack Electronics	East Coast Transistor*D		East Coast Transistor*D
Zack/Joseph Electronics*D	E.I.L. Instruments, Inc.*D		E.I.L. Instruments, Inc.*D
	Electronic Parts Supply*D		Electro Tool, Inc.
	Electronix Express*D		Electronic Parts Supply*D
	Elenco Electronics, Inc.		Electronix Corporation*D80
	Fotronic Corporation*D		Electronix Express*D
	Global Micro-Parts Depot*MD		Elenco Electronics, Inc.
	Global Specialties		Exttech Instruments Corporation*D
	Harco Electronics*D		Fieldpiece Instruments
	Herman Electronics*D		Foley-Belsaw*D
	HMC - Hub Material Company*D		Fotronic Corporation*D
	Hosfelt Electronics, Inc.*D		Global Micro-Parts Depot*MD
	Hy Tec Dealer Service		Global Specialties
	IET Labs, Inc.		Harco Electronics*D
	Instek Corporation*D		Herman Electronics*D
	Jameco Electric Components*D		HMC - Hub Material Company*D
	JDR Microdevices*D		Hosfelt Electronics, Inc.*D
	W.S. Jenks & Son*D		Hy Tec Dealer Service
	Keithley Instruments		IET Labs, Inc.
	Kelvin Electronics*D		Instek Corporation*D
			Jameco Electric Components*D
			JDR Microdevices*D
			W.S. Jenks & Son*D
			Keithley Instruments
			Kelvin Electronics*D

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Hosfelt Electronics, Inc.*D	Sencore Electronics5	Fieldpiece Instruments	HMC — Hub Material Company*D
Hy Tec Dealer Service	Snap-On Incorporated	Fotronic Corporation*D	Hosfelt Electronics, Inc.*D
Instek Corporation*D	Specialized Prods Company*D	Harco Electronics*D	Howard Electronic Insts. Inc.*D
Jameco Electric Components*D	Herman H. Sticht Company, Inc.*D	HMC - Hub Material Company*D	Hy Tec Dealer Service
W.S. Jenks & Son*D	Sun Equipment Corporation	Hunter Products, Inc.	Instek Corporation*D
Jensen Tools, Inc.*D	Techni-Tool Inc.*D	Jameco Electric Components*D	Jameco Electric Components*D
Kelvin Electronics*D	Tenna Test Equipment	W.S. Jenks & Son*D	JDR Microdevices*D
LEM Instruments Inc	Test Equipment Depot*D	Marshall Industries*D	W.S. Jenks & Son*D
Marshall Industries*D	Time Motion Tools*D	M.A.T. Electronics*D	Keithley Instruments
MCM Electronics*D	Tritronics, Inc.*D80	MCM Electronics*D	Kelvin Electronics*D
Metric Supply*D	Tucker Electronics Company	Metric Supply*D	Kenwood U.S.A. Corporation
Morrow Wave Inc.	Union Electronics Distrib.*D	OmniTron Electronics*MD	Lascar Electronics Inc.
Mouser Electronics*D	Wavetek Corporation	Pacer Industries, Inc.	Leader Instruments Corporation
Omega Engineering, Inc.	Zack Electronics	Prime Technology, Inc.	Marshall Industries*D
Omega-Vanzetti, Inc.	Zack/Joseph Electronics*D	Print Products International*D	MCM Electronics*D
OmniTron Electronics*MD		RAG Electronics Inc.*D	Metric Supply*D
Philips ECG Company*D	METERS, SIGNAL LEVEL	RNJ Electronics Inc.*D	Mouser Electronics*D
Philips ECG	Accutest Instruments, Inc.*D	Simpson Electronic Company	Newport Electronics, Inc.
Print Products International*D	American Reliance	Snap-On Incorporated	Omega Engineering, Inc.
RAG Electronics Inc.*D	Vance Baldwin Inc.*D80	Sun Equipment Corporation	Omega-Vanzetti, Inc.
RNJ Electronics Inc.*D	B-B&W Electronics*D	Techni-Tool Inc.*D	OmniTron Electronics*MD
RS Electronics*D	Conway Engineering, Inc.	Telulex, Inc.	Parts Express International*D
Salen Enterprises*D	CSI/SPCCO	Tenna Test Equipment	Philips ECG Company*D
Simpson Electronic Company	The Current Source*D	Test Equipment Connection Corp.	Philips ECG
A.W. Sperry Instruments, Inc.	Dalbani Corporation*D	Test Equipment Depot*D	Prime Technology, Inc.
Sun Equipment Corporation	East Coast Transistor*D	Time Motion Tools*D	Print Products International*D
TechAmerica*D	Electronix Express*D	Tritronics, Inc.*D80	H.C. Protek
Techni-Tool Inc.*D	Fotronic Corporation*D	Tucker Electronics Company	QuadTech, Inc.
Tenna Test Equipment	Harco Electronics*D	Union Electronics Distrib.*D	RAG Electronics Inc.*D
Test Equipment Depot*D	W.S. Jenks & Son*D	Wholesale Electronics Inc.*D	RNJ Electronics Inc.*D
TIF Instruments, Inc.	Leader Instruments Corporation	Zack Electronics	RS Electronics*D
Time Motion Tools*D	Marshall Industries*D	Zack/Joseph Electronics*D	Salen Enterprises*D
Triplet Corporation	M.A.T. Electronics*D		Schlumberger Technologies
Tritronics, Inc.*D80	MCM Electronics*D	METERS, VOLTMETERS, AC	Sencore Electronics5
Tucker Electronics Company	Omega-Vanzetti, Inc.	Accutest Instruments, Inc.*D	Simpson Electronic Company
Union Electronics Distrib*D	OmniTron Electronics*MD	Alfa Electronics*D	Snap-On Incorporated
Universal Enterprises (UEI)	Parts Express International*D	Ames Supply Company*D	Specialized Prods Company*D
Wavetek Corporation	Prime Technology, Inc.	Amprobe	A.W. Sperry Instruments, Inc.
Wholesale Electronics Inc.*D	Print Products International*D	Antique Electronic Supply*D	Herman H. Sticht Company, Inc.*D
Zack Electronics	RAG Electronics Inc.*D	Arrow Electronics	Sun Equipment Corporation
Zack/Joseph Electronics*D	RNJ Electronics Inc.*D	AVO International	A.G. Tannenbaum*D
	RS Electronics*D	Vance Baldwin Inc.*D80	TechAmerica*D
METERS, FIELD STRENGTH	Sencore Electronics5	Bel Merit Corporation	Techni-Tool Inc.*D
Accutest Instruments, Inc.*D	Snap-On Incorporated	BK Precision	Tegam Inc.
Alfa Electronics*D	Herman H. Sticht Company, Inc.*D	Brunelle Instruments, Inc.	Tektronix, Inc.
American Reliance	Sun Equipment Corporation	Bursma Electronic Distrib.*D	Telogy*D
Vance Baldwin Inc.*D80	Techni-Tool Inc.*D	C&S Sales*D	Telulex, Inc.
Bel Merit Corporation	Tektronix, Inc.	Consolidated Electronics, Inc.*D	Tenna Test Equipment
Bird Electronics Corporation	Tektronix	Contact East, Inc.*D	Test Equipment Connection Corp.
Brunelle Instruments, Inc.	Telogy*D	CSI/SPCCO	Test Equipment Depot*D
Bursma Electronic Distrib.*D	Telulex, Inc.	The Current Source*D	TIF Instruments, Inc.
C&S Sales*D	Tenna Test Equipment	Dalbani Corporation*D	Time Motion Tools*D
Contact East, Inc.*D	Test Equipment Depot*D	Digi-Key D*	Triplet Corporation
The Current Source*D	Time Motion Tools*D	Dranetz-BMI	Tritronics, Inc.*D80
East Coast Transistor*D	Tritronics, Inc.*D80	East Coast Transistor*D	Tucker Electronics Company
Eiger Electronics*D	Tucker Electronics Company	Eiger Electronics*D	Union Electronics Distrib.*D
Electronix Express*D	Union Electronics Distrib.*D	E.I.L. Instruments, Inc.*D	Universal Enterprises (UEI)
Electroservice Laboratories	Universal Enterprises (UEI)	Electro Tool, Inc.	Wavetek Corporation
Fotronic Corporation*D	Wavetek Corporation	Electronic Design Specialists13	Wholesale Electronics Inc.*D
Harco Electronics*D	Zack Electronics	Electronic Parts Supply*D	Zack Electronics
Hy Tec Dealer Service	Zack/Joseph Electronics*D	Electronix Corporation*D80	Zack/Joseph Electronics*D
Integrity Design & Research		Electronix Express*D	
Jameco Electric Components*D	METERS, SOUND LEVEL	Extel Instruments Corporation*D	METERS, WOW, AND FLUTTER
JDR Microdevices*D	Accutest Instruments, Inc.*D	Fieldpiece Instruments	Accutest Instruments, Inc.*D
W.S. Jenks & Son*D	Alfa Electronics*D	Fixer Corporation	Alfa Electronics*D
Jensen Tools, Inc.*D	American Reliance	Fluke Corporation	Arrow Electronics
Kelvin Electronics*D	B-B&W Electronics*D	Foley-Belsaw*D	The Current Source*D
Leader Instruments Corporation	Brunelle Instruments, Inc.	Fotronic Corporation*D	East Coast Transistor*D
MCM Electronics*D	CSI/SPCCO	Fox International*D	E.I.L. Instruments, Inc.*D
Metric Supply*D	The Current Source*D	Galco Industrial Electronics*D	Electronic Parts Supply*D
OmniTron Electronics*MD	East Coast Transistor*D	GC Electronics*D	Electronix Express*D
Print Products International*D	E.I.L. Instruments, Inc.*D	Global Micro-Parts Depot*MD	Fotronic Corporation*D
RNJ Electronics Inc.*D	Electronix Express*D	Harco Electronics*D	Herman Electronics*D
RS Electronics*D	Extel Instruments Corporation*D	Herman Electronics*D	Instek Corporation*D

See Adv. Page

W.S. Jenks & Son*D
Kenwood U.S.A. Corporation
Leader Instruments Corporation
Marshall Industries*D
MCM Electronics*D
Metric Supply*D
Omnitron Electronics*MD
Print Products International*D
RAG Electronics Inc.*D
RNJ Electronics Inc.*D
Specialized Prods Company*D
Herman H. Sticht Company, Inc.*D
Sun Equipment Corporation
Techni-Tool Inc.*D
Tenma Test Equipment
Test Equipment Depot*D
Tritronics, Inc.*D.....80
Tucker Electronics Company
Union Electronics Distrib.*D
Wholesale Electronics Inc.*D
Zack Electronics
Zack/Joseph Electronics*D

MICROWAVE LEAKAGE TESTERS

Accutest Instruments, Inc.*D
Amprobe
Arrow Electronics
B-B&W Electronics*D
Brunelle Instruments, Inc.
C&S Sales*D
The Current Source*D
Dalbani Corporation*D
Eiger Electronics*D
E.I.L. Instruments, Inc.*D
Electronic Corporation*D.....80
Fotronic Corporation*D
Fox International*D
Global Micro-Parts Depot*MD
W.S. Jenks & Son*D
Marshall Industries*D
M.A.T. Electronics*D
MCM Electronics*D
Metric Supply*D
Nationwide Electronics
Omnitron Electronics*MD
Print Products International*D
RAG Electronics Inc.*D
RNJ Electronics Inc.*D
Simpson Electronic Company
A.W. Sperry Instruments, Inc.
Techni-Tool Inc.*D
Tology*D
Tenma Test Equipment
Test Equipment Depot*D
Tritronics, Inc.*D.....80
Tucker Electronics Company
Union Electronics Distrib.*D
Zack Electronics
Zack/Joseph Electronics*D

MULTIMETERS: ANALOG/ DIGITAL

Accutest Instruments, Inc.*D
 Alfa Electronics*D
 Allison Technology Corporation
 American Reliance
 Amprobe
 Antique Electronic Supply*D
 Arrow Electronics
 AVO International
 Vance Baldwin Inc.*D80
 B-B&W Electronics*D
 Bel Merit Corporation

See Adv. Page

BK Precision
 Brilliant King, Inc.
 Brunelle Instruments, Inc.
 Bursma Electronic Distrib.*D
 C&S Sales*D
 Computer Component Source*D
 Computer Services of America*D
 Consolidated Electronics, Inc.*D
 Contact East, Inc.*D
 Conway Engineering, Inc.
 The Current Source*D
 Dalbani Corporation*D
 Dranetz-BMI
 East Coast Transistor*D
 Eiger Electronics*D
 E.I.L. Instruments, Inc.*D
 Electro Tool, Inc.
 Electronic Design Specialists.....13
 Electronic Prod. Specialties*D
 Electronic Parts Supply*D
 Electronix Express*D
 Elenco Electronics, Inc.
 Extex Instruments Corporation*D
 Fieldpiece Instruments
 Fluke Corporation
 Foley-Belsaw*D
 Fotronic Corporation*D
 Fox International*D
 Galco Industrial Electronics*D
 Hameg Instruments, Inc.
 Harco Electronics*D
 Heath Company
 Herman Electronics*D
 HMC — Hub Material Company*D
 Hy Tec Dealer Service
 JDR Microdevices*D
 W.S. Jenks & Son*D
 Jensen Tools, Inc.*D
 Keithley Instruments
 Kelvin Electronics*D
 Kenwood U.S.A. Corporation
 LaserImpact
 Leader Instruments Corporation
 Morrow Wave Inc.
 Marshall Industries*D
 M.A.T. Electronics*D
 MCM Electronics*D
 Metric Supply*D
 Mouser Electronics*D
 National Instruments Corporation
 Newport Electronics, Inc.
 Omega Engineering, Inc.
 Omega-Vanzetti, Inc.
 Omnitron Electronics*MD
 Philips ECG Company*D
 Print Products International*D
 Progressive Electronics
 Prostat Corporation
 H.C. Protek
 RAG Electronics Inc.*D
 RNJ Electronics Inc.*D
 RS Electronics*D
 Salen Enterprises*D
 Schlumberger Technologies
 Sencore Electronics.....14
 Simpson Electronic Company
 Snap-On Incorporated
 Specialized Prods. Company*D
 A.W. Sperry Instruments, Inc.
 Sun Equipment Corporation
 A.G. Tannenbaum*D
 TechAmerica*D
 Techni-Tool Inc.*D
 Tegam Inc.

See Adv. Page

Tektronix, Inc.
Tektronix
Telogy*
Tenna Test Equipment
Test Equipment Connection Corp.
Test Equipment Depot*
TIF Instruments, Inc.
Time Motion Tools*
Triplett Corporation
Tritronics, Inc.*80
Tucker Electronics Company
Union Electronics Distrib.*
Universal Enterprises (UEI)
Wavetek Corporation
Wholesale Electronics Inc.*
Zack Electronics
Zack/Joseph Electronics*

OSCILLOSCOPES

Accutest Instruments, Inc.*D
Alfa Electronics*D
Allison Technology Corporation
Ames Supply Company*D
Analogic Corporation
AnaTek Corporation
Arrow Electronics
Vance Baldwin Inc.*D.....80
B-B&W Electronics*D
Bel Merit Corporation
BK Precision
Brunelle Instruments, Inc.
Bursma Electronic Distrib.*D
C&S Sales*D
Computer Component Source*D
Compuvideo Test Instruments
Consolidated Electronics, Inc.*D
Contact East, Inc.*D
Conway Engineering, Inc.
The Current Source*D
Dalbani Corporation*D
Digi-Key D*
East Coast Transistor*D
Eiger Electronics*D
E.I.L. Instruments, Inc.*D
Electro Tool, Inc.
Electronic Prod. Specialties*D
Electronic Parts Supply*D
Electronix Corporation*D.....80
Electronix Express*D
Elenco Electronics, Inc.
Emulation Technology, Inc.
Exttech Instruments Corporation*D
Fluke Corporation
Fotronic Corporation*D
Galco Industrial Electronics*D
Global Micro-Parts Depot*MD
Global Specialties
Gould Instrument Systems Inc.
Hameg Instruments, Inc.
Harco Electronics*D
Heath Company
Herman Electronics*D
Hi-Techniques, Inc.
HMC — Hub Material Company*D
Hosfelt Electronics, Inc.*D
Instek Corporation*D
Iwatsu America
Jameco Electronic Components*D
JDR Microdevices*D
W.S. Jenks & Son*D
Jensen Tools, Inc.*D
Kelvin Electronics*D
Kenwood U.S.A. Corporation
LaserImpact

See Adv. Page

Leader Instruments Corporation
 Morrow Wave Inc.
 Marconi Instruments Inc.
 Marshall Industries***D**
 M.A.T. Electronics***D**
 MCM Electronics***D**
 Metric Supply***D**
 Mouser Electronics***D**
 National Instruments Corporation
 Omega-Vanzetti, Inc.
 Omnitron Electronics***MD**
 Orion Instruments, Inc.
 Panasonic Industrial Company
 Parts Express International***D**
 PC Instruments Incorporated
 Print Products International***D**
 H.C. Protek
 RAG Electronics Inc.***D**
 RNJ Electronics Inc.***D**
 RS Electronics***D**
 Salen Enterprises***D**
 Sencore Electronics.....5
 Snap-On Incorporated
 Specialized Prods Company***D**
 Herman H. Sticht Company, Inc.***D**
 Sun Equipment Corporation
 TechAmerica***D**
 Techni-Tool Inc.***D**
 Tektronix, Inc.
 Tektronix
 Tology***D**
 Tenma Test Equipment
 Test Equipment Connection Corp.
 Test Equipment Depot***D**
 Tritronics, Inc.***D**.....80
 Tucker Electronics Company
 Union Electronics Distrib.***D**
 Wavetek Corporation
 Wholesale Electronics Inc.***D**
 Zack Electronics
 Zack/Joseph Electronics***D**

PERSONAL COMPUTER REPAIR/TEST EQUIPMENT

American Reliance
 Ames Supply Company*D
 AnaTek Corporation
 Arrow Electronics
 B&B Electronics Manufacturing
 Vance Baldwin Inc.*D.....80
 Consolidated Electronics, Inc.*D
 Contact East, Inc.*D
 CSTS Inc.
 The Current Source*D
 Dalco Electronics*D
 Data Depot, Inc.
 Eagan Technical Services, Inc.
 Electro Tool, Inc.
 Electronic Parts Supply*D
 Electronix Corporation*D.....80
 Electronix Express*D
 Fluke Corporation
 Fotronic Corporation*D
 Harco Electronics*D
 HMC — Hub Material Company*D
 Huntron Instruments, Inc.
 Hy-Tronix Instruments, Inc.
 JDR Microdevices*D
 W.S. Jenks & Son*D
 Jensen Tools, Inc.*D
 Kasco Distributing*D
 Kewill E Commerce Inc*D
 LaserImpact
 Leader Instruments Corporation

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Marshall Industries*D	Computer Component Source*D	MCM Electronics*D	Zack Electronics
M.A.T. Electronics*D	Consolidated Electronics, Inc.*D	Mouser Electronics*D	Zack/Joseph Electronics*D
MCM Electronics*D	The Current Source*D	National Instruments Corporation	
Micro 2000, Inc.	Dalco Electronics*D	OmniTron Electronics*MD	TEMPERATURE SENSORS
Moody Tools, Inc.	East Coast Transistor*D	Print Products International*D	Alfa Electronics*D
Nationwide Electronics	Eiger Electronics*D	H.C. Protek	Allison Technology Corporation
Netway 2000 Inc.	E.I.L. Instruments, Inc.*D	RAG Electronics Inc.*D	Anritsu Products
Network Technologies, Inc.	Electronic Design Specialists.....13	RNJ Electronics Inc.*D	Arrow Electronics
O.K. Industries, Inc.	Electronic Parts Supply*D	RS Electronics*D	Consolidated Electronics, Inc.*D
Omega-Vanzetti, Inc.	Electronix Corporation*D.....80	Schlumberger Technologies	Contact East, Inc.*D
OmniTron Electronics*MD	Electronix Express*D	Smith Design	The Current Source*D
PC Instruments Incorporated	Elenco Electronics, Inc.	Specialized Prods Company*D	Dalbani Corporation*D
Print Products International*D	Fotronic Corporation*D	Techni-Tool Inc.*D	Dranetz-BMI
Richardson Electronics, Ltd.*D	Fox International*D	Technology Programs	East Coast Transistor*D
RNJ Electronics Inc.*D	Galco Industrial Electronics*D	Tektronix, Inc.	E.I.L. Instruments, Inc.*D
RS Electronics*D	Harco Electronics*D	Tektronix	Electronix Express*D
SMH Electronics Company, Inc.	Hosfelt Electronics, Inc.*D	Telogy*D	Exttech Instruments Corporation*D
A.W. Sperry Instruments, Inc.	Hy-Tronix Instruments, Inc.	Tenna Test Equipment	Fotronic Corporation*D
Sprague Magnetics, Inc.*D	IET Labs, Inc.	Test Equipment Connection Corp.	Galco Industrial Electronics*D
Sun Equipment Corporation	W.S. Jenks & Son*D	Test Equipment Depot*D	Hexacon Electric Company
Telematic	Jensen Tools, Inc.*D	Tritronics, Inc.*D.....80	HMC — Hub Material Company*D
Tenna Test Equipment	Keithley Instruments	Tucker Electronics Company	JDR Microdevices*D
Test Equipment Depot*D	L'il Bitty Tester	Union Electronics Distrib*D	W.S. Jenks & Son*D
Time Motion Tools*D	Marshall Industries*D	Wholesale Electronics Inc.*D	Lascar Electronics Inc.
Tritronics, Inc.*D.....80	M.A.T. Electronics*D	Zack Electronics	Marshall Industries*D
Ultra-X, Inc.	MCM Electronics*D	Zack/Joseph Electronics*D	MCM Electronics*D
Video Products Inc.....14	Omega-Vanzetti, Inc.		Multicore Solders
Warrantech Corporation	OmniTron Electronics*MD	TELEPHONE ANALYZERS/	Newport Electronics, Inc.
Wescorp	Print Products International*D	TESTERS	Omega Engineering, Inc.
Zack Electronics	QuadTech, Inc.	American Reliance	Omega-Vanzetti, Inc.
Zack/Joseph Electronics*D	RAG Electronics Inc.*D	Vance Baldwin Inc.*D.....80	OmniTron Electronics*MD
	RNJ Electronics Inc.*D	BK Precision	Pacer Industries, Inc.
RECEPTACLE CIRCUIT	RS Electronics*D	C&S Sales*D	Philips ECG Company*D
TESTERS	Sencore Electronics.....5	Consolidated Electronics, Inc.*D	Print Products International*D
Vance Baldwin Inc.*D.....80	Specialized Prods Company*D	Contact East, Inc.*D	RAG Electronics Inc.*D
Brunelle Instruments, Inc.	Sun Equipment Corporation	Conway Engineering, Inc.	RNJ Electronics Inc.*D
Contact East, Inc.*D	TechAmerica*D	CUI Stack	RS Electronics*D
The Current Source*D	Techni-Tool Inc.*D	The Current Source*D	Simpson Electronic Company
East Coast Transistor*D	Telogy*D	Dalco Electronics*D	SAT/A SPIRIG Company*D
E.I.L. Instruments, Inc.*D	Tenna Test Equipment	East Coast Transistor*D	Techni-Tool Inc.*D
Electro Tool, Inc.	Test Equipment Depot*D	Electro Tool, Inc.	Technology Programs
Electronix Corporation*D.....80	Tritronics, Inc.*D.....80	Electronix Express*D	Tenna Test Equipment
Electronix Express*D	Tucker Electronics Company	Elenco Electronics, Inc.	Test Equipment Depot*D
Fieldpiece Instruments	Union Electronics Distrib.*D	Fotronic Corporation*D	Time Motion Tools*D
Foley-Belsaw*D	Wholesale Electronics Inc.*D	Harco Electronics*D	Tritronics, Inc.*D.....80
Fotronic Corporation*D	Zack Electronics	Herman Electronics*D	Tucker Electronics Company
HMC — Hub Material Company*D	Zack/Joseph Electronics*D	HMC — Hub Material Company*D	Union Electronics Distrib.*D
W.S. Jenks & Son*D		W.S. Jenks & Son*D	Universal Enterprises (UEI)
Marshall Industries*D	SPECTRUM ANALYZERS	Jensen Tools, Inc.*D	Wavetek Corporation
MCM Electronics*D	Accutest Instruments, Inc.*D	Marshall Industries*D	Wholesale Electronics Inc.*D
OmniTron Electronics*MD	Alfa Electronics*D	M.A.T. Electronics*D	Zack Electronics
Print Products International*D	Allison Technology Corporation	MCM Electronics*D	Zack/Joseph Electronics*D
Progressive Electronics	Analogic Corporation	Metric Supply*D	
RNJ Electronics Inc.*D	Arrow Electronics	OmniTron Electronics*MD	TRANSISTOR TESTERS
RS Electronics*D	Vance Baldwin Inc.*D.....80	Print Products International*D	Accutest Instruments, Inc.*D
Sun Equipment Corporation	BK Precision	RAG Electronics Inc.*D	AnaTek Corporation
Techni-Tool Inc.*D	Brunelle Instruments, Inc.	RNJ Electronics Inc.*D	Arrow Electronics
Tenna Test Equipment	C&S Sales*D	RS Electronics*D	B-B&W Electronics*D
Test Equipment Depot*D	Consolidated Electronics, Inc.*D	Specialized Prods Company*D	Bel Merit Corporation
Time Motion Tools*D	The Current Source*D	A.W. Sperry Instruments, Inc.	BK Precision
Tritronics, Inc.*D.....80	East Coast Transistor*D	Sun Equipment Corporation	Bursma Electronic Distrib.*D
Tucker Electronics Company	E.I.L. Instruments, Inc.*D	Techni-Tool Inc.*D	Computer Component Source*D
Wholesale Electronics Inc.*D	Electronix Express*D	Tektronix, Inc.	Consolidated Electronics, Inc.*D
Zack Electronics	Fotronic Corporation*D	Telogy*D	The Current Source*D
Zack/Joseph Electronics*D	Global Specialties	Tenna Test Equipment	East Coast Transistor*D
	Hameg Instruments, Inc.	Test Equipment Connection Corp.	Eiger Electronics*D
SEMICONDUCTOR TESTERS	Harco Electronics*D	Test Equipment Depot*D	Electronic Design Specialists.....13
AnaTek Corporation	Hi-Techniques, Inc.	Time Motion Tools*D	Electronic Parts Supply*D
Arrow Electronics	Integrity Design & Research	Triplett Corporation	Electronix Corporation*D.....80
Vance Baldwin Inc.*D.....80	W.S. Jenks & Son*D	Tritronics, Inc.*D.....80	Electronix Express*D
B-B&W Electronics*D	Jensen Tools, Inc.*D	Tucker Electronics Company	Elenco Electronics, Inc.
BK Precision	Marconi Instruments Inc.	Union Electronics Distrib.*D	Fotronic Corporation*D
Bursma Electronic Distrib.*D	Marshall Industries*D	Wavetek Corporation	HMC — Hub Material Company*D
	M.A.T. Electronics*D	Wholesale Electronics Inc.*D	W.S. Jenks & Son*D

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
<p>Kelvin Electronics* L'il Bitty Tester Marshall Industries* M.A.T. Electronics* MCM Electronics* Omega Engineering, Inc. Omnitron Electronics* Print Products International* RAG Electronics Inc.* RNJ Electronics Inc.* RS Electronics* Sencore Electronics.....5 Sun Equipment Corporation A.G. Tannenbaum* Telogy* Tenma Test Equipment Test Equipment Depot* Time Motion Tools* Tritronics, Inc.*.....80 Tucker Electronics Company Union Electronics Distrib.* Wholesale Electronics Inc.* Zack Electronics Zack/Joseph Electronics*</p> <p>VECTORSCOPES Accutest Instruments, Inc.* Arrow Electronics AudioVisual Inc.* Vance Baldwin Inc.*.....80 Compuvideo Test Instruments The Current Source* East Coast Transistor* E.I.L. Instruments, Inc.* Fotronic Corporation* Herman Electronics* W.S. Jenks & Son* Kenwood U.S.A. Corporation Leader Instruments Corporation Marshall Industries* MCM Electronics* Metric Supply* Omnitron Electronics* Print Products International* RAG Electronics Inc.* RNJ Electronics Inc.* RS Electronics* Sencore Electronics.....5 Techni-Tool Inc.* Tektronix, Inc. Tektronix Tenma Test Equipment Test Equipment Depot* Tritronics, Inc.*.....80 Tucker Electronics Company Ultech Corp. Union Electronics Distrib* Wavetek Corporation Wholesale Electronics Inc.* Zack Electronics Zack/Joseph Electronics*</p> <p>OTHER TEST EQUIPMENT Accutest Instruments, Inc.* ACM Company Allison Technology Corporation American Reliance Ames Supply Company* Amprobe Anritsu Products ASG Division of Jergens Inc. AVO International B&B Electronics Manufacturing Vance Baldwin Inc.*.....80 Bel Merit Corporation Bird Electronics Corporation BK Precision Brunelle Instruments, Inc. Bursma Electronic Distrib.* C&S Sales* Computer Component Source* Computer & Monitor Maintenance Consolidated Electronics, Inc.* Conway Engineering, Inc. The Current Source* Dalco Electronics* Dranetz-BMI East Coast Transistor* E.I.L. Instruments, Inc.* Electro Standards Lab, Inc. Electronix Corporation*.....80 Electronix Express* Elenco Electronics, Inc. Emulation Technology, Inc. Fluke Corporation Fotronic Corporation* Global Specialties Gould Instrument Systems Inc. Hamag Instruments, Inc. Herman Electronics* HMC — Hub Material Company* Howard Electronic Insts. Inc.* Huntron Instruments, Inc.</p> <p>WAVEFORM MONITORS Accutest Instruments, Inc.* Allison Technology Corporation Arrow Electronics AudioVisual Inc.* Vance Baldwin Inc.*.....80 Compuvideo Test Instruments Contact East, Inc.* The Current Source* East Coast Transistor* E.I.L. Instruments, Inc.* Electronix Express* Fotronic Corporation* Gould Instrument Systems Inc. Herman Electronics*</p>	<p>Hi-Techniques, Inc. W.S. Jenks & Son* Kenwood U.S.A. Corporation LaserImpact Leader Instruments Corporation Marshall Industries* MCM Electronics* Metric Supply* Omega-Vanzetti, Inc. Omnitron Electronics* PC Instruments Incorporated Print Products International* RAG Electronics Inc.* RNJ Electronics Inc.* RS Electronics* Sencore Electronics.....5 Specialized Prods Company* Techni-Tool Inc.* Tektronix, Inc. Tektronix Telogy* Tenma Test Equipment Test Equipment Connection Corp. Test Equipment Depot* Tritronics, Inc.*.....80 Tucker Electronics Company Ultech Corp. Union Electronics Distrib* Wavetek Corporation Wholesale Electronics Inc.* Zack Electronics Zack/Joseph Electronics*</p>	<p>IET Labs, Inc. Instek Corporation* Interconnect Devices, Inc. International Light, Inc. International Power Technologies Iwatsu America Jameco Electronic Components* JDR Microdevices* W.S. Jenks & Son* Jensen Tools, Inc.* Kasco Distributing* Keithley Instruments Kenwood U.S.A. Corporation Kewill E Commerce Inc* Lascar Electronics Inc. LaserImpact L-Com Inc. Leader Instruments Corporation LEM Instruments Inc L'il Bitty Tester Marshall Industries* MCM Electronics* Mouser Electronics* Multicore Solders National Instruments Corporation Nutronix Inc. Omega-Vanzetti, Inc. Omnitron Electronics* Pacer Industries, Inc. Panasonic Industrial Company Print Products International* Progressive Electronics QuadTech, Inc. Quantum Data RAG Electronics Inc.* Richardson Electronics, Ltd.* RNJ Electronics Inc.* RS Electronics* Sencore Electronics.....5 Sibley TV Simpson Electronic Company Sirius Technologies Snap-On Incorporated Sorensen Specialized Prods Company* A.W. Sperry Instruments, Inc. Sun Equipment Corporation Synergetix TechAmerica* Techni-Tool Inc.* Technology Programs Tektronix, Inc. Tektronix Telogy* Temptronic Corporation Ten-Lab Tenma Test Equipment Tentel Test Equipment Depot* TIF Instruments, Inc. Time Motion Tools* Triplett Corporation Tritronics, Inc.*.....80 Tucker Electronics Company UBM Corporation Union Electronics Distrib.* Universal Enterprises (UEI) Vector-VID Inc. Viking Electronics Walker Scientific Wavetek Corporation Zack Electronics Zack/Joseph Electronics*</p>	<p>Test Equipment Accessories</p> <p>AUDIO DUMMY LOADS Accutest Instruments, Inc.* American Reliance Computer Services of America* The Current Source* Dalco Electronics* Electronic Parts Supply* Fotronic Corporation* IET Labs, Inc. Marshall Industries* MCM Electronics* Metric Supply* Omnitron Electronics* Parts Express International* Print Products International* RNJ Electronics Inc.* Tenma Test Equipment Test Equipment Depot* Tritronics, Inc.*.....80 Tucker Electronics Company Zack Electronics Zack/Joseph Electronics*</p> <p>DECADE BOXES: CAPACITANCE/INDUCTANCE/RESISTANCE Accutest Instruments, Inc.* Arrow Electronics Vance Baldwin Inc.*.....80 B-B&W Electronics* Brunelle Instruments, Inc. Bursma Electronic Distrib.* C&S Sales* Consolidated Electronics, Inc.* The Current Source* E.I.L. Instruments, Inc.* Electronix Express* Elenco Electronics, Inc. Fotronic Corporation* GC Electronics* HMC — Hub Material Company* Hosfelt Electronics, Inc.* IET Labs, Inc. W.S. Jenks & Son* Jensen Tools, Inc.* Kenwood U.S.A. Corporation Marshall Industries* MCM Electronics* Mouser Electronics* Omnitron Electronics* Prime Technology, Inc. Print Products International* Prostat Corporation RAG Electronics Inc.* RNJ Electronics Inc.* Sun Equipment Corporation Techni-Tool Inc.* Tenma Test Equipment Test Equipment Depot* Tritronics, Inc.*.....80 Tucker Electronics Company Union Electronics Distrib* Vector-VID Inc. Wavetek Corporation Zack Electronics Zack/Joseph Electronics*</p> <p>IC TEST CLIPS Accutest Instruments, Inc.* Arrow Electronics Vance Baldwin Inc.*.....80</p>

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
B-B&W Electronics*D	Electronic Parts Supply*D	Nationwide Electronics	Philips ECG Company*D
Bursma Electronic Distrib.*D	Electronix Corporation*D.....80	Omnitron Electronics*MD	Philips ECG
Cal Test Electronics	Electronix Express*D	Print Products International*D	Pomona Electronics.....IFC
Computer Component Source*D	Electroservice Laboratories	RNJ Electronics Inc.*D	Premium Parts+ Electronics Co*D
Computer Services of America*D	Elgar Corporation	Telematic	Print Products International*D
Consolidated Electronics, Inc.*D	Fiske Corporation	Tentel	Probe Master, Inc.
Contact East, Inc.*D	Foley-Belsaw*D	Test Equipment Depot*D	Prostat Corporation
The Current Source*D	Fotronic Corporation*D	Tritronics, Inc.*D.....80	RAG Electronics Inc.*D
Dalbani Corporation*D	Fox International*D	Union Electronics Distrib.*D	RNJ Electronics Inc.*D
Digi-Key D*	Global Specialties	Zack Electronics	RS Electronics*D
East Coast Transistor*D	Hameg Instruments, Inc.	Zack/Joseph Electronics*D	Schurter, Inc.
Eiger Electronics*D	Harco Electronics*D		Sencore Electronics.....5
Electronic Parts Supply*D	Heath Company		Simpson Electronic Company
Electronix Corporation*D.....80	Herman Electronics*D		Specialized Products Company*D
Electronix Express*D	HMC — Hub Material Company*D		Sun Equipment Corporation
E-Z Hook	Hosfelt Electronics, Inc.*D		TechAmerica*D
Fotronic Corporation*D	IET Labs, Inc.		Techni-Tool Inc.*D
Fox International*D	Instek Corporation*D		Tegam Inc.
Harco Electronics*D	Jameco Electronic Components*D		Tektronix, Inc.
Richard Hirschmann of America	JDR Microdevices*D		Tektronix
HMC — Hub Material Company*D	W.S. Jenks & Son*D		Tenna Test Equipment
Hosfelt Electronics, Inc.*D	Jensen Tools, Inc.*D		Test Equipment Depot*D
Hy-Tronix Instruments, Inc.	Keithley Instruments		TIF Instruments, Inc.
Jameco Electronic Components*D	Kelvin Electronics*D		Time Motion Tools*D
JDR Microdevices*D	Kenwood U.S.A. Corporation		Triplett Corporation
W.S. Jenks & Son*D	Leader Instruments Corporation		Tritronics, Inc.*D.....80
Kelvin Electronics*D	Marconi Instruments Inc.		Tucker Electronics Company
Marshall Industries*D	Marshall Industries*D		Union Electronics Distrib.*D
M.A.T. Electronics*D	M.A.T. Electronics*D		Universal Enterprises (UEI)
MCM Electronics*D	MCM Electronics*D		Wavetek Corporation
Mouser Electronics*D	Metric Supply*D		Wholesale Electronics Inc.*D
Omnitron Electronics*MD	Omega Engineering, Inc.		Zack Electronics
Pomona Electronics.....IFC	Omega-Vanzetti, Inc.		Zack/Joseph Electronics*D
Premium Parts+ Electronics Co*D	Omnitron Electronics*MD		
Print Products International*D	Print Products International*D		TRANSFORMERS:
R.C. Distributing Co	RAG Electronics Inc.*D		ISOLATION/VARIABLE
RNJ Electronics Inc.*D	RNJ Electronics Inc.*D		Accutest Instruments, Inc.*D
RS Electronics*D	RS Electronics*D		Antique Electronic Supply*D
Sencore Electronics.....5	Salen Enterprises*D		Arrow Electronics
Sun Equipment Corporation	Sencore Electronics.....5		Vance Baldwin Inc.*D.....80
Techni-Tool Inc.*D	Sorensen		B-B&W Electronics*D
Tenna Test Equipment	Herman H. Sticht Company, Inc.*D		BK Precision
Test Equipment Depot*D	Sun Equipment Corporation		C & S Sales*D
Time Motion Tools*D	TechAmerica*D		Consolidated Electronics, Inc.*D
Tritronics, Inc.*D.....80	Techni-Tool Inc.*D		Controlled Power Company
Union Electronics Distrib*D	Telogy*D		The Current Source*D
Wholesale Electronics Inc.*D	Tenna Test Equipment		Dana Corp Warner Electric
Zack Electronics	Test Equipment Depot*D		Electronic Parts Supply*D
Zack/Joseph Electronics*D	Total Power International*MD		Electronic Specialists, Inc.
	Tritronics, Inc.*D.....80		Electronix Corporation*D.....80
	Tucker Electronics Company		Electronix Express*D
	Union Electronics Distrib.*D		Electroservice Laboratories
	Vector-VID Inc.		Elenco Electronics, Inc.
	Wholesale Electronics Inc.*D		Elgar Corporation
	Zack Electronics		Fotronic Corporation*D
	Zack/Joseph Electronics*D		Harco Electronics*D
			Herman Electronics*D
	TEST JIGS AND FIXTURES		HMC — Hub Material Company*D
	Vance Baldwin Inc.*D.....80		Hosfelt Electronics, Inc.*D
	Computer Component Source*D		Jameco Electronic Components*D
	The Current Source*D		JDR Microdevices*D
	Dalbani Corporation*D		W.S. Jenks & Son*D
	East Coast Transistor*D		Jensen Tools, Inc.*D
	Electronic Parts Supply*D		Kelvin Electronics*D
	Electronix Corporation*D.....80		Kenwood U.S.A. Corporation
	Electronix Express*D		L-Com Inc.
	Excel Distributing*D		Leader Instruments Corporation
	E-Z Hook		Marshall Industries*D
	Foley-Belsaw*D		M.A.T. Electronics*D
	Fotronic Corporation*D		MCM Electronics*D
	Hy-Tronix Instruments, Inc.		Morrow Wave Inc.
	W.S. Jenks & Son*D		Oldaker Corporation
	Keithley Instruments		Omega-Vanzetti, Inc.
	MCM Electronics*D		Omnitron Electronics*MD
			Prints Express International*D
			PC Instruments Incorporated

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Sencore Electronics5 Staco Energy Products Sun Equipment Corporation TechAmerica*D Tenma Test Equipment Test Equipment Depot*D Tritronics, Inc.*D80 Union Electronics Distrib.*D Wholesale Electronics Inc.*D Zack Electronics Zack/Joseph Electronics*D VCR TEST JIG KITS Vance Baldwin Inc.*D80 Computer Component Source*D The Current Source*D Dalbani Corporation*D East Coast Transistor*D Electronic Parts Supply*D Electronix Corporation*D80 Electroservice Laboratories Foley-Belsaw*D Fotronic Corporation*D Fox International*D Herman Electronics*D Marshall Industries*D M.A.T. Electronics*D MCM Electronics*D Nationwide Electronics Omnitron Electronics*MD RNJ Electronics Inc.*D Sencore Electronics5 Sun Equipment Corporation Tenma Test Equipment Tentel Test Equipment Depot*D Tritronics, Inc.*D80 Union Electronics Distrib.*D Zack Electronics Zack/Joseph Electronics*D OTHER TEST EQUIPMENT ACCESSORIES Accutest Instruments, Inc.*D Allison Technology Corporation American Reliance Anritsu Products Vance Baldwin Inc.*D80 Bel Merit Corporation BK Precision Brunelle Instruments, Inc. Bursma Electronic Distrib.*D C & S Sales*D Chicago Case Company Computer Component Source*D Consolidated Electronics, Inc.*D The Current Source*D Dalbani Corporation*D Dalco Electronics*D East Coast Transistor*D E.I.L. Instruments, Inc.*D Electro Standards Lab, Inc. Electronic Parts Supply*D Electronix Corporation*D80 Electronix Express*D Electroservice Laboratories Elenco Electronics, Inc. Elgar Corporation Emulation Technology, Inc. E-Z Hook Fluke Corporation Fotec Inc Fotronic Corporation*D Fox International*D	Gemini Inc. Hameg Instruments, Inc. Herman Electronics*D HMC - Hub Material Company*D Hy-Tronix Instruments, Inc. Instek Corporation*D Interconnect Devices, Inc. International Light, Inc. JDR Microdevices*D W.S. Jenks & Son*D Jensen Tools, Inc.*D Kenwood U.S.A. Corporation Kewill E Commerce Inc*D LaserImpact L-Com Inc. Marshall Industries*D M.A.T. Electronics*D MCM Electronics*D Moody Tools, Inc. Mouser Electronics*D Nationwide Electronics Omega Engineering, Inc. Omega-Vanzetti, Inc. Omnitron Electronics*MD Parts Express International*D Pomona ElectronicsIFC Premium Parts+ Electronics Co.*D Print Products International*D Probe Master, Inc. RAG Electronics Inc.*D R.C. Distributing Co RNJ Electronics Inc.*D RS Electronics*D Sencore Electronics5 Simpson Electronic Company Specialized Prods Company*D Synergetix TechAmerica*D Techni-Tool Inc.*D Tektronix, Inc. Tektronix Telematic Temptronic Corporation Tenma Test Equipment Tentel Test Equipment Depot*D Time Motion Tools*D Tritronics, Inc.*D80 Tucker Electronics Company Ultech Corp Union Electronics Distrib.*D Universal Enterprises (UEI) Wavetek Corporation Zack Electronics Zack/Joseph Electronics*D	Print Products International*D Specialized Products Company*D Time Motion Tools*D Tritronics, Inc.*D80 Zack Electronics Zack/Joseph Electronics*D POWER LINE MONITORS Accutest Instruments, Inc.*D Ames Supply Company*D Arrow Electronics Vance Baldwin Inc.*D80 Bi-Tronics Inc. BMI-Basic Measuring Instrument Brunelle Instruments, Inc. Computer Power Inc. Consolidated Electronics, Inc.*D Contact East, Inc.*D Conway Engineering, Inc. The Current Source*D Digi-Key D* E.I.L. Instruments, Inc.*D Electronic Specialists, Inc. Electroservice Laboratories Galco Industrial Electronics*D Global Specialties HMC — Hub Material Company*D Hosfelt Electronics, Inc.*D IET Labs, Inc. JDR Microdevices*D W.S. Jenks & Son*D Jensen Tools, Inc.*D L-Com Inc. M.A.T. Electronics*D PowerTronics Print Products International*D RS Electronics*D SL Waber, Inc. Specialized Products Company*D Sun Equipment Corporation Techni-Tool Inc.*D Tenma Test Equipment Time Motion Tools*D Tritronics, Inc.*D80 Tucker Electronics Company Wholesale Electronics Inc.*D Zack Electronics Zack/Joseph Electronics*D STANDBY POWER SYSTEMS Alpha Technologies American Reliance Ames Supply Company*D Arrow Electronics Vance Baldwin Inc.*D80 Bi-Tronics Inc. Computer Power Inc. Consolidated Electronics, Inc.*D Controlled Power Company The Current Source*D Dalco Electronics*D Dana Corp Warner Electric Digi-Key D* Fox International*D Harco Electronics*D Herman Electronics*D HMC — Hub Material Company*D Hosfelt Electronics, Inc.*D W.S. Jenks & Son*D M.A.T. Electronics*D Meirick, Inc. Parts Express International*D Philips ECG Company*D Philtek Power Corporation	J.S. Popper, Inc. Powerline*D Print Products International*D RNJ Electronics Inc.*D RS Electronics*D SL Waber, Inc. Specialized Products Company*D Sutton Designs, Inc. Tenma Test Equipment Tripp Lite Tritronics, Inc.*D80 Union Electronics Distrib.*D Wholesale Electronics Inc.*D Zack Electronics Zack/Joseph Electronics*D SURGE/SPIKE PROTECTORS Alpha Technologies American Power Conversion Corp. Ames Supply Company*D Arrow Electronics Vance Baldwin Inc.*D80 B-B&W Electronics*D Bi-Tronics Inc. Bursma Electronic Distrib.*D Computer Component Source*D Computer Services of America*D Consolidated Electronics, Inc.*D Contact East, Inc.*D Controlled Power Company The Current Source*D Dalbani Corporation*D Dalco Electronics*D Dana Corp Warner Electric Delta Warranty Digi-Key D* Eiger Electronics*D E.I.L. Instruments, Inc.*D Electro Standards Lab, Inc. Electronic Parts Supply*D Electronic Specialists, Inc. Electronix Express*D Excel Distributing*D Fox International*D Galco Industrial Electronics*D GC Electronics*D Harco Electronics*D Herman Electronics*D HMC — Hub Material Company*D Hosfelt Electronics, Inc.*D International Power Technologies JDR Microdevices*D W.S. Jenks & Son*D Jensen Tools, Inc.*D Kalglo Electronics Company, Inc. Kasco Distributing*D L-Com Inc. Marshall Industries*D M.A.T. Electronics*D MCG Surge Protection MCM Electronics*D Meirick, Inc. MGE UPS Systems Mouser Electronics*D Omega Engineering, Inc. Panamax, Inc. Parts Express International*D Philips ECG J.S. Popper, Inc. Powerline*D Print Products International*D Recoton Corporation RNJ Electronics Inc.*D RS Electronics*D

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Shape Electronics SL Waber, Inc. Specialized Products Company*D Sutton Designs, Inc. Techni-Tool Inc.*D Tenma Test Equipment Time Motion Tools*D Tripp Lite Tritronics, Inc.*D80 Union Electronics Distrib.*D Union Electronics Distrib.*D Wholesale Electronics Inc.*D Zack Electronics Zack/Joseph Electronics*D	Tritronics, Inc.*D.....80 Union Electronics Distrib.*D Wholesale Electronics Inc.*D Zack Electronics Zack/Joseph Electronics*D VOLTAGE REGULATORS Arrow Electronics Vance Baldwin Inc.*D80 B&D Enterprises*D3 Bi-Tronics Inc. Computer Component Source*D Computer Power Inc. Consolidated Electronics, Inc.*D Contact East, Inc.*D Controlled Power Company The Current Source*D Dalbani Corporation*D Dalco Electronics*D Dana Corp Warner Electric Digi-Key D* Eiger Electronics*D E.I.L. Instruments, Inc.*D Electronic Parts Supply*D Electronic Specialists, Inc. Electronix Express*D Electroservice Laboratories Fox International*D Harco Electronics*D Herman Electronics*D Hexacon Electric Company HMC — Hub Material Company*D Hosfelt Electronics, Inc.*D JDR Microdevices*D W.S. Jenks & Son*D Kelvin Electronics*D M.A.T. Electronics*D MGE UPS Systems Mouser Electronics*D Parts Express International*D Philips ECG Print Products International*D RS Electronics*D Salen Enterprises*D Shape Electronics SL Waber, Inc. Snap-On Incorporated Specialized Products Company*D Staco Energy Products Sun Equipment Corporation Sutton Designs, Inc. TechAmerica*D Time Motion Tools*D Tritronics, Inc.*D80 Wholesale Electronics Inc.*D Zack Electronics Zack/Joseph Electronics*D	Consolidated Electronics, Inc.*D The Current Source*D Dalbani Corporation*D Desco East Coast Transistor*D Eiger Electronics*D Electro Dynamics, Inc.*D Electronic Prod. Specialties*D Electronix Express*D Electroservice Laboratories Excel Distributing*D Fox International*D GC Electronics*D Harco Electronics*D Herman Electronics*D HMC — Hub Material Company*D Hy Tec Dealer Service W.S. Jenks & Son*D JIT Resources, Inc. Klein Tools, Inc. 3M Black Watch c/o Ginther Group Marshall Industries*D M.A.T. Electronics*D MCM Electronics*D MG Chemicals Micro Care Corporation Miller-Stephenson Chemical Co. Mouser Electronics*D Nationwide Electronics Philips ECG Company*D Print Products International*D Prostat Corporation RNJ Electronics Inc.*D Rogers Anti-Static Chemicals RS Electronics*D Syon Corporation Tandy National Parts*D Tech Spray, Inc. Techni-Tool Inc.*D 3M Electronic Prods Division Time Motion Tools*D Tritronics, Inc.*D80 Union Electronics Distrib.*D Wescorp Wholesale Electronics Inc.*D Zack Electronics Zack/Joseph Electronics*D ANTISTATIC IONIZATION DEVICES Charleswater Computer Services of America*D Contact East, Inc.*D The Current Source*D Desco Electronic Prod. Specialties*D Electro-Tech Systems, Inc. Harco Electronics*D HMC — Hub Material Company*D W.S. Jenks & Son*D JIT Resources, Inc. Marshall Industries*D M.A.T. Electronics*D Nationwide Electronics Print Products International*D Prostat Corporation RS Electronics*D Semtronics Corporation Simco Static Cntrl & Chnrm Prd Techni-Tool Inc.*D 3M Electrc Hndlg & Prot Div 3M Electronic Prods Division Time Motion Tools*D Tritronics, Inc.*D80	Wescorp Wholesale Electronics Inc.*D Zack Electronics Zack/Joseph Electronics*D ANTISTATIC MATS/ BENCHTOPS/ WRIST STRAPS/OTHERS All Metal Designs Ames Supply Company*D Andrews Electronics*D.....IBC Armand Mfg. Inc. Aven Tools, Inc. Vance Baldwin Inc.*D80 B-B&W Electronics*D Bursma Electronic Distrib.*D Charleswater Clauss Electronics Div. Computer Component Source*D Computer Services of America*D Contact East, Inc.*D The Current Source*D Dalbani Corporation*D Dalco Electronics*D Den-On Instruments (USA), Inc. Desco Digi-Key D* Electro Tool, Inc. Electronic Prod. Specialties*D Electro-Tech Systems, Inc. Electronix Express*D Electroservice Laboratories Elenco Electronics, Inc. Excel Distributing*D Fox International*D Harco Electronics*D Herman Electronics*D HMC — Hub Material Company*D Hosfelt Electronics, Inc.*D W.S. Jenks & Son*D Jensen Tools, Inc.*D JIT Resources, Inc. Kasco Distributing*D Marshall Industries*D M.A.T. Electronics*D MCM Electronics*D MG Chemicals Micro Care Corporation Moody Tools, Inc. Mouser Electronics*D Nationwide Electronics Platt Luggage, Inc. Pomona ElectronicsIFC Print Products International*D Prostat Corporation Richmond Technology RNJ Electronics Inc.*D Rogers Anti-Static Chemicals RS Electronics*D Semtronics Corporation Simco Static Control & Chnrm Prd SAT/A SPIRIG Company*D Specialized Prods Company*D Sun Equipment Corporation Tandy National Parts*D TechAmerica*D Techni-Tool Inc.*D Teclab-Kalamazoo Tech Furn 3M Electrc Hndlg & Prot Div 3M Electronic Prods Division Time Motion Tools*D Tritronics, Inc.*D80 Union Electronics Distrib.*D

See Adv. Page

Waldmann Lighting Company
Wescorp
Wholesale Electronics Inc.*D
PDR Xytronic*MD
Zack Electronics
Zack/Joseph Electronics*D

ESD FLEXIBLE PACKAGING

Ames Supply Company*D
Armand Mfg. Inc.
Charleswater
Contact East, Inc.*D
The Current Source*D
Desco
Electronic Prod. Specialties*D
Electro-Tech Systems, Inc.
Electronix Express*D
Electroservice Laboratories
Harco Electronics*D
HMC — Hub Material Company*D
W.S. Jenks & Son*D
JIT Resources, Inc.
Marshall Industries*D
Nationwide Electronics
Print Products International*D
Richmond Technology
RS Electronics*D
Seco Industries
Semtronics Corporation
Techni-Tool Inc.*D
3M Electronic Hndlg & Prot Div
3M Electronic Products Division
Time Motion Tools*D
Tritronics, Inc.*D.....80
Wescorp
Zack Electronics
Zack/Joseph Electronics*D

STATIC DETECTION METERS

Vance Baldwin Inc.*D.....80
Charleswater
Computer Services of America*D
Contact East, Inc.*D
The Current Source*D
Desco
E.I.L. Instruments, Inc.*D
Electronic Prod. Specialties*D
Electro-Tech Systems, Inc.
Electroservice Laboratories
Harco Electronics*D
HMC — Hub Material Company*D
W.S. Jenks & Son*D
JIT Resources, Inc.
Marshall Industries*D
Mouser Electronics*D
Nationwide Electronics
Print Products International*D
Prostat Corporation
Richmond Technology
RS Electronics*D
Semtronics Corporation
Simco Static Control & Clum Prd
Specialized Prods Company*D
Techni-Tool Inc.*D
3M Electronic Hndlg & Products Div.
3M Electronic Prods Division
Time Motion Tools*D
Tritronics, Inc.*D.....80
Wescorp
Wholesale Electronics Inc.*D
Zack Electronics
Zack/Joseph Electronics*D

See Adv. Page

Supplies/ Accessories/ Equipment

BATTERIES

Alpha Technologies
American Power Conversion Corp.
Ames Supply Company*D
Andrews Electronics*D.....IBC
Antique Electronic Supply*D
Arrow Electronics
Vance Baldwin Inc.*D.....80
B-B&W Electronics*D
B&D Enterprises*D.....3
Bursma Electronic Distrib.*D
Computer Component Source*D
The Current Source*D
Dalbani Corporation*D
Dalco Electronics*D
Digi-Key D*
Diversified Parts*D
East Coast Transistor*D
Electro Dynamics, Inc.*D
Electronic Parts Supply*D
Electronix Corporation*D.....80
Electroservice Laboratories
Excel Distributing*D
Fedco Electronics, Inc.*D
Fixer Corporation
Fox International*D
Harco Electronics*D
Herman Electronics*D
HMC - Hub Material Company*D
Hosfelt Electronics, Inc.*D
JDR Microdevices*D
W.S. Jenks & Son*D
Jensen Tools, Inc.*D
Kelvin Electronics*D
M-Tronics*D
Marshall Industries*D
M.A.T. Electronics*D
MCM Electronics*D
Mouser Electronics*D
Nationwide Electronics
Nesco Batteries
Omega Engineering, Inc.
ORA Electronics
Panasonic Industrial Company
Parts Express International*D
PC Service Source*D
J.S. Popper, Inc.
Powerline*D
Premium Parts+ Electrics Co*D
Print Products International*D
RNJ Electronics Inc.*D
RS Electronics*D
Sencore Electronics.....5
A.W. Sperry Instruments, Inc.
Tandy National Parts*D
TEC
TechAmerica*D
Techni-Tool Inc.*D
Tenma Test Equipment
Time Motion Tools*D
Total Power International*MD
Tritronics, Inc.*D.....80
Wholesale Electronics Inc.*D
Zack Electronics
Zack/Joseph Electronics*D
Zenith Sales Company

BENCHES/CABINETS

All Metal Designs

See Adv. Page

Alpha Technologies
Arrow Electronics
Vance Baldwin Inc.*D.....80
Computer Services of America*D
Contact East, Inc.*D
The Current Source*D
Dalco Electronics*D
East Coast Transistor*D
Electronic Prod. Specialties*D
Electroservice Laboratories
Harco Electronics*D
HMC — Hub Material Company*D
I.A.C. Industries
JDR Microdevices*D
W.S. Jenks & Son*D
Jensen Tools, Inc.*D
JIT Resources, Inc.
Klein Tools, Inc.
Lista International Corporation
Marshall Industries*D
MCM Electronics*D
Mouser Electronics*D
J.S. Popper, Inc.
Print Products International*D
RNJ Electronics Inc.*D
RS Electronics*D
Specialized Prods Company*D
Techni-Tool Inc.*D
Teclab-Kalamazoo Tech Furn
Tenma Test Equipment
Time Motion Tools*D
Tritronics, Inc.*D.....80
Workplace Systems, Inc.
PDR Xytronic*MD
Zack Electronics
Zack/Joseph Electronics*D
Zero Corporation, East Div.

CHEMICALS

Aervo-Pacific Company
Alternative Technical Services
Ames Supply Company*D
Andrews Electronics*D.....IBC
Antique Electronic Supply*D
Arrow Electronics
Vance Baldwin Inc.*D.....80
B-B&W Electronics*D
Bursma Electronic Distrib.*D
CAIG Laboratories, Inc.
Ciba Specialty Chemicals
Computer Component Source*D
Computer Services of America*D
Consolidated Electronics, Inc.*D
CRC Industries, Inc.
The Current Source*D
Dalbani Corporation*D
Dynaloy, Inc.
East Coast Transistor*D
Echelon Industries*D
Eiger Electronics*D
E.I.L. Instruments, Inc.*D
Electro Dynamics, Inc.*D
Electronic Prod. Specialties*D
Electronic Parts Supply*D
Electronix Express*D
Excel Distributing*D
Fixer Corporation
Foley-Belsaw*D
Four Star Chemical
Fox International*D
Galco Industrial Electronics*D
GC Electronics*D
Global Micro-Parts Depot*MD
Harco Electronics*D

See Adv. Page

Herman Electronics*D
HMC — Hub Material Company*D
Hosfelt Electronics, Inc.*D
Hy Tec Dealer Service
W.S. Jenks & Son*D
Klein Tools, Inc.
M-Tronics*D
Marshall Industries*D
M.A.T. Electronics*D
MCM Electronics*D
MG Chemicals
Micro Care Corporation
Miller-Stephenson Chemical Co.
Mouser Electronics*D
Multicore Solders
Nationwide Electronics
Neptune Electronics*D
P.K. Neuses*D
Parts Express International*D
Phillips ECG Company*D
Phillips ECG
Planned Products
Premium Parts+ Electronics Co*D
Print Products International*D
Rawn Company Inc.
RNJ Electronics Inc.*D
Rogers Anti-Static Chemicals
RS Electronics*D
Russell Industries*D
Stoner, Inc.
Syon Corporation
Tech Spray, Inc.
TechAmerica*D
Techni-Tool Inc.*D
Tenma Test Equipment
The Texwipe Company/CleanTex
Tritronics, Inc.*D.....80
Union Electronics Distrib*D
Wholesale Electronics Inc.*D
Zack Electronics
Zack/Joseph Electronics*D
Zenith Sales Company

CLEANING SUPPLIES

Aervo-Pacific Company
Alternative Technical Services
Ames Supply Company*D
Antique Electronic Supply*D
Bursma Electronic Distrib.*D
Chemtronics
Computer Component Source*D
Computer Services of America*D
Consolidated Electronics, Inc.*D
Contact East, Inc.*D
CRC Industries, Inc.
The Current Source*D
Dalbani Corporation*D
Dalco Electronics*D
East Coast Transistor*D
Echelon Industries*D
Eiger Electronics*D
Eiger Electronics*D
Electro Dynamics, Inc.*D
Electronic Prod. Specialties*D
Electronic Parts Supply*D
Electronix Express*D
Electroservice Laboratories
Falcon Safety Products
Fixer Corporation
Foley-Belsaw*D
Four Star Chemical
Fox International*D
Global Micro-Parts Depot*MD
Harco Electronics*D
HMC — Hub Material Company*D

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Hosfelt Electronics, Inc.*D	Specialized Prods Company*D	Electronic Parts Supply*D	Jensen Tools, Inc.*D
Hy Tec Dealer Service	TechAmerica*D	Electroservice Laboratories	Kasco Distributing*D
W.S. Jenks & Son*D	Techni-Tool Inc.*D	Fox International*D	Kelvin Electronics*D
Jensen Tools, Inc.*D	Teclab-Kalamazoo Tech Furn	HMC — Hub Material Company*D	Kester Solder
Kasco Distributing*D	Tenna Test Equipment	Hosfelt Electronics, Inc.*D	M-Tronics*D
Klein Tools, Inc.	Time Motion Tools*D	Hy Tec Dealer Service	Marshall Industries*D
Leland Ltd., Inc.	Tritronics, Inc.*D.....80	I.A.C. Industries	M.A.T. Electronics*D
Marshall Industries*D	Union Electronics Distrib.*D	JDR Microdevices*D	MCM Electronics*D
M.A.T. Electronics*D	Waldmann Lighting Company	W.S. Jenks & Son*D	MG Chemicals
MCM Electronics*D	Wholesale Electronics Inc.*D	Jensen Tools, Inc.*D	Mouser Electronics*D
MG Chemicals	PDR Xytronic*MD	JIT Resources, Inc.	Multicore Solders
Micro Care Corporation	Zack Electronics	L-Com Inc.	Nationwide Electronics
Mouser Electronics*D	Zack/Joseph Electronics*D	Marshall Industries*D	Omnitron Electronics*MD
Multicore Solders		M.A.T. Electronics*D	Parts Express International*D
P.K. Neuses*D	MAGNIFIERS	MCM Electronics*D	Philips ECG
Parts Express International*D	Aven Tools, Inc.	Mouser Electronics*D	Plato Products, Inc.
Print Products International*D	Vance Baldwin Inc.*D.....80	Print Products International*D	Premium Parts+ Electronics Co*D
RNJ Electronics Inc.*D	B-B&W Electronics*D	Snap-On Incorporated	Print Products International*D
Rogers Anti-Static Chemicals	Bonkote America, Inc.	Specialized Prods Company*D	RNJ Electronics Inc.*D
RS Electronics*D	Computer Component Source*D	Techni-Tool Inc.*D	RS Electronics*D
Stoner, Inc.	Consolidated Electronics, Inc.*D	Teclab-Kalamazoo Tech Furn	Soder-Wick Fine-Braid
Syon Corporation	Contact East, Inc.*D	Tektronix, Inc.	SAT/A SPIRIG Company*D
Tech Spray, Inc.	The Current Source*D	Time Motion Tools*D	Tech Spray, Inc.
TechAmerica*D	Dalbani Corporation*D	Trace Racks	TechAmerica*D
Techni-Tool Inc.*D	Dazor Manufacturing Corporation	Tritronics, Inc.*D.....80	Techni-Tool Inc.*D
The Texwipe Company/CleanTex	Digi-Key D*	Union Electronics Distrib*D	Tenna Test Equipment
Time Motion Tools*D	East Coast Transistor*D	Zack Electronics	Time Motion Tools*D
Tritronics, Inc.*D.....80	Edroy Products	Zack/Joseph Electronics*D	Tritronics, Inc.*D.....80
Wholesale Electronics Inc.*D	Electro Tool, Inc.		Union Electronics Distrib*D
Zack Electronics	Electronic Prod. Specialties*D	SOLDER/DESOLDERING	Virtual Industries
Zack/Joseph Electronics*D	Electronic Parts Supply*D	BRAID/FLUX	Wholesale Electronics Inc.*D
	Electronix Express*D	Ames Supply Company*D	Zack Electronics
	Electroservice Laboratories	Andrews Electronics*D.....IBC	Zack/Joseph Electronics*D
	Foley-Belsaw*D	Antique Electronic Supply*D	
	Fox International*D	Arrow Electronics	TUBING
	Harco Electronics*D	Aven Tools, Inc.	Ames Supply Company*D
	Herman Electronics*D	Vance Baldwin Inc.*D.....80	Andrews Electronics*D.....IBC
	HMC — Hub Material Company*D	B-B&W Electronics*D	Antique Electronic Supply*D
	Hosfelt Electronics, Inc.*D	Bonkote America, Inc.	Arrow Electronics
	Howard Electronic Insts. Inc.*D	Bursma Electronic Distrib.*D	Vance Baldwin Inc.*D.....80
	JDR Microdevices*D	C&S Sales*D	B-B&W Electronics*D
	W.S. Jenks & Son*D	Chemtronics	Bi-Tronics Inc.
	Jensen Tools, Inc.*D	Computer Component Source*D	Bursma Electronic Distrib.*D
	Luxo Corporation	Consolidated Electronics, Inc.*D	Computer Component Source*D
	Marshall Industries*D	Contact East, Inc.*D	Consolidated Electronics, Inc.*D
	M.A.T. Electronics*D	The Current Source*D	The Current Source*D
	MCM Electronics*D	Dalco Electronics*D	Digi-Key D*
	O.C. White	Den-On Instruments (USA), Inc.	East Coast Transistor*D
	Print Products International*D	Digi-Key D*	Electronic Parts Supply*D
	RNJ Electronics Inc.*D	Diversified Parts*D	Electronix Express*D
	RS Electronics*D	East Coast Transistor*D	Electroservice Laboratories
	Specialized Prods Company*D	Eiger Electronics*D	Fox International*D
	TechAmerica*D	Electro Tool, Inc.	Galco Industrial Electronics*D
	Techni-Tool Inc.*D	Electro Dynamics, Inc.*D	Harco Electronics*D
	Teclab-Kalamazoo Tech Furn	Electronic Prod. Specialties*D	Herman Electronics*D
	Tenna Test Equipment	Electronic Parts Supply*D	Hosfelt Electronics, Inc.*D
	Tentel	Electronix Express*D	JDR Microdevices*D
	Time Motion Tools*D	Electroservice Laboratories	W.S. Jenks & Son*D
	Tritronics, Inc.*D.....80	Excel Distributing*D	Jensen Tools, Inc.*D
	Union Electronics Distrib.*D	Fixer Corporation	Manhattan/CDT
	Waldmann Lighting Company	Foley-Belsaw*D	MCM Electronics*D
	PDR Xytronic*MD	Fox International*D	Mouser Electronics*D
	Zack Electronics	Galco Industrial Electronics*D	M.M. Newman Corporation
	Zack/Joseph Electronics*D	Global Micro-Parts Depot*MD	Parts Express International*D
		Harco Electronics*D	RS Electronics*D
		Herman Electronics*D	Russell Industries*D
	SHELVES/RACKS/BINS	Hexacon Electric Company	Techni-Tool Inc.*D
	American Power Conversion Corp.	HMC — Hub Material Company*D	Tenna Test Equipment
	Arrow Conversions	Hosfelt Electronics, Inc.*D	3M Electronic Hndlg. & Prot. Div.
	Bi-Tronics Inc.	Hy Tec Dealer Service	Tritronics, Inc.*D.....80
	Computer Component Source*D	Internat'l Components Corp.*D	Union Electronics Distrib*D
	Contact East, Inc.*D	JDR Microdevices*D	Wholesale Electronics Inc.*D
	The Current Source*D	JDV Products Inc.	Zack Electronics
	Dalco Electronics*D	W.S. Jenks & Son*D	Zack/Joseph Electronics*D
	Electronic Prod. Specialties*D		

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Eiger Electronics* ^D	Union Electronics Distrib* ^D	M.M. Newman Corporation	Jensen Tools, Inc.* ^D
Electro Tool, Inc.	Wholesale Electronics Inc.* ^D	O.K. Industries, Inc.	Jonard Industries Corporation
Electronic Prod. Specialties* ^D	Zack Electronics	Omniatron Electronics* ^{MD}	Kelvin Electronics* ^D
Electronic Parts Supply* ^D	Zack/Joseph Electronics* ^D	PACE, Inc.	Klein Tools, Inc.
The Eraser Company, Inc.		Paladin Tools	Marshall Industries* ^D
Foley-Belsaw* ^D	SOLDERING/DESOLDERING	Parts Express International* ^D	M.A.T. Electronics* ^D
Fox International* ^D	EQUIPMENT	Philips ECG Company* ^D	MCM Electronics* ^D
Galco Industrial Electronics* ^D	Ames Supply Company* ^D	Plato Products, Inc.	Medallion Case * ^D
Global Micro-Parts Depot* ^{MD}	Andrews Electronics*^D.....IBC	Portasol, Inc.	Mouser Electronics* ^D
Harco Electronics* ^D	Antique Electronic Supply* ^D	Premium Parts+ Electronics Co* ^D	P.K. Neuses* ^D
Herman Electronics* ^D	A.P.E.	Print Products International* ^D	Omniatron Electronics* ^{MD}
HMC — Hub Material Company* ^D	Arrow Electronics	RNJ Electronics Inc.* ^D	Platt Luggage, Inc.
Hosfelt Electronics, Inc.* ^D	Aven Tools, Inc.	RS Electronics* ^D	Premium Parts+ Electronics Co* ^D
Howard Electronic Insts Inc.* ^D	Vance Baldwin Inc.*^D.....80	Snap-On Incorporated	Print Products International* ^D
JDR Microdevices* ^D	B-B&W Electronics* ^D	SAT/A SPIRIG Company* ^D	RNJ Electronics Inc.* ^D
W.S. Jenks & Son* ^D	Bonkote America, Inc.	Specialized Products Company* ^D	RS Electronics* ^D
Jensen Tools, Inc.* ^D	Bursma Electronic Distrib.* ^D	Sun Equipment Corporation	Snap-On Incorporated
Kelvin Electronics* ^D	C & S Sales* ^D	Tandy National Parts* ^D	Specialized Prods Company* ^D
The Malcom Company	Chip Quik	TechAmerica* ^D	Spencer Industries
Marshall Industries* ^D	Computer Component Source* ^D	Techni-Tool Inc.* ^D	Sun Equipment Corporation
M.A.T. Electronics* ^D	Computer Services of America* ^D	Tenma Test Equipment	Techni-Tool Inc.* ^D
MCM Electronics* ^D	Consolidated Electronics, Inc.* ^D	Time Motion Tools* ^D	Tenma Test Equipment
Mouser Electronics* ^D	Contact East, Inc.* ^D	Tritronics, Inc.*^D.....80	Time Motion Tools* ^D
Omniatron Electronics* ^{MD}	Cooper Tools	Tucker Electronics Company	Tritronics, Inc.*^D.....80
Paladin Tools	CRC Components* ^D	Ungar, A Rubbermaid Company	Tucker Electronics Company
Parts Express International* ^D	The Current Source* ^D	Union Electronics Distrib.* ^D	Union Electronics Distrib* ^D
Portasol, Inc.	Dalbani Corporation* ^D	Virtual Industries	Weller/Cooper Tools
Print Products International* ^D	Digi-Key D*	Wahl Clipper Corporation	Wholesale Electronics Inc.* ^D
RNJ Electronics Inc.* ^D	East Coast Transistor* ^D	Weller/Cooper Tools	Zack Electronics
RS Electronics* ^D	Eiger Electronics* ^D	Wholesale Electronics Inc.* ^D	Zack/Joseph Electronics* ^D
Snap-On Incorporated	E.I.L. Instruments, Inc.* ^D	Xuron Corporation	Zero Corporation, East Div.
Specialized Prods Company* ^D	Electro Tool, Inc.	PDR Xytronic* ^{MD}	
Techni-Tool Inc.* ^D	Electro Dynamics, Inc.* ^D	Zack Electronics	
Tenma Test Equipment	Electronic Prod. Specialties* ^D	Zack/Joseph Electronics* ^D	
Time Motion Tools* ^D	Electronic Parts Supply* ^D		
Tritronics, Inc.*^D.....80	Electroservice Laboratories	TOOL CASES	
Ungar, A Rubbermaid Company	Elenco Electronics, Inc.	Ames Supply Company* ^D	
Union Electronics Distrib* ^D	Emulation Technology, Inc.	Andrews Electronics*^D.....IBC	
Weller/Cooper Tools	ESP Inc.	Arrow Electronics	
Wholesale Electronics Inc.* ^D	Excel Distributing* ^D	Aven Tools, Inc.	
Zack Electronics	Fixer Corporation	Vance Baldwin Inc.*^D.....80	
Zack/Joseph Electronics* ^D	Foley-Belsaw* ^D	B-B&W Electronics* ^D	
	Fox International* ^D	C & S Sales* ^D	
	GC Electronics* ^D	Chicago Case Company	
JIGS/FIXTURES/VISES	Global Micro-Parts Depot* ^{MD}	Computer Component Source* ^D	
Vance Baldwin Inc.*^D.....80	American Hakko Products, Inc.	Consolidated Electronics, Inc.* ^D	
Consolidated Electronics, Inc.* ^D	Harco Electronics* ^D	Contact East, Inc.* ^D	
Cooper Tools	Heath Company	Cooper Tools	
The Current Source* ^D	Herman Electronics* ^D	The Current Source* ^D	
Dalbani Corporation* ^D	Hexacon Electric Company	Dalbani Corporation* ^D	
Digi-Key D*	HMC — Hub Material Company* ^D	Dalco Electronics* ^D	
Electro Tool, Inc.	Hosfelt Electronics, Inc.* ^D	Diversified Case Company, Inc.	
Electronic Prod. Specialties* ^D	Howard Electric Insts Inc.* ^D	East Coast Transistor* ^D	
Electronic Parts Supply* ^D	Internat'l Components Corp.* ^D	Electro Tool, Inc.	
Electroservice Laboratories	JDR Microdevices* ^D	Electro Dynamics, Inc.* ^D	
Harco Electronics* ^D	JDV Products Inc.	Electronic Prod. Specialties* ^D	
Herman Electronics* ^D	W.S. Jenks & Son* ^D	Electronic Parts Supply* ^D	
HMC — Hub Material Company* ^D	Jensen Tools, Inc.* ^D	Electroservice Laboratories	
W.S. Jenks & Son* ^D	Jonard Industries Corporation	Elenco Electronics, Inc.	
Jensen Tools, Inc.* ^D	Kasco Distributing* ^D	C.H. Ellis Company, Inc.	
Kelvin Electronics* ^D	Kelvin Electronics* ^D	Fixer Corporation	
M-Tronics* ^D	Leads Metal Products (ENDECO)	Fox International* ^D	
M.A.T. Electronics* ^D	M-Tronics* ^D	Galco Industrial Electronics* ^D	
MCM Electronics* ^D	The Malcom Company	Gemini Inc.	
Mouser Electronics* ^D	Marshall Industries* ^D	Global Micro-Parts Depot* ^{MD}	
PanaVise Products	M.A.T. Electronics* ^D	Willi Hahn Corp U.S.A.	
Premium Parts+ Electronics Co* ^D	MCM Electronics* ^D	Harco Electronics* ^D	
RNJ Electronics Inc.* ^D	Metric Supply* ^D	Herman Electronics* ^D	
RS Electronics* ^D	Mouser Electronics* ^D	Highland Products, Inc.	
Snap-On Incorporated	Multicore Solders	HMC — Hub Material Company* ^D	
Specialized Prods Company* ^D	Nationwide Electronics	Hosfelt Electronics, Inc.* ^D	
Techni-Tool Inc.* ^D	Nederman, Inc.	Hy Tec Dealer Service	
Tenma Test Equipment	Neptune Electronics* ^D	JDR Microdevices* ^D	
Time Motion Tools* ^D	P.K. Neuses* ^D	W.S. Jenks & Son* ^D	
Tritronics, Inc.*^D.....80			

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
JDR Microdevices* ^D	Wholesale Electronics Inc.* ^D	Elenco Electronics, Inc.	Omnitron Electronics* ^{MD}
JDV Products Inc.	Zack Electronics	Emulation Technology, Inc.	Paladin Tools
W.S. Jenks & Son* ^D	Zack/Joseph Electronics* ^D	The Eraser Company, Inc.	PanaVise Products
Jensen Tools, Inc.* ^D		Excel Distributing* ^D	Parts Express International* ^D
Jonard Industries Corporation		Fixer Corporation	Portasol, Inc.
Kasco Distributing* ^D	TOOLS, MISCELLANEOUS	Foley-Belsaw* ^D	Premium Parts+ Electronics Co* ^D
Kelvin Electronics* ^D	Alternative Technical Services	Fotec Inc	Print Products International* ^D
Klein Tools, Inc.	Ames Supply Company* ^D	Fox International* ^D	Progressive Electronics
L-Com Inc.	AMP	GC Electronics* ^D	RAM Enterprises
M-Tronics* ^D	Andrews Electronics* ^DIBC	Global Micro-Parts Depot* ^{MD}	RF Industries
Marshall Industries* ^D	Antique Electronic Supply* ^D	Willi Hahn Corp U.S.A.	Ripley Company
M.A.T. Electronics* ^D	Arrow Electronics	Harco Electronics* ^D	RNJ Electronics Inc.* ^D
MCM Electronics* ^D	Aven Tools, Inc.	Herman Electronics* ^D	RS Electronics* ^D
Moody Tools, Inc.	Vance Baldwin Inc.* ^D80	HMC — Hub Material Company* ^D	Smithy Co
Mouser Electronics* ^D	B-B&W Electronics* ^D	Hosfelt Electronics, Inc.* ^D	Snap-On Incorporated
P.K. Neuses* ^D	Bi-Tronics Inc.	Howard Electric Insts Inc.* ^D	Specialized Prods Company* ^D
Omnitron Electronics* ^{MD}	Bondhus Corporation	Hy Tec Dealer Service	A.W. Sperry Instruments, Inc.
Paladin Tools	Bursma Electronic Distrib.* ^D	JDR Microdevices* ^D	Sun Equipment Corporation
Premium Parts+ Electronics Co* ^D	C & S Sales* ^D	JDV Products Inc.	Tandy National Parts* ^D
Print Products International* ^D	Clauss Electronics Div.	W.S. Jenks & Son* ^D	TechAmerica* ^D
RNJ Electronics Inc.* ^D	Cleveland Inst. of Electronics	Jensen Tools, Inc.* ^D	Techni-Tool Inc.* ^D
RS Electronics* ^D	Computer Component Source* ^D	Jonard Industries Corporation	Tenna Test Equipment
Snap-On Incorporated	Consolidated Electronics, Inc.* ^D	Kasco Distributing* ^D	Tentel
Specialized Prods Company* ^D	Contact East, Inc.* ^D	Kelvin Electronics* ^D	Time Motion Tools* ^D
Spencer Industries	Cooper Tools	Klein Tools, Inc.	Tritronics, Inc.* ^D80
Sun Equipment Corporation	The Current Source* ^D	L-Com Inc.	Tucker Electronics Company
Tandy National Parts* ^D	Dalbani Corporation* ^D	M-Tronics* ^D	Ungar, A Rubbermaid Company
TechAmerica* ^D	Dalco Electronics* ^D	3M Black Watch c/o Ginther Group	Union Electronics Distrib* ^D
Techni-Tool Inc.* ^D	Digi-Key D*	Marshall Industries* ^D	Virtual Industries
Tenna Test Equipment	Diversified Parts* ^D	M.A.T. Electronics* ^D	Weller/Cooper Tools
Tentel	Dremel	MCM Electronics* ^D	Wholesale Electronics Inc.* ^D
Time Motion Tools* ^D	East Coast Transistor* ^D	Micro Care Corporation	Wiha Tools
Tritronics, Inc.* ^D80	Eiger Electronics* ^D	Moody Tools, Inc.	Xuron Corporation
Trompeter Electronics	Electro Tool, Inc.	Mouser Electronics* ^D	Zack Electronics
Tucker Electronics Company	Electro Dynamics, Inc.* ^D	Nationwide Electronics	Zack/Joseph Electronics* ^D
Union Electronics Distrib.* ^D	Electronic Prod. Specialties* ^D	P.K. Neuses* ^D	
Weller/Cooper Tools	Electronic Parts Supply* ^D	O.K. Industries, Inc.	
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See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
COMPUTER DIAGNOSTIC SOFTWARE A-Tech Electronics Accurate Technologies Inc. American Megatrends, Inc. B&B Electronics Manufacturing Beige Bag Software Cleveland Institute of Electronics Computer Services of America*D CSTS Inc. Data Depot, Inc. DisplayMate Technologies Corp. Eagan Technical Services, Inc. Electronic Software Developers Electronix Corporation*D80 Electronix Express*D Electroservice Laboratories EURAS USA, Inc. Fessenden Technologies, Inc. Gibson Research Corporation Higher Intelligence Software JDR Microdevices*D Jensen Tools, Inc.*D MCM Electronics*D Micro 2000, Inc. Microcode Engineering Ontrack Data Recovery, Inc. RG Software, Inc. Sony Service Company Specialized Products Company*D Tech Assist, Inc. Tenma Test Equipment Touchstone Software Corporation TV Man Tech Tips Inc. Ultra-X, Inc. Warrantech Corporation Windsor Technologies, Inc.	Gibson Research Corporation Micro 2000, Inc. Netway 2000 Inc. Peripheral Parts Support*D Reset, Inc. SMH Electronics Company, Inc. Sprague Magnetics, Inc.*D Valtron Technologies Warrantech Corporation ONLINE SERVICES A-Tech Electronics AnaTek Corporation Andrews Electronics*DIBC B&D Enterprises*D3 Blue Fin Technologies Inc.*D Electronix Corporation*D80 Electroservice Laboratories EURAS USA, Inc. Fotec Inc InfoTech/Computer Doctors MaxServ, Inc. PC Service Source*D Philips Service Solutions Grp*MD ..11 PowerSource Online Inc SMH Electronics Company, Inc. Sony Service Company Tritronics, Inc.*D80 PC BOARD REPAIR/REWORK Amcom Corporation*D Blue Fin Technologies Inc.*D Cablescon Chip Quik Circuit Technology Center, Inc. CSTS Inc. CTS Services Datatech Depot, Inc. Eagan Technical Services, Inc. Eiger Electronics*D Electronic Software Developers Electroservice Laboratories Fessenden Technologies, Inc. Galco Industrial Electronics*D Hosfelt Electronics, Inc.*D Hy Tec Dealer Service InfoTech/Computer Doctors JDR Microdevices*D W.S. Jenks & Son*D KDM Associates LaserImpact Mesa Systems, Inc. MG Chemicals Nationwide Electronics Netway 2000 Inc. PACE, Inc. PC Service Source*D Peripheral Parts Support*D Service Electronics Inc.. SMH Electronics Company, Inc. Softdesk Retail Products 3E Corporation Valtron Technologies	RENTAL/LEASING EQUIPMENT Accutest Instruments, Inc.*D Amcom Corporation*D Fotronic Corporation*D JDR Microdevices*D PD Software The Peak Technologies Group QuadTech, Inc. Richardson Electronics, Ltd.*D RS Electronics*D Test Equipment Depot*D SERVICE BULLETIN SOFTWARE A-Tech Electronics Cahill Electronics Electronic Software Developers Electronix Corporation*D80 High Tech Electronic Services Higher Intelligence Software ICM Components*D M.I. Technologies Philips Consumer Electronics Philips Service Solutions Grp*MD ..11 Philips Technical Training RAM Enterprises Sony Service Company Tech-M Tech. Info. Procurement Serv. TV Man Tech Tips Inc.	PD Software Plaza Distributing*D RAM Enterprises RNJ Electronics Inc.*D Sage Data Systems SBS Direct Service Management Software ServicePlus Corporation Servicing Systems Sirius Software Inc. DW Smith & Associates SyncPulse Systems TV Man Tech Tips Inc. Warrantech Corporation TEST EQUIPMENT REPAIR/CALIBRATION Accutest Instruments, Inc.*D Anritsu Products ASG Division of Jergens Inc. Brunelle Instruments, Inc. Cablescon Computer Services of America*D CSTS Inc. The Current Source*D Dalco Electronics*D Electronix Corporation*D80 Electroservice Laboratories Fluke Corporation Fotronic Corporation*D InfoTech/Computer Doctors W.S. Jenks & Son*D Keithley Instruments Marconi Instruments Inc. Mouser Electronics*D Newport Electronics, Inc. Omega Engineering, Inc. QuadTech, Inc. RNJ Electronics Inc.*D RS Electronics*D Sencore Electronics5 TEKSERV Telenetics Inc. Tenma Test Equipment Tentel Test Equipment Depot*D Universal Enterprises (UEI) Wavetek Corporation TUNER/MODULE REPAIR Bursma Electronic Distrib.*D Computer Component Source*D CTS Services Eiger Electronics*D Fixer Corporation Higher Intelligence Software M-Tronics*D Module Exchange PTS Corporation Union Electronics Distrib.*D

Replacement Parts/ Components Directory

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See Adv. Page

See Adv. Page

See Adv. Page

See Adv. Page

ANTENNAS/ROTORS/ SATELLITE SYSTEMS

Andrews Electronics***D**.....**IBC**
Vance Baldwin Inc.***D**.....**80**
B-B&W Electronics***D**
Bursma Electronic Distrib.***D**
Cititronix/Panson***D**
Computer Component Source***D**
The Current Source***D**
Dalbani Corporation***D**
Diversified Parts***D**
East Coast Transistor***D**
Eiger Electronics***D**
Electro Dynamics, Inc.***D**
Electronic Parts Supply***D**
Electronix Express***D**
Electroservice Laboratories
Excel Distributing***D**
Fixer Corporation
Fox International***D**
GC Electronics***D**
M.A.T. Electronics***D**
MCM Electronics***D**
Mouser Electronics***D**
Nationwide Electronics
Parts Express International***D**
Philips ECG Company***D**
Philips ECG
Premium Parts+ Electronics Co.***D**
R.C. Distributing Co.
Recoton Corporation
RNJ Electronics Inc.***D**
Sears Roebuck & Company
Sony Service Company
TechAmerica***D**
Tenma Test Equipment
Tritronics, Inc.***D**.....**80**
Union Electronics Distrib.***D**
Wholesale Electronics Inc.***D**
Winegard Company
Zack Electronics
Zack/Joseph Electronics***D**

AUDIO HEADS

Andrews Electronics***D**.....**IBC**
Vance Baldwin Inc.***D**.....**80**
Cititronix/Panson***D**
CRC Components***D**
The Current Source***D**
Dalbani Corporation***D**
Diversified Parts***D**
East Coast Transistor***D**
Eiger Electronics***D**
Electronic Parts Supply***D**
Electroservice Laboratories
Excel Distributing***D**
Fox International***D**
Herman Electronics***D**
LG Electronics Service USA

M-Tronics***D**
M.A.T. Electronics***D**
MCM Electronics***D**
Nationwide Electronics
Neptune Electronics***D**
Premium Parts+ Electronics Co***D**
Quasar
RNJ Electronics Inc.***D**
Sears Roebuck & Company
Sony Service Company
Sprague Magnetics, Inc.***D**
Technics
Tenma Test Equipment
Tritronics, Inc.***D**.....**80**
Union Electronics Distrib.***D**
Yamaha Electronics Corp. USA
Zack Electronics
Zack/Joseph Electronics***D**

BELTS/DRIVE WHEELS

Andrews Electronics***D**.....**IBC**
Vance Baldwin Inc.***D**.....**80**
B-B&W Electronics***D**
Bursma Electronic Distrib.***D**
C. Hoelzle Associates, Inc.
Cititronix/Panson***D**
Computer Component Source***D**
Compuvideo Test Instruments
Consolidated Electronics, Inc.***D**
The Current Source***D**
Dalbani Corporation***D**
Diversified Parts***D**
East Coast Transistor***D**
Eiger Electronics***D**
Electro Dynamics, Inc.***D**
Electronic Parts Supply***D**
Electronix Corporation***D**.....**80**
Electronix Express***D**
Electroservice Laboratories
E.M.T. Parts, Inc.***D**
Excel Distributing***D**
Fixer Corporation
Foley-Belsaw***D**
Fox International***D**
Herman Electronics***D**
LG Electronics Service USA
M-Tronics***D**
M.A.T. Electronics***D**
MCM Electronics***D**
Nationwide Electronics
Neptune Electronics***D**
Pfanstiehl Corporation***D**
Premium Parts+ Electronics Co.***D**
Quasar
RNJ Electronics Inc.***D**
Russell Industries***D**
Sears Roebuck & Company
Sony Service Company
Tandy National Parts***D**

Technics
Tenma Test Equipment
Tritronics, Inc.***D**.....**80**
Union Electronics Distrib***D**
Warrantech Corporation
Wholesale Electronics Inc.***D**
Yamaha Electronics Corp., USA
Zack Electronics
Zack/Joseph Electronics***D**

CAPACITORS

Andrews Electronics***D**.....**IBC**
Antique Electronic Supply***D**
ASC Capacitors
Arrow Electronics
Vance Baldwin Inc.***D**.....**80**
B-B&W Electronics***D**
B&D Enterprises***D**.....**3**
Bursma Electronic Distrib.***D**
Cititronix/Panson***D**
Computer Component Source***D**
Computer Services of America***D**
Compuvideo Test Instruments
Consolidated Electronics, Inc.***D**
CRC Components***D**
The Current Source***D**
Curtis Mathes
Dalbani Corporation***D**
Digi-Key D*
Diversified Parts***D**
East Coast Transistor***D**
Eiger Electronics***D**
Electro Dynamics, Inc.***D**
Electronic Parts Supply***D**
Electronix Corporation***D**.....**80**
Electronix Express***D**
Electroservice Laboratories
Excel Distributing***D**
Fixer Corporation
Foley-Belsaw***D**
Fox International***D**
Galco Industrial Electronics***D**
Global Micro-Parts Depot***MD**
Herman Electronics***D**
Hitachi America Ltd.
Hosfelt Electronics, Inc.***D**
JDR Microdevices***D**
Jim-Pak***D**
Kelvin Electronics***D**
LG Electronics Service USA
L.J. Enterprises***D**
M-Tronics***D**
Marshall Industries***D**
M.A.T. Electronics***D**
MCM Electronics***D**
Mouser Electronics***D**
Nationwide Electronics
Neptune Electronics***D**
Netway 2000 Inc.

NTE Electronics, Inc.
Panasonic Industrial Company
Parts Express International***D**
Premium Parts+ Electronics Co***D**
Q B Products***D**
Quasar
RF Parts***D**
RNJ Electronics Inc.***D**
RS Electronics***D**
Russell Industries***D**
Sears Roebuck & Company
Sony Service Company
Tandy National Parts***D**
TechAmerica***D**
Technics
Tenma Test Equipment
Tritronics, Inc.***D**.....**80**
Union Electronics Distrib.***D**
Wholesale Electronics Inc.***D**
Yamaha Electronics Corp. USA
Zack Electronics
Zack/Joseph Electronics***D**

CIRCUIT BREAKERS

Andrews Electronics***D**.....**IBC**
Arrow Electronics
Vance Baldwin Inc.***D**.....**80**
Bursma Electronic Distrib.***D**
Cititronix/Panson***D**
Consolidated Electronics, Inc.***D**
The Current Source***D**
Diversified Parts***D**
East Coast Transistor***D**
Eiger Electronics***D**
Electronic Parts Supply***D**
Electronix Express***D**
Electroservice Laboratories
Excel Distributing***D**
Fox International***D**
Galco Industrial Electronics***D**
Hosfelt Electronics, Inc.***D**
LG Electronics Service USA
M.A.T. Electronics***D**
MCM Electronics***D**
NTE Electronics, Inc.
Panasonic Industrial Company
Parts Express International***D**
Pfanstiehl Corporation***D**
Philips ECG Company***D**
Quasar
RNJ Electronics Inc.***D**
RS Electronics***D**
Schurter, Inc.
Sears Roebuck & Company
Sony Service Company
Technics
Tenma Test Equipment
Tritronics, Inc.***D**.....**80**
Union Electronics Distrib.***D**

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Wholesale Electronics Inc.*D	Yamaha Electronics Corp., USA	Diversified Parts*D	Excel Distributing*D
Zack Electronics	Zack Electronics	East Coast Transistor*D	Fixer Corporation
Zack/Joseph Electronics*D	Zack/Joseph Electronics*D	Eiger Electronics*D	Fox International*D
CONNECTORS/TERMINALS	FLYBACKS	Electro Dynamics, Inc.*D	Galco Industrial Electronics*D
Amcom Corporation*D	Andrews Electronics*D.....IBC	Electronic Parts Supply*D	Hosfelt Electronics, Inc.*D
AMP	Vance Baldwin Inc.*D.....80	Electronix Corporation*D.....80	JDR Microdevices*D
Amphenol Corporation	B-B&W Electronics*D	Electronix Express*D	Jim-Pak*D
Andrews Electronics*D.....IBC	Bursma Electronic Distrib.*D	Electroservice Laboratories	Kasco Distributing*D
Antique Electronic Supply*D	Cititronix/Panson*D	Excel Distributing*D	Kelvin Electronics*D
Arrow Electronics	Computer Component Source*D	Fixer Corporation	Keystone Electronics Corporation
Vance Baldwin Inc.*D.....80	Computer Services of America*D	Foley-Belsaw*D	LG Electronics Service USA
B-B&W Electronics*D	Consolidated Electronics, Inc.*D	Fox International*D	M-Tronics*D
Bi-Tronics Inc.	CRC Components*D	Galco Industrial Electronics*D	M.A.T. Electronics*D
Bursma Electronic Distrib.*D	The Current Source*D	GC Electronics*D	MCD Electronics *D
Cititronix/Panson*D	Curtis Mathes	Global Micro-Parts Depot*MD	MCM Electronics*D
Computer Component Source*D	Dalbani Corporation*D	Herman Electronics*D	Mouser Electronics*D
Consolidated Electronics, Inc.*D	Datatronix, Inc.	Hitachi America Ltd	Nationwide Electronics
The Current Source*D	Diversified Parts*D	Hosfelt Electronics, Inc.*D	Netway 2000 Inc.
Curtis Mathes	East Coast Transistor*D	Internat'l Components Corp.*D	Parts Express International*D
Dalbani Corporation*D	Eiger Electronics*D	JDR Microdevices*D	Parts Port Ltd*D
Dalco Electronics*D	Electro Dynamics, Inc.*D	Jim-Pak*D	PC Service Source*D
Digi-Key D*	Electronic Parts Supply*D	Kelvin Electronics*D	Quasar
Diversified Parts*D	Electronix Corporation*D.....80	LG Electronics Service USA	RNJ Electronics Inc.*D
East Coast Transistor*D	E.M.T. Parts, Inc.*D	L.J. Enterprises*D	RS Electronics*D
Eiger Electronics*D	Excel Distributing*D	M-Tronics*D	Russell Industries*D
Electro Dynamics, Inc.*D	Fixer Corporation	M.A.T. Electronics*D	Sears Roebuck & Co.
Electro Standards Lab, Inc.	Fox International*D	MCM Electronics*D	Sony Service Company
Electronic Parts Supply*D	Herman Electronics*D	Mouser Electronics*D	TechAmerica*D
Electronix Corporation*D.....80	Hitachi America Ltd.	Nationwide Electronics	Technics
Electronix Express*D	ICM Components*D	Neptune Electronics*D	Tenna Test Equipment
Electroservice Laboratories	LG Electronics Service USA	Parts Express International*D	Tritronics, Inc.*D.....80
Excel Distributing*D	L.J. Enterprises*D	Pfanstiehl Corporation*D	Union Electronics Distrib.*D
Foley-Belsaw*D	M-Tronics*D	Premium Parts+ Electronics Co*D	Wholesale Electronics Inc.*D
Fox International*D	M.A.T. Electronics*D	Q B Products*D	Yamaha Electronics Corp., USA
Galco Industrial Electronics*D	MCM Electronics*D	Quasar	Zack Electronics
Hosfelt Electronics, Inc.*D	Nationwide Electronics	RNJ Electronics Inc.*D	Zack/Joseph Electronics*D
Internat'l Components Corp.*D	Neptune Electronics*D	RS Electronics*D	
JDR Microdevices*D	Netway 2000 Inc.	Russell Industries*D	HOLDERS/CLIPS
Jensen Tools, Inc.*D	NTE Electronics, Inc.	Schurter, Inc.	Andrews Electronics*D.....IBC
Jim-Pak*D	Panasonic Industrial Company	Sears Roebuck & Co.	Antique Electronic Supply*D
Kasco Distributing*D	Parts Port Ltd*D	Sony Service Company	Arrow Electronics
Kelvin Electronics*D	Premium Parts+ Electronics Co*D	Tandy National Parts*D	Vance Baldwin Inc.*D.....80
Keystone Electronics Corporation	Quasar	TechAmerica*D	Bursma Electronic Distrib.*D
Klein Tools, Inc.	Richardson Electronics, Ltd.*D	Technics	Cititronix/Panson*D
L-Com Inc.	RNJ Electronics Inc.*D	Tenna Test Equipment	The Current Source*D
LG Electronics Service USA	Sears Roebuck & Co.	Tritronics, Inc.*D.....80	Dalbani Corporation*D
M-Tronics*D	SHOGYO International Corporation	Union Electronics Distrib*D	Dalco Electronics*D
Marshall Industries*D	Sony Service Company	Wholesale Electronics Inc.*D	Dialight Corporation
M.A.T. Electronics*D	Technics	Yamaha Electronics Corp. USA	Digi-Key D*
MCM Electronics*D	Tenna Test Equipment	Zack Electronics	Diversified Parts*D
Mouser Electronics*D	Tritronics, Inc.*D.....80	Zack/Joseph Electronics*D	East Coast Transistor*D
Nationwide Electronics	Union Electronics Distrib.*D		Eiger Electronics*D
Omega Engineering, Inc.	Video Display Corporation	HARDWARE	Electro Dynamics, Inc.*D
Parts Express International*D	Vintage TV and Radio Supply*D	Amcom Corporation*D	Electronic Parts Supply*D
Pfanstiehl Corporation*D	Wholesale Electronics Inc.*D	Andrews Electronics*D.....IBC	Electronix Corporation*D.....80
Pomona Electronics.....IFC	Zack Electronics	Antique Electronic Supply*D	Electronix Express*D
Quasar	Zack/Joseph Electronics*D	Arrow Electronics	Electroservice Laboratories
RF Industries		Vance Baldwin Inc.*D.....80	Excel Distributing*D
RS Electronics*D	FUSES	Bivar Inc	E-Z Hook
Russell Industries*D	Andrews Electronics*D.....IBC	Blue Fin Technologies Inc.*D	Fox International*D
Schurter, Inc.	Antique Electronic Supply*D	Bursma Electronic Distrib.*D	Hosfelt Electronics, Inc.*D
Sears Roebuck & Company	Arrow Electronics	C. Hoelzle Associates, Inc.	JDR Microdevices*D
SHOGYO International Corporation	Vance Baldwin Inc.*D.....80	Cititronix/Panson*D	Jim-Pak*D
Sony Service Company	B-B&W Electronics*D	The Current Source*D	Kelvin Electronics*D
Tandy National Parts*D	Bursma Electronic Distrib.*D	Dalbani Corporation*D	Keystone Electronics Corporation
TechAmerica*D	Cititronix/Panson*D	Dalco Electronics*D	Klein Tools, Inc.
Technics	Computer Component Source*D	Digi-Key D*	LG Electronics Service USA
Tenna Test Equipment	Computervideo Test Instruments	Diversified Parts*D	M.A.T. Electronics*D
3M Electronic Prods Division	Consolidated Electronics, Inc.*D	East Coast Transistor*D	MCM Electronics*D
Tritronics, Inc.*D.....80	CRC Components*D	Eiger Electronics*D	Mouser Electronics*D
Trompeter Electronics	The Current Source*D	Electronic Parts Supply*D	Quasar
Union Electronics Distrib.*D	Dalbani Corporation*D	Electronix Corporation*D.....80	RS Electronics*D
Wholesale Electronics Inc.*D	Digi-Key D*	Electronix Express*D	Schurter, Inc.
		Electroservice Laboratories	Sears Roebuck & Co.

March 2000 **Electronic Servicing & Technology** 49

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Diversified Parts*D	Union Electronics Distrib.*D	Cititronix/Panson*D	Electro Dynamics, Inc.*D
Eiger Electronics*D	Wholesale Electronics Inc.*D	Computer Component Source*D	Electronic Parts Supply*D
Electronic Parts Supply*D	Yamaha Electronics Corp, USA	Computer Services of America*D	Electronix Corporation*D.....80
Electroservice Laboratories	Zack Electronics	Compuvideo Test Instruments	Electronix Express*D
Excel Distributing*D	Zack/Joseph Electronics*D	Consolidated Electronics, Inc.*D	Electroservice Laboratories
Fox International*D		The Current Source*D	Excel Distributing*D
Herman Electronics*D	RECTIFIERS	Digi-Key D*	Fixer Corporation
Hitachi America Ltd.	Andrews Electronics*D.....IBC	Diversified Parts*D	Fox International*D
LG Electronics Service USA	Arrow Electronics	East Coast Transistor*D	Galco Industrial Electronics*D
M-Tronics*D	Vance Baldwin Inc.*D.....80	Eiger Electronics*D	Global Micro-Parts Depot*MD
M.A.T. Electronics*D	B-B&W Electronics*D	Electro Dynamics, Inc.*D	Herman Electronics*D
MCM Electronics*D	B&D Enterprises*D.....3	Electronic Parts Supply*D	Hitachi America Ltd.
Nationwide Electronics	Bursma Electronic Distrib.*D	Electronix Corporation*D.....80	Hosfelt Electronics, Inc.*D
Panasonic Industrial Company	C. Hoelzle Associates, Inc.	Electronix Express*D	JDR Microdevices*D
Quasar	Cititronix/Panson*D	Electroservice Laboratories	Jim-Pak*D
Richardson Electronics, Ltd.*D	Computer Component Source*D	Excel Distributing*D	Kelvin Electronics*D
RS Electronics*D	Consolidated Electronics, Inc.*D	Fixer Corporation	LG Electronics Service USA
Sears Roebuck & Company	Controlled Power Company	Fox International*D	M-Tronics*D
Sony Service Company	The Current Source*D	Galco Industrial Electronics*D	Marshall Industries*D
Technics	Curtis Mathes	Global Micro-Parts Depot*MD	M.A.T. Electronics*D
Tenma Test Equipment	Dalbani Corporation*D	Hitachi America Ltd.	MCM Electronics*D
Tritronics, Inc.*D.....80	Data Business Publishing	Hosfelt Electronics, Inc.*D	Mouser Electronics*D
Tucker Electronics Company	Digi-Key D*	JDR Microdevices*D	Nationwide Electronics
Union Electronics Distrib.*D	Diversified Parts*D	Jim-Pak*D	NEC Technologies, Inc.*D
Video Display Corporation	East Coast Transistor*D	Kelvin Electronics*D	Neptune Electronics*D
Warrantech Corporation	Eiger Electronics*D	LG Electronics Service USA	Netway 2000 Inc.
Wholesale Electronics Inc.*D	Electro Dynamics, Inc.*D	L.J. Enterprises*D	NTE Electronics, Inc.
Zack Electronics	Electronic Parts Supply*D	M-Tronics*D	Panasonic Industrial Company
Zack/Joseph Electronics*D	Electronix Corporation*D.....80	M.A.T. Electronics*D	Parts Express International*D
Zenith Sales Company	Electronix Express*D	MCD Electronics *D	Philips ECG Company*D
	Electroservice Laboratories	MCM Electronics*D	Philips ECG
	Excel Distributing*D	Mouser Electronics*D	Premium Parts+ Electronics Co*D
	Fixer Corporation	Nationwide Electronics	Prime Technology, Inc.
POTENTIOMETERS	Fox International*D	Neptune Electronics*D	Quasar
Andrews Electronics*D.....IBC	Galco Industrial Electronics*D	NTE Electronics, Inc.	RS Electronics*D
Antique Electronic Supply*D	Global Micro-Parts Depot*MD	Philips ECG Company*D	Sears Roebuck & Company
Arrow Electronics	Hitachi America Ltd.	Philips ECG	Sony Service Company
Vance Baldwin Inc.*D.....80	JDR Microdevices*D	Prime Technology, Inc.	Tandy National Parts*D
B-B&W Electronics*D	Jim-Pak*D	Quasar	TechAmerica*D
Bursma Electronic Distrib.*D	Kelvin Electronics*D	RF Parts*D	Technics
C. Hoelzle Associates, Inc.	LG Electronics Service USA	RS Electronics*D	Tenma Test Equipment
Cititronix/Panson*D	M-Tronics*D	Sears Roebuck & Company	Tritronics, Inc.*D.....80
Computer Component Source*D	M.A.T. Electronics*D	Sony Service Company	Union Electronics Distrib.*D
Consolidated Electronics, Inc.*D	MCD Electronics *D	Tandy National Parts*D	Wholesale Electronics Inc.*D
CRC Components*D	MCM Electronics*D	TechAmerica*D	Yamaha Electronics Corp, USA
The Current Source*D	Mouser Electronics*D	Technics	Zack Electronics
Dalbani Corporation*D	Nationwide Electronics	Tenma Test Equipment	Zack/Joseph Electronics*D
Digi-Key D*	Neptune Electronics*D	Tritronics, Inc.*D.....80	
Diversified Parts*D	NTE Electronics, Inc.	Union Electronics Distrib*D	SEMICONDUCTORS, DIODES
East Coast Transistor*D	Philips ECG Company*D	Wholesale Electronics Inc.*D	Andrews Electronics*D.....IBC
Eiger Electronics*D	Philips ECG	Yamaha Electronics Corp, USA	Arrow Electronics
Electro Dynamics, Inc.*D	Quasar	Zack Electronics	Vance Baldwin Inc.*D.....80
Electronix Express*D	RF Parts*D	Zack/Joseph Electronics*D	B-B&W Electronics*D
Excel Distributing*D	RS Electronics*D		B&D Enterprises*D.....3
Fox International*D	Sears Roebuck & Company	RESISTORS	Bursma Electronic Distrib.*D
Galco Industrial Electronics*D	Tandy National Parts*D	Andrews Electronics*D.....IBC	C. Hoelzle Associates, Inc.
Hitachi America Ltd.	TechAmerica*D	Antique Electronic Supply*D	Cititronix/Panson*D
JDR Microdevices*D	Technics	Arrow Electronics	Computer Component Source*D
Jim-Pak*D	Tenma Test Equipment	Vance Baldwin Inc.*D.....80	Compuvideo Test Instruments
Kelvin Electronics*D	Tritronics, Inc.*D.....80	B-B&W Electronics*D	Consolidated Electronics, Inc.*D
LG Electronics Service USA	Union Electronics Distrib.*D	Bursma Electronic Distrib.*D	The Current Source*D
M-Tronics*D	Wholesale Electronics Inc.*D	C. Hoelzle Associates, Inc.	Curtis Mathes
M.A.T. Electronics*D	Yamaha Electronics Corp, USA	Cititronix/Panson*D	Dalbani Corporation*D
MCM Electronics*D	Zack Electronics	Computer Component Source*D	Data Business Publishing
Mouser Electronics*D	Zack/Joseph Electronics*D	Compuvideo Test Instruments	Digi-Key D*
Nationwide Electronics		Consolidated Electronics, Inc.*D	Diversified Parts*D
Panasonic Industrial Company		The Current Source*D	East Coast Transistor*D
Quasar		Curtis Mathes	Eiger Electronics*D
RS Electronics*D		Dalbani Corporation*D	Electro Dynamics, Inc.*D
Sears Roebuck & Company		Data Business Publishing	Electronic Parts Supply*D
SHOGYO International Corporation		Digi-Key D*	Electronix Corporation*D.....80
TechAmerica*D		Diversified Parts*D	Electronix Express*D
Technics		East Coast Transistor*D	Electroservice Laboratories
Tenma Test Equipment		Eiger Electronics*D	Excel Distributing*D
Tritronics, Inc.*D.....80			

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Fixer Corporation	Galco Industrial Electronics* D	Hitachi America Ltd.	JDR Microdevices* D
Foley-Belsaw* D	Herman Electronics* D	Hosfelt Electronics, Inc.* D	Jim-Pak* D
Fox International* D	Hitachi America Ltd.	JDR Microdevices* D	Kelvin Electronics* D
Galco Industrial Electronics* D	Hosfelt Electronics, Inc.* D	Jim-Pak* D	LG Electronics Service USA
Global Micro-Parts Depot* MD	IC Master	Kelvin Electronics* D	M-Tronics* D
Herman Electronics* D	JDR Microdevices* D	LG Electronics Service USA	Marshall Industries* D
Hitachi America Ltd.	Jim-Pak* D	M-Tronics* D	M.A.T. Electronics* D
Hosfelt Electronics, Inc.* D	Kelvin Electronics* D	Marshall Industries* D	MCD Electronics* D
JDR Microdevices* D	LG Electronics Service USA	M.A.T. Electronics* D	MCM Electronics* D
Jim-Pak* D	L.J. Enterprises* D	MCD Electronics* D	MCM Electronics* D
Kelvin Electronics* D	M-Tronics* D	MCM Electronics* D	Mouser Electronics* D
LG Electronics Service USA	Marshall Industries* D	Mouser Electronics* D	Nationwide Electronics
M-Tronics* D	M.A.T. Electronics* D	Nationwide Electronics	NEC Technologies, Inc.* D
Marshall Industries* D	MCM Electronics* D	NEC Technologies, Inc.* D	Neptune Electronics* D
M.A.T. Electronics* D	Mouser Electronics* D	Neptune Electronics* D	NTE Electronics, Inc.
MCD Electronics* D	Nationwide Electronics	NTE Electronics, Inc.	Parts Express International* D
MCM Electronics* D	NCM Electronics	Parts Express International* D	Philips ECG Company* D
Mouser Electronics* D	NEC Technologies, Inc.* D	Philips ECG Company* D	Philips ECG
Nationwide Electronics	Neptune Electronics* D	Philips ECG	Premium Parts+ Electronics Co* D
NEC Technologies, Inc.* D	Netway 2000 Inc.	Quasar	Quasar
Neptune Electronics* D	NTE Electronics, Inc.	RF Parts* D	RF Parts* D
NTE Electronics, Inc.	Panasonic Industrial Company	Richardson Electronics, Ltd.* D	RNJ Electronics Inc.* D
Parts Express International* D	Parts Express International* D	RNJ Electronics Inc.* D	RS Electronics* D
Philips ECG Company* D	Philips ECG Company* D	RS Electronics* D	Sears Roebuck & Company
Philips ECG	Philips ECG	Sears Roebuck & Company	Sony Service Company
Premium Parts+ Electronics Co* D	Premium Parts+ Electronics Co* D	Sony Service Company	Tandy National Parts* D
Quasar	Quasar	Tandy National Parts* D	TechAmerica* D
RF Parts* D	RF Parts* D	TechAmerica* D	Technics
RNJ Electronics Inc.* D	RNJ Electronics Inc.* D	Technics	Tenma Test Equipment
RS Electronics* D	RS Electronics* D	Tenma Test Equipment	Tritronics, Inc.*D.....80
Sears Roebuck & Company	Sears Roebuck & Company	Tritronics, Inc.*D.....80	Union Electronics Distrib.* D
Sony Service Company	Sony Service Company	Union Electronics Distrib.* D	Wholesale Electronics Inc.* D
Tandy National Parts* D	Tandy National Parts* D	Wholesale Electronics Inc.* D	Yamaha Electronics Corp., USA
TechAmerica* D	TechAmerica* D	Yamaha Electronics Corp., USA	Zack Electronics
Technics	Technics	Zack Electronics	Zack/Joseph Electronics* D
Tenma Test Equipment	Tenma Test Equipment	Zack/Joseph Electronics* D	
Tritronics, Inc.*D.....80	Tritronics, Inc.*D.....80		
Union Electronics Distrib.* D	Union Electronics Distrib.* D		
Wholesale Electronics Inc.* D	Wholesale Electronics Inc.* D		
Yamaha Electronics Corp., USA	Yamaha Electronics Corp., USA		
Zack Electronics	Zack Electronics		
Zack/Joseph Electronics* D	Zack/Joseph Electronics* D		
SEMICONDUCTORS, ICs	SEMICONDUCTORS, SCRs/ TRIACS	SEMICONDUCTORS, TRANSISTORS	SOCKETS
Andrews Electronics* D IBC	Andrews Electronics* D IBC	Andrews Electronics* D IBC	AMP
Arrow Electronics	Arrow Electronics	Antique Electronic Supply* D	Andrews Electronics* D IBC
Vance Baldwin Inc.* D 80	Vance Baldwin Inc.* D 80	Arrow Electronics	Antique Electronic Supply* D
B-B&W Electronics* D	B-B&W Electronics* D	Vance Baldwin Inc.* D 80	Arrow Electronics
B&D Enterprises* D 3	B&D Enterprises* D 3	B-B&W Electronics* D	Vance Baldwin Inc.* D 80
Blue Fin Technologies Inc.* D	Blue Fin Technologies Inc.* D	B-B&W Electronics* D	B-B&W Electronics* D
Bursma Electronic Distrib.* D	Bursma Electronic Distrib.* D	B&D Enterprises* D 3	Bursma Electronic Distrib.* D
C. Hoelzle Associates, Inc.	C. Hoelzle Associates, Inc.	Blue Fin Technologies Inc.* D	C. Hoelzle Associates, Inc.
Cititronix/Panson* D	Cititronix/Panson* D	Bursma Electronic Distrib.* D	Cititronix/Panson* D
Computer Component Source* D	Computer Component Source* D	C. Hoelzle Associates, Inc.	Computer Component Source* D
Compuvideo Test Instruments	Compuvideo Test Instruments	Cititronix/Panson* D	Computer Component Source* D
Consolidated Electronics, Inc.* D	Consolidated Electronics, Inc.* D	Computer Component Source* D	Compuvideo Test Instruments
CRC Components* D	CRC Components* D	Computer Services of America* D	Consolidated Electronics, Inc.* D
The Current Source* D	The Current Source* D	Compuvideo Test Instruments	The Current Source* D
Curtis Mathes	Curtis Mathes	Consolidated Electronics, Inc.* D	Dalbani Corporation* D
Dalbani Corporation* D	Dalbani Corporation* D	CRC Components* D	Dalco Electronics* D
Data Business Publishing	Data Business Publishing	The Current Source* D	Dialight Corporation
Digi-Key D*	Digi-Key D*	Curtis Mathes	Digi-Key D*
Diversified Parts* D	Diversified Parts* D	Dalbani Corporation* D	Diversified Parts* D
East Coast Transistor* D	East Coast Transistor* D	Data Business Publishing	Diversified Parts* D
Eiger Electronics* D	Eiger Electronics* D	Digi-Key D*	East Coast Transistor* D
Electro Dynamics, Inc.* D	Electro Dynamics, Inc.* D	Diversified Parts* D	Eiger Electronics* D
Electronic Parts Supply* D	Electronic Parts Supply* D	East Coast Transistor* D	Electro Dynamics, Inc.* D
Electronix Corporation*D.....80	Electronix Corporation*D.....80	Eiger Electronics* D	Electronic Parts Supply* D
Electronix Express* D	Electronix Express* D	Electro Dynamics, Inc.* D	Electronix Express* D
Electroservice Laboratories	Electroservice Laboratories	Electronic Parts Supply* D	Excel Distributing* D
Excel Distributing* D	Excel Distributing* D	Electronix Corporation*D.....80	Fox International* D
Fixer Corporation	Fixer Corporation	Electronix Express* D	Galco Industrial Electronics* D
Foley-Belsaw* D	Foley-Belsaw* D	Electroservice Laboratories	Hitachi America Ltd.
Fox International* D	Fox International* D	Excel Distributing* D	Hosfelt Electronics, Inc.* D
		Fixer Corporation	JDR Microdevices* D
		Foley-Belsaw* D	Jim-Pak* D
		Fox International* D	Kelvin Electronics* D
		Galco Industrial Electronics* D	LG Electronics Service USA
		Herman Electronics* D	M.A.T. Electronics* D
		Hitachi America Ltd.	MCM Electronics* D
		Hosfelt Electronics, Inc.* D	Mouser Electronics* D
			Nationwide Electronics
			NTE Electronics, Inc.

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Parts Express International*D	Cinda Acoustic	Jim-Pak*D	M.A.T. Electronics*D
Philips ECG	Cititronix/Panson*D	Kelvin Electronics*D	MCM Electronics*D
Quasar	Computer Component Source*D	LG Electronics Service USA	Mouser Electronics*D
RS Electronics*D	Consolidated Electronics, Inc.*D	M-Tronics*D	Nationwide Electronics
Sears Roebuck & Company	CSI/SPCCO	M.A.T. Electronics*D	Panasonic Industrial Company
SHOGYO International Corporation	The Current Source*D	MCM Electronics*D	Parts Express International*D
Snap-On Incorporated	Curtis Mathes	Mouser Electronics*D	Parts Port Ltd*D
TechAmerica*D	Dalbani Corporation*D	Nationwide Electronics	Pfanstiehl Corporation*D
Technics	Dalco Electronics*D	Panasonic Industrial Company	Premium Parts+ Electronics Co*D
Tenna Test Equipment	Digi-Key D*	Parts Express International*D	Q B Products*D
Tritronics, Inc.*D80	Diversified Parts*D	Pfanstiehl Corporation*D	R.C. Distributing Co
Union Electronics Distrib.*D	East Coast Transistor*D	Premium Parts+ Electronics Co*D	Recoton Corporation
Wholesale Electronics Inc.*D	Eiger Electronics*D	R.C. Distributing Co	RNJ Electronics Inc.*D
Yamaha Electronics Corp., USA	Electro Dynamics, Inc.*D	Recoton Corporation	RS Electronics*D
Zack Electronics	Electronic Parts Supply*D	RNJ Electronics Inc.*D	Schurter, Inc.
Zack/Joseph Electronics*D	Electronix Corporation*D80	Sears Roebuck & Company	Sears Roebuck & Company
	Electronix Express*D	SHOGYO International Corporation	SHOGYO International Corporation
	Electroservice Laboratories	Sony Service Company	Tandy National Parts*D
SPEAKERS	Excel Distributing*D	Tandy National Parts*D	TechAmerica*D
Andrews Electronics*DIBC	Fox International*D	Tenna Test Equipment	Tenna Test Equipment
Antique Automobile Radio*D	GC Electronics*D	Tritronics, Inc.*D80	Union Electronics Distrib.*D
Antique Electronic Supply*D	Hitachi America Ltd	Union Electronics Distrib.*D	Wholesale Electronics Inc.*D
Vance Baldwin Inc.*D80	Hosfelt Electronics, Inc.*D	Wholesale Electronics Inc.*D	Yamaha Electronics Corp., USA
B-B&W Electronics*D	Internat'l Components Corp.*D	Yamaha Electronics Corp., USA	Zack Electronics
Blue Fin Technologies Inc.*D	JDR Microdevices*D	Zack Electronics	Zack/Joseph Electronics*D
Bursma Electronic Distrib.*D		Zack/Joseph Electronics*D	
		Zenith Sales Company	

TRANSFORMERS

Andrews Electronics*DIBC
Antique Automobile Radio*D
Antique Electronic Supply*D
Arrow Electronics
Vance Baldwin Inc.*D80
B-B&W Electronics*D
Bi-Tronics Inc.
Bursma Electronic Distrib.*D
C. Hoelzle Associates, Inc.
Cititronix/Panson*D
Computer Component Source*D
Compuvideo Test Instruments
Consolidated Electronics, Inc.*D
The Current Source*D
Dalbani Corporation*D
Datatronics, Inc.
Digi-Key D*
Diversified Parts*D
East Coast Transistor*D
Eiger Electronics*D
Electro Dynamics, Inc.*D
Electronic Parts Supply*D
Electronic Specialists, Inc.
Electronix Express*D
Electroservice Laboratories
Excel Distributing*D
Fixer Corporation
Fox International*D
Galco Industrial Electronics*D
Global Micro-Parts Depot*MD
Herman Electronics*D
Hitachi America Ltd.
Hosfelt Electronics, Inc.*D
JDR Microdevices*D
Jensen Tools, Inc.*D
Jim-Pak*D
Kelvin Electronics*D
LG Electronics Service USA
M-Tronics*D
M.A.T. Electronics*D
MCM Electronics*D
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Bursma Electronic Distrib.*D
C. Hoelzle Associates, Inc.
Cititronix/Panson*D
Computer Component Source*D
Compuvideo Test Instruments
Consolidated Electronics, Inc.*D
The Current Source*D
Dalbani Corporation*D
Dalco Electronics*D
Data Business Publishing
Dialight Corporation
Digi-Key D*
Diversified Parts*D
East Coast Transistor*D
Eiger Electronics*D
Electro Dynamics, Inc.*D
Electro-Mech Components
Electronic Parts Supply*D
Electronix Corporation*D80
Electronix Express*D
Electroservice Laboratories
Excel Distributing*D
Fixer Corporation
Fox International*D
Galco Industrial Electronics*D
GC Electronics*D
Global Micro-Parts Depot*MD
Herman Electronics*D
Hitachi America Ltd
Hosfelt Electronics, Inc.*D
JDR Microdevices*D
Jim-Pak*D
Kelvin Electronics*D
L. Com Inc.
LG Electronics Service USA
L.J. Enterprises*D
M-Tronics*D

See Adv. Page

Recoton Corporation
RNJ Electronics Inc.*D
RS Electronics*D
Sears Roebuck & Company
SHOGYO International Corporation
Sony Service Company
Tandy National Parts*D
TechAmerica*D
Technics
Tenma Test Equipment
Thordarson-Meissner
Tritronics, Inc.*D.....80
Union Electronics Distrib.*D
Wholesale Electronics Inc.*D
Yamaha Electronics Corp., USA
Zack Electronics
Zack/Joseph Electronics*D

VACUUM TUBES

Andrews Electronics*D.....IBC
Antique Automobile Radio*D
Antique Electronic Supply*D
Vance Baldwin Inc.*D.....80
B-B&W Electronics*D
Bursma Electronic Distrib.*D
Cititronix/Panson*D
Consolidated Electronics, Inc.*D
The Current Source*D
Curtis Mathes
Diversified Parts*D
Eiger Electronics*D
Electronic Parts Supply*D
Excel Distributing*D
Fox International*D
Galco Industrial Electronics*D

See Adv. Page

Internat'l Components Corp.*D
Kelvin Electronics*D
MCD Electronics*D
MCM Electronics*D
Parts Express International*D
RF Parts*D
Richardson Electronics, Ltd.*D
RS Electronics*D
Sears Roebuck & Co
Tenma Test Equipment
Tritronics, Inc.*D.....80
Tucker Electronics Company
Union Electronics Distrib.*D
Video Display Corporation
Vintage TV and Radio Supply*D
Zack Electronics
Zack/Joseph Electronics*D

VIDEO HEADS

Ancom Corporation*D
Andrews Electronics*D.....IBC
ASTI Magnetics Corporation
Vance Baldwin Inc.*D.....80
B-B&W Electronics*D
Bursma Electronic Distrib.*D
Cititronix/Panson*D
Computer Component Source*D
Consolidated Electronics, Inc.*D
CRC Components*D
The Current Source*D
Curtis Mathes
Dalbani Corporation*D
Diversified Parts*D
East Coast Transistor*D
Eiger Electronics*D

See Adv. Page

Electro Dynamics, Inc.*D
Electronic Parts Supply*D
Electronix Corporation*D.....80
Electroservice Laboratories
E.M.T. Parts, Inc.*D
Excel Distributing*D
Fixer Corporation
Foley-Belsaw*D
Fox International*D
Herman Electronics*D
Hitachi America Ltd.
LG Electronics Service USA
M-Tronics*D
M.A.T. Electronics*D
MCM Electronics*D
Nationwide Electronics
Neptune Electronics*D
Pfanstiehl Corporation*D
Premium Parts+ Electronics Co.*D
Quasar
RNJ Electronics Inc.*D
Sears Roebuck & Company
Sony Service Company
Sprague Magnetics, Inc.*D
Tandy National Parts*D
Technics
Tenma Test Equipment
Tritronics, Inc.*D.....80
Union Electronics Distrib.*D
Wholesale Electronics Inc.*D
Zack Electronics
Zack/Joseph Electronics*D

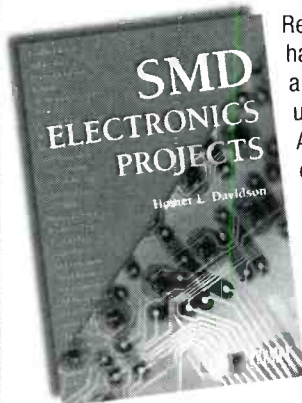
YOKES

Andrews Electronics*D.....IBC

See Adv. Page

Vance Baldwin Inc.*D.....80
B-B&W Electronics*D
Bursma Electronic Distrib.*D
Cititronix/Panson*D
Computer Component Source*D
CRC Components*D
Curtis Mathes
Dalbani Corporation*D
Diversified Parts*D
Eiger Electronics*D
Electronic Parts Supply*D
Electronix Corporation*D.....80
Excel Distributing*D
Fox International*D
Hitachi America Ltd.
LG Electronics Service USA
M.A.T. Electronics*D
MCM Electronics*D
Nationwide Electronics
Panasonic Industrial Company
Quasar
Richardson Electronics, Ltd.*D
Sears Roebuck & Company
Sony Service Company
Technics
Tenma Test Equipment
Tritronics, Inc.*D.....80
Union Electronics Distrib.*D
Video Display Corporation
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Wholesale Electronics Inc.*D
Zack Electronics
Zack/Joseph Electronics*D

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A line listing that is in color indicates that the company has an ad in this issue. The number following the listing is the number of the page on which the ad is located. BC means Back Cover; IBC means Inside Back Cover; IFC means Inside Front Cover.

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
BOOKS/MANUALS			
Abbot, Langer, & Associates	Microtech Productions	O.K. Industries, Inc.	B&D Enterprises* D3
Andrews Electronics* DIBC	Mouser Electronics*D	PACE, Inc.	C. Hoelzle Associates, Inc.
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The Computer Industry Almanac	Tab Books		Foley-Belsaw*D
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Eiger Electronics*D		SCHOOLS:	
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<http://www.microwavefilter.com>

Milgray Electronics

77 Schmitt Blvd.
Farmingdale, NY 11735-1403
516-756-7160

Miller-Stephenson Chemical Co.

55 Backus Avenue
Danbury, CT 06810
203-743-4447
800-992-2424
Fax: 203-791-8702
Website: www.miller-stephenson.com

Mindshare, Inc.

2202 Buttercup Drive
Richardson, TX 75082
214-231-2216
Fax: 214-783-4715

Module Exchange

706 Space Way
Duncanville, TX 75137
972-298-1212
800-632-6637
Fax: 972-283-1778
E-mail: Ji@flash.net
Website: www.tvparts.com

Montgomery Ward

1 Montgomery Ward Plaza
619 West Chicago Location 4B
Chicago, IL 60610-2421
312-467-3248
Fax: 312-467-2731

Montgomery Ward*D

National Parts Center
5750 McDermott Avenur
Berkeley, IL 60163
800-323-1965
Fax: 800-215-3767

Moody Tools, Inc.

42-60 Crompton Avenue
P.O. Box 230
East Greenwich, RI 02818-0230
401-885-0911
800-866-5462
Fax: 401-885-4565
E-mail: Infodesk@moodytools.com
Website:
<http://www.moodytools.com>

Moore Business Products

111 Barclay Blvd. #400
Lincolnshire, IL 60069
847-913-3200
Fax: 847-913-3293

Morrow Wave Inc.

13013 East 166th Street
Cerritos, CA 90703-2201
562-404-0101
Fax: 562-921-6227
E-mail: morrow@flashcom.net
Website:
<http://www.oscilloscope.com>

Mouser Electronics*^D

958 North Main Street
Mansfield, TX 76063
817-483-6888
800-346-6873
Fax: 817-483-6899
E-mail: sales@mouser.com
Website: <http://www.mouser.com>

Mr Appliance

1020 North University Parks Drive
Box 3146
Waco, TX 76707
254-745-5050

Mueller Electric Company

1583 East 31st Street
Cleveland, OH 44114-4354
216-771-5225
800-955-2629
Fax: 216-771-3068

Multicore Solders

1751 Jay Ell Drive
Richardson, TX 75081-1835
14-238-1224
Fax: 214-437-0288

Multidyne Inc

191 Forest Avenue
Locust Valley, NY 11560-2132
516-671-7278
800-4TV-TEST
Fax: 516-671-3362
E-mail: Info@multidyne.com
Website: <http://www.multidyne.com>

Multiplex Technology, Inc.

3200 East Birch Street
Brea, CA 92621-6258
714-996-4100
800-999-5225
Fax: 714-996-4900

N

National Computer Association

Ulmerton Business Center
13555 Automobile Blvd., Suite 240
Clearwater, FL 34622
813-556-2775
800-615-6224
Fax: 813-556-2783
E-mail: Nca@gte.net
Website: <http://www.nca-net.com>

Nat'l Assoc. of Service Dealers

Division of NARDA
10 East 22nd Street
Lombard, IL 60148-4977
630-953-8950
800-621-0298
Fax: 630-953-8957
E-mail: Nardahdq@aol.com
Website: <http://www.narda.com>

National Parts Depot*^D

31 Elkay Drive
Chester, NY 10918
914-469-4800
Fax: 914-469-4855

National Electronics Warranty

44873 Falcon Place
Sterling, VA 20166
703-318-7700
800-942-8763
Fax: 703-709-7929
E-mail: Info@newcorp.com

National Instruments Corporation

6504 Bridge Point Parkway
Austin, TX 78730-5039
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Fax: 512-794-8411
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Website: <http://www.natinst.com>

Nationwide Electronics

1242 East Lexington Avenue
Pomona, CA 91766-5561
909-591-5885
800-659-3186
Fax: 909-627-3391
E-mail: Info@neiparts.net
Website: <http://www.neiparts.net>

NATM

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NCM Electronics

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NEC Technologies, Inc.*^D

1250 Arlington Heights
Itasca, IL 60143
630-467-5000
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Nederman, Inc.

39115 Warren Road
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Website: www.nederman.com

Neptune Electronics*^D

3611 14th Avenue
Brooklyn, NY 11218
718-854-8284
800-242-5556
Fax: 800-239-6349

Nesco Batteries

7110 Gerald Avenue
Van Nuys, CA 91046-3779
800-606-3726

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2708 West Berry
Fort Worth, TX 76109-2356
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Fax: 817-921-3741
Website: <http://www.nesda.com>

Netway 2000 Inc.

18657 Parthenia Street
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Network Technologies, Inc.

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M.M. Newman Corporation

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Newport Electronics, Inc.

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Website: <http://www.newportus.com>

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206-882-2040

NorthStar MatrixServ

7101 31st Avenue North
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NRI Training for Professionals

McGraw-Hill Continuing Ed Center
4401 Connecticut Avenue NW
Washington, DC 20008

NRI School of Electronics

4401 Connecticut Avenue, N.W.
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Fax: 914-969-6650

Oldaker Corporation

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Omega Engineering, Inc.

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800-826-6342
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OPTOelectronics Inc.

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PACE, Inc.

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Website: <http://www.paceusa.com>

Pacer Industries, Inc.

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Fax: 715-723-7890

Paladin Tools

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Houston, TX 77064
281-469-9485
800-272-8665
Fax: 800-272-5257

Panamax, Inc.

150 Mitchell Blvd.
San Rafael, CA 94903
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Fax: 415-472-5540

Panasonic Industrial Company

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201-348-7000
Website: <http://www.panasonic.com>

Panasonic Services Company

20421 84th Avenue South
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Kent, WA 98032
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Fax: 253-395-0820

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E-mail: info@panavise.com
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Fax: 800-332-3922

Parts Express International*ID

725 Pleasant Valley Drive
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E-mail: Xpress@parts-express.com
Website: <http://www.parts-express.com>

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E-mail: sebastian@partsport.com
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PBS Software

490 West Arrow Highway, Suite F
San Dimas, CA 91773
909-592-1880
888-PBS-6288
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PD Software

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Fax: 281-251-9300
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Website: <http://www.infohwy.com/~pallen>

The Peak Technologies Group

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Website: <http://www.peaktech.com>

PerfectData Corporation

110 West Easy Street
Simi Valley, CA 93065
805-581-4000
Fax: 805-522-5788

Peripheral Computer Support

Division of Cerplex
2219 Oakland Road
San Jose, CA 95131
408-428-6420

Peripheral Parts Support*ID

219 Bear Hill Road
Waltham, MA 02451
781-890-9101
Fax: 781-890-7767
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Pfanstiehl Corporation*ID

3300 Washington Street
Waukegan, IL 60085
708-623-1360
800-323-9446
Fax: 708-623-9107

Philips Consumer Electronics

P.O. Box 555
Jefferson City, TN 37760-0555
423-475-0044
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Philips Consumer Electronics

Software Development
P.O. Box 555
Jefferson City, TN 37760-0555
423-475-0393
Fax: 423-475-0178
E-mail: Forcesupport@knox.pcec.philips.com
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Philips ECG Company*ID

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423-636-5693
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E-mail: Ecgnat@extn.net
Website: <http://www.ecgproducts.com>

Philips Technical Training

Service Co.
P.O. Box 555
Jefferson City, TN 37760
423-475-0115
E-mail: Force.support@knox.pcet.philips.com

Philips ECG

1001 Snapps Ferry Road
P.O. Box 967
Greeneville, TN 37744-0967
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Philips Service Solutions Group

Old Andrew Johnson Highway
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Philtek Power Corporation

P.O. Box 1
Blaine, WA 98231-0001
360-332-7252
800-727-4877
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E-mail: Info@philtek.com
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Pioneer Research

1745 Berkeley Street
Santa Monica, CA 90404
310-829-6751
800-233-1745
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Planned Products

5467 Tesoro Court
San Jose, CA 95124-6133
408-459-8088
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Plato Products, Inc.
18371 Railroad Street
City of Industry, CA 91748
626-965-8044
800-423-4510
Fax: 626-965-8960
E-mail: Sales@plato products.com
Website:
<http://www.platoproducts.com>

Platt Luggage, Inc.
4051 W. 51st Street
Chicago, IL 60632-4211
773-838-2000
800-222-1555
Fax: 773-838-2010
E-mail: info@plattcases.com
Website:
<http://www.platluggage.com>

Plaza Distributing*D
13268 66th Street North
Largo, FL 34643
813-531-5484
800-531-5484
Fax: 813-530-1821

Pomona Electronics
1500 East Ninth Street
Pomona, CA 91766-3835
909-469-2900
Fax: 909-629-3317
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Website: <http://www.pomona-electronics.com>

G. M. Popkey Company, Inc.
2035 Larsen Road
P.O. Box 12237
Green Bay, WI 54307-2237
414-497-0400
800-444-5920
Fax: 414-497-4894

J.S. Popper, Inc.
P.O. Box 206
Little Ferry, NJ 07643
201-641-3252
Fax: 201-440-4283

Portasol, Inc.
3129 Chaucer Drive
Charlotte, NC 28210-4818
704-553-7346
Fax: 704-553-7974

Powerline*D
Battery Specialist Company
4268 Los Angeles Avenue
Simi Valley, CA 93063-3366
805-527-2288
800-234-2444
Fax: 805-527-8336
E-mail: Mail@powerline-battery.com
Website: Powerline-battery.com

PowerSource Online Inc.
5703 Oberlin Drive, Suite 202
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Pre-Owned Electronics
125 Middlesex Turnpike
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617-778-4600
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Projector Recorder Belt*D
P.O. Box 176
Whitewater, WI 53190-0176
414-473-2151
800-558-9572
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E-mail: Info@prblne.com
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Preferred Computer Services Inc.
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Prelco Electronics
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Union, NJ 07083-9318
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Premium Parts+ Electronics Co*D
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Prentice Hall PTR
Simon & Schuster Education Group
One Lake Street
Upper Saddle River, NJ 07458
201-236-7139
Fax: 201-236-7131

Prime Technology, Inc.
International Insts. Div.
Twin Lakes Road, P.O. Box 185
North Branford, CT 06471
203-481-5721
Fax: 203-481-8937

Princeton Computer Support
5 Crescent Avenue
P.O. Box 787
Rocky Hill, NJ 08553
609-921-8889
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Print Products International*D
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Priority Computer Parts
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Probe Master, Inc.
215 Denny Way
El Cajon, CA 92020
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Production Devices
215 Denny Way
El Cajon, CA 92020
619-258-7303
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Progressive Electronics
325 South El Dorado
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800-528-8224
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E-mail: info@progressive-inc.com
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R.C. Distributing Company
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South Bend, IN 46624
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Read/Right Products Division
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Recoton Corporation
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Ripley Company

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The panelists, six corporate executives and an industry analyst, said wireless devices would perform a wide range of functions including peer-to-peer communications, digital chats, enterprise mail, brokerage and banking transactions, as well as paging and voice communication. Opinions of the panel participants differed on exactly what devices would be necessary to deliver the wide range of services.

"I do not believe all of this can be stuffed into any one telephone," said Bill Lenahan of Bell South Wireless Data Services. "People will have to carry two devices."

Mark Lowenstein, a Yankee Group analyst, predicted that the industry will become increasingly innovative with hardware. One device will be a telephone. The other will be a personal digital assistant or, perhaps, a "mobile companion." Lowenstein added, "CES is going to take center stage for hardware for wireless." Indeed, many people in the industry believe this wireless explosion is already developing.

The 2000 CES wireless product area features a host of advanced technologies from many of the world's leading manufacturers including Ericsson, Motorola, Nokia, Samsung, and others. Wireless products at the show range from telephones and pagers to hand-held GPS receivers and wireless Internet devices.

Panelist Bo Dimert of Ericsson predicted that disparate mobile communications hardware in the near future will be capable of seamless communications. There will be, he predicted, equipment — a phone, a headset, a printer, a keyboard, etc. — that all work together but are connected without wires.

Bluetooth, the standard that permits the networking and integration of arbitrary devices, is being demonstrated at the 2000 International CES. The underlying technology is based on low-

cost, short-range radio links among devices, and the Bluetooth compatibility standard is gaining acceptability among hardware companies and momentum in the world of software.

Panelists noted that wireless communications products soon will be imbedded into appliances to facilitate remote maintenance and monitoring; that wireless equipment could be woven into clothes and worn and could replace cameras, credit cards, and wireline telephones.

In fact, Roxanne Jozwick of AT&T Wireless noted that there are more mobile than wireline phones in Finland and suggested that a growing number of Americans are relying on wireless systems as their primary telephone service. She noted that some Internet users are turning to wireless access instead of waiting for digital subscriber line (DSL) service.

In contrast to the majority of the panel's predictions of more sophisticated wireless services, one panelist, Sue Swenson of Leap Wireless International, made the case for a more basic approach. Swenson explained that 30 percent of Americans have wireless phones and asked, "what about the other 70 percent?" Among that group, she said, is a substantial market for basic limited voice service.

Wireless technology discussions are included in the 11 conference tracks and 130 conference sessions offered at the 2000 International CES. In addition to wireless and mobile electronic communications, the show includes tracks on emerging technologies, lifestyle technology, e-commerce, retail management, specialty audio, and workstyle technology. Digital Hollywood and the Habitech Institute provide an array of sessions on home theater, integrated home systems, and digital entertainment.

CEA expresses concern with FCC lower power rule

The following statement was issued in January by Consumer Electronics Association (CEA) President and CEO Gary Shapiro in response to the previous week's ruling by the Federal Communications Commission (FCC) to develop a new low power FM (LPFM) radio service. The Commission announced that it will create two new classes of broadcast stations with power of up to 10 and 100 watts, respectively, and will remove the third adjacent channel interference protection currently enjoyed by FM broadcasters.

"We share the FCC's worthy commitment to promoting greater access to the airwaves. Unfortunately, we have found that the method chosen by the Commission — specifically, the removal of third adjacent channel protection — may result in interference to existing FM radio service and would adversely effect consumers' investment in the 710 million FM receivers currently in use in the United States. In addition, these new FM stations will cause interference that may hinder the introduction of terrestrial digital audio broadcasting (DAB).

"CEA conducted extensive FM receiver tests with the support of National Public Radio and the Corporations for Public Broadcasting. These tests, which were submitted to the FCC, demonstrated that third adjacent channel interference protection should be retained to prevent new interference to existing FM receptions."

"We look forward to working with the Commissions on additional ways to promote diversity in radio voices. But this laudable goal must not come at the expense of impairing the quality of FM radio service that the American public receives today."

ES&T Calendar

2000 National All Service Convention
March 1-5, 2000
Orlando, FL

Electronic Technicians Association
602 N. Jackson Street
Greencastle, IN 46135
Phone: 800-288-3824
Fax: 765-653-4287
E-mail: eta@indy.tdsnet.com
Website: www.eta-sda.com

Home Automation Convention
March 3-5, 2000
Orange County Convention Center
Orlando, FL
John Galanie 703-352-9111

ETA Annual Membership Meeting
May 5-6, 2000
ETA Headquarters
604 N. Jackson
Greencastle, IN 46135, and
The Walden Inn
Greencastle, IN
ETA: 765-653-8262

NESDA 50th/ISCET 30th/NIAS 8th Annual National Professional Service Convention and Professional Service Trade Show
August 7-12, 2000
John Ascuaga's Nugget Hotel
Sparks (Reno) NV

Books

***Automotive Electrical Systems: Troubleshooting and Repair Basics*, by Vaughn D. Martin, 272 pages, \$29.95**

Your car has an electrical problem — maybe your entire electrical system is shorting out or your battery is continually drained. Can you fix it yourself? *With Automotive Electrical Systems: Troubleshooting and Repair Basics*, you most likely can! Chilton manuals assume that you already know enough to fully understand and fix the problem you are having. *Automotive Electrical Systems* fills that knowledge and experience gap, allowing you to better understand your car's electrical systems and computers well enough to buy replacement parts and then use the manual to aid in the installation.

***Computer Monitor Troubleshooting and Repair*, by Joseph Desposito and Kevin Garabedian, 336 pages, \$34.95**

Learn the basics of computer monitor circuits, tools and test equipment, special safety procedures, how to find a problem, how to troubleshoot and repair dozens of specific circuits, how to find a fault in the CRT, plus much more.

PROMPT Publications, 2647 Waterfront Parkway, East Drive, Indianapolis, IN 46214-2041

***Troubleshooting & Repair Guide to TV, 2/E*, by the Engineering Staff of Howard W. Sams, 264 pages, \$34.95**

The most complete and up-to-date television repair book available with tips on how to troubleshoot the newest circuits in today's TVs. This useful guide contains comprehensive coverage of television basics, and extensive coverage of common TV symptoms and how to correct them. Included are tips on how to find electronic problems that interfere with TV performance, and a question-and-answer section at the end of each chapter — useful for instructors or anyone teaching themselves TV repair.

PROMPT Publications, 2647 Waterfront Parkway, East Drive, Indianapolis, IN 46214-2041

***Complete VCR Troubleshooting and Repair*, by Joe Desposito and Kevin Garabedian, 192 pages, \$34.95**

Complete VCR Troubleshooting and Repair contains sound troubleshooting procedures beginning with an examination of the external parts of the VCR, then narrowing the view to the gears, springs, pulleys, belts, and other mechanical parts.

PROMPT Publications, 2647 Waterfront Parkway, East Drive, Indianapolis, IN 46214-2041

***Complete Camcorder Troubleshooting & Repair*, by Joe Desposito & Kevin Garabedian, 208 pages, \$34.95**

Learn everything you ever needed to know about the upkeep and repair of video camcorders with Howard W. Sams' *Complete Camcorder Troubleshooting & Repair*. Covering such diverse topics as tools and test equipment, general camcorder maintenance, safety procedures and troubleshooting audio circuits, this book is designed for electronics hobbyists, professional technicians, and video professionals.

PROMPT Publications, 2647 Waterfront Parkway, East Drive, Indianapolis, IN 46214-2041

***CSS Study Guide for Customer Service Specialists*, by the Electronics Technicians Association, 116 pages, paperback, \$30.00**

The Electronics Technician Association, International, Inc., has published the second edition of the *CSS Study Guide for Customer Service Specialists*.

The 116 page book contains 19 chapters of instruction, rules, policies, and techniques that have proven to be needed by workers who handle customers, as service technicians, installers, repairers, help-desk workers, receptionists, and sales people.

While ETA's Certification program for customer service specialists was originally intended for electronics technicians, in 1980 when it was conceived, it quickly was reconfigured to broaden its scope to cover virtually all areas of work that require interfacing with the public.

The CSS program is now offered as a stand-alone short course at some technical schools and as a segment added onto many computer and electronics technical courses. This CSS study guide provides a virtual course outline and prepares students to pass the CSS Certification Examination. It contains over 170 practice CSS Quiz questions.

ETA, 604 N Jackson, Greencastle, IN 46135, Phone: 765-653-8262, Fax: 765-653-4287, Website: www.eta-sda.com, E-mail: eta@indy.tdsnet.com

***U.S. Consumer Electronics Industry Today*, by the Consumer Electronics Manufacturers Association, \$11.99 (CEMA members), \$14.99 non-members**

The Consumer Electronics Manufacturers Association (CEMA) has published *U.S. Consumer Electronics Industry Today*. The book gives a historical perspective on the technological advances that have affected trends in the consumer electronics market as well as provides updated statistics for 1998.

Inclusive in *U.S. Consumer Electronics Industry Today* are chapters on video, audio, mobile electronics, communication and information technology, integrated home systems and accessories. For the first time, the publication will include a pull-out timeline showing significant industry events dating back more than a century and equates them with today's technological milestones. It also includes an overview of the industry during 1998 and a directory listing of other consumer electronics industry sources.

All statistics in *U.S. Consumer Electronics Industry Today* were compiled by CEMA's Market Research department.

CEMA, 2500 Wilson Blvd., Arlington, VA 22201, Phone: 703-907-7600, Fax: 703-907-7601, Website: www.CEMAcity.org

***Power Supply Troubleshooting & Repair*, by Lanny L. Logan, 208 pages, \$29.95**

Power Supply Troubleshooting & Repair is designed to provide technicians with a better understanding of how switched-mode power supplies operate. It also provides practical, useful procedures to follow when you are troubleshooting switched-mode power supplies.

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ES&T's April issue will feature an article by John Ross
 on service management software: what it is, how it can
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And for those of you who want to know a little more
 about digital television (DTV), we will feature an arti-
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The buzzwords of the day in consumer electronics
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 Convergence means the coming together of previ-

ously disparate elements. For example, today, a lot
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Sencore model VA48 TV analyzer, \$185.00. B & K Model 467 3-meter CRT tester/restorer, \$160.00. Heathkit Model IP-5220 variable isolated ac power supply, O-3A, O-140V, \$150.00. More items available. *Contact: Gene, 870-246-7234.*

Sencore SC3100 scope, \$1600.00. Tentel gunges set (4), \$100.00, signal tracer, \$30.00, square wave generator, \$30.00, flyback tester, \$35.00, crick-et tester, \$100.00, NTSC generator B/K, \$65.00, power supply 40V-250 ma, \$25.00, power supply 15V-3A, \$25.00, tuner sub., \$25.00 or best offer. *Contact: Ralph Bianco, 1431 Robinson Avenue., Havertown, PA 19083, phone: 610-446-7788.*

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Sencore VC93 all format VCR analyzer, like new with all manuals, schematics, tapes and accessories, \$525.00 plus shipping. *Contact: Gerald Wheaton, 252-745-4493 or 252-745-5707.*

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AIWA DC stereo amplifier, P22 Model No. SA-P22H schematic and parts list. *Contact: Salvage King, 2818 O'Donnell Street, Baltimore, MD 21224, phone: 410-675-7525.*

Zenith Cha. 16T20 vertical transformer 95-1421 subs to Merit A3036 or Stancor A8113 or Thordarson 26S7B or Triad A-108X. Yoke- 95-1427 subs to Merit MDF-01 or Stancor DY-13A or Thordarson Y14 or Y39 or Triad Y40-1. *Contact: Lewis TV, 326 Main Street, Huntington Beach, CA 92648, phone: 714-846-1591.*

Magnavox (old) turntable Model W604 balance arm, Part # 76190019, 76190048 or 76190049. *Contact: Gary Manzo, 163 Horseneck Road, Fairfield, NJ 07004, phone: 973-575-4694.*



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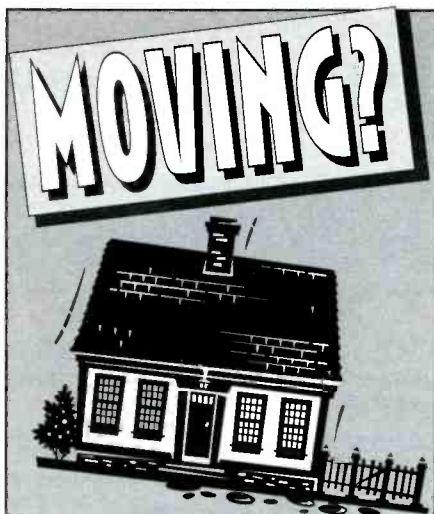
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