

THE PROFESSIONAL MAGAZINE FOR ELECTRONICS AND COMPUTER SERVICING

ELECTRONICTM

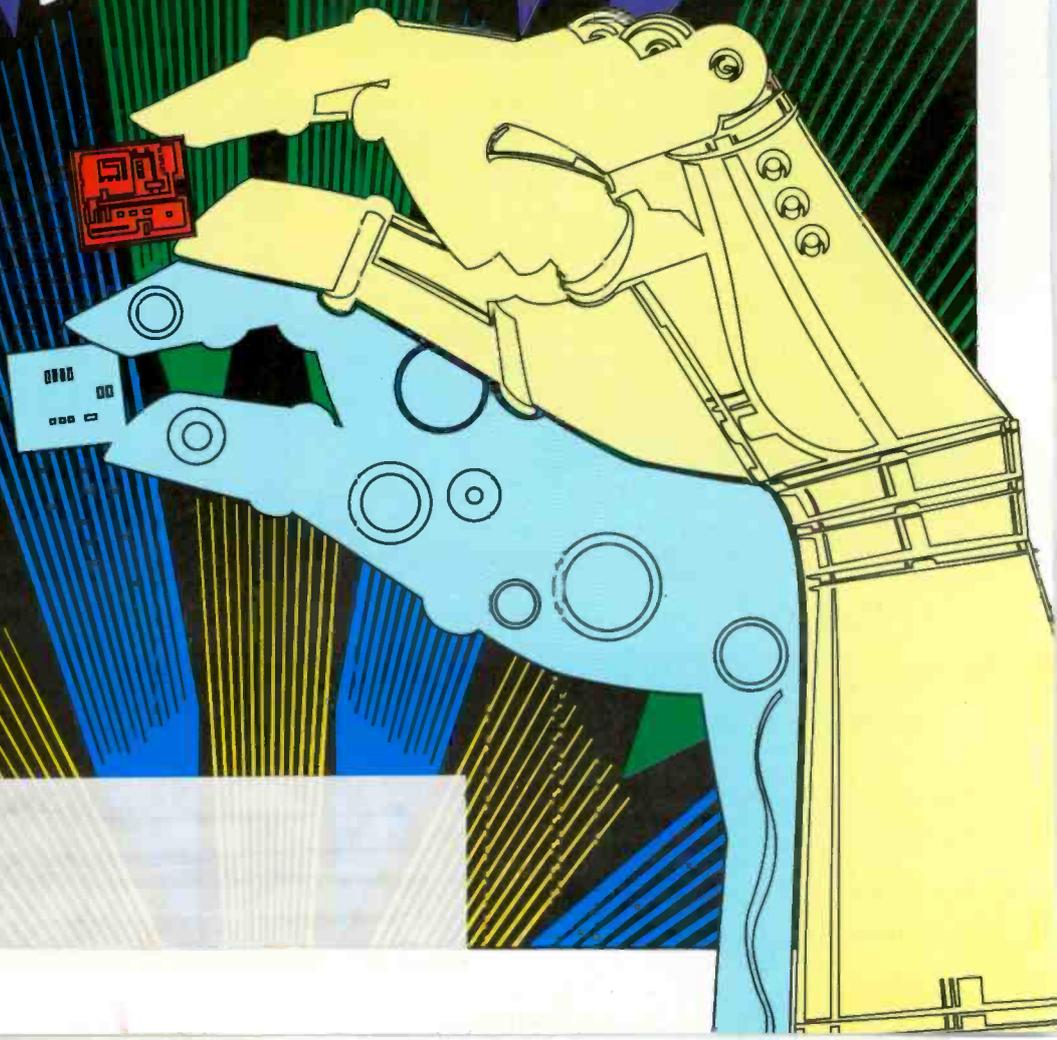
Servicing & Technology

March 1996

Product directory • Services directory • Mailing addresses

Replacement parts/Components directory

1996 Electronic Servicing Buyers' Guide



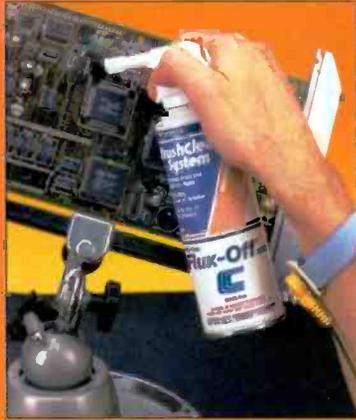
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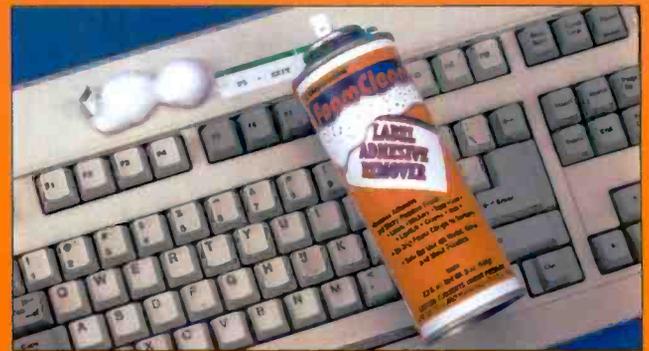


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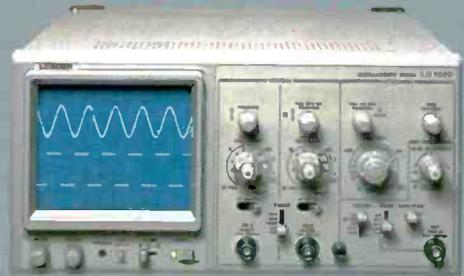
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Circle (6) For Product Information

Circle (7) For Product Information & Demonstration

ELECTRONIC

Servicing & Technology

Volume 16, No. 3 March 1996

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By Homer L. Davidson

According to the author, most vertical circuits can be serviced without a schematic by comparing waveforms and voltages at the various vertical circuits and components against those observed in a known chassis in a Sharp 19SB60R.

14 Motors in consumer electronics

By The ES&T Staff

The expansion of consumer electronics from the traditional products such as TVs, VCRs, etc. has meant an increase in the number and types of motors that a technician will encounter and possibly have to service. This article addresses these concerns and how to go about dealing with them.

16 A technician's glossary

By The ES&T Staff

These days, the internet is beginning to intrude into the lives of technicians whether they like it or not. So, for those technicians who wish to start communicating via the 'net', ES&T has provided a glossary of words to help you become more familiar with this process.

1996 Buyer's Guide

Running a service center takes technical skills, management ability, a comprehen-

sive library of technical literature, and a broad range of tools, test equipment, accessories and replacement parts. The **Electronic Servicing and Technology Buyer's Guide** contains information on hundreds of manufacturers and distributors who make and sell thousands of products. We have scanned the literature and attended trade shows that have to do with new areas of interest to ES&T readers and have come up with this list.

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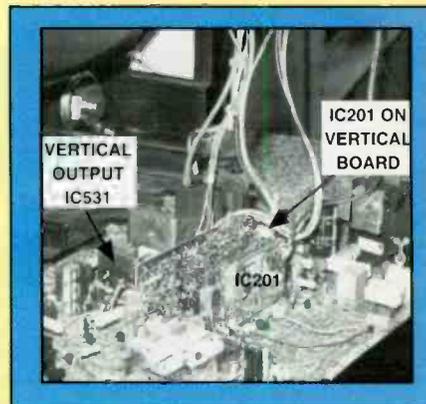
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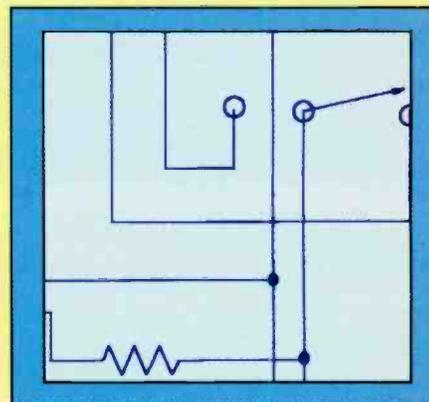
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ON THE COVER

Today's consumer electronics servicing technician is faced with a huge array of products, manufacturers, brands, and models, many of which incorporate a host of unique, specially designed and manufactured components. The annual Buyer's Guide brings all of this information together in a comprehensive list that will help any servicer bring his business into the computer age.

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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WAVETEK

Listening to our readers

A magazine, a newspaper, a TV program; any one of these forms of mass communication can only be as good, and as useful, to the people who read or watch, as the usefulness of the information conveyed. That's the reason that this magazine publishes nothing but articles on the servicing of consumer electronics. That's what our readers do, and that's our reason for being.

And that's why the editors attend trade shows and association meetings, and pay visits and make calls to service centers. Visiting with the owners, service managers and technicians from service centers throughout the country helps us to understand the problems servicers face and gain a deeper understanding of their information needs.

Letters and telephone calls from readers asking specific questions are also helpful. Every letter and every telephone call tells us a little more about what readers need to know.

Another avenue of communication between **ES&T** and readers are the Reader Survey Cards we include in every issue. We often think that certain types of articles would be useful, but what do the *readers* think? Are the readers really concerned about the subject under consideration for an article? Do they already know what they need to know, thus making an article on that subject superfluous? The responses to the questions on the bound-in **ES&T** Reader Survey Cards help us to perform that kind of evaluation.

In the Reader Survey Card in the November issue we explored the subject of soldering/desoldering. Seventy-seven readers took the time to fill out answers to the questions on that card. We really appreciate the time and effort put forth by those people. It provided us with some very useful information, which we intend to use in soldering/desoldering articles in future issues.

In response to the question "Do you have any special soldering/desoldering equipment?" 31 respondents said no, 36 said they use special soldering tips, 12 said they use a hot-air system, and 9 others said they use some other type of special equipment.

Readers who used some other type of special soldering/desoldering equipment specified such products as solder suckers, desoldering braids, solder tweezers, PC board rework systems, low melting alloys, butane torch/soldering iron, and desoldering stations.

You'll note in many of these discussions that the answers add up to more than 100% or more than the total number of responses. That's because many respondents gave multiple answers. For example, some readers may have said that they use special soldering tips, and they also use a hot-air system, and possibly some other type of special equipment as well.

In response to the question "Do you use any special jigs/fixtures to hold chassis/PC boards?" we received quite a variety of answers. Thirty-seven respondents said they did not use any special jigs or fixtures, but the other respondents said that they do. Nineteen respondents said that they use PC board holders, seven use a vise of some kind, and several said that they use either a homemade jig or fixture or "helping hands," the type of holder that consists of a weighted base with several alligator clips on universal joints. Other special fixtures mentioned were tweezers, and one specified that he uses a combination portable workbench/vise.

The respondents showed a great degree of ingenuity and creativity in their answers to the question "Do you use specialized tools/devices to pick up and place small components?" Twenty-nine respondents said that they do not use any specialized tools/devices, but

the answers of the rest of the respondents ran the gamut from typical service tools to devices borrowed from the medical/dental profession, and even the kitchen. Here is a list of the tools mentioned, in no special order: pliers, screwdrivers, tweezers, magnetic tools, vacuum tool, hemostats and other various medical tools, wood sticks, dentists picks and tools, homemade holding devices, the vacuum tool portion of a solder station, a homemade vacuum tool, a pick, a scratch awl, ice cube tongs, IC inserters/extractors.

In answer to the question "Do you use special lighting/magnification to help see tiny parts?" surprisingly, nine sharp eyed respondents said no. The remaining respondents use a wide variety of visual assistance. Nine, for example, use some type of special task lighting to help them see. Most of the others use some type of magnification as well.

Here is a list of some of the magnification methods mentioned by these respondents: handheld magnifier, magnifier lamp, jeweler's loupe, microscope, camera imaging system, visor magnifier, magnifying spectacles attached to glasses. Two respondents even mentioned that they use a video camera trained on the area of interest (one mentioned using the macro function on the lens), with the picture on a fairly large screen TV.

Judging by these responses, the subject of use of aids in handling PC boards, tiny components and soldering/desoldering continues to be one on which continued discussion is needed. We'll be serving up some more articles on these important areas in the future.

Nile Conrad Penner

Consumers highly satisfied with their consumer electronics products

Owners of full stereo systems voice high levels of satisfaction with their equipment, the Consumer Electronics Group of the Electronic Industries Association (EIA/CEG) reported today.

A survey, conducted in May and announced at the CES Specialty Audio and Home Theater Show found that 58 percent of the stereo system owners are "very satisfied" with the quality of the sound from their equipment, while less than 4 percent said they were not satisfied.

In addition, EIA/CEG asked the 500 stereo owners to identify recreational and leisure time products they owned and to then compare that product's "entertainment value for the money" with their audio equipment. The results:

- 76 percent say their specialty audio equipment is a better value than their pool table; 14 percent say the two are equal.
- 69 percent say their specialty audio equipment is a better value than their exercise equipment; 14 percent say the values of the two are equal.
- 59 percent say their specialty audio equipment is a better value than their hot tub; 11 percent say the two are equal.
- 49 percent say their specialty audio equipment is a better value than their boat; 14 percent say the two are equal.
- 48 percent say their specialty audio equipment is a better value than their motorcycles; 20 percent say the two are equal.
- 43 percent say their specialty audio equipment is a better value than their camper or motor home; 21 percent say the values of the two are equal.
- 43 percent say their specialty audio equipment is a better value than their pool; 13 percent the two are equal.

In each comparison, those who had an opinion and did not select the stereo system as a better value said the other product was a better value.

Information contained in this release was obtained during May 1995 via telephone interviews. Approximately 1,200 interviews were conducted with U.S. heads of households across three groups:

500 home theater system owners, 574 component stereo systems owners, 500 randomly selected consumers not owning a home theater or stereo system. Individual samples will not add to total interviews since some consumers owned both

a home theater system and a stereo system. Survey questions were designed by CEG and administered by the Verity Group, Inc. from their headquarters in Fullerton, CA. All results have a margin of error of +/- 4 percentage points. ■

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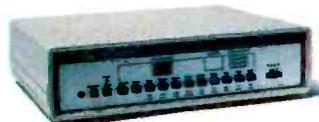
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LITERATURE

Electronic repair center website

Anatek Corporation has established the Electronic Repair Center (ERC) for hardware service and repair professionals on the World Wide Web at <http://www.anatekcorp.com/repair.htm>.

ERC includes a technician's forum where users submit repair tips, supplier information, technical articles, questions, and answers to questions from other users. All of the data submitted is posted in searchable databases: repair tips on monitors, televisions, VCRs and printers; technical articles on hardware repair topics; the question and answer database.

More than 100 electronic component suppliers are listed with links to WWW sites. Suppliers are listed in a supplier contact database and are cross-referenced by component type. A supplier ranking survey form is available where users can identify their favorite suppliers for various components. The results of the survey will be posted at ERC.

The site also includes links to many Internet sites of interest to service and repair professionals.

Circle (91) on Reply Card

Publisher now on world wide web

Digital Press, a publisher of books for computing professionals, has announced the establishment of a new home page on the World Wide Web.

The site—located at <http://www.bh.com/bh/dp/>—contains descriptions for over 120 titles. Individual book pages include title, detailed description, contents, author and bibliographic information. The site also includes information on how to order books or free catalogs, as well as links to affiliated web sites.

An e-mail mailing list is available for readers to learn about news releases, special offers and other news from Digital Press. Anyone interested in being added to the e-mail mailing list can e-mail a request to majordomo@world.std.com; include in the message body (not in subject line) subscribe digital-press.

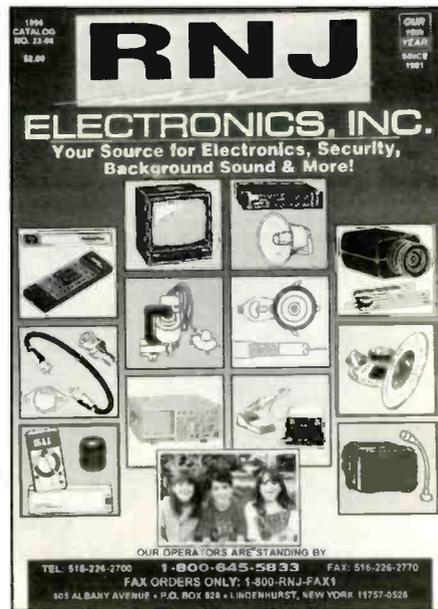
Digital Press, publisher of many books for computing professionals including *The SQL Server Handbook*, *Advanced Ethernet/802.3 Management and Performance, Second Edition*, and *The X Window System* by Scheifler and Gettys, is an

imprint of Butterworth-Heinemann, a publisher for professionals in the technical and medical areas. Other imprints of Butterworth-Heinemann include Focal Press and Butterworth Architecture.

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New 1996 catalog

RNJ Electronics Inc. is now offering their free new 1996 catalog containing 136 pages of test equipment, video and audio accessories, TV, VCR and microwave oven parts, IC's, tools and soldering equipment. It also contains CCTV equipment as well as background sound and home theater equipment.



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Electronics books catalog

Butterworth-Heinemann, a publisher of books for electronics professionals, has announced the availability of its 1996 Electronics Books Catalog.

The free 24-page catalog contains descriptions for over 130 books, including 52 new titles. Books are listed in the categories of circuit design, test and measurement, packaging and production, computer electronics, communications, electronic business, and security.

Included among the new titles introduced are such books as *Inside OrCad* by Chris Schroeder, *Inside PC Card* by Faisal Haque, *The Art and Science of Analog Circuit Design* by Jim Williams, and two new titles from John Lenk: *Simplified De-*

sign of IC Amplifiers and Simplified Design of Micropower and Battery Circuits.

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Book catalog

Digital Press, a publisher of books for computing professionals, has announced the availability of its 1996 Digital Press Books Catalog.

The free 24-page catalog contains descriptions for over 120 books, including 45 new titles not previously listed. It announces the publication of such new books as *The SQL Server Handbook: A Guide to Microsoft Database Computing*; *Advanced Ethernet/802.3 Management and Performance, Second Edition*; and *Software Implementation Techniques: Writing Software in OpenVMS, UNIX, OS/2 and Windows NT, Second Edition*.

Also included is the announcement of the publication this spring of the new revised edition of *The X Window System* by Scheifler and Gettys. These comprehensive new volumes cover the libraries, standards, and protocols of X Version 11, Release 6.1.

Circle (95) on Reply Card

Electronics book publisher

Butterworth-Heinemann, a publisher of books for electronics professionals, has announced the establishment of a new home page on the World Wide Web.

The site—located at <http://www.bh.com/bh/>—contains descriptions for over 130 titles. Individual book pages include title, detailed description, contents, author, and bibliographic information. The site also includes information on how to order books or free catalogs, as well as links to affiliated web sites.

An e-mail mailing list is available for readers to learn about new releases, special offers and other news from Butterworth-Heinemann Electronics. Anyone interested in being added to the e-mail mailing list can e-mail a request to majordomo@world.std.com; include in the message body (not in subject line) subscribe bh-electronics.

Butterworth-Heinemann publishes many books for electronics professionals and students, including circuit design books from John Lenk and other well-known authors. Other imprints of Butterworth-Heinemann, a leading publisher in the technical and medical fields, include Digital Press, Focal Press and Butterworth Architecture.

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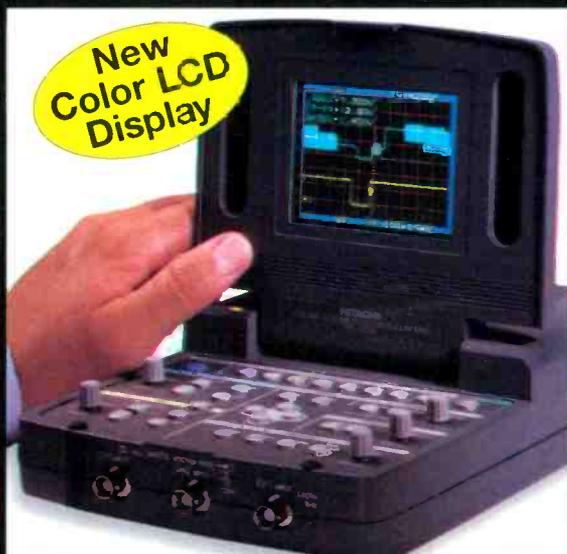


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HITACHI

Servicing the vertical circuits in the Sharp 19SB60R

By Homer L. Davidson

The vertical circuits in a TV set are much easier to service than the horizontal circuits. Absence of vertical sweep results in a horizontal white line on the screen. Insufficient sweep causes a black area at the top or bottom of the picture, or both.

Intermittent vertical sweep circuits may be more difficult to service. If two or more components in the vertical circuits are defective, this can complicate matters, and the problem may be very difficult to locate. This can take up a great deal of valuable service time.

Most problems in the vertical circuits are the result of a leaky vertical output transistor or IC. The vertical output of earlier model sets consisted of two vertical output transistors, while in today's chassis, a vertical output IC takes their place (Figure 1). If an output transistor is open or leaky, the symptom may be insufficient vertical sweep, intermittent raster, or no sweep, resulting in a horizontal white line. The same symptoms can occur if the vertical output IC is defective.

Components connected to the vertical circuits can break down and cause intermittent vertical sweep, insufficient sweep, or absence of vertical sweep. A 100 μ F capacitor in the vertical output circuits has been known to cause intermittent or no vertical sweep. Incorrect voltage from the low voltage power sources feeding both the vertical deflection IC and output circuits can result in insufficient vertical sweep or absence of vertical sweep. A leaky vertical output IC can destroy components in the low voltage power supply.

By observing the vertical output waveforms of each IC, you can quickly determine if the IC or other parts in that circuit are defective.

In the Sharp 19SB60R, IC201 contains the VIF/SIF/Sync/Chroma/vertical and horizontal deflection circuits. Check for a drive waveform at pin 3 of IC201. This vertical drive waveform should be around 4V in this portable set. The vertical out-

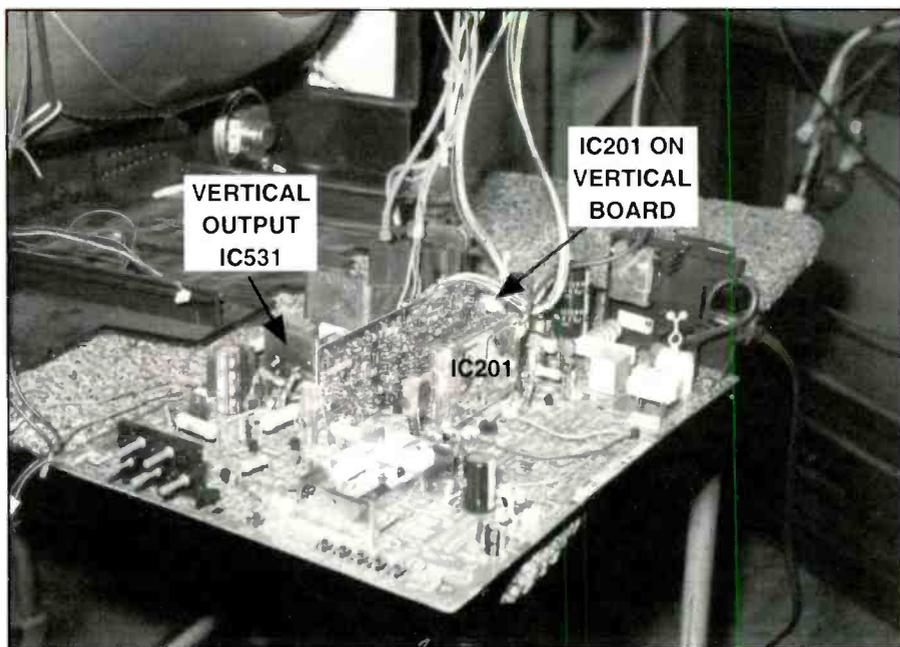


Figure 1. This photograph shows the various vertical semiconductors located on the Sharp 19SB60R chassis.

put yoke drive pulse should have an amplitude of close to 50V.

Servicing vertical circuits without a schematic

When a schematic is not available for a certain TV chassis, start your diagnosis by locating the vertical components on the TV chassis. Most vertical output transistors and vertical output ICs are located on separate heat sinks. In the latest TV chassis, the vertical and horizontal deflection circuits are located in one large IC near the vertical output components (Figure 2). In fact, in this Sharp chassis there are two large IC's, IC1001 and IC201. IC1001 contains the system control CPU circuits while IC201 covers most of the working TV circuits.

IC1001 is located on the main chassis inside a shielded area. IC201 is on a vertical mounting board in the middle of the chassis. If you don't know which IC relates to the vertical deflection circuits, note the Sharp part numbers stamped on top of the ICs and look them up in the universal replacement manual.

The part number of IC201 (VHIT-DA8305A-1) or TDA8305 is not even listed in Howard Sams Photofacts. Look up the part number in the universal manual for the deflection IC. This will provide you with the supply voltage and pin outlines. Once you know the pinout information for the IC, you will know which are the vertical sweep pins, and you'll be able to observe the vertical and horizontal sweep waveforms. Of course, without documentation you won't know what the exact amplitude or voltage of the drive waveform should be, but this waveform varies from 1.5V to 5V in most TV chassis of recent manufacture (Figure 3).

Locate the vertical output power IC. It's on a separate heat sink. If in doubt, find the part number stamped on the IC and look up the information listed for the universal replacement in one of the semiconductor manuals. This will provide you with information such as the specified supply voltage and pin assignments. Another method is to check for the highest dc voltage found on any pin of the IC. Usually, the vertical output IC operates from

Davidson is a TV servicing consultant for ES&T.

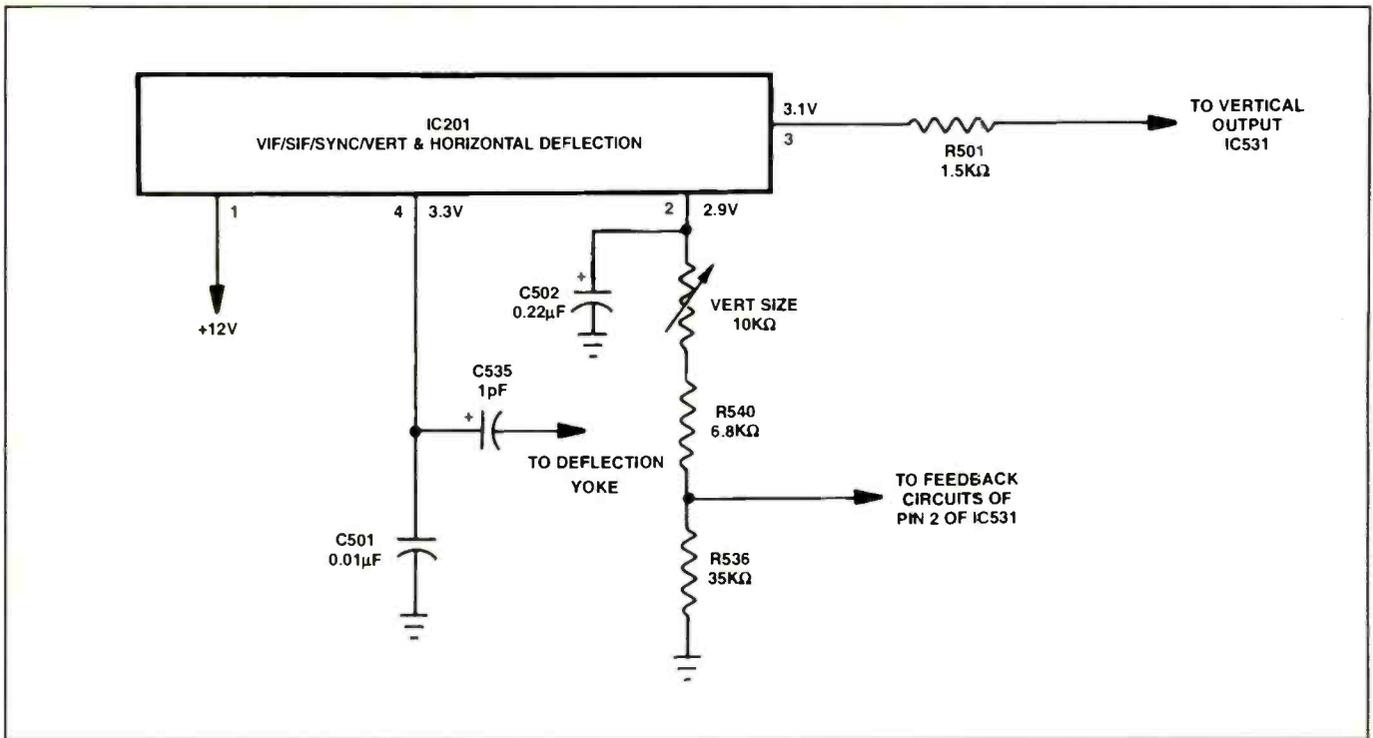


Figure 2. The vertical and horizontal deflection circuits of the Sharp 19SB60R are in IC201.

a source voltage of 20V to 35V. With the exception of the horizontal output transistor, the vertical circuits have a higher voltage source than any other IC component. IC531 is located on a grounded heat sink at one side of the Sharp TV chassis.

Vertical power supply circuits

In modern TV sets, the vertical voltage supply source for the deflection and output ICs are taken from the flyback derived-voltage circuits. Often the higher output voltage for IC531 is taken from a separate winding with a single diode rectifier. The deflection IC voltage source is taken from a voltage regulator circuit (Figure 4). Here we find a transistor and zener diode regulation circuit.

In the Sharp 19SB60R chassis, the 24V source for the vertical output IC is fed from D532 and filtered with C536. The 12V source feeding the deflection IC201 is supplied from voltage regulator transistor Q704 and zener diodes D723 and D722. A shorted or leaky zener diode can lower the deflection voltage source, while an open regulator transistor results in zero output voltage. A leaky Q704 may lower or raise the deflection voltage source.

A leaky diode D532 in the 24V source results in lower supply voltage at the output IC531. Often, when D532 becomes shorted, R541 (1Ω) may open up and be-

come warm, resulting in chassis shut-down. If capacitor C536 opens or becomes reduced in capacitance the 24V source will become lower in voltage. A leaky C536 will also lower the dc source.

Horizontal white line

Just about any component within the vertical circuits can cause absence of ver-

tical sweep. The most troublesome components in the vertical circuits are the vertical output IC, transistors, diodes, electrolytic capacitors, and incorrect source voltages. In this Sharp chassis, these components consist of IC531, C534, D531 and the 24V source. If the symptom is that the picture has been reduced to a horizontal white line, the cause may be an

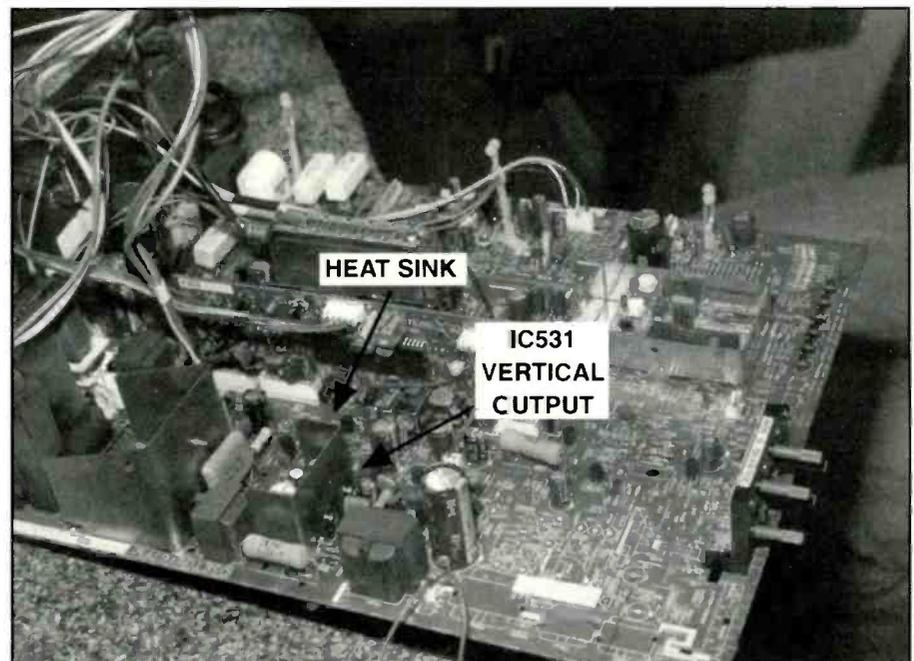


Figure 3. The vertical output IC, IC531, is located on a separate heat sink.

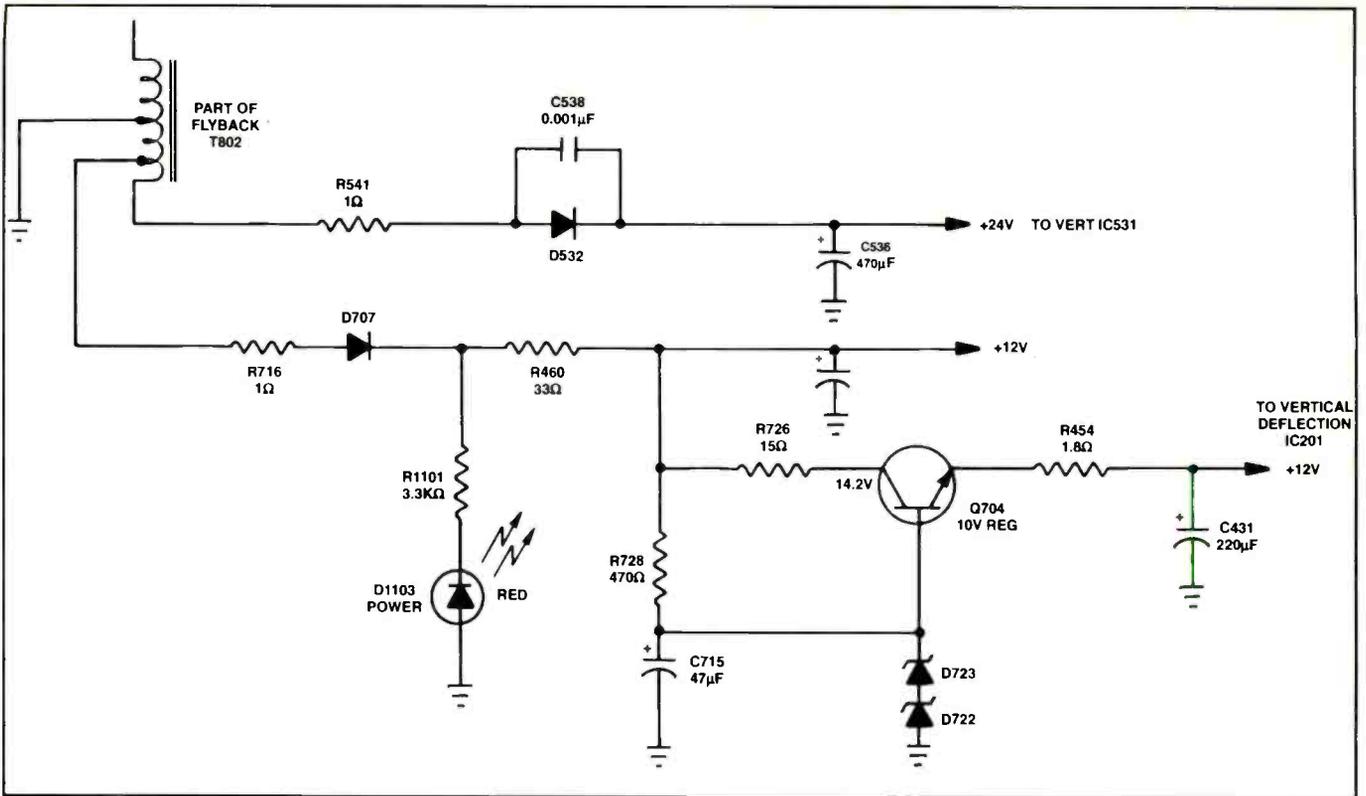


Figure 4. The 12V regulated source supplies voltage to IC201 deflection circuits, and a 24V source is fed to the vertical output IC, IC531.

open yoke winding, a faulty electrolytic coupling capacitor, or a faulty return resistor.

Observation of waveforms and voltage measurements will help to locate the de-

fective component or components in the vertical circuits. Observation of the waveform at the vertical output IC can determine if the deflection IC and out-

put circuits are normal at this point in the circuit, suspect the yoke, return and feedback circuits. Notice if the vertical input waveform at the output of the IC is normal with the unstable pulse feeding the ver-

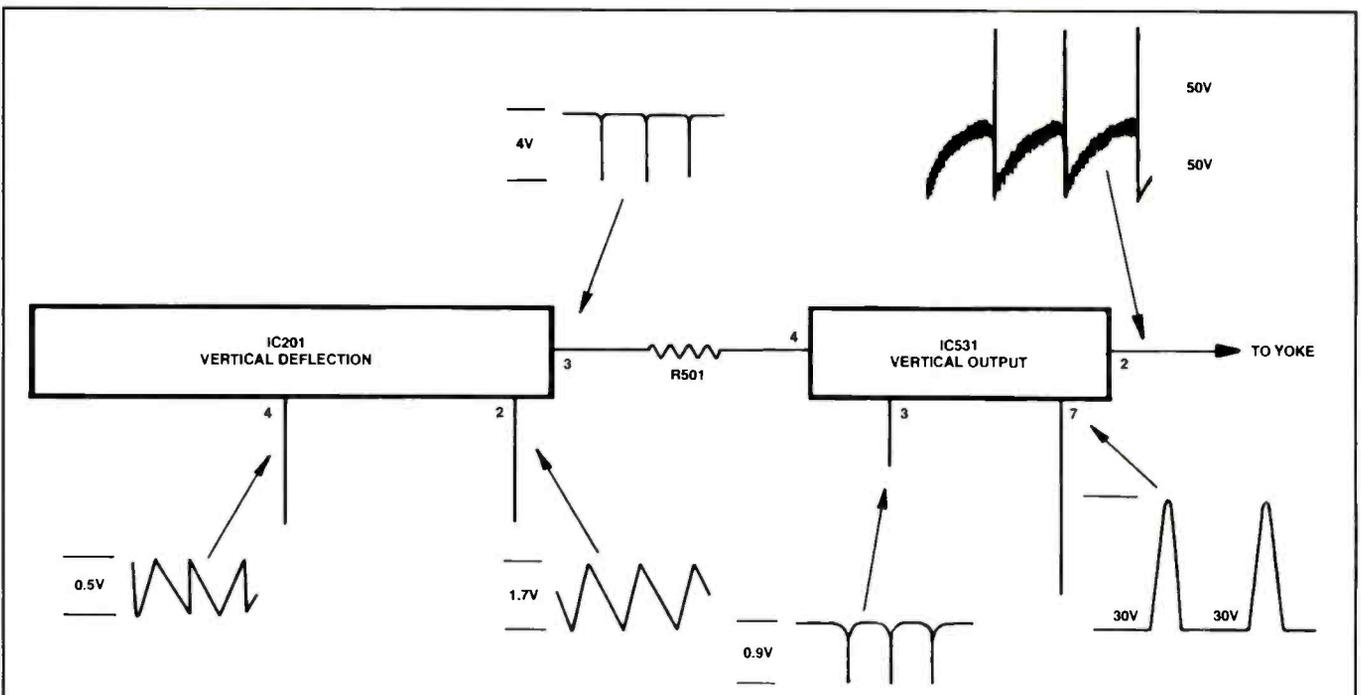


Figure 5. Observe waveforms on IC201 and IC531 to determine what stage the defective component is located in.

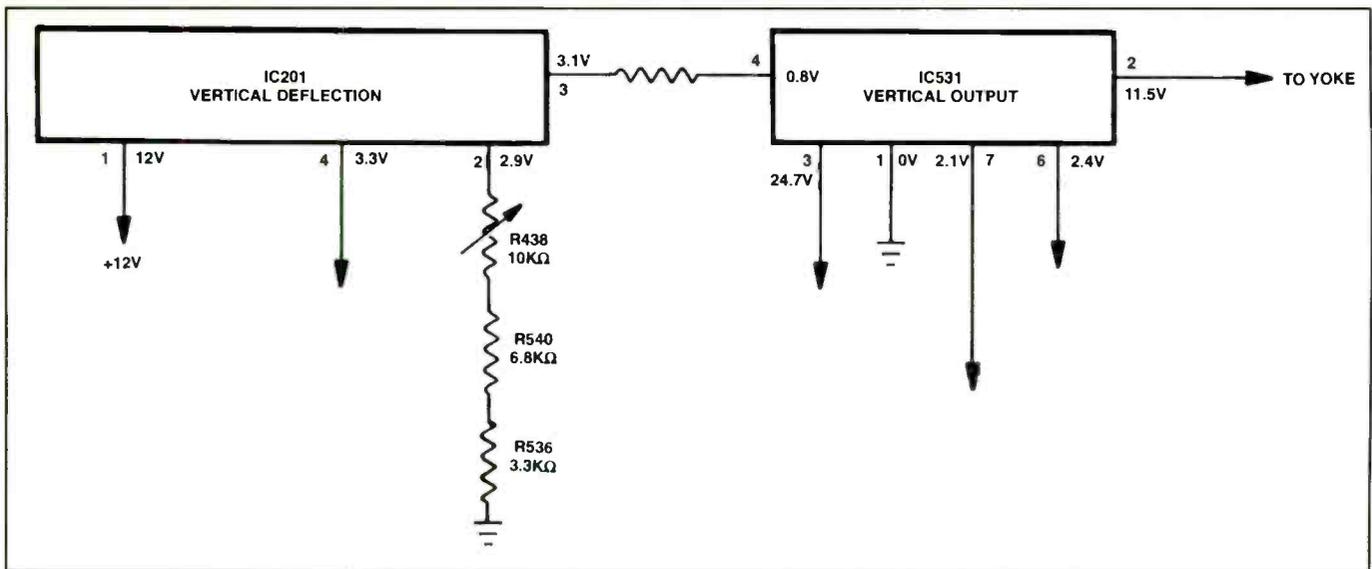


Figure 6. Measure voltage on IC201 and IC531 to determine if either IC is leaky.

tical yoke winding. Determine if the input and output waveforms have the required amplitude and voltage. If not, suspect the deflection circuits.

No vertical sweep - IC201

Use the oscilloscope to observe the vertical deflection waveform at pin 3 of IC201. The amplitude of this drive wave-

form should be around 4V (Figure 5). If this waveform is not present, suspect IC201 and corresponding circuits. Check the sawtooth feedback waveform at pins 2 and 4 of IC201. Now measure the supply voltage at pin 1. It should be +12V.

If this voltage is incorrect, suspect IC201 or a component in the low voltage supply source: IC201 can become leaky

and cause a low voltage at pin 1. To further narrow down the possibilities, disconnect pin 1 from the board by using desoldering braid or a solder sucker. Now measure the voltage at the board connector to which pin 1 of the IC was connected. If the voltage returns to normal, suspect IC201. Measure the resistance from pin 1 to common ground. A low measure-

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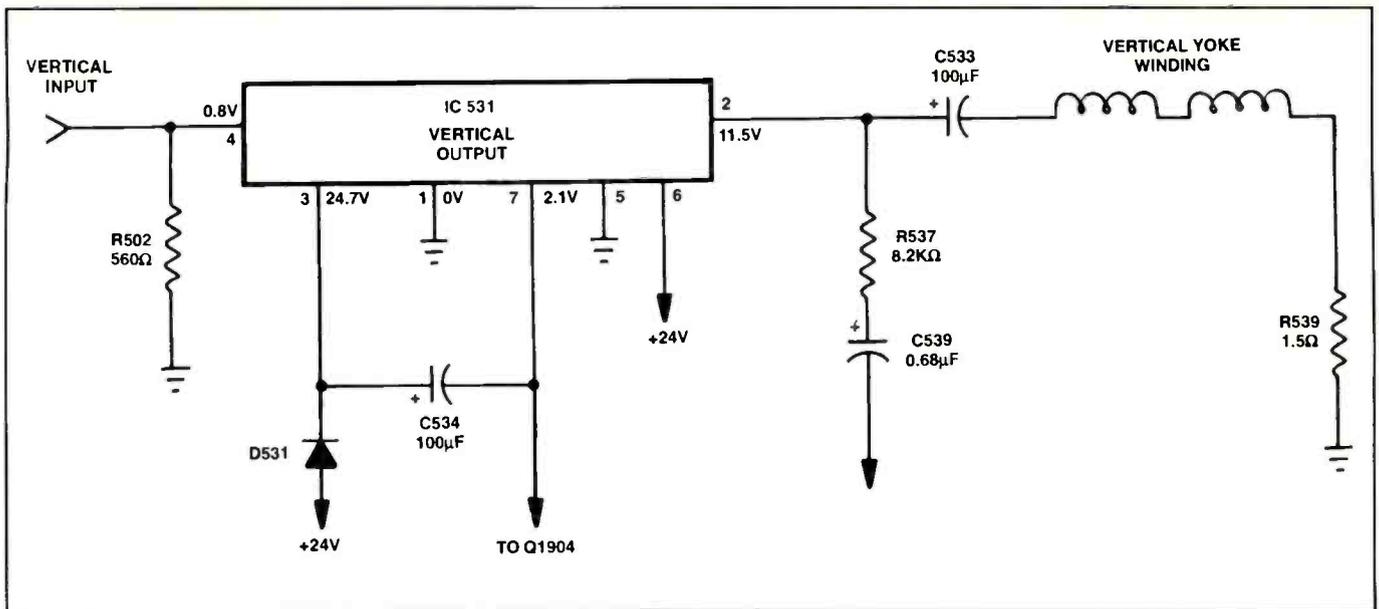


Figure 7. Leaky IC531 can cause improper or no vertical sweep and a low 24V power source.

ment (less than 1KΩ), may indicate a leaky deflection IC.

If IC201 is highly leaky, the heavy leakage currents may have caused components in the 12V source to be damaged. Check R434 (1.8Ω) to see if it is burned or open. Test Q704 for leakage between emitter and collector terminal. Check diodes D722 and D723 for leakage.

Horizontal white line - IC531

If the vertical drive waveform is normal, suspect a defective vertical output

IC, IC531. A leaky IC531 can cause the output of the low voltage power supply to be abnormally low, and possibly cause damage to the low voltage power supply. Check the vertical output waveform at pin 2. Measure the supply voltage at pin 6 with around 24V and boosted voltage input at pin 3 (Figure 6).

Scope the waveforms at pins 3 and 7. An incorrect waveform at pin 7 may indicate problems in the vertical sync circuits. Check all components tied to the vertical output IC terminals before replacing the

suspected IC. Replace C534 (100μF) since many of these vertical capacitors have caused many sweep problems in other vertical circuits. With one lead of D531 unsoldered to isolate it from the circuit, check it with the diode function of the DMM for leakage. If all other components and voltage sources are normal, replace IC 531.

A white line or improper vertical sweep

Low voltage, or zero voltage from the low voltage power supplies, which pro-

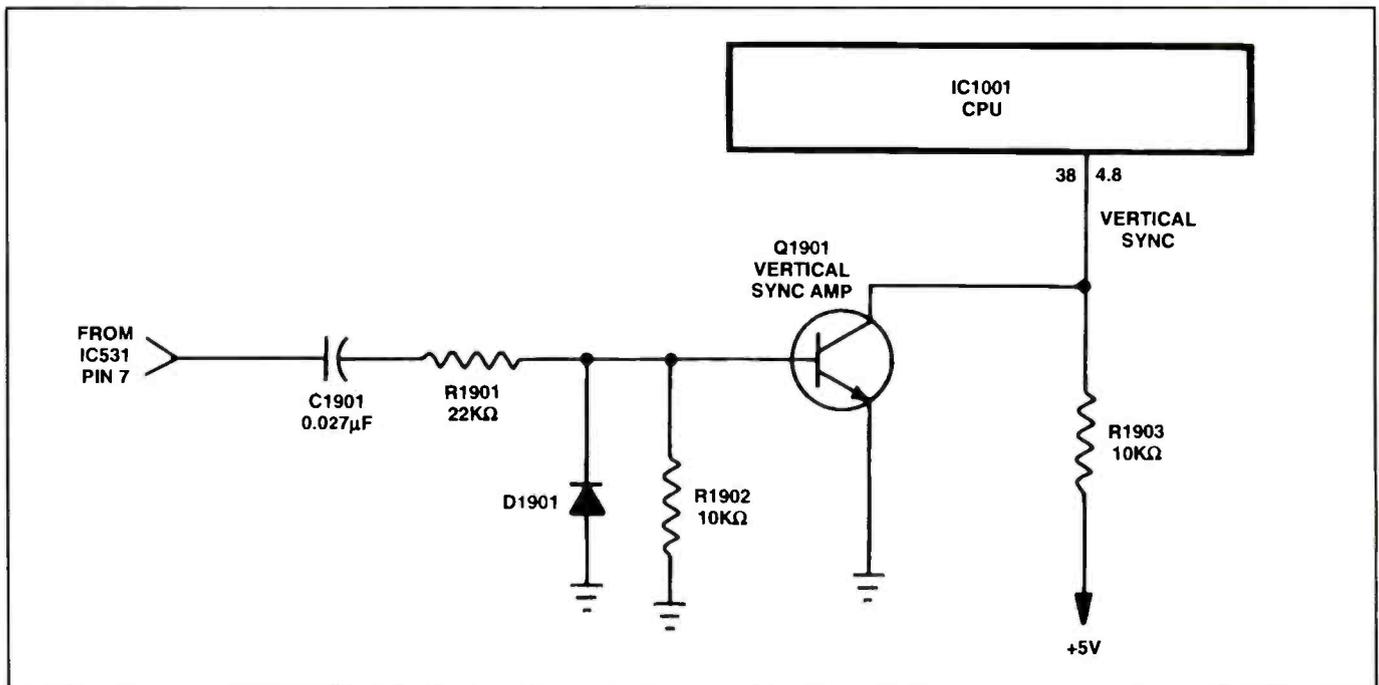


Figure 8. Intermittent vertical sync amplifier (Q1901) terminals produced the intermittent vertical symptom.

vide 12V to the deflection IC201 and 24V to the vertical output IC, IC531, can cause problems that result in the absence of vertical sweep. If either voltage is missing, or if both voltages are missing, when there is only a horizontal white line on the screen, go directly to the scan-derived voltage sources. Usually when both source voltages are missing the chassis is completely shut down.

A low 24V source voltage may result from a burned or leaky D532 diode or C536 (47 μ F) capacitor. If the vertical output IC, IC531, is leaky, it may cause damage to the diode and isolation resistor. When D532 becomes leaky, R541 (1 Ω) will become open. An increase in resistance of R541 may produce a lower voltage to the vertical output IC even if the diode is normal (Figure 7).

Insufficient vertical sweep

I had taken in a Sharp 19SB60R for service. The problem was intermittent absence of vertical sweep. I did not have the correct service literature for this set, so I ordered it from the manufacturer. While waiting for the schematic to arrive, I began to observe waveforms on pins 2 and 4 of IC531. When the vertical sweep failed, the vertical output waveform was very weak indicating a possible defective output IC. Under these conditions, the picture on the screen was less than 1 inch high. At other times only a white horizon-

tal line appeared. The dc voltages at pins 3 and 6 were fairly normal compared to other vertical output circuits.

In my experience, a defective boost capacitor was the cause of this problem in several sets I had serviced, so I replaced capacitor C534 (100 μ F) in this set. The problem remained. I checked the waveforms again, but they looked normal. I ordered a replacement for IC531. The new part arrived the same day as the schematic.

With a new IC531 installed, the set played for several hours. Unfortunately, after that period of time the picture reduced to a horizontal line. I observed waveforms and measured voltages once again and compared them to the values specified on the new schematic. The only difference between specified and measured values was at pin 7. The amplitude of the 30V waveform was quite low. I resoldered all pins of the new output IC but this did not improve the situation.

According to the schematic, pin 7 of IC351 is connected to the vertical sync circuits. The vertical sync circuits were traced to Q1901, which is located next to Q704, a 12V regulator mounted on the main chassis. When I touched Q1901 with the meter probes the picture became normal. The vertical sync pulse from pin 36 of IC1001 is amplified by this vertical amp (Figure 8). Soldering the terminal connections of Q1901 solved the intermittent vertical raster. Other possible

causes of improper vertical linearity and foldover problems are electrolytic capacitors C533, C541, C539, C543 and feedback circuits.

In another chassis, the intermittent vertical sweep was repaired by soldering the contacts of the vertical PCB on which IC201 is mounted. This board is mounted in the center of the chassis. Instead of taking time to trace out the possible defective connections, I soldered all connections on this vertical board to the pc wiring of the main chassis. These vertical problems were finally repaired only after securing the correct circuit diagram.

Parts replacement

IC201 (TDA8305) may not be listed in the universal semiconductor replacement manual, while IC531 can be replaced with a ECG1676 or RCA SK7653 replacement. Both IC's can be obtained from the manufacturers parts depot. If either IC cannot be found locally, they can be obtained from a mail order firm.

Conclusion

Most vertical circuits can be serviced without a schematic by comparing waveforms and voltages at the various vertical circuits and components against those observed in a known chassis. Observation of critical waveforms and voltage measurements can help to quickly locate the defective vertical component. ■

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Motors in consumer electronics

By The ES&T Staff

The expansion of consumer electronics from the traditional products such as TV and audio to include VCRs, camcorders, CD players, personal computers and more has meant a huge increase in the number and types of motors that a service technician will encounter, and may well be required to diagnose and replace.

For example, a technician servicing a VCR might encounter problems with a cassette loading motor, a head drum motor, a capstan motor, or any of the drive circuits associated with those motors. When it comes to camcorders, there are still other motors: an iris motor, a zoom motor and an autofocus motor.

Complex motors/drive circuits

There was a time when most motors and drive circuits were relatively simple. The demanding requirements of today's complex electronics products, such as VCRs, require motors that can be con-

trolled precisely in terms of both their speed and their absolute position (phase).

All such motor/drive systems require some type of feedback control system that compares the actual speed and position of the motor with the desired speed and position so that corrections may be made continuously to keep the motor precisely controlled. This is necessary in order to keep the picture information being generated during playback, or being recorded during the record process, precisely synchronized. Otherwise, of course, the picture will be unviewable.

Troubleshooting motors

Unfortunately there isn't room in this issue to look at the many types of motors and drive circuits in the consumer electronics products. Plans are to publish a more in-depth article in a future issue. However, there are some straightforward steps that a technician can take to get

some idea of the condition of a motor.

For starters, gently turning the motor by hand with power to the unit turned off will tell you if the motor is free to run, or if a bearing has seized up. If the motor moves but its movement seems loose, the problem may be a worn bearing.

Electrical tests of the motor

No matter how complicated the motor, or its drive circuitry may be, all motors still have windings. If a motor refuses to run, consult the service manual to see how the motor is constructed. Ohmmeter readings of the motor's coils will reveal if any are open circuited. An open circuit means that the motor is bad and must be replaced.

Troubleshooting the drive circuits

Some VCR and camcorder motor drive circuits are extremely complex. In some products, in order to eliminate the problems inherent with motor brushes, manu-

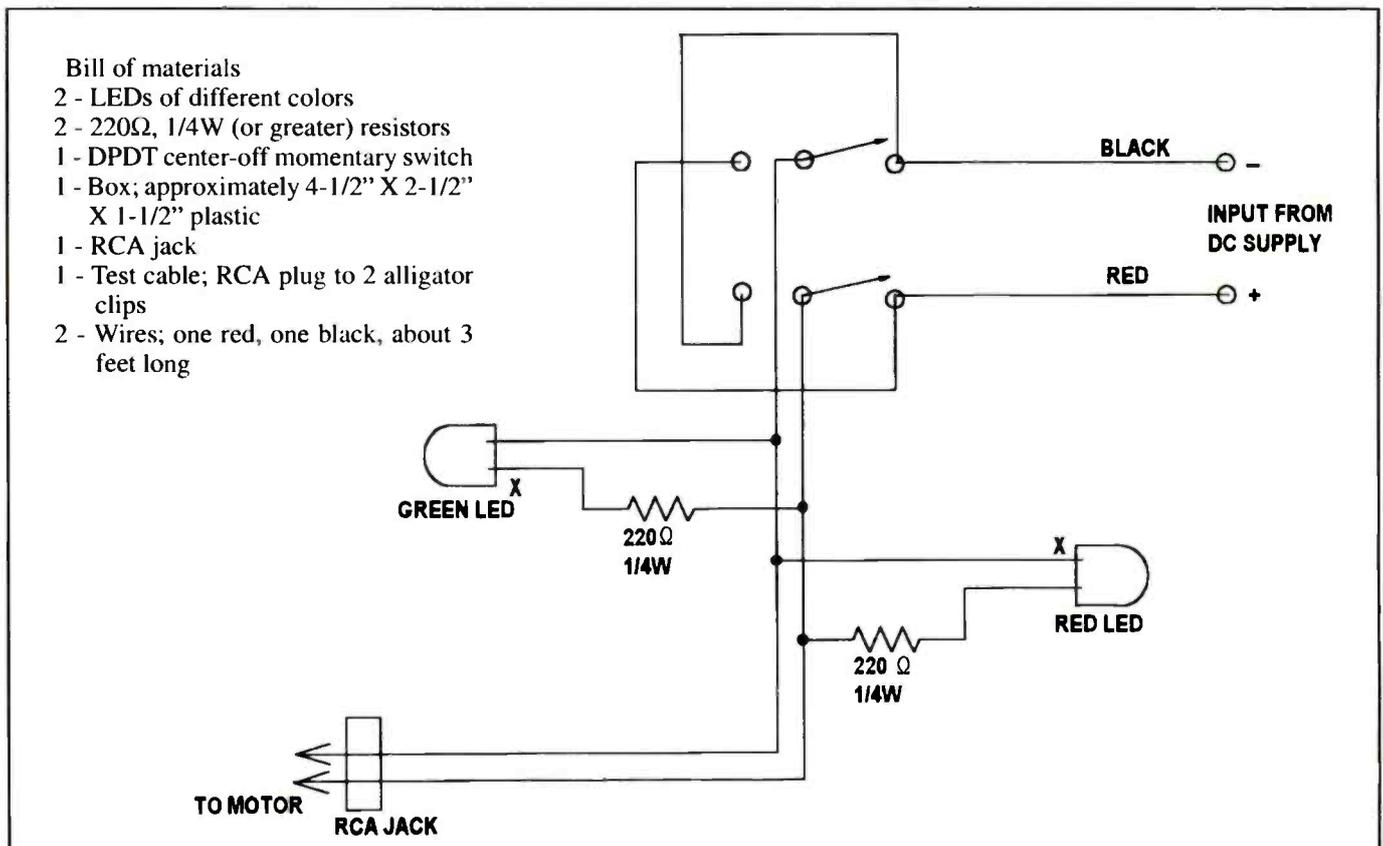


Figure 1. Use this easy to build circuit to diagnose the condition of dc motors.

A handy dc motor control box

By Hugh Thornley

In our service center we found a need for a device that we could use to run dc motors in different units we were repairing. It had to be easy and quick to build and made of parts we had on hand or at an electronics hobby shop, such as Radio Shack. This unit met all the requirements (Figure 1).

Use any small box. Mount a small DPDT momentary center-off switch on top of the box. Mount two different color LEDs, one on either side of the switch. Run one red and one black wire from the box to a dc regulated adjustable dc power supply. Use alligator clips or banana plugs or whatever works best for your supply. A deluxe model may be built with a variable regulated dc supply within the box. We put an RCA-type jack on one end so we could use existing test cable with an RCA plug on one end and alligator clips on the other end. Cables can be any length to suit what is needed.

To use the box, set the dc voltage low to start if you don't know the specified operating voltage for the unit. If you have the service literature for the product, set the voltage specified for the motor. Momentarily move the switch to the closed position and note motor operation or absence of operation. Note the reading of the current meter on the supply. If current is excessive, the motor may be shorted or jammed.

This device is useful for troubleshooting dc motors on VCR decks and cassette loading units, CD players, camcorders, or any other consumer electronics product that uses a dc motor.

Thornley is an independent consumer electronics technician.

facturers have introduced three-phase synchronous motors. To drive such motors requires that the circuits in the product generate a three-phase electrical motor drive signal. The circuit converts a dc voltage into three separate, but related ac signals that are 120 degrees out of phase

with each other. The effect of these three separate phase signals applied to the motor's windings is a rotating magnetic field that pulls the rotor around smoothly.

If one of these motors is not operating, or operating incorrectly, one diagnostic step is to observe the drive waveforms generated by the motor drive IC. If the motor windings show continuity, and these waveforms are not as specified by

the manufacturer's service literature, it may be necessary to replace this IC.

A handy motor control box

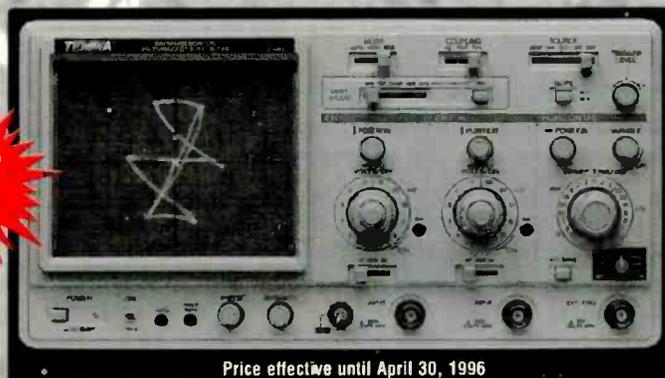
If you encounter a dc motor that seems bad, an operational check with a known-good voltage supply may help to determine the motor's condition. See the accompanying box for one reader's advice on checking out dc motors. ■

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March 1996 *Electronic Servicing & Technology* 15

A technician's glossary

The internet

By The ES&T Staff

Every profession has its own language. Outsiders sometimes feel that it's a way for insiders to keep the club away from them. There may be a measure of truth to that, but for the most part every profession simply deals with a lot of subject matter that those outside the profession have no interest in. Dealing with that subject matter requires a vocabulary of specialized words to describe it.

The vocabulary that a consumer electronics servicing technician requires is very specialized, very extensive, and becoming larger every day. As the makeup of consumer electronics changes and grows, the sheer number of words necessary to understand it changes and grows to keep pace. Moreover, as the tools and test equipment and other facilities required to perform consumer electronics service evolve and grow, the vocabulary required to describe that area also changes and grows accordingly.

For example, it's only in the relatively recent past that satellite TV, VCRs, projection TV, compact disk, and personal computers were added to the definition of consumer electronics. Technicians have had to learn a host of terms to be able to understand and describe these newcomers. Words like DOS and Windows, hard and floppy disks, the internet, came along with the computer. Terms such as head drum, VHS, head protrusion, and eye pattern were introduced along with the VCR.

For that reason, once a year, and sometimes more often, **ES&T** publishes a technician's glossary to try to provide a useful definition of some of the newer terms that might not be well understood.

These days, the internet is beginning to intrude into the lives of technicians, whether they like it or not. Technicians who service personal computers will invariably find their customers talking about their experiences on the 'net'. Technicians who wish to communicate via electronic mail, or use the internet for informational purposes will find themselves inundated with internet related terms. The terms that follow are some that we thought might be useful.

E-mail: Electronic mail. This feature of the internet and companies that provide access to it allows users to send mail electronically to any other internet user.

E-mail address: This is the series of letters and other characters that provide a unique address for internet users. As an example, the e-mail address for the editor of **ES&T** is cpersedit@aol.com. In this case, cpersedit is the name chosen by the editor (many other possible names were taken) the @ symbol means "at," and the aol.com means that the editor is being served by America OnLine (AOL), which is a commercial (.com) provider.

FTP: File transfer protocol. This is a method of transferring files between computers that are connected to the internet. Because this protocol is independent of the type of computer, or

the type of operating system, any two computers can interchange files using this protocol, even if they are very dissimilar.

Home page: This is a presence on the internet that is available to anyone who can afford to contract with an internet provider for space on their computer, and who either has the skills to create such a home page, or who contracts with a company that provides the service of creating home pages. Actually, the computer space provided by the provider is surprisingly inexpensive. The cost of designing a home page may be very expensive. Many forward looking companies have home pages today, including many consumer electronics manufacturers and even a few consumer electronic service centers have home pages as an additional place where their potential customers can find information about the services they provide.

HTML: Hypertext markup language. This is the computer software language that is used to create hypertext.

Hypertext: This is not limited to the internet, but is found on the internet, as well as any computer equipped with Windows, or other similar software. It's a form of text presented on the computer screen in which certain key words are highlighted. By moving the cursor to the highlighted words and clicking on a mouse button, the computer user can move to a range of subjects described by that key word. Each time the user clicks on a hypertext link word, he is presented with a new group of hypertext key words, usually including a link word that will get him back to the page he just left.

Internet: a network of computer networks throughout the world through which an individual who owns a computer and a modem, and has some form of access, can communicate and/or gather information on a virtually limitless range of subjects, anywhere in the world.

Service provider: Any company that has a large computer connected to the internet and offers commercially available connection via that computer to the internet. Many of these services are quite inexpensive and offer unlimited access to the internet for a flat monthly fee. Some of these providers also offer space on their computers where their clients may establish a home page.

We feel that this is such an important subject area that we will be bringing you more definitions and more information on the internet in the future. To give you some idea of how pervasive this method of communication is becoming, take a look at the "Literature" section in this issue. In that section we have listed home page information for two technical book publishers and a company that offers computer monitor service tips. That company now also has a home page that technicians can access in order to gather information and exchange service tips with other technicians. ■

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1996 Buyer's Guide

When it comes to finding the store that sells the products that they need, consumers have no problem. The newspapers feature ads every day that name the stores, describe the products they sell and detail what's on sale or being featured. The Yellow Pages also provide listings that let the consumer know where to go to buy the groceries, pick up some socks or a shirt and who's got gas and tires for the car.

Unfortunately, when a service center is looking for a replacement transistor for a TV that's sitting on the shelf, or a head drum for a VCR, or a new hard drive for a computer that a customer brought in for service, the local papers and yellow pages don't provide much help.

Of course, most service centers have a local distributor to turn to for most replacement parts, and to buy the badly-needed DMM or oscilloscope, but in many cases the distributor's stock is not comprehensive, and the service center has to look elsewhere to fulfill its needs.

Moreover, what happens when a service center decides to expand its business into a new area: for example a TV/VCR service center that decides to begin servicing microwave ovens, or compact disk players, or personal computers and peripherals? Where do they find listings that will tell them where they might find magnetrons, or replacement memory chips, or what companies provide such services as hard disk refurbishment or data recovery?

The ES&T Buyers' Guide

That's where the **ES&T Buyers' Guide** comes in. By maintaining constant contact with owners, service managers and technicians in consumer electronics service centers, we remain aware of the concerns of the service community: what kinds of products they're servicing and what parts seem to be hard to obtain. We also attend shows like the Electronic Distribution Show and Service Support Management, and additionally remain in frequent contact with the manufacturers, distributors and third and fourth party service providers in consumer electronics. By doing so, we're able to identify and contact the companies that manufacture and/or distribute the test equipment, replacement parts, services and information needed by service centers.

Once a year we send each of these companies a questionnaire that asks for their current address, telephone numbers, toll-free telephone numbers and fax numbers. In addition the questionnaire contains a list of products and services: test equipment, test equipment accessories, replacement parts and services; over one hundred separate items. We ask the recipients of the questionnaires to check the items that they offer.

Once all of this information is in, it is compiled by computer and the result is this annual Buyers' Guide. This year the listings contain the names, addresses and telephone numbers of over 700 manufacturers, distributors and service providers of interest to consumer electronics service centers, and over 6,000 individual listings, sorted by product, and by name of the companies that manufacture or distribute that product.

Save this issue. We get long-distance calls every day from readers who need an address. One look in the Buyers' Guide is usually all it takes to help them. If the caller had looked for themselves, they could have saved time and a toll call.

Using the Buyers' Guide

If you're in the market for a new DMM this year, you would probably know the names of some of the major DMM manufacturers, and you might have some of those companies' addresses somewhere in your files. Or maybe you would like to learn how to service computer disk drives, or compact disc players, but you have no idea who offers a course on that subject. If you figure the EIA is your source, you still have to figure out where to find that eternally misplaced address.

That's why we put together this Buyers' Guide—all the information you need is gathered together in one place. No need to search through stacks of papers. Here's your one-source alternative.

If you want a DMM turn to the Product Directory and look up DMMs. Every company that checked off DMMs on our questionnaire

will be listed there, and every company's address will be listed in the Company Address Directory.

We've broken down this information into five categories:

- Product Directory..... page 19.
- Replacement Parts Components Directory page 48.
- Association/Educational Sources Directory page 54.
- Services Directory page 57.
- Company Address Directory page 58.

Finding a product or part

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.

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 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 more than 700 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 service management software systems that can help you run your business.

Keep in touch

Although the annual Buyers' Guide is a year in the making, we realize it can't be absolutely complete—companies are always starting up, going out of business, or moving. And technology keeps adding new products to track. If you know of a company that you think other readers should be aware of, or if you would like us to extend our coverage to new product areas, drop us a line.

If you become aware that a company listed has changed its address or telephone number, please let us know. Of course, if you find a mistake, please contact us immediately. We'll publish a correction in the first available issue that we can get it into. ■

See Adv. Page

See Adv. Page

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See Adv. Page

Philips ECG
Print Products International*D
RNJ Electronics Inc.*D52
Sencore ElectronicsIBC
Sony Service Co.
A.G. Tannenbaum*D
Techni-Tool, Inc.*D
Time Motion Tools*D
Tritronics, Inc.*D
Union Electronics*D
Wholesale Electronics Inc.*D

W.S. Jenks & Son*D
Joseph Electronics*D
Kasco Distributing*D
MAI/Prime Parts*D
Marshall Industries*D
M-Test Equipment
Omega Engineering, Inc.
Omnitron Electronics*D
Philips Consumer Electronics*M/D
Print Products International*D
Racal Instruments Inc.
RNJ Electronics Inc.*D52
RS Electronics*D
Schlumberger Technologies
Sencore ElectronicsIBC
Simpson Electronic Company
Sony Service Co.
Specialized Prods Company*D
Techni-Tool, Inc.*D
Tektronix, Inc.
Tektronix Test & Meas. Group
Telogy*D
Time Motion Tools*D
Trompeter Electronics
Tucker Electronics Co.
Union Electronics*D

Print Products International*D
RAG Electronics Inc.*D
Schlumberger Technologies
Herman H. Sticht Co., Inc.*D
A.G. Tannenbaum*D
Techni-Tool, Inc.*D
Tektronix Test & Meas. Group
Telogy*D
Time Motion Tools*D
Trompeter Electronics
Tucker Electronics Co.
Union Electronics*D

Simpson Electronic Company
Specialized Prods Company*D
Herman H. Sticht Co., Inc.*D
Sun Equipment Corporation
Tandy National Parts*D
A.G. Tannenbaum*D
Techni-Tool, Inc.*D
Tektronix Test & Meas. Group
Telogy*D
Time Motion Tools*D
Tucker Electronics Co.
Union Electronics*D
Vector-VID Inc.
Wavetek Corporation3
Wholesale Electronics Inc.*D

CURVE TRACERS

Accutest Instruments, Inc.*D
Allied Electronics, Inc.*D
Vance Baldwin Inc.*D
Bursma Electronic Distrib.*D
Computer Component Source*D
Computer Svcs of America*D
The Current Source*D
East Coast Transistor*D
Eiger Electronics*D
Electronics Warehouse Corp.*D
Fotronic Corporation*D
Hameg Instruments, Inc.
IET Labs, Inc.

RS Electronics*D
Schlumberger Technologies
Sencore ElectronicsIBC
Simpson Electronic Company
Sony Service Co.
Specialized Prods Company*D
Techni-Tool, Inc.*D
Tektronix, Inc.
Tektronix Test & Meas. Group
Telogy*D
Time Motion Tools*D
Trompeter Electronics
Tucker Electronics Co.
Union Electronics*D
Wavetek Corporation3
Wholesale Electronics Inc.*D

FREQUENCY COUNTERS

Accutest Instruments, Inc.*D
Alfa Electronics*D
Allied Electronics, Inc.*D
American Reliance
Arrow Electronics
Atrix, Inc.*D
AT&T Capital Corporation*D
Vance Baldwin Inc.*D
B-B&W Electronics*D
Bel Merit Corporation
B&K Precision5
Brunelle Instruments, Inc.
Bursma Electronic Distrib.*D
C&S Sales*D
Computer Svcs of America*D
Consolidated Electronics, Inc.*D
Contact East*D
The Current Source*D
Daetron

FUNCTION GENERATORS

Accutest Instruments, Inc.*D
Alfa Electronics*D
Allied Electronics, Inc.*D
American Reliance
Analogic Corp.
Arrow Electronics
AT&T Capital Corporation*D
Vance Baldwin Inc.*D
B-B&W Electronics*D
Bel Merit Corporation
B&K Precision5
Brunelle Instruments, Inc.
Bursma Electronic Distrib.*D
C&S Sales*D
Computer Component Source*D
Consolidated Electronics, Inc.*D
Contact East*D
The Current Source*D

Joseph Electronics*D
Key Tek Instrument Corp.
Leader Instruments Corp.1
MAI/Prime Parts*D
Marshall Industries*D
MCM Electronics*D15
Omega Engineering, Inc.
Omnitron Electronics*D
Philips Consumer Electronics*M/D
Print Products International*D
RAG Electronics Inc.*D
RNJ Electronics Inc.*D52
Herman H. Sticht Co., Inc.*D
Tektronix Test & Meas. Group
Time Motion Tools*D
Tucker Electronics Co.
Union Electronics*D

DISC DRIVE ANALYZERS/TESTERS

Accurite Technologies Inc.53
Analogic Corp.
AT&T Capital Corporation*D
AVA Instrumentation, Inc.
Brian Instruments, Inc.
Bursma Electronic Distrib.*D
Computer Doctors
Computer Svcs of America*D
Contact East*D
Data Depot, Inc.
Eiger Electronics*D
Fox International*D
HMC - Hub Material Co.*D
JDR Micro*D
W.S. Jenks & Son*D
Kenwood U.S.A. Corp.
Leader Instruments Corp.1
Marshall Industries*D
Omnitron Electronics*D
Pioneer Research
Print Products International*D
RAG Electronics Inc.*D
Sony Service Co.
Tech Assist, Inc.
Techni-Tool, Inc.*D
Time Motion Tools*D
Union Electronics*D

Dalhani Corporation*D77
Digi-Key D*
East Coast Transistor*D
Eiger Electronics*D
E.I.L. Instruments, Inc.*D
Electro Tool, Inc.
Electronic Parts Supply*D
Electronics Warehouse Corp.*D
Electronix Express*D
Elenco Electronics, Inc.
Fieldpiece Instruments
Fluke CorporationBC
Fotronic Corporation*D
Fox International*D
Global Specialties
Hameg Instruments, Inc.
Harco Electronics*D
Heath Company
Herman Electronics*D11
HMC - Hub Material Co.*D
Instek Corp.*D
Jameco Electronics Components*D
JDR Micro*D
W.S. Jenks & Son*D
Joseph Electronics*D
Keithley Instruments
Kelvin Electronics*D
Kenwood U.S.A. Corp.
Leader Instruments Corp.1
LG Precision
MAI/Prime Parts*D
Marconi Instruments
Marshall Industries*D
MCM Electronics*D15
Mouser Electronics*D
Omnitron Electronics*D
Parts Express*D53
Philips Consumer Electronics*M/D
Philips ECG
Print Products International*D
Protek
RAG Electronics Inc.*D
Ramsey Electronics Inc.
RNJ Electronics Inc.*D52
RS Electronics*D
Salen Enterprises*D
Sencore ElectronicsIBC
Sibex, Inc.

Dalhani Corporation*D77
Digi-Key D*
East Coast Transistor*D
Eiger Electronics*D
E.I.L. Instruments, Inc.*D
Electro Tool, Inc.
Electronic Parts Supply*D
Electronics Warehouse Corp.*D
Electronix Express*D
Elenco Electronics, Inc.
Emulation Technology, Inc.
Fieldpiece Instruments
Fluke CorporationBC
Fotronic Corporation*D
Fox International*D
Global Specialties
Hameg Instruments, Inc.
Harco Electronics*D
Heath Company
Herman Electronics*D11
HMC - Hub Material Co.*D
Instek Corp.*D
Jameco Electronics Components*D
JDR Micro*D
W.S. Jenks & Son*D
Joseph Electronics*D
Keithley Instruments
Kelvin Electronics*D
Kenwood U.S.A. Corp.
Leader Instruments Corp.1
LG Precision
MAI/Prime Parts*D
Marshall Industries*D
M.A.T. Electronics*D74
MCM Electronics*D15
Omega Engineering, Inc.
Omnitron Electronics*D
Parts Express*D53
PC Instruments Incorporated
Philips Consumer Electronics*M/D
Philips ECG
Print Products International*D
Protek
RAG Electronics Inc.*D
RNJ Electronics Inc.*D52
RS Electronics*D

DATA COMMUNICATION ANALYZERS/MONITORS/TESTERS

Accutest Instruments, Inc.*D
Advanced Electronic Applicatio
Atrix, Inc.*D
AT&T Capital Corporation*D
B&B Electronics Manufacturing
Vance Baldwin Inc.*D
Benedict Computer
B&K Precision5
Bursma Electronic Distrib.*D
Contact East*D
Conway Engineering, Inc.
The Current Source*D
Datatran Corp.
Digitech Industries Inc.
East Coast Transistor*D
Eiger Electronics*D
E.I.L. Instruments, Inc.*D
Electro Standards Lab, Inc.
Electro-Metrics, Incorporated
Electronics Warehouse Corp.*D
Extech Instruments Corp.*D73
Fieldpiece Instruments
Fluke CorporationBC
Fotec Inc
Fotronic Corporation*D
Frederick Engineering, Inc.
Harco Electronics*D
HMC - Hub Material Co.*D
International Disk Svcs, Inc.
Jameco Electronics Components*D
JDR Micro*D

DISTORTION ANALYZERS

Accutest Instruments, Inc.*D
AEMC Instruments
Allied Electronics, Inc.*D
AT&T Capital Corporation*D
Vance Baldwin Inc.*D
BMI-Basic Measuring Instrument
Bursma Electronic Distrib.*D
East Coast Transistor*D
Eiger Electronics*D
E.I.L. Instruments, Inc.*D
Electronics Warehouse Corp.*D
Fotronic Corporation*D
Fox International*D
Herman Electronics*D11
Joseph Electronics*D
Leader Instruments Corp.1
MCM Electronics*D15
Omnitron Electronics*D
Philips Consumer Electronics*M/D

Accutest Instruments, Inc.*D
AEMC Instruments
Allied Electronics, Inc.*D
AT&T Capital Corporation*D
Vance Baldwin Inc.*D
BMI-Basic Measuring Instrument
Bursma Electronic Distrib.*D
East Coast Transistor*D
Eiger Electronics*D
E.I.L. Instruments, Inc.*D
Electronics Warehouse Corp.*D
Fotronic Corporation*D
Fox International*D
Herman Electronics*D11
Joseph Electronics*D
Leader Instruments Corp.1
MCM Electronics*D15
Omnitron Electronics*D
Philips Consumer Electronics*M/D
Philips ECG
Print Products International*D
Protek
RAG Electronics Inc.*D
Ramsey Electronics Inc.
RNJ Electronics Inc.*D52
RS Electronics*D
Salen Enterprises*D
Sencore ElectronicsIBC
Sibex, Inc.

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Computer Svcs of America*D	Union Electronics*D	RAG Electronics Inc.*D	Warrantech Corp.
Consolidated Electronics, Inc.*D	Universal Enterprises (UEI)	Republic Packaging Corp.	Windsor Technologies, Inc.
Contact East*D	Vector-VID Inc.	RNJ Electronics Inc.*D 52	
CSI/SPCCO	Wavetek Corporation 3	RS Electronics*D	
The Current Source*D	Wholesale Electronics Inc.*D	Salen Enterprises*D	
Daetron	Yokogawa Corp. of America	Sencore Electronics IBC	
Dalbani Corporation*D 77		Snap-On Incorporated	
Daico Electronics*D		Specialized Prods Company*D	
Digi-Key D*		Herman H. Sticht Co., Inc.*D	
East Coast Transistor*D		Sun Equipment Corporation	
Eiger Electronics*D		Tandy National Parts*D	
E.I.L. Instruments, Inc.*D		A.G. Tannenbaum*D	
Electro Tool, Inc.		Techni-Tool, Inc.*D	
Electronic Controls/		Tektronix, Inc.	
Electronic Design Specialists		Tektronix Test & Meas. Group	
Electronic Prod. Specialties*D		Telogy*D	
Electronic Parts Supply*D		Tritronics, Inc.*D	
Electronics Warehouse Corp.*D		Tucker Electronics Co.	
Elenco Electronics, Inc.		Union Electronics*D	
Extech Instruments Corp.*D 75		Wavetek Corporation 3	
Fieldpiece Instruments		Wholesale Electronics Inc.*D	
Fluke Corporation BC		Yokogawa Corp. of America	
Foley-Belsaw*D			
Fotronic Corporation*D			
Fox International*D			
Galco Industrial Electronics*D			
Global Specialties			
Hameg Instruments, Inc.			
Harco Electronics*D			
Heath Company			
Herman Electronics*D 11			
HMC - Hub Material Co.*D			
Hy Tec Dealer Service			
Instek Corp.*D			
Jameco Electronics Components*D			
JDR Micro*D			
W.S. Jenks & Son*D			
Jensen Tools, Inc.*D			
Joseph Electronics*D			
Keithley Instruments			
Kelvin Electronics*D			
Kenwood U.S.A. Corp.			
Leader Instruments Corp. 1			
LG Precision			
MAI/Prime Parts*D			
Marshall Industries*D			
MCM Electronics*D 15			
Mouser Electronics*D			
Omega Engineering, Inc.			
Omnitron Electronics*D			
Parts Express*D 53			
PC Instruments Incorporated			
Philips Consumer Electronics*M/D			
Philips ECG			
Print Products International*D			
Protek			
RAG Electronics Inc.*D			
RNJ Electronics Inc.*D 52			
RS Electronics*D			
Salen Enterprises*D			
Schlumberger Technologies			
Simpson Electronic Company			
Snap-On Incorporated			
SAT/ A SPIRIG CO.			
Specialized Prods Company*D			
A.W. Sperry Instruments, Inc.			
Start International*D			
Sun Equipment Corporation			
Tandy National Parts*D			
A.G. Tannenbaum*D			
Techni-Tool, Inc.*D			
Tegam Inc.			
Tektronix, Inc.			
Tektronix Test & Meas. Group			
Telogy*D			
TIF Instruments, Inc.			
Time Motion Tools*D			
Total Power International			
Triplet Corp.			
Tritronics, Inc.*D			
Trompeter Electronics			
Trumco of California Inc.*D			
Tucker Electronics Co.			

OSCILLOSCOPES

Accutest Instruments, Inc.*D	
Alfa Electronics*D	
Allied Electronics, Inc.*D	
Analogic Corp.	
Arrow Electronics	
AT&T Capital Corporation*D	
Vance Baldwin Inc.*D	
B-B&W Electronics*D	
Bel Merit Corporation	
B&K Precision 5	
Brunelle Instruments, Inc.	
Bursma Electronic Distrib.*D	
C&S Sales*D	
Computer Component Source*D	
Compuvideo	
Consolidated Electronics, Inc.*D	
Contact East*D	
CSI/SPCCO	
The Current Source*D	
Dalbani Corporation*D 77	
Digi-Key D*	
East Coast Transistor*D	
Eiger Electronics*D	
E.I.L. Instruments, Inc.*D	
Electro Tool, Inc.	
Electronic Prod. Specialties*D	
Electronics Warehouse Corp.*D	
Electronix Express*D	
Elenco Electronics, Inc.	
Emulation Technology, Inc.	
Fieldpiece Instruments	
Fluke Corporation BC	
Fotronic Corporation*D	
Fox International*D	
Galco Industrial Electronics*D	
Global Micro-Parts Depot*D	
Global Specialties	
Gould Instrument Systems Inc.	
Hameg Instruments, Inc.	
Harco Electronics*D	
Heath Company	
Herman Electronics*D 11	
Hitachi Denshi America Ltd. 7	
Hi-Techniques, Inc.	
HMC - Hub Material Co.*D	
Hosfelt Electronics, Inc.*D	
Instek Corp.*D	
Jameco Electronics Components*D	
JDR Micro*D	
W.S. Jenks & Son*D	
Jensen Tools, Inc.*D	
Joseph Electronics*D	
Kelvin Electronics*D	
Kenwood U.S.A. Corp.	
Kikusui International Corp.	
Leader Instruments Corp. 1	
LG Precision	
MAI/Prime Parts*D	
Marshall Industries*D	
M.A.T. Electronics*D 74	
MCM Electronics*D 15	
Mouser Electronics*D	
Oldaker Corp.	
Omega Engineering, Inc.	
Omnitron Electronics*D	
Orion Instruments, Inc.	
Panasonic Industrial Co.	
Parts Express*D 53	
PC Instruments Incorporated	
Philips Consumer Electronics*M/D	
Philips ECG	
Print Products International*D	
Protek	

PERSONAL COMPUTER REPAIR/TEST EQUIPMENT

American Design Components	
Aristo Computers, Inc.	
Arrow Electronics	
Atrix, Inc.*D	
AT&T Capital Corporation*D	
B&B Electronics Manufacturing	
Vance Baldwin Inc.*D	
B&K Precision 5	
Bursma Electronic Distrib.*D	
CN Software	
Computer Component Source*D	
Computer Doctors	
Contact East*D	
The Current Source*D	
Daico Electronics*D	
Data Depot, Inc.	
Datatron Corp.	
Eagan Technical Services, Inc. 47	
East Coast Transistor*D	
Eiger Electronics*D	
Electronics Warehouse Corp.*D	
Electronix Corp.*D	
Fluke Corporation BC	
Fotronic Corporation*D	
Harco Electronics*D	
HMC - Hub Material Co.*D	
Hy-Tronix Instruments, Inc.	
Innovative Solutions	
Jameco Electronics Components*D	
JDR Micro*D	
W.S. Jenks & Son*D	
Jonard Industries Corp.	
Joseph Electronics*D	
MAI/Prime Parts*D	
Marshall Industries*D	
MCM Electronics*D 15	
Micro 2000, Inc.	
Network Technologies Inc.	
O.K. Industries, Inc.	
Omnitron Electronics*D	
Parts Express*D 53	
PC Service Source*D	
Philips Consumer Electronics*M/D	
Print Products International*D	
RNJ Electronics Inc.*D 52	
RS Electronics*D	
Schurter, Inc.	
Specialized Prods Company*D	
Sun Equipment Corporation	
Techni-Tool, Inc.*D	
Telogy*D	
Time Motion Tools*D	
Total Power International	
Union Electronics*D	
Vu-Data	

RECEPTACLE CIRCUIT TESTERS

AESI/Stedi Watt	
Amprobe Instrument	
Atrix, Inc.*D	
AT&T Capital Corporation*D	
Vance Baldwin Inc.*D	
Bursma Electronic Distrib.*D	
Computer Component Source*D	
Contact East*D	
The Current Source*D	
Eiger Electronics*D	
E.I.L. Instruments, Inc.*D	
Electro Tool, Inc.	
Electronics Warehouse Corp.*D	
Fieldpiece Instruments	
Fotronic Corporation*D	
HMC - Hub Material Co.*D	
W.S. Jenks & Son*D	
Joseph Electronics*D	
L-Com Inc.	
Marshall Industries*D	
Omnitron Electronics*D	
Philips Consumer Electronics*M/D	
Print Products International*D	
Schurter, Inc.	
Specialized Prods Company*D	
Techni-Tool, Inc.*D	
Time Motion Tools*D	
Trompeter Electronics	
Union Electronics*D	
Wholesale Electronics Inc.*D	
Yokogawa Corp. of America	

SEMICONDUCTOR TESTERS

Allied Electronics, Inc.*D	
American Design Components	
Arrow Electronics	
AT&T Capital Corporation*D	
Vance Baldwin Inc.*D	
B-B&W Electronics*D	
B&K Precision 5	
Bursma Electronic Distrib.*D	
C&S Sales*D	
Computer Component Source*D	
Consolidated Electronics, Inc.*D	
The Current Source*D	
Digi-Key D*	
East Coast Transistor*D	
Eiger Electronics*D	
E.I.L. Instruments, Inc.*D	
Electronic Design Specialists	
Electronics Warehouse Corp.*D	
Electronix Corp.*D	
Electronix Express*D	
Fotronic Corporation*D	
GlobeTech International, Inc.	
Harco Electronics*D	
Herman Electronics*D 11	
HMC - Hub Material Co.*D	
Hosfelt Electronics, Inc.*D	
Hy-Tronix Instruments, Inc.	
IET Labs, Inc.	
Jameco Electronics Components*D	
JDR Micro*D	
W.S. Jenks & Son*D	
Joseph Electronics*D	
Keithley Instruments	
Key Tek Instrument Corp.	
L'il Bitty Tester	
MAI/Prime Parts*D	
Marshall Industries*D	
MCM Electronics*D 15	
Omega Engineering, Inc.	
Omnitron Electronics*D	
Philips Consumer Electronics*M/D	
Philips ECG	

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
East Coast Transistor*D	Wavetek Corporation3	Arrow Electronics	Electronics Warehouse Corp.*D
Eiger Electronics*D	Wholesale Electronics Inc.*D	Atrix, Inc.*D	Electronix Corp.*D
E.I.L. Instruments, Inc.*D	Yokogawa Corp. of America	Vance Baldwin Inc.*D	Electronix Express*D
Electro Standards Lab, Inc.		B-B&W Electronics*D	Elenco Electronics, Inc.
Electro-Metrics, Incorporated		Bursma Electronic Distrib.*D	Elgar Corp.
Electron Processing		Computer Component Source*D	Fluke CorporationBC
Electronic Design Specialists		Computer Svcs of America*D	Hameg Instruments, Inc.
Electronics Warehouse Corp.*D		Consolidated Electronics, Inc.*D	Harco Electronics*D
Electronix Corp.*D		Contact East*D	Heath Company
Elenco Electronics, Inc.		The Current Source*D	Herman Electronics*D11
Extech Instruments Corp.*D73		Dalbani Corporation*D77	Hosfelt Electronics, Inc.*D
Fluke Corporation BC		Digi-Key D*	Instek Corp.*D
Fotec Inc		East Coast Transistor*D	Jameco Electronics Components*D
Fotronic Corporation*D		Eiger Electronics*D	W.S. Jenks & Son*D
Fox International*D		Electronics Warehouse Corp.*D	Joseph Electronics*D
GlobeTech International, Inc.		Electronix Express*D	Kelvin Electronics*D
Gould Instrument Systems, Inc.		Elenco Electronics, Inc.	Kenwood U.S.A. Corp.
Hameg Instruments, Inc.		Emulation Technology, Inc.	Kikusui International Corp.
Herman Electronics*D11		E-Z Hook	LG Precision
HMC - Hub Material Co.*D		Global Specialties	MAI/Prime Parts*D
Huntron Instruments, Inc.		Fox International*D	Marshall Industries*D
IET Labs, Inc.		MCM Electronics*D15	M.A.T. Electronics*D74
Instek Corp.*D		Omnitron Electronics*D	Omega Engineering, Inc.
International Power Tchnlgies		Parts Express*D53	Omnitron Electronics*D
Jameco Electronics Components*D		Philips Consumer Electronics*M/D	Parts Express*D53
JDR Micro*D		Print Products International*D	Philips Consumer Electronics*M/D
W.S. Jenks & Son*D		RNJ Electronics Inc.*D52	Philips ECG
Jensen Tools, Inc.*D		Union Electronics*D	Print Products International*D
JIT Resources, Inc.			Protek
Jonard Industries Corp.			RAG Electronics Inc.*D
Joseph Electronics*D			RNJ Electronics Inc.*D52
Keithley Instruments			RS Electronics*D
Kenwood U.S.A. Corp.			Salen Enterprises*D
Kester Solder			Sola Electric
Key Tek Instrument Corp.			Specialized Prods Company*D
Kobetron, Inc.			Herman H. Sticht Co., Inc.*D
Leader Instruments Corp.1			Sun Equipment Corporation
MAI/Prime Parts*D			Tandy National Parts*D
Marconi Instruments			A.G. Tannenbaum*D
Marshall Industries*D			Techni-Tool, Inc.*D
MCM Electronics*D15			Telogy*D
Mouser Electronics*D			Union Electronics*D
M-Test Equipment			Vector-VID Inc.
Multicore Solders			Wholesale Electronics Inc.*D
Nutronic Inc.			
Oldaker Corp.			
Omega Engineering, Inc.			
Omnitron Electronics*D			
Pacer Industries, Inc.			
Panasonic Industrial Co.			
Philips Consumer Electronics*M/D			
Philips ECG			
Print Products International*D			
Progressive Electronics			
Protek			
RAG Electronics Inc.*D			
Ramsey Electronics Inc.			
Republic Packaging Corp.			
Richmond Static Control Svcs			
RNJ Electronics Inc.*D52			
Salen Enterprises*D			
Schurter, Inc.			
Sencore Electronics IBC			
Simpson Electronic Company			
Sirius Technologies			
Snap-On Incorporated			
Specialized Prods Company*D			
A.W. Sperry Instruments, Inc.			
Tandy National Parts*D			
A.G. Tannenbaum*D			
Techni-Tool, Inc.*D			
Technology Programs			
Tektronix, Inc.			
Tektronix Test & Meas. Group			
Telogy*D			
Temptronic Corp.			
Tentel13			
Time Motion Tools*D			
Total Power International			
Trompeter Electronics			
Union Electronics*D			
Universal Enterprises (UEI)			
Vector-VID Inc.			

Test equipment accessories

AUDIO DUMMY LOADS

Vance Baldwin Inc.*D	
Computer Component Source*D	
Computer Svcs of America*D	
The Current Source*D	
Eiger Electronics*D	
Electronics Warehouse Corp.*D	
Fox International*D	
Joseph Electronics*D	
Marshall Industries*D	
MCM Electronics*D15	
Omnitron Electronics*D	
Parts Express*D53	
Philips Consumer Electronics*M/D	
Print Products International*D	
RNJ Electronics Inc.*D52	
Union Electronics*D	

DECADE BOXES: CAPACITANCE/INDUCTANCE/RESISTANCE

Accutest Instruments, Inc.*D	
Allied Electronics, Inc.*D	
Arrow Electronics	
Vance Baldwin Inc.*D	
Brunelle Instruments, Inc.	
Bursma Electronic Distrib.*D	
C&S Sales*D	
Computer Component Source*D	
Consolidated Electronics, Inc.*D	
The Current Source*D	
Daetron	
Eiger Electronics*D	
E.I.L. Instruments, Inc.*D	
Electromatic Controls/	
Electronics Warehouse Corp.*D	
Electronix Express*D	
Elenco Electronics, Inc.	
Fotronic Corporation*D	
GC Electronics*D	
Fox International*D	
HMC - Hub Material Co.*D	
Hosfelt Electronics, Inc.*D	
IET Labs, Inc.	
W.S. Jenks & Son*D	
Joseph Electronics*D	
Kenwood U.S.A. Corp.	
MAI/Prime Parts*D	
Marshall Industries*D	
Omnitron Electronics*D	
Parts Express*D53	
Philips Consumer Electronics*M/D	
Prime Technology, Inc.	
Print Products International*D	
RAG Electronics Inc.*D	
RNJ Electronics Inc.*D52	
Specialized Prods Company*D	
A.G. Tannenbaum*D	
Techni-Tool, Inc.*D	
Tucker Electronics Co.	
Union Electronics*D	
Vector-VID Inc.	
Wavetek Corporation3	
Yokogawa Corp. of America	

IC TEST CLIPS

Allied Electronics, Inc.*D	
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Arrow Electronics	
Atrix, Inc.*D	
Vance Baldwin Inc.*D	
B-B&W Electronics*D	
Bursma Electronic Distrib.*D	
Computer Component Source*D	
Computer Svcs of America*D	
Consolidated Electronics, Inc.*D	
Contact East*D	
The Current Source*D	
Dalbani Corporation*D77	
Digi-Key D*	
East Coast Transistor*D	
Eiger Electronics*D	
Electronics Warehouse Corp.*D	
Electronix Express*D	
Elenco Electronics, Inc.	
Emulation Technology, Inc.	
E-Z Hook	
Global Specialties	
Fox International*D	
Hameg Instruments, Inc.	
Harco Electronics*D	
Herman Electronics*D11	
HMC - Hub Material Co.*D	
Hosfelt Electronics, Inc.*D	
Hy-Tronix Instruments, Inc.	
Innovative Solutions	
ITT Pomona Electronics	
Jameco Electronics Components*D	
JDR Micro*D	
W.S. Jenks & Son*D	
Jim-Pak*D	
Joseph Electronics*D	
Kelvin Electronics*D	
MAI/Prime Parts*D	
Marshall Industries*D	
MCM Electronics*D15	
Mouser Electronics*D	
Omnitron Electronics*D	
Philips Consumer Electronics*M/D	
Philips ECG	
Premium Parts+ Electronics Co*D	
RS Electronics*D	
Specialized Prods Company*D	
Techni-Tool, Inc.*D	
Tektronix Test & Meas. Group	
Time Motion Tools*D	
Union Electronics*D	
Wholesale Electronics Inc.*D	

POWER SUPPLIES, BENCH

Accutest Instruments, Inc.*D	
Alfa Electronics*D	
Allied Electronics, Inc.*D	
American Reliance	
Arrow Electronics	
AT&T Capital Corporation*D	
Vance Baldwin Inc.*D	
BAPCO Bowden's Automated Prods	
B-B&W Electronics*D	
Behlman Electronics	
Bel Merit Corporation	
B&K Precision5	
Brunelle Instruments, Inc.	
Bursma Electronic Distrib.*D	
Computer Component Source*D	
Computer Products	
Computer Svcs of America*D	
Compuvideo	
Consolidated Electronics, Inc.*D	
Contact East*D	
CSI/SPCCO	
The Current Source*D	
Dalbani Corporation*D77	
Deltron, Inc.	
Digi-Key D*	
East Coast Transistor*D	
Eiger Electronics*D	
E.I.L. Instruments, Inc.*D	
Electronic Parts Supply*D	

Electronics Warehouse Corp.*D	
Electronix Corp.*D	
Electronix Express*D	
Elenco Electronics, Inc.	
Elgar Corp.	
Fluke CorporationBC	
Hameg Instruments, Inc.	
Harco Electronics*D	
Heath Company	
Herman Electronics*D11	
Hosfelt Electronics, Inc.*D	
Instek Corp.*D	
Jameco Electronics Components*D	
W.S. Jenks & Son*D	
Joseph Electronics*D	
Kelvin Electronics*D	
Kenwood U.S.A. Corp.	
Kikusui International Corp.	
LG Precision	
MAI/Prime Parts*D	
Marshall Industries*D	
M.A.T. Electronics*D74	
Omega Engineering, Inc.	
Omnitron Electronics*D	
Parts Express*D53	
Philips Consumer Electronics*M/D	
Philips ECG	
Print Products International*D	
Protek	
RAG Electronics Inc.*D	
RNJ Electronics Inc.*D52	
RS Electronics*D	
Salen Enterprises*D	
Sola Electric	
Specialized Prods Company*D	
Herman H. Sticht Co., Inc.*D	
Sun Equipment Corporation	
Tandy National Parts*D	
A.G. Tannenbaum*D	
Techni-Tool, Inc.*D	
Telogy*D	
Union Electronics*D	
Vector-VID Inc.	
Wholesale Electronics Inc.*D	

TEST JIGS AND FIXTURES

Vance Baldwin Inc.*D	
B-B&W Electronics*D	
Brian Instruments, Inc.	
Bursma Electronic Distrib.*D	
Computer Component Source*D	
The Current Source*D	
Dalbani Corporation*D77	
Digi-Key D*	
Eiger Electronics*D	
Electronics Warehouse Corp.*D	
Electronix Corp.*D	
E-Z Hook	
Foley-Belsaw*D	
Fox International*D	
Hitachi Home Electronics	
Hy-Tronix Instruments, Inc.	
W.S. Jenks & Son*D	
Joseph Electronics*D	
Omnitron Electronics*D	
Philips Consumer Electronics*M/D	
Philips ECG	
Polaris Div. of UXL Corp.	
RNJ Electronics Inc.*D52	
RS Electronics*D	
Schurter, Inc.	
Sony Service Co.	
Techni-Tool, Inc.*D	
Tentel13	
Tritronics, Inc.*D	
Union Electronics*D	

TEST LEADS AND PROBES

Accutest Instruments, Inc.*D	
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Alfa Electronics*
 Allied Electronics, Inc.*
 American Design Components
 Amprobe Instrument
 Atrix, Inc.*
 Avex Probes, Inc. (API)
 Vance Baldwin Inc.*
 B-B&W Electronics*
 Bel Merit Corporation
B&K Precision.....5
 Brian Instruments, Inc.
 Brunelle Instruments, Inc.
 Bursma Electronic Distrib.*
 C&S Sales*
 Computer Component Source*
 Consolidated Electronics, Inc.*
 Contact East*
 CSI/SPCCO
 CUI Stack
 The Current Source*
Dalbani Corporation*.....77
 Dandy Mfg. Co.
 Digi-Key*
 East Coast Transistor*
 Eiger Electronics*
 E.I.L. Instruments, Inc.*
 Electromatic Controls/
 Electro Standards Lab, Inc.
 Electronics Warehouse Corp.*
 Elenco Electronics, Inc.
 Emulation Technology, Inc.
 E-Z Hook
Fluke Corporation.....BC
 Fotronic Corporation*
 Hameg Instruments, Inc.
 Harco Electronics*
 Heath Company
Herman Electronics*.....11
 Richard Hirschmann of America
 HMC - Hub Material Co.*
 Hosfelt Electronics, Inc.*
 Innovative Solutions
 ITT Pomona Electronics
 Jameco Electronics Components*
 JDR Micro*
 W.S. Jenks & Son*
 Jensen Tools, Inc.*
 Joseph Electronics*
 Kelvin Electronics*
 Kenwood U.S.A. Corp.
 Keystone Electronics Corp.
 Klein Tools, Inc.
 MAI/Prime Parts*
 Marshall Industries*
M.A.T. Electronics*.....74
 Oldaker Corp.
 Omega Engineering, Inc.
 Omnitron Electronics*
Parts Express*.....53
 Philips Consumer Electronics*M/D
 Philips ECG
 J.S. Popper, Inc.
 Premium Parts+ Electronics Co*
 Print Products International*
 Probe Master, Inc.
 Protek
 RAG Electronics Inc.*
 Ramsey Electronics Inc.
RNJ Electronics Inc.*.....52
 RS Electronics*
 Schurter, Inc.
Sencore Electronics.....IBC
 Simpson Electronic Company
 Specialized Prods Company*
 Synergetix
 Tandy National Parts*
 Techni-Tool, Inc.*
 Tegam Inc.
 Tektronix, Inc.
 Test Probes, Inc.
 Time Motion Tools*
 Tritronics, Inc.*
 Union Electronics*

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Universal Enterprises (UEI)
Wavetek Corporation.....3
 Wholesale Electronics Inc.*

**TRANSFORMERS:
 ISOLATION/VARIABLE**

Allied Electronics, Inc.*
 American Design Components
 Arrow Electronics
 Vance Baldwin Inc.*
 BAPCO Bowden's Automated Prods
 B-B&W Electronics*
B&K Precision.....6
 Bursma Electronic Distrib.*
 Computer Component Source*
 Compuvideo
 Consolidated Electronics, Inc.*
 Contact East*
 The Current Source*
 Eiger Electronics*
 E.I.L. Instruments, Inc.*
 Electronic Parts Supply*
 Electronics Warehouse Corp.*
 Electronix Express*
 Fotronic Corporation*
 Galco Industrial Electronics*
 Fox International*
 Harco Electronics*
Herman Electronics*.....11
 HMC - Hub Material Co.*
 Hosfelt Electronics, Inc.*
 Jameco Electronics Components*
 JDR Micro*
 W.S. Jenks & Son*
 Joseph Electronics*
 Kelvin Electronics*
 MAI/Prime Parts*
 Marshall Industries*
M.A.T. Electronics*.....74
 Mouser Electronics*
 Omnitron Electronics*
Parts Express*.....53
 Philips Consumer Electronics*M/D
 Philips ECG
 Print Products International*
 RAG Electronics Inc.*
 RS Electronics*
Sencore Electronics.....IBC
 Specialized Prods Company*
 A.G. Tannenbaum*
 Techni-Tool, Inc.*
 Union Electronics*
 Vector-VID Inc.
 Wholesale Electronics Inc.*

VCR TEST JIG KITS

Vance Baldwin Inc.*
 B-B&W Electronics*
 Bursma Electronic Distrib.*
 Computer Component Source*
 The Current Source*
Dalbani Corporation*.....77
 East Coast Transistor*
 Eiger Electronics*
 Electronic Parts Supply*
 Electronics Warehouse Corp.*
 Electronix Corp.*
 Foley-Belsaw*
 Fox International*
Herman Electronics*.....11
 Hitachi Home Electronics
 Joseph Electronics*
 Marshall Industries*
M.A.T. Electronics*.....74
MCM Electronics*.....15
 Nippon Shokuhin Sangyo USA Ltd
 Omnitron Electronics*
Parts Express*.....53

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Philips Consumer Electronics*M/D
 Philips ECG
RNJ Electronics Inc.*.....52
 Sony Service Co.
Tentel.....13
 Tritronics, Inc.*
 Union Electronics*

**OTHER TEST EQUIPMENT
 ACCESSORIES**

Accutest Instruments, Inc.*
 AESI/Stedi Watt
 Allied Electronics, Inc.*
 Amprobe Instrument
 Vance Baldwin Inc.*
 Bel Merit Corporation
B&K Precision.....6
 Brian Instruments, Inc.
 Bursma Electronic Distrib.*
 C&S Sales*
 Chicago Case Company
 Computer Component Source*
 Consolidated Electronics, Inc.*
 Contact East*
 CRC Industries, Inc.
 The Current Source*
Dalbani Corporation*.....77
 East Coast Transistor*
 Eiger Electronics*
 E.I.L. Instruments, Inc.*
 Electro Standards Lab, Inc.
 Electro-Metrics, Incorporated
 Electron Processing
 Electronic Parts Supply*
 Electronics Warehouse Corp.*
 Electronix Corp.*
 E-Z Hook
Fluke Corporation.....BC
 Fotronic Corporation*
 Gemini Inc.
 Fox International*
 Hameg Instruments, Inc.
Herman Electronics*.....11
 HMC - Hub Material Co.*
 Hy-Tronix Instruments, Inc.
 Innovative Solutions
 Instek Corp.*
 ITT Pomona Electronics
 Jameco Electronics Components*
 JDR Micro*
 W.S. Jenks & Son*
 Jensen Tools, Inc.*
 Joseph Electronics*
 Kenwood U.S.A. Corp.
 Kester Solder
 L-Com Inc.
 MAI/Prime Parts*
 Marshall Industries*
MCM Electronics*.....16
 Mouser Electronics*
 National Instruments
 Oldaker Corp.
 Omnitron Electronics*
 Philips Consumer Electronics*M/D
 Philips ECG
 Premium Parts+ Electronics Co*
 Print Products International*
 Probe Master, Inc.
 Protek
 RAG Electronics Inc.*
 Ramsey Electronics Inc.
 Republic Packaging Corp.
RNJ Electronics Inc.*.....52
 RS Electronics*
 Schurter, Inc.
 Sencore ElectronicsIBC
 Simpson Electronic Company
 Specialized Prods Company*
 Tandy National Parts*
 A.G. Tannenbaum*

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Techni-Tool, Inc.*
 Tektronix, Inc.
Tentel.....13
 Time Motion Tools*
 Tritronics, Inc.*
 Ultech Corp
 Union Electronics*
 Universal Enterprises (UEI)
Wavetek Corporation.....3
 Wholesale Electronics Inc.*

**Circuit damage
 protective
 equipment/supplies**

GROUNDING SYSTEMS

Arrow Electronics
 Atrix, Inc.*
 Vance Baldwin Inc.*
 Computer Component Source*
 Contact East*
 Controlled Power Co.
 The Current Source*
 HMC - Hub Material Co.*
 W.S. Jenks & Son*
 Joseph Electronics*
 MAI/Prime Parts*
RNJ Electronics Inc.*.....52
 Static Prevention Inc.
 Techni-Tool, Inc.*
 3M Electrical Specialties Div
 Time Motion Tools*
 Union Electronics*
 Verite
 Wescorp

POWER LINE MONITORS

Accutest Instruments, Inc.*
 Allied Electronics, Inc.*
 Arrow Electronics
 Atrix, Inc.*
 AT&T Capital Corporation*
 Vance Baldwin Inc.*
B&K Precision.....6
 BMI-Basic Measuring Instrument
 Brunelle Instruments, Inc.
 Bursma Electronic Distrib.*
 Computer Component Source*
 Consolidated Electronics, Inc.*
 Contact East*
 Controlled Power Co.
 The Current Source*
 Dranetz Technologies, Inc.
 EFI Electronics Corporation
 E.I.L. Instruments, Inc.*
 Electronic Specialists, Inc.
 Electronics Warehouse Corp.*
 HMC - Hub Material Co.*
 Hosfelt Electronics, Inc.*
 JDR Micro*
 W.S. Jenks & Son*
 Joseph Electronics*
 MAI/Prime Parts*
M.A.T. Electronics*.....74
MCM Electronics*.....15
 Mendon Electronics Corp.
Parts Express*.....53
 Perma Power Electronics, Inc.
 PowerTronics
 Print Products International*
RNJ Electronics Inc.*.....52
 RS Electronics*
 SL Waber, Inc.
 Sola Electric
 Specialized Prods Company*
 Superior Electric
 Techni-Tool, Inc.*

Product directory

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Time Motion Tools*D Tripp Lite Union Electronics*D Vector-VID Inc. Wholesale Electronics Inc.*D	Electron Processing Electronic Parts Supply*D Electronic Specialists, Inc. Electronics Warehouse Corp.*D Electronix Express*D Elgar Corp. Excel Distributing*D Fox International*D GC Electronics*D Geist Inc. Harco Electronics*D Herman Electronics*D 11 Hitachi Home Electronics HMC - Hub Material Co.*D Hosfelt Electronics, Inc.*D International Power Tchnlgies Jameco Electronics Components*D JDR Micro*D W.S. Jenks & Son*D Jensen Tools, Inc.*D Jim-Pak*D Joseph Electronics*D Kalglo Electronics Co., Inc. MAI/Prime Parts*D Marshall Industries*D M.A.T. Electronics*D 74 MCG Electronics MCM Electronics*D 15 Meirick, Inc. Minuteman UPS Mouser Electronics*D Omega Engineering, Inc. ORA Electronics Panamax, Inc. Parts Express*D 53 Perma Power Electronics, Inc. Philips Consumer Electronics*M/D Print Products International*D RNJ Electronics Inc.*D 52 RS Electronics*D SL Waber, Inc. Sola Electric Specialized Prods Company*D Superior Electric Sutton Designs, Inc. Techni-Tool, Inc.*D Tripp Lite Tucker Electronics Co. Union Electronics*D Wholesale Electronics Inc.*D	Delta Warranty Digi-Key D* EFI Electronics Corporation Electronic Specialists, Inc. Electronics Warehouse Corp.*D Electronix Express*D Elgar Corp. Fotronic Corporation*D Galco Industrial Electronics*D General Power Systems, Inc. Harco Electronics*D Herman Electronics*D 11 HMC - Hub Material Co.*D Hosfelt Electronics, Inc.*D ICS Inc., Electro-Pac Div. International Power Tchnlgies Jameco Electronics Components*D JDR Micro*D W.S. Jenks & Son*D Joseph Electronics*D MAI/Prime Parts*D M.A.T. Electronics*D 74 MCM Electronics*D 15 Meirick, Inc. Minuteman UPS Perma Power Electronics, Inc. Philips Consumer Electronics*M/D Phitek Power Corp. Print Products International*D RNJ Electronics Inc.*D 52 RS Electronics*D SL Waber, Inc. Sola Electric Specialized Prods Company*D Staco Energy Products Superior Electric Sutton Designs, Inc. Techni-Tool, Inc.*D Tripp Lite Tucker Electronics Co. Union Electronics*D Wholesale Electronics Inc.*D	Omnitron Electronics*D Perma Power Electronics, Inc. Philips Consumer Electronics*M/D Print Products International*D RNJ Electronics Inc.*D 52 RS Electronics*D Shape Electronics SL Waber, Inc. Snap-On Incorporated Sola Electric Staco Energy Products Superior Electric Time Motion Tools*D Tripp Lite Union Electronics*D Wholesale Electronics Inc.*D
STANDBY POWER SYSTEMS			Electrostatic discharge protection
Accutest Instruments, Inc.*D Acme Electric Corporation AESI/Stedi Watt Allied Electronics, Inc.*D Alpha Technologies American Design Components Arrow Electronics Vance Baldwin Inc.*D Bursma Electronic Distrib.*D Computer Component Source*D Computer Power Inc. Consolidated Electronics, Inc.*D Controlled Power Co. The Current Source*D Digi-Key D* Electronic Specialists, Inc. Electronics Warehouse Corp.*D Elgar Corp. Harco Electronics*D Herman Electronics*D 11 HMC - Hub Material Co.*D Hosfelt Electronics, Inc.*D Jameco Electronics Components*D JDR Micro*D W.S. Jenks & Son*D Joseph Electronics*D MAI/Prime Parts*D Meirick, Inc. Minuteman UPS Parts Express*D 53 Perma Power Electronics, Inc. Print Products International*D RNJ Electronics Inc.*D 52 RS Electronics*D SL Waber, Inc. Sola Electric Superior Electric Sutton Designs, Inc. Techni-Tool, Inc.*D Tripp Lite Tucker Electronics Co. Union Electronics*D Wholesale Electronics Inc.*D			ANTISTATIC CHEMICALS
SURGE/SPIKE PROTECTORS	UNINTERRUPTIBLE POWER SUPPLIES	VOLTAGE REGULATORS	Aervo-Pacific Co. Allied Electronics, Inc.*D Atrix, Inc.*D Vance Baldwin Inc.*D B-B&W Electronics*D Bursma Electronic Distrib.*D Charleswater Chemtronics IFC Computer Component Source*D Computer Svcs of America*D Consolidated Electronics, Inc.*D Contact East*D The Current Source*D Dalbani Corporation*D 77 Desco Industries, Inc. Digi-Key D* Dow U.S.A. East Coast Transistor*D Electronic Prod. Specialties*D Electronic Parts Supply*D Electronics Warehouse Corp.*D Electronix Corp.*D Electronix Express*D Fox International*D Galco Industrial Electronics*D GC Electronics*D Harco Electronics*D Herman Electronics*D 11 HMC - Hub Material Co.*D Hy Tec Dealer Service JDR Micro*D W.S. Jenks & Son*D JIT Resources, Inc. Joseph Electronics*D Klein Tools, Inc. MAI/Prime Parts*D Marshall Industries*D Miller-Stephenson Chemical Co. Omnitron Electronics*D Philips Consumer Electronics*M/D Philips ECG Print Products International*D PROSTAT RNJ Electronics Inc.*D 52 Rogers Anti-Static Chemicals RS Electronics*D Specialized Prods Company*D Static Prevention Inc. Stoner, Inc. Syon Corporation Tandy National Parts*D Tech Spray, Inc. Techni-Tool, Inc.*D 3M Electronic Prods Division Time Motion Tools*D Tritronics, Inc.*D Union Electronics*D

Wescorp
Wholesale Electronics Inc.*D

ANTISTATIC IONIZATION DEVICES

Atrix, Inc.*D
Vance Baldwin Inc.*D
Chapman Corporation
Charleswater
Computer Component Source*D
Computer Svcs of America*D
Contact East*D
The Current Source*D
Desco Industries, Inc.
E.I.L. Instruments, Inc.*D
Electronic Prod. Specialties*D
Harco Electronics*D
HMC - Hub Material Co.*D
W.S. Jenks & Son*D
JIT Resources, Inc.
Joseph Electronics*D
Marshall Industries*D
Omniatron Electronics*D
Print Products International*D
Richmond Static Control Svcs
RS Electronics*D
Semtronics Corp.
The Simco Co., Inc.
Static Prevention Inc.
Tandy National Parts*D
Techni-Tool, Inc.*D
Gregory Thomas Inc.
3M Electrical Specialties Div
3M Electronic Prods Division
Time Motion Tools*D
Union Electronics*D
Voltura Enterprises, Inc.
Wescorp

ANTISTATIC MATS/ BENCHTOPS/WRIST STRAPS/OTHERS

Allied Electronics, Inc.*D
Atrix, Inc.*D
Vance Baldwin Inc.*D
B-B&W Electronics*D
Bursma Electronic Distrib.*D
Charleswater
Clauss Electronics Div.
Computer Component Source*D
Computer Svcs of America*D
Contact East*D
The Current Source*D
Dalco Electronics*D
Desco Industries, Inc.
Digi-Key D*
E.I.L. Instruments, Inc.*D
Electro Tool, Inc.
Electronic Prod. Specialties*D
Electronics Warehouse Corp.*D
Electronix Corp.*D
Electronix Express*D
Elenco Electronics, Inc.
C.H. Ellis Company, Inc.
Fox International*D
Galco Industrial Electronics*D
The Granite Corp.
Harco Electronics*D
Herman Electronics*D11
HMC - Hub Material Co.*D
Hosfelt Electronics, Inc.*D
ITT Pomona Electronics
Jameco Electronics Components*D
JDR Micro*D
W.S. Jenks & Son*D
Jim-Pak*D
JIT Resources, Inc.
Joseph Electronics*D

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Kasco Distributing*D
MAI/Prime Parts*D
Marshall Industries*D
Mouser Electronics*D
Omniatron Electronics*D
Parts Express*D53
Philips Consumer Electronics*M/D
Philips ECG
Print Products International*D
PROSTAT
The Rex Company
Richmond Static Control Svcs
RNJ Electronics Inc.*D52
RS Electronics*D
Semtronics Corp.
The Simco Co., Inc.
SAT/ A SPIRIG CO.
Sony Service Co.
Specialized Prods Company*D
Static Prevention Inc.
Tandy National Parts*D
Techni-Tool, Inc.*D
Teclab
Gregory Thomas Inc.
3M Electrical Specialties Div
3M Electronic Prods Division
Time Motion Tools*D
Trace Racks
Tritronics, Inc.*D
Union Electronics*D
Waldmann Lighting Company
Wescorp
Wholesale Electronics Inc.*D

ESD FLEXIBLE PACKAGING

Armand Mfg. Inc.
Atrix, Inc.*D
Vance Baldwin Inc.*D
Bursma Electronic Distrib.*D
Charleswater
Computer Component Source*D
Contact East*D
Desco Industries, Inc.
Digi-Key D*
Electronic Prod. Specialties*D
Electronics Warehouse Corp.*D
Galco Industrial Electronics*D
Global Kitting
Harco Electronics*D
HMC - Hub Material Co.*D
W.S. Jenks & Son*D
JIT Resources, Inc.
Joseph Electronics*D
MAI/Prime Parts*D
Marshall Industries*D
Omniatron Electronics*D
Print Products International*D
Republic Packaging Corp.
Richmond Static Control Svcs
RS Electronics*D
Seco Industries
Semtronics Corp.
The Simco Co., Inc.
Techni-Tool, Inc.*D
3M Electrical Specialties Div
3M Electronic Prods Division
Time Motion Tools*D
Union Electronics*D
Wescorp

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Computer Svcs of America*D
Contact East*D
The Current Source*D
Desco Industries, Inc.
Digi-Key D*
E.I.L. Instruments, Inc.*D
Electronic Prod. Specialties*D
Harco Electronics*D
HMC - Hub Material Co.*D
W.S. Jenks & Son*D
JIT Resources, Inc.
Joseph Electronics*D
Marshall Industries*D
Monroe Electronics, Inc.
Omniatron Electronics*D
Print Products International*D
PROSTAT
Richmond Static Control Svcs
RS Electronics*D
Semtronics Corp.
The Simco Co., Inc.
Specialized Prods Company*D
Tech Spray, Inc.
Techni-Tool, Inc.*D
Gregory Thomas Inc.
3M Electrical Specialties Div
3M Electronic Prods Division
Time Motion Tools*D
Union Electronics*D
Voltura Enterprises, Inc.
Wescorp
Wholesale Electronics Inc.*D

BATTERIES

Acme Electric Corporation
Allied Electronics, Inc.*D
Alpha Technologies
Ambico
American Design Components
Amprobe Instrument
Andrews Electronics*D47
Antique Electronic Supply*D
Arrow Electronics
Atrix, Inc.*D
AudioVisual Inc.*D
Avex Probes, Inc. (API)
Vance Baldwin Inc.*D
B-B&W Electronics*D
Bursma Electronic Distrib.*D
Cititronix/Panson*D
Computer Component Source*D
Compuvideo
Consolidated Electronics, Inc.*D
Contact East*D
The Current Source*D
Daibani Corporation*D77
Dalco Electronics*D
Digi-Key D*
East Coast Transistor*D
Eiger Electronics*D
Electronic Parts Supply*D
Electronics Warehouse Corp.*D
Electronix Express*D
Elenco Electronics, Inc.
Entech Corporation
Excel Distributing*D
Fox International*D
Galco Industrial Electronics*D
Harco Electronics*D
Herman Electronics*D11
HMC - Hub Material Co.*D
Hosfelt Electronics, Inc.*D
JDR Micro*D
W.S. Jenks & Son*D

STATIC DETECTION METERS

Accutest Instruments, Inc.*D
Allied Electronics, Inc.*D
Atrix, Inc.*D
Vance Baldwin Inc.*D
Bursma Electronic Distrib.*D
Chapman Corporation
Charleswater
Computer Component Source*D

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Joseph Electronics*D
Kelvin Electronics*D
MAI/Prime Parts*D
Marshall Industries*D
M.A.T. Electronics*D74
MCM Electronics*D15
Mouser Electronics*D
NESCO Batteries
Omega Engineering, Inc.
Omniatron Electronics*D
ORA Electronics
Panasonic Industrial Co.
Parts Express*D53
PC Service Source*D
Philips Consumer Electronics*M/D
Premium Parts+ Electronics Co*D
Print Products International*D
RNJ Electronics Inc.*D52
RS Electronics*D
Sanyo Energy Corp.
Sony Service Co.
Specialized Prods Company*D
Tadiran Computer Batteries
Techni-Tool, Inc.*D
Time Motion Tools*D
Tritronics, Inc.*D
Union Electronics*D
Wholesale Electronics Inc.*D
Zenith Sales Co.

BENCHES/CABINETS

Allied Electronics, Inc.*D
Arrow Electronics
Vance Baldwin Inc.*D
Computer Svcs of America*D
Contact East*D
The Current Source*D
East Coast Transistor*D
E.I.L. Instruments, Inc.*D
Electronic Prod. Specialties*D
Fox International*D
Harco Electronics*D
Herman Electronics*D11
HMC - Hub Material Co.*D
I.A.C. Industries
W.S. Jenks & Son*D
Jensen Tools, Inc.*D
Jim-Pak*D
JIT Resources, Inc.
Joseph Electronics*D
Lista International Corp.
Marshall Industries*D
M.A.T. Electronics*D74
MCM Electronics*D15
Parts Express*D53
Philips Consumer Electronics*M/D
Print Products International*D
The Rex Company
RNJ Electronics Inc.*D52
RS Electronics*D
Specialized Prods Company*D
Techni-Tool, Inc.*D
Teclab
Time Motion Tools*D
Union Electronics*D
Workplace Systems, Inc.
Zero Corp., East Div.

CHEMICALS

Allied Electronics, Inc.*D
Alternative Technical Services
Andrews Electronics*D47
Antique Electronic Supply*D
Arrow Electronics
Atrix, Inc.*D
AudioVisual Inc.*D
Vance Baldwin Inc.*D
B-B&W Electronics*D
Bursma Electronic Distrib.*D

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Computer Svcs of America*D
Contact East*D
The Current Source*D
Desco Industries, Inc.
Digi-Key D*
E.I.L. Instruments, Inc.*D
Electronic Prod. Specialties*D
Harco Electronics*D
HMC - Hub Material Co.*D
W.S. Jenks & Son*D
JIT Resources, Inc.
Joseph Electronics*D
Marshall Industries*D
Monroe Electronics, Inc.
Omniatron Electronics*D
Print Products International*D
PROSTAT
Richmond Static Control Svcs
RS Electronics*D
Semtronics Corp.
The Simco Co., Inc.
Specialized Prods Company*D
Tech Spray, Inc.
Techni-Tool, Inc.*D
Gregory Thomas Inc.
3M Electrical Specialties Div
3M Electronic Prods Division
Time Motion Tools*D
Union Electronics*D
Voltura Enterprises, Inc.
Wescorp
Wholesale Electronics Inc.*D

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Jim-Pak*D
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Kasco Distributing*D
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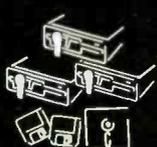
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Fax: 714-992-5553

Brilliant King, Inc.

37 W. 39th St
Room 401
New York, NY 10018
212-730-6797
Fax: 212-730-6797

Brunelle Instruments, Inc.

PO Box 1223
Newport, VT 05855
819-563-9096
Fax: 819-569-1408

Burks, P.I.*D

842 S. Seventh Ave.
Louisville, KY 40203
502-589-3960
800-274-2875
Fax: 800-723-8383

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1030 Scribner N.W.
Grand Rapids, MI 49504
616-459-4325
800-777-2604
Fax: 616-459-1294

Butterworth Heinemann

313 Washington St
Newton, MA 02158-1626
800-366-2665

C

C&S Sales*D

150 W. Carpenter Ave
Wheeling, IL 60090
800-292-7711
Fax: 708-541-9904

C. Hoelzle Associates, Inc.

17321 Eastman Street
Irvine, CA 92714-5523
714-251-9000
Fax: 714-251-9291

Cahill Electronics

160 Main Street
PO Box 568
Kingston, NH 03848
603-642-4292
Fax: 603-642-7941

CAIG Laboratories, Inc.

16744 West Bernardo Drive
San Diego, CA 92127-1904
619-451-1799
Fax: 619-451-2799
800-CAIG-123

Cambridge University Press

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40 W. 20th St.
New York, NY 10011-4211
212-924-3900
Fax: 212-691-3239

Casio Technical Info Center

570 Mount Pleasant Avenue
Dover, NJ 07801
201-361-5400
800-458-0212

CEDIA

9202 N Meridian #200
Indianapolis, IN 46260
317-571-5602
800-669-5329
Fax: 317-571-5603

Central Point Software

15220 NW Greenbrier Parkway
Suite 200
Beaverton, OR 97006
800-445-4064

Cerplex Group, Inc

3332 E. LaPalma Ave.
Anaheim, CA 92705
714-566-3900
Fax: 714-259-1944

Channel Master

Div. of Avnet, Inc.
P.O. Box 1416
Smithfield, NC 27577
919-934-9711
Fax: 919-989-2200

Company mailing addresses

Chapman Corporation
125 Presumpscot Street
PO Box 10700
Portland, ME 04104-6100
207-773-4726
Fax: 207-775-1369

Charleswater
Div. of Desco Industries, Inc.
90 Hudson Rd.
Canton, MA 02021-1407
617-964-8370
Fax: 617-964-0172

Chemtronics
8125 Cobb Center Drive
Kennesaw, GA 30144
404-424-4888
800-645-5244
Fax: 404-424-4267

Chicago Case Company
4446 Ashland Ave.
Chicago, IL 60609
312-927-1600
Fax: 800-333-8172

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3 Second St
Framingham, MA 01701
508-879-7727
800-836-2447

Circuit Repair Corp.
108 Turnpike
Rowley, MA 01969
508-948-7973
Fax: 508-948-2365

Circuit Specialists
Box 3047
Scottsdale, AZ 85257

Cititronix/Panson*D
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St. Louis, MO 63132
314-427-3420
800-846-CITI
Fax: 800-397-8587

Clary Corp.
1960 S. Walker Ave.
Monrovia, CA 91016
818-359-4486
800-44-CLARY
Fax: 818-305-0254

Classic Cmpnts Supply, Inc.*D
3336 Commercial Ave.
Northbrook, IL 60062-1975
708-272-9650
Fax: 708-272-9264

Clauss Electronics Div.
223 N. Prospect
Fremont, OH 43420
419-332-7344
800-225-2877
Fax: 419-332-8077

Cleveland Inst. of Electronics
1776 East 17th St.
Cleveland, OH 44114
216-781-9400
800-CIE-OHIO
Fax: 216-781-0331

Clipper Products
P.O. Box 458200
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513-528-7011
800-543-0324
Fax: 513-528-7676

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A Division of CNS Inc.
100 Ford Road
Denville, NJ 07834
201-625-4056
Fax: 201-625-9489

Colorado Spectrum, Inc.
748 Whalers Way, Suite E-201
Fort Collins, CO 80525
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The Component Exchange
5-7 Ray Avenue
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800-786-9590
Fax: 617-391-9150

Computer Component Source*D
135 Eileen Way
Syosset, NY 11791
516-496-8727
800-356-1227
Fax: 800-926-2062

Computer Doctors
9204-B Baltimore Blvd.
College Park, MD 20740
301-474-3095

The Computer Industry Almanac
PO Box 600
Glenbrook, NV 89413
702-749-5053
Fax: 702-749-5864

Computer Maintenance Training
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Marlboro, MA 01752
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800-952-5977
Fax: 508-624-4179

Computer & Monitor Maintenance
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Norcross, GA 30092
404-662-5633
800-466-4411
Fax: 404-662-5633

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818-879-1100
Fax: 818-879-1199

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800-282-2541

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124 W. High St.
High Bridge, NJ 08829
908-638-8000
800-526-5088
Fax: 908-638-4931

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Power Conversion**
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South Boston, MA 02127
617-464-6639
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Computer Svcs of America*D
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Manchester, NH 03103
603-644-5005
800-255-7815
Fax: 603-644-4645

Computer Transaction Systems
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North Weymouth, MA 02191
617-331-6968
800-331-6968
Fax: 617-331-6969

Computer Connection
1101 W 80th
Minneapolis, MN 55420
612-884-0758
Fax: 612-884-2206

Computing Technology Ind. Assoc.
CTIA
450 E 22nd St
Lombard, IL 60148-6158
800-333-9532
Fax: 708-268-1384

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3861 Oceanview Ave.
Brooklyn, NY 11224
212-213-6818

Connector Corporation
4720 Yender Ave
Lisle, IL 60532
708-969-3400
Fax: 708-969-3545

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705 Watervliet Ave.
PO Box 20070
Dayton, OH 45420-0070
513-252-5662
800-543-3568
Fax: 513-252-4066

Contact East*D
335 Willow Street
PO Box 786
North Andover, MA 01845-5995
508-682-2000
800-225-5334
Fax: 508-688-7829

Controlled Power Co.
1955 Stephenson Highway
Troy, MI 48083
800-521-4792
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Conway Engineering, Inc.
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800-626-6929
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Cook's Inst. of Elec. Engrg.
4251 Cypress Drive
Jackson, MS 39212
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112 Oakwood Road
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412-941-6473
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Groton, MA 01450
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Sunnyvale, CA 94089
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Fax: 408-745-1816

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Raleigh, NC 27622
919-362-7510

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800-822-1272
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Fax: 909-594-4761

CRC Industries, Inc.
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Box C-5000
Warminster, PA 18974-0586
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800-556-5074
Fax: 215-674-2207

CRC Press, Inc.
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407-994-0555

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17W755 Butterfield Road
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Clawson, MI 48017
810-435-8916

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800-645-5516
Fax: 516-957-9142

CSTS Inc.
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Anaheim, CA 92807-1827
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Fax: 714-777-2360

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9640 S.W. Sunshine Ct,
Suite 700
Beaverton, OR 97005
503-643-4899
Fax: 503-643-6129

The Current Source*D
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Boise, ID 83714
208-323-9692
Fax: 208-323-9691

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800-657-1979
Fax: 214-494-1585

Custom Components Corp*D
W224 S8445 Industrial Drive
Big Bend, WI 53103
414-662-5266
Fax: 414-662-3781

Company mailing addresses

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Baltimore, MD 21234
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800-451-0137
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Los Gatos, CA 95032
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Fax: 408-354-5058

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15681 Highway 72
Rolla, MO 65401-5827
314-364-0193

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Daetron

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Postal Station U, Box 641
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416-676-1600

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Mechanicsburg, PA 17055
717-795-9544
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Fargo, ND 58103
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Fax: 305-594-6588

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275 Pioneer Blvd
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Muskogee, OK 74403
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Cypress, CA 90630
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800-447-4666
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800-837-7574
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Bristol, CT 06010
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Milford, NH 03055
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603-673-3091

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Anaheim, CA 92806
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Fax: 714-970-1670

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Denver, CO 80223
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DAYTA-CO

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Mesa, AZ 85275
602-835-2243
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St. Louis, MO 63110
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DC Electronics

PO Box 3203
Scottsdale, AZ 85257
602-945-7736
800-423-0070
Fax: 602-994-1707

Delta Warranty

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Bellevue, WA 98004
206-462-7773
800-733-3358
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North Wales, PA 19454
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Fax: 215-699-2310

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Monterey Park, CA 91754
213-266-5960
800-397-5966
Fax: 213-266-5963

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1340 Campus Parkway
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800-648-6833

Desco Industries, Inc.

761 Penarth Avenue
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Fax: 909-595-7028

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Utica, NY 13502
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503-236-6140
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800-487-6025
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Fax: 908-248-1834

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Hanover, NJ 07936
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Fax: 201-887-3678

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Fax: 508-898-9995

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1380 Corporate Center Curve,
Suite 107
Eagan, MN 55121
612-688-0098
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Fax: 612-688-7829

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West Hemstead, NY 11552
516-483-5742
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Walnut, CA 91789
714-594-1891
Fax: 714-598-3810

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Nyack, NY 10960
914-358-6600
800-223-8803

EFI Electronics Corporation

2415 South 2300 West
Salt Lake City, UT 84119
800-729-3496
Fax: 801-977-0200

Eico Electronics

363 Merit Road
Lynbrook, NY 11563
516-599-5744

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800-835-8316
Fax: 516-242-2586

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Hunt Valley, MD 21031-1320
410-584-7400
Fax: 410-584-7561

Electro Insulation Corporation

3921 Ventura Drive
Arlington Heights, IL 60004
312-632-1020
800-247-2114
Fax: 312-632-1089

Company mailing addresses

Electro Tool, Inc.

9103 Gilman
Livonia, MI 48150

Electrodyn, Inc.

501 E. Temperance St.
Ellettsville, IN 47429
812-876-2522
800-937-1023
Fax: 812-876-2533

Electro Dynamics, Inc.*D

EDI
135 Eileen Way
Syosset, NY 11791-9022
516-496-400
800-426-6423
Fax: 800-873-2948

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2495 Pembroke Ave.
Hoffman Estates, IL 60195
708-882-5757
800-222-2659
Fax: 708-882-7234

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Data Comm Prods Div
36 Western Industrial Drive
Cranston, RI 02921
401-943-1164
Fax: 401-946-5790

Electro-Metrics, Incorporated

A Penril Corporation
231 Enterprise Road
Johnstown, NY 12095
518-762-2600

Electron Processing

P.O. Box 68
Cedar, MI 49621
616-228-7020

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4823 Avenue N
Brooklyn, NY 11234

Electronic Design Specialists

4647 Appalachian St
Boca Raton, FL 33428
407-487-6103

EIA/CEMA Product Services

2500 Wilson Blvd
Arlington, VA 22201
703-907-7670
Fax: 703-841-0030

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800-783-3337
Fax: 414-783-6707

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510-420-1040

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800-225-4876
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Rockford, IL 61101
815-968-1040
Fax: 815-962-1495

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800-223-3205
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Glenside, PA 19038
215-887-2196

Electronix Express*D

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800-972-2225
Fax: 908-381-1572

Electroservice Laboratories

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Ventura, CA 93003
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800-336-4ESL
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Elenco Electronics, Inc.

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708-541-3800
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San Diego, CA 92121
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Indianapolis, IN 46201
317-636-3351
800-466-3351
Fax: 317-635-5140

Eltrex Industries Inc.

65 Sullivan St.
Rochester, NY 14605
716-454-6100 X222
Fax: 716-263-7766

Elvo Division of Zumbach Electronics Corp.

140 Kisco Ave.
Mount Kisco, NY 10549-1407
914-241-1008

Emerson Radio Corp.

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Suite J
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714-758-8769
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Fax: 714-758-8768

Emulation Technology, Inc.

2344 Walsh Ave., Building F
Santa Clara, CA 95051
408-982-0660
Fax: 408-982-0664

Entech Corp

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Mississauga, ON
Canada L52 1J9
905-820-3030

Equus C/O Unistar

13562 Pawnee
Tustin, CA 92680
714-730-7936

The Eraser Company, Wybar Div.

Oliva Drive
PO Box 4961
Syracuse, NY 13221
315-454-3237
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Fax: 315-454-3090

ESP Inc.

14 Blackstone Valley Place
Lincoln, RI 02865
401-333-3800
800-338-4353
Fax: 401-333-4954

Essential Seminars

297-101 Kinderkamack Road
Suite 122
Oradell, NJ 07649
201-986-1678
Fax: 201-986-1679

EURAS USA, Inc.

501 Sycamore Street,
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Waterloo, IA 50703-4643
319-236-2000
800-453-8727
Fax: 319-236-2020

Electronic Technicians Assn.

602 N. Jackson
Greencastle, IN 46135
317-653-8262
800-288-3824
Fax: 317-653-8262

Excel Distributing*D

1819 Mentor Ave
Cincinnati, OH 45212
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800-733-3329
Fax: 513-735-8007

Extech Instruments Corp.*D

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617-890-7440
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E-Z Hook

225 North Second Avenue
PO Box 450
Arcadia, CA 91066
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Fax: 818-466-0972

F

Fairway Electronics*D

4210 Howard Ave.
Kensington, MD 20895
301-564-1440

The Fax Doctor

85 West Wilmot St.
Richmond Hill, ON
Canada L4B 1K7
905-882-0700
800-265-0700

Falcon Safety Products

25 Chubb Way
Branchburg, NJ 08876
908-707-4900
Fax: 908-707-8855

Fedco Electronics, Inc.*D

PO Box 1403
Fond Du Lac, WI 54936
414-922-6490
Fax: 414-922-6750

Federal Warranty Service Corp.

919 North Michigan Avenue
Suite 3202
Chicago, IL 60611
312-944-6161
Fax: 312-944-8966

Fessenden Technologies

116 3rd Street
Ozark, MO 65721
417-485-2501
Fax: 417-485-3133

Fiber Options, Inc.

80 Orville Drive
Bohemia, NY 11716-2506
516-567-8320

Fieldpiece Instruments

231 East Imperial Highway
Suite 250
Fullerton, CA 92635
714-992-1239
Fax: 714-992-6541

Fifth Generation Systems

10049 North Reiger Road
Baton Rouge, LA 70809-4562
504-291-7221

Fluke Corporation

PO Box 9090 M/S 250E
Everett, WA 98206-9090
206-347-6100
800-44-FLUKE
Fax: 206-356-5116

Foley-Belsaw*D

6301 Equitable Road
Kansas City, MO 64120-1395
816-483-6400
800-821-3452
Fax: 816-483-5010

Foresight Resources

10725 Ambassador Drive
Kansas City, MO 64153
816-891-1040
Fax: 816-891-8018

Fotec Inc

529 Main Street
Boston, MA 02129
617-241-7810
800-537-8254
Fax: 617-241-8616

Fotronic Corporation*D

PO Box 708
Medford, MA 02155
617-665-1400
800-996-3837
Fax: 617-665-0780

Company mailing addresses

Four Star Chemical

5701 South Compton Avenue
Los Angeles, CA 90011
213-588-7166
800-243-6264
Fax: 213-582-6226

Fox International*D

23600 Aurora Road
Bedford Heights, OH 44146
216-439-8500
800-321-6993
Fax: 800-445-7991

Franks Electronics*D

PO Box 357
Glen, MS 38846
601-287-1594

R. Frazier Inc.*D

1300 Intervale Drive
Salem, VA 24153
703-387-3799
Fax: 703-387-1180

Frederick Engineering, Inc.

10200 Old Columbia Rd.
Columbia, MD 21046
410-290-9000
Fax: 410-381-7180



Galco Industrial Electronics*D

26010 Pinehurst Drive
Madison Hts., MI 48071-4189
810-542-9090
800-827-8902
Fax: 810-542-8031

GC Electronics*D

A Division of GC Thorsen Co.
1801 Morgan Street
Rockford, IL 61105-1209
815-968-9661
800-443-0852
Fax: 800-527-3436

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Norcross, GA 30071
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800-431-7671
Fax: 404-263-5780

GE Consumer Service

4421 Bishop Lane
Louisville, KY 40218
800-572-2455

Geist Inc.

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Lincoln, NE 68501
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Multidyne

191 Forest Ave
Locust Valley, NY 11560
516-671-7278
800-4TV-TEST
Fax: 516-671-3362

Multiplex Technology, Inc.

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

Multiverse Communications

148 West 77th Street,
Suite 3A
New York, NY 10024
704-522-6183

N

National Advancement Corp.

2730-J South Harbor
Santa Ana, CA 92704
714-754-7110
800-832-4787
Fax: 714-754-7166

Nat'l Assoc. of Svc Dealers

Division of NARDA
10 E 22nd St
Lombard, IL 60148
708-953-8950
800-621-0298
Fax: 708-953-8957

National Parts Depot*D

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

National Technical Schools

PO Box 1548
La Canada, CA 91012-5548

National Electronics Warranty

44873 Falcon Place,
Suite 174
Sterling, VA 22170

National Instruments

6504 Bridge Point Parkway
Austin, TX 78730-5039
512-794-0100
800-433-3488
Fax: 512-794-8411

NATM

1 Penn Plaza
New York, NY 10119
212-239-7222

NCM Electronics

20393 Kent Way
Los Gatos, CA 95030-9112
408-496-0290
Fax: 408-496-0388

NEC Technologies, Inc.*D

1255 Michael Drive
Wood Dale, IL 60191
708-860-9500
800-366-3632

Nederman, Inc.

6100 Hix Road
Westland, MI 48185
313-729-3344

Neptune Electronics*D

PO Box 245495
Brooklyn, NY 11224
800-242-5556
800-239-6349

NESDA

2708 W. Berry
Fort Worth, TX 76109
817-921-9061
Fax: 817-921-3741

Company mailing addresses

Network Technologies Inc.

1275 Danner Drive
Aurora, OH 44202
216-562-7070
800-742-8324
Fax: 216-562-1999

P.K. Neuses*D

1401 Rohlwing Rd.
Rolling Meadows, IL 60008
708-253-6555
Fax: 708-253-6652

M.M. Newman Corporation

24 Tioga Way
PO Box 615
Marblehead, MA 01945
617-631-7100
Fax: 617-631-8887

Newport Electronics, Inc.

2229 South Yale Street
Santa Ana, CA 92704-4426
714-540-4914
800-639-7678
Fax: 714-546-3022

Nikko

AVS Technologies
2100 Trans-Canada
Highway S
Montreal, PQ
Canada H9P 2N4
514-683-1771
Fax: 514-683-5307

Nintendo America

4820 150th Avenue NE
Redmond, WA 98052
206-882-2040

Nippon America, Inc.*D

9600 NW 12th Street
Miami, FL 33172

Nippon Shokuhin Sangyo USA Ltd

861 Hinckley Rd
Burlingame, CA 94010
415-697-1558
800-366-4677
Fax: 415-697-2890

Northeast Electronics Inc.*D

6 Wilkins Drive #207
Plainville, MA 02762
508-699-6935
Fax: 508-695-9694

NorthStar MatrixServ

7101 31st Avenue N
Minneapolis, MN 55427
612-591-0009
800-969-0009
Fax: 612-591-0029

NRI Training for Professionals

McGraw-Hill Continuing
Education Center
4401 Connecticut Ave. NW
Washington, DC 20008

NRI School of Electronics

4401 Connecticut Ave., N.W.
Washington, DC 20008
202-244-1600
Fax: 202-244-2047

NTE Electronics, Inc.*D

44 Farrand Street
Bloomfield, NJ 07003
201-748-5089
800-631-1250
Fax: 201-748-6224

Nu-Concept Systems

P.O. Box 587
Colmar, PA 18915
215-822-8400
800-762-4278
Fax: 215-822-1427

Nutronix Inc.

P.O. Box 77103
Sterling Heights, MI 48077
313-726-1278
Fax: 313-726-9150



O.C. White

Bridge St./PO Box 128
Three Rivers, MA 01810
413-289-1751
Fax: 413-289-1754

Odem, Inc.

Instrumentation Division
PO Box 666
Ephrata, PA 17522
717-738-2330

The Ogment Group

PO Box 781
Lafayette, CA 94549
415-284-7372
415-284-4142

OHM/Electronics

746 Vermont Avenue
Palatine, IL 60067

O.K. Industries, Inc.

4 Executive Plaza
Yonkers, NY 10701
914-969-6800
Fax: 914-969-6650

Oldaker Corp.

301 N. Main St.
Dunkirk, OH 45836
419-759-3551
Fax: 419-759-3312

Omega Engineering, Inc.

One Omega Drive
PO Box 4047
Stamford, CT 06907-4047
203-359-1660
800-826-6342
Fax: 203-359-7990

Omnitron Electronics*D

280 North Midland Ave.
Saddle Brook, NJ 07662
201-703-9800
800-379-6664
Fax: 201-703-9804

Ontrack Computer Systems

6321 Bury Drive
Eden Prairie, MN 55346
612-937-1107
800-752-1333
Fax: 612-937-5815

Ontrack Data Recovery, Inc.

6321 Bury Drive,
Suites 13-21
Eden Prairie, MN 55346
612-937-5161
800-872-2599
Fax: 612-937-5750

OPTOelectronics Inc.

5821 NE 14th Avenue
Fort Lauderdale, FL 33334
305-771-2050
800-327-5912
Fax: 305-771-2052

OTI International

319 North Main Street
PO Box 194
West Point, NE 68788
402-372-5650

ORA Electronics

9410 Owensmouth Ave.
Chatsworth, CA 91311
818-772-2700
Fax: 818-718-8626

Orion Instruments, Inc.

1376 Borregas Ave
Sunnyvale, CA 94089-1004
408-747-0440
800-729-7700
Fax: 408-747-0688



PACE, Inc.

9893 Brewers Court
Laurel, MD 20723-1990
301-490-9860
Fax: 301-498-3252

Pacer Industries, Inc.

1450 First Ave.
Chippewa Falls, WI 54729
715-723-1141
800-283-1141
Fax: 715-723-7890

Panamax, Inc.

150 Mitchell Blvd.
San Rafael, CA 94903
415-499-3900
800-472-5555
Fax: 415-472-5540

Panasonic Industrial Co.

Two Panasonic Way
Secaucus, NJ 07094
201-348-7000

PanaVise Products

1485 Southern Way
Sparks, NV 89431
702-353-2900 EXT19
800-759-7535
Fax: 702-353-2929

Parts Express*D

340 East First Street
Dayton, OH 45402
513-222-0173
800-338-0531
Fax: 513-222-4644

Parts Port*D

1801 Walthall Cr Dr
Colonial Heights, VA 23834
804-733-0591
800-253-0515
Fax: 800-253-5640

Patco Service, Inc.

2515 Glencoe Road
Baltimore, MD 21234
410-444-4010
Fax: 410-254-9566

PC Instruments Incorporated

9261 Ravenna Road,
Bldg B11
Twinsburg, OH 44087
216-963-0800
Fax: 216-425-1590

PC Service Source*D

2350 Valley View Lane
Dallas, TX 75234
214-406-8583
800-727-2787
Fax: 214-406-9081

PD Software

7320 Louetta Rd
Spring, TX 77379
713-370-0600

The Peak Technologies Group

9200 Berger Rd
Columbia, MD 21046-1602
410-992-9922 X5410
800-950-6372

JC Penney

National Parts Center
6840 Barton Road
Morrow, GA 30260
404-961-8400

PerfectData Corporation

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

Peripheral Computer Support

2219 Oakland Road
San Jose, CA 95131
408-263-4043

Perma Power Electronics, Inc.

5627 W Howard St.
Niles, IL 60714-4011
312-763-0763
Fax: 312-763-8330

Pfanstiehl Corp.*D

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

Philips Consumer Electronics*MD

Service Parts
907 Snapp Ferry Rd.
Greenville, TN 37744-0967
800-851-8885
Fax: 800-535-3715

Philips ECG*D

2001 West Blue Heron Blvd
Riviera Beach, FL 33404
407-881-3308

Philips ECG*D

Baldwin Green Common #109
Woburn, MA 01801
617-932-9070

Philips Technical Training

Service Co.
P.O. Box 555
Jefferson City, TN 37760
615-475-0044
Fax: 615-475-0221

Philips ECG

1001 Snapps Ferry Road
PO Box 967
Greenville, TN 37744-0967
423-636-5693
Fax: 800-346-6621

Company mailing addresses

Philips Service Company

Old Andrew Johnson Highway
PO Box 555
Jefferson City, TN 37760
615-475-0329
Fax: 615-475-0258

Philtek Power Corp.

4320 Sweet Rd., Unit B
Blaine, WA 98230-9110
360-332-7252
800-727-4877
Fax: 360-332-7253

Pioneer Research

1745 Berkeley St.
Santa Monica, CA 90404
310-829-6751
800-233-1745
Fax: 310-453-3929

Plato Products, Inc.

18371 Railroad Street
City of Industry, CA 91748
818-965-8044
800-423-4510
Fax: 818-965-8960

Platt Luggage, Inc.

4051 W. 51st St.
Chicago, IL 60632
312-838-2000
800-222-1555
Fax: 312-838-2010

Plaza Distributing*D

13268 66th Street N.
Largo, FL 34643
813-531-5484
800-531-5484
Fax: 813-530-1821

Polaris Div. of UXL Corp.

108-02 Otis Ave.
Corona, NY 11368
718-271-5200
Fax: 718-271-5738

J.S. Popper, Inc.

200 Liberty Street
PO Box 206
Little Ferry, NJ 07643
201-641-3252

Portasol, Inc.

3129 Chaucer Drive
Charlotte, NC 28210-4818
704-543-6239
Fax: 704-543-6839

PowerTronics

143 Raymond Road
PO Box 735
Candia, NH 03034
603-483-5876
Fax: 603-483-5938

Projector Recorder Belt*D

P.O. Box 176
Whitewater, WI 53190-0176
414-473-2151
800-558-9572
Fax: 800-887-2727

Preferred Computer Svcs Inc.

6120 West by NW Blvd Suite 100
Houston, TX 77040
713-895-0600
800-225-1923
Fax: 713-895-6885

Prelco Electronics

605 Chestnut St.
Union, NJ 07083
908-851-8600
Fax: 908-686-4656

Premium Parts+ Electrncs Co*D

W9390 State Road 59
PO Box 28
Whitewater, WI 53190-0176
414-473-2151
800-558-9572
Fax: 800-887-2727

Prentice Hall PTR

Simon & Schuster Education Grp
One Lake St
Upper Saddle River, NJ 07458
201-236-7139
Fax: 201-236-7131

Prime Technology, Inc.

International Insts. Div.
Twin Lakes Rd PO Box 185
North Branford, CT 06471
203-481-5721
Fax: 203-481-8937

Princeton Computer Support

5 Crescent Avenue
PO Box 787
Rocky Hill, NJ 08553
609-921-8889
800-682-6158
Fax: 609-921-7693

Print Products International*D

8931 Brookville Rd.
Silver Spring, MD 20910
301-587-7824
800-638-2020
Fax: 800-545-0058

Pro-Services

808 North First Street
Grants, NM 87020
505-285-5604

ProAmerica*D

959 E. Collins
Richardson, TX 75081
800-888-9600
Fax: 214-690-8648

Probe Master, Inc.

215 Denny Way
El Cajon, CA 92020
619-258-7412
800-772-1519
Fax: 619-258-7413

Production Devices

215 Denny Way
El Cajon, CA 92020
619-258-7303
800-824-4226
Fax: 619-258-1753

Professional Business Systems

490 W. Arrow Highway, Suite F
San Oiams, CA 91733

Progressive Electronics

325 South El Dorado
Mesa, AZ 85202
602-966-2931
800-967-8602
Fax: 602-967-8602

PROSTAT

1072 Tower Lane
Bensenville, IL 60106
708-238-8883
Fax: 708-238-9717

Protek

154 Veterans Drive
Northvale, NJ 07647
201-767-7242
Fax: 201-784-0611

PTS Corporation

5233 South Highway 37
PO Box 272
Bloomington, IN 47402
812-824-9331
800-844-7871
Fax: 812-824-2848



Q B Products*D

1260 Karl Court
Wauconda, IL 60084-1094
708-487-3333
800-323-6856
Fax: 708-487-2689

Quantum Data

2111 Big Timber Road
Elgin, IL 60123
708-888-0450
Fax: 708-888-2802

Quasar

50 Meadowlands Parkway
Secaucus, NJ 07094
800-447-4700



R&K Supply Co.*D

650 W Smith Rd #17
Medina, OH 44256
800-362-6780
Fax: 800-840-TOOL

Racal Instruments Inc.

4 Goodyear Street
Irvine, CA 92718
714-859-8999
800-722-2528
Fax: 714-859-2505

RAG Electronics Inc.*D

Box 2450 Turquoise Circle
Newbury Park, CA 91320
805-498-9933
800-732-3457
Fax: 805-498-3733

RAM Software Enterprises

3434 Bren Lee Court
Indianapolis, IN 46227-7905
317-881-0690
800-323-9654

Ramsey Electronics Inc.

793 Caning Parkway
Victor, NY 14564
716-924-4560
Fax: 716-924-4555

Rawn Co. Inc.

P.O. Box 9
Spooner, WI 54801
715-635-8711
800-826-6791
Fax: 715-635-2200

RCA Consumer Electronics

600 North Sherman Drive
Indianapolis, IN 46201
317-267-5661

Read/Right Products Division

The Texwipe Company
650 East Crescent Avenue
Upper Saddle River, NJ 07458
201-327-9100 X315
800-327-1237
Fax: 800-569-3600

Recoton Corporation

46-23 Crane Street
Long Island City, NY 11101
718-392-6442
800-223-6009
Fax: 718-784-1080

Rehart Engineering

646 Gibbons Street
Los Angeles, CA 90031
213-225-7349

Republic Packaging Corp.

9160 S. Green
Chicago, IL 60620
312-233-6530
Fax: 312-233-6005

Resonance

5173 Waring Road, Suite 115
San Diego, CA 92120
619-287-3348

Research Specialists Inc.

1816 Settlers Reserve Oval
Westlake, OH 44145
216-871-8909

Reset, Inc.

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

The Rex Company

12311 Loreleen St.
Garden Grove, CA 92641
714-530-0330
Fax: 714-530-8577

RF Parts*D

435 S Pacific St
San Marcos, CA 92069
619-744-0700

RG Software, Inc.

6900 E. Camelback Rd,
Suite 630
Scottsdale, AZ 85251
602-423-8000

RGD Electronics

107 Trumbull St
Elizabeth, NJ 07206
908-354-2300

Richardson Electronics, Ltd.*D

40W267 Keslinger Road
LaFox, IL 60147
708-208-2200
800-348-5580
Fax: 708-208-2550

Richmond Static Control Svcs

3101 E. Alejo Rd.
Palm Springs, CA 92262
619-325-3211
800-538-0750
Fax: 619-322-2073

Ripley Company

Miller Tool Division
46 Nooks Hill Rd.
Cromwell, CT 06416
860-635-2220
800-528-8665
Fax: 860-635-3631

Company mailing addresses

Rite Off

105 Park Ave.
Seaford Industrial Park
Seaford, DE 19973
302-628-2100
800-645-5863
Fax: 302-628-2110

RNJ Electronics Inc.*D

805 Albany Ave.
PO Box 528
Lindenhurst, NY 11757
516-226-2700
800-645-5833
Fax: 800-226-2770

Rogers Anti-Static Chemicals

120 W. Madison, Room 1118
Chicago, IL 60602
312-276-0665
Fax: 312-276-4371

Rose Research & Development

1626 Becky Court
Santa Rosa, CA 95403
707-526-9044

RS Electronics*D

34443 Schoolcraft
Livonia, MI 48150
313-525-1155
800-366-7750
Fax: 313-525-1184

Ruppman Parts Distribution*D

2130 Townline Road
Peoria, IL 61615-1560
800-662-0504
Fax: 309-691-2271

Russell Industries*D

3000 Lawson Ave.
Oceanside, NY 11572
516-536-5000
800-645-2202
Fax: 516-764-5747

S

Sage Data Systems

Division of America West C&E
1900 Elk St.
Rock Springs, WY 82901
307-382-5663
800-542-9378
Fax: 307-382-7323

Salen Enterprises*D

P.O. Box 915
Morton Grove, IL 60053
312-736-0999
Fax: 312-736-4238

Howard W. Sams & Company

2647 Waterfront Pkwy E. Drive
Indianapolis, IN 46214
317-298-5400
800-428-SAMS
Fax: 317-298-5604

Sanyo Energy Corp.

1201 Sanyo Ave.
San Diego, CA 92073
619-661-6620
Fax: 619-661-6743

Sargent Tool Company

30 East Industrial Road
Branford, CT 06405

Schematic Solutions, Inc.

13043 Hunters Ridge St
San Antonio, TX 78230
512-696-0404
Fax: 512-696-7135

Schlumberger Technologies

Instruments Div.
P.O. Box 7004
Billerica, MA 01821
508-671-9700
800-225-5765
Fax: 508-671-9704

Schurter, Inc.

1016 Clegg Court
Petaluma, CA 94954
707-778-6311
800-848-2600
Fax: 707-778-6401

SDI Technologies

800 Federal Boulevard
Carteret, NJ 07008-1002
908-855-9750
Fax: 908-855-0224

Sears Industrial Sales

3333 Beverly Rd E3-375A
Hoffman Estates, IL 60179
708-286-6923

Satellite Dealers Association

602 N. Jackson St.
Greencastle, IN 46135
317-653-4301
800-288-3824
Fax: 317-653-8262

Seco Industries

6909 E. Washington Blvd
Montebello, CA 90640
213-726-9721
Fax: 213-726-9776

SelecTronics, Inc.

Two Tobey Village Office Park
Pittsford, NY 14534
716-248-3875
Fax: 716-248-3868

Semtronics Corp.

PO Box 94
Oldwick, NJ 08858
908-439-2030
800-946-4646
Fax: 404-487-1128

Sencore Electronics

3200 Sencore Drive
Sioux Falls, SD 57107
605-339-0100
800-SENCORE
Fax: 605-339-0317

Service Electronics Inc.

682 Passaic Avenue
Nutley, NJ 07110
201-284-1200 X524
Fax: 201-284-1550

Service Management Software

931 Sunset Boulevard
West Columbia, SC 29169
803-791-5860
Fax: 803-791-8521

Serviceplan, Inc.

1099 18th Street Suite 950
Denver, CO 80202
303-297-9032

Service Systems International

8717 West 110th St,
Suite 600
Overland Park, KS 66210
913-661-0190
Fax: 913-661-0220

ServiceWare Inc.

300 Allegheny River Blvd.
Oakmont, PA 15139
412-826-1158
Fax: 412-826-0577

ServiceWare Corporation

2280 St. Laurent Blvd.,
Suite 104
Ottawa, ON
Canada K1G 4K1
613-521-7391
Fax: 613-521-5595

Servicing Systems

132 Lamplighter Drive
Manchester, CT 06040
860-647-9124
Fax: 860-647-9124

Shape Electronics

2105 Corporate Drive
Addison, IL 60101-1484
708-620-8394
800-367-5811
Fax: 708-620-0784

Sharp Electronics Corp

Sharp Plaza
PO Box 650
Mahwah, NJ 07430-2135
201-529-8200

SHOGYO International Corp.

45 Executive Drive
Plainview, NY 11803
516-349-5200
Fax: 516-349-7744

Sibex, Inc.

1040 Harbor Lake Drive
Safety Harbor, FL 34698
813-726-4343
Fax: 813-726-4434

Sigma Electronics

632 Elkton Dr
Colorado Springs, CO 80907
719-528-1115
Fax: 1-719-522-9291

Signal Measurement Company

PO Box 1607
Tomball, TX 77377-1607
713-356-2584

The Simco Co., Inc.

2257 N. Penn Rd.
Hatfield, PA 19440
215-822-2171
Fax: 215-822-3795

Simpson Electronic Company

853 Dundee Ave.
Elgin, IL 60120
708-697-2260
Fax: 708-697-2272

Sirius Technologies

Route 2, Box 196A
Colfax, WI 54730
715-962-3592
800-359-3592

Sirius Software Inc.

345 West Second St,
Suite 201
Dayton, OH 45402-1443
513-228-4849
800-788-4849
Fax: 513-228-1159

SL Waber, Inc.

520 Fellowship Rd.
Mount Laurel, NJ 08054
609-866-8888
800-634-1485
Fax: 609-866-1945

SMH Electronics Co., Inc.

21 Pattersons Brook Rd.
West Wareham, MA 02576
508-291-7447
Fax: 508-291-7449

DW Smith & Associates

2929 Campus Drive,
Suite 200
San Mateo, CA 94403
415-349-7725
Fax: 415-349-5693

Smith Design

207 E Prospect Ave
North Wales, PA 19454
215-661-9107
Fax: 215-661-9107

Snap-On Incorporated

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Kenosha, WI 53141-1410
1-800-973-8665
Fax: 414-656-4980

Soder-Wick Fine-Braid

8125 Cobb Center Drive
Kennesaw, GA 30152
770-424-4888
800-645-5244
Fax: 770-424-4267

Sola Electric

1717 Busse Road
Elk Grove Village, IL 60007
708-439-2800
800-TRY-SOLA
Fax: 800-626-6269

SAT/A SPIRIG CO.

Solder Absorbing Tech. Inc.
Springfield, MA 01108-1787
413-788-6191
800-628-8862
Fax: 413-788-0490

Solomat Neotronics

26 Pearl St.
Norwalk, CT 06850
203-849-3111
800-SOLO-MAT
Fax: 203-847-9320

Sonera Technologies

PO Box 565
Rumson, NJ 07760
908-747-6886
800-932-6323
Fax: 908-747-4523

Sony Service Company

Sony Drive
Park Ridge, NJ 07656
201-930-1000

Company mailing addresses

Sony Service Co.

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

Sony Technician Devel. Ctr.

390 University Ave.
Westwood, MA 02090
617-329-8308

SOS Computer Solutions*D

PO Box 794
Greenland, NH 03840-0794
603-433-1600
800-767-2554
Fax: 603-433-7367

Specialized Prods Company*D

3131 Premier Drive
Irving, TX 75063
214-550-1923
800-234-8286
Fax: 214-550-8286

Spectrum Computer Technologies

2150 Liberty Drive
Niagara Falls, NY 14304
716-283-0825
800-879-3225
Fax: 716-283-0828

Spencer Industries

PO Box 449
Dale, IN 47523
812-937-4561
Fax: 812-937-4637

A.W. Sperry Instruments, Inc.

P.O. Box 9300
Smithtown, NY 11787
516-231-7050
800-645-5398
Fax: 516-434-3128

Sperry Tech, Inc.

PO Box 5234
Lincoln, NE 68505
402-489-4054
800-228-4338

Spi-Ro Manufacturing, Inc.

PO Box 5500
Lakeland, FL 33807-5500
813-646-7925

Sprague Magnetics, Inc.*D

15720 Stagg St.
Van Nuys, CA 91406
818-994-6602
800-553-8712
Fax: 818-994-2153

SR Components, Inc.*D

52 Railroad Ave.
Valley Stream, NY 11580
516-872-8100
800-341-0003
Fax: 516-872-8118

Staco Energy Products

301 Gaddis Boulevard
Dayton, OH 45403
513-253-1191
Fax: 513-253-1723

Start International*D

3361 Boyington Suite 120
Carrollton, TX 75006
214-960-1986
800-259-1987
Fax: 214-702-9551

Static Prevention Inc.

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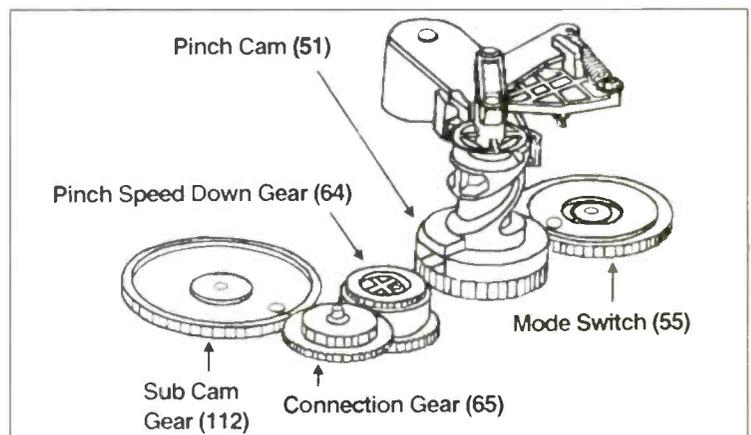
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The author is an electrical engineer with nearly 20 years of experience in data processing and industrial electronics. A former college instructor, he is a private engineering consultant whose clients have included DuPont and Ralston Purina.

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Troubleshooting, Maintaining, & Repairing Personal Computers: A Technician's Guide, By Stephen J. Bigelow, McGraw-Hill, Inc., 1104 pages, 350 illus., Paperback \$44.95, Hardcover \$70.00 (disk included)

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niques rather than theory, Troubleshooting, Maintaining, & Repairing Personal Computers: A Technician's Guide, is a practical and comprehensive technician-level guide. This volume's 1000-plus pages are filled with advice and information, including nearly 400 specific problems completely detailed and explained. In addition, the bundled disk contains a large collection of diagnostic freeware, shareware, and utilities that will prove invaluable to anyone who needs to troubleshoot and repair computers.

Covering IBMs and compatibles, including Pentiums, author Stephen J. Bigelow provides hundreds of POST and diagnostic codes to help readers pinpoint and correct even the rarest problems. He discusses hardware and operating systems, providing information on interpreting symptoms and performing diagnostics on computers and peripherals. He also covers optimizing and upgrading PCs.

This easy-to-use reference is divided into three sections, the first of which is a technician's primer, serving as the book's technical foundation. The second section provides an extensive array of service procedures, and the third offers practical advice and procedures for maintenance and support. Nine appendices include resource and reference information, useful forms, a sample technician's certification test, and more.

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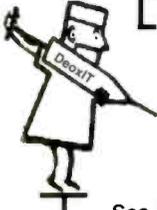
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ProGold - Next generation contact cleaner that improves conductivity, preserves & lubricates electrical connections - **Only product that penetrates plated surfaces and molecularly bonds to base metals.**

DeoxIT - Fast acting deoxidizing solution that cleans, preserves, lubricates and improves conductivity on connectors and contacts. Use as a general purpose treatment.

PreservIT - Seals & lubricates clean/new connectors/contacts.

OpticALL - Anti-static cleaner & preservative for glass, plastic & metal.

StaticALL - Neutralizes static buildup - protects equipment.

DustALL - Precision air duster. Remove dirt, dust & particles.

FreezALL - Locates intermittents, cools circuits to -54°C.

CircuitWriter - Conductive ink dispenser pen, makes traces on most surfaces.

CircuitSealer - Conformal coating pen, protects & insulates.

CaiKleen IPA - Ultra-pure alcohol for cleaning & degreasing.

CaiKleen 41 - Contact cleaner/degreaser - approved TF replacement.

CaiKleen TRP - Degreaser/Cleaner/Defluxer - citrus-based.

CaiKleen A/V - Cleaner for magnetic & optical read/write heads.

CaiKleen RBR - Rubber cleaner/rejuvenator for rollers & platens.

CaiShield S7 - Metal sealant & protectant for nonferrous metals.

CaiKote EMI - Conductive coating - shields against EMI/ESD.

ElectricALL - Similar to DeoxIT - more deoxidizing and less preserving properties.

MechanicALL - Concentrated anti-corrosive/tarnishing lubricant

CaiLube MCL - Moving Contact Lubricant for faders, switches potentiometers & other sliding surfaces.

CaiLube Pastes - semi-solid formulations for cleaning, protecting & lubricating. Available with copper, quartz, graphite and without particles.

CaiLube X105 - Precision instrument oil, contains silicone.

CaiLube 360 - Multipurpose, concentrated, high penetrating oil/additive.

Lint-Free Accessories - Lint-free cloths, swabs, cleaning brushes and other applicators and accessories.

Soldering Apparatus - solder pots, wave solder pots, dip coating pots, plastic welding & cutting tools, modular ovens & conveyor systems.

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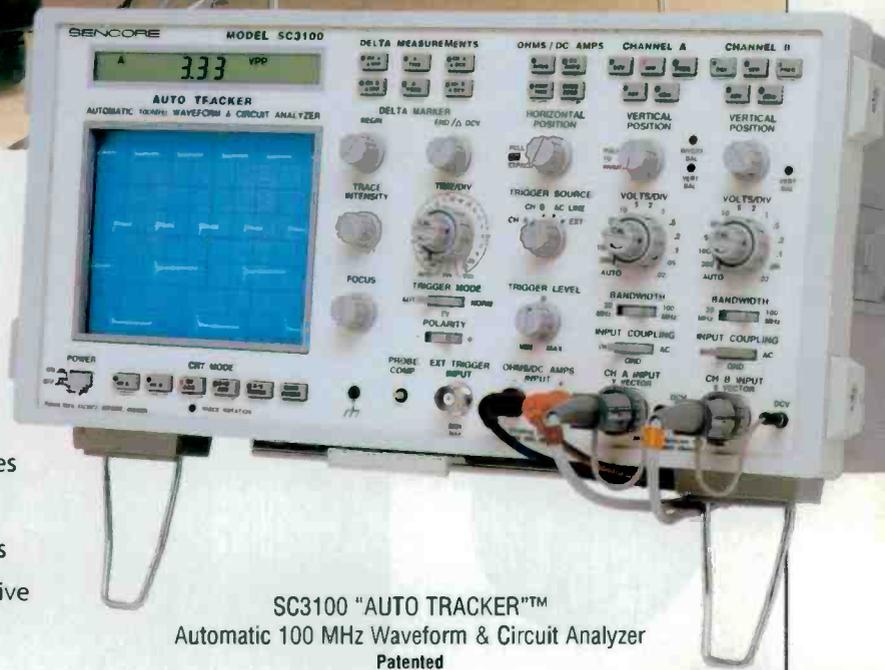
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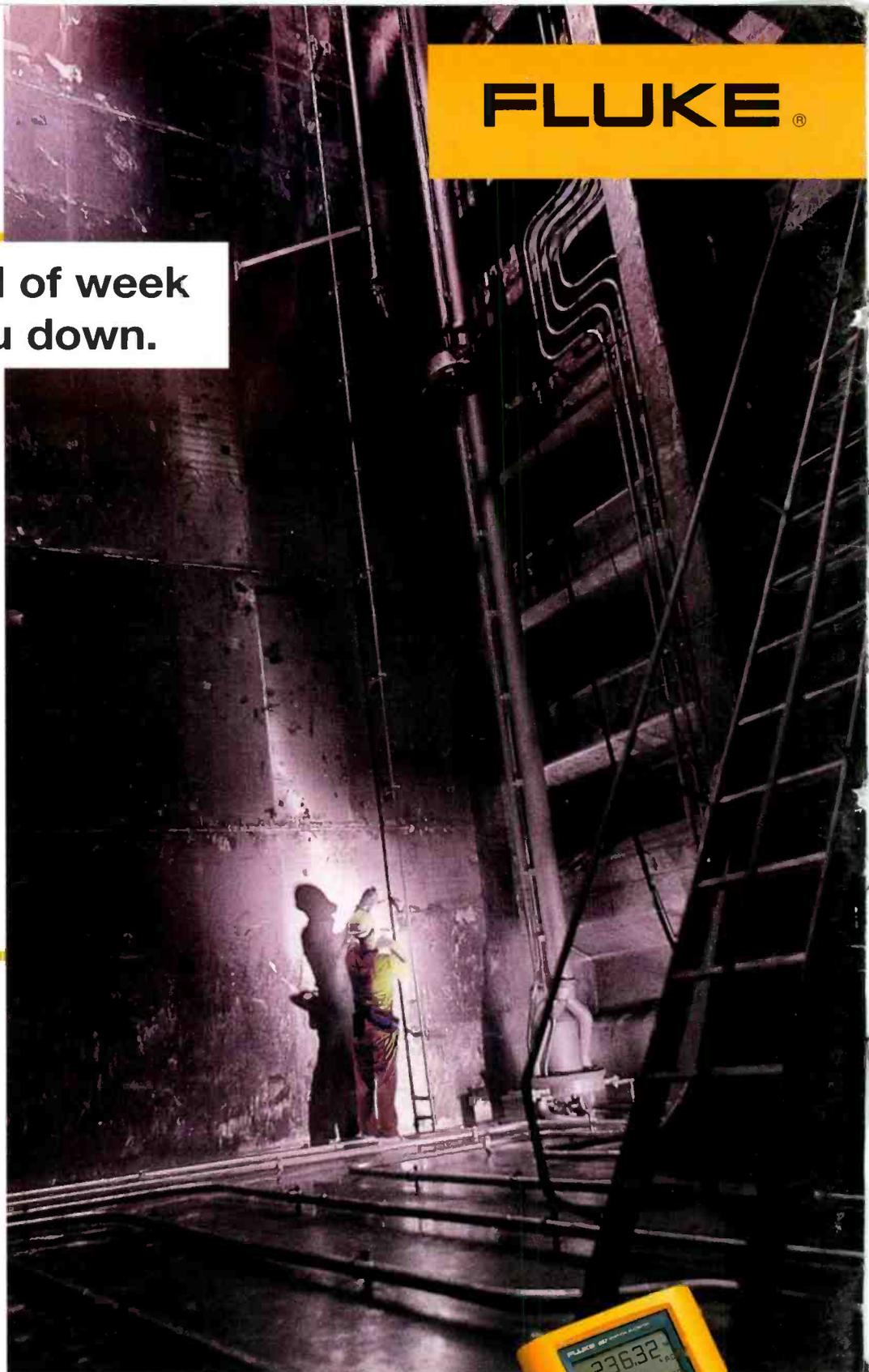


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