

THE PROFESSIONAL MAGAZINE FOR ELECTRONICS AND COMPUTER SERVICING

ELECTRONICTM

Servicing & Technology

March 1997

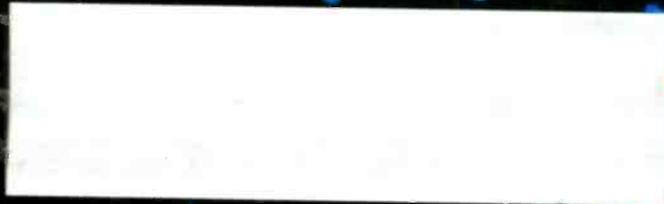
Servicing technicians glossary

Motors in electronics

Buyers' Guide **ES&T** 1997

Directories for:

- **Products**
- **Services**
- **Replacement Parts/
Components**
- **Company Addresses**

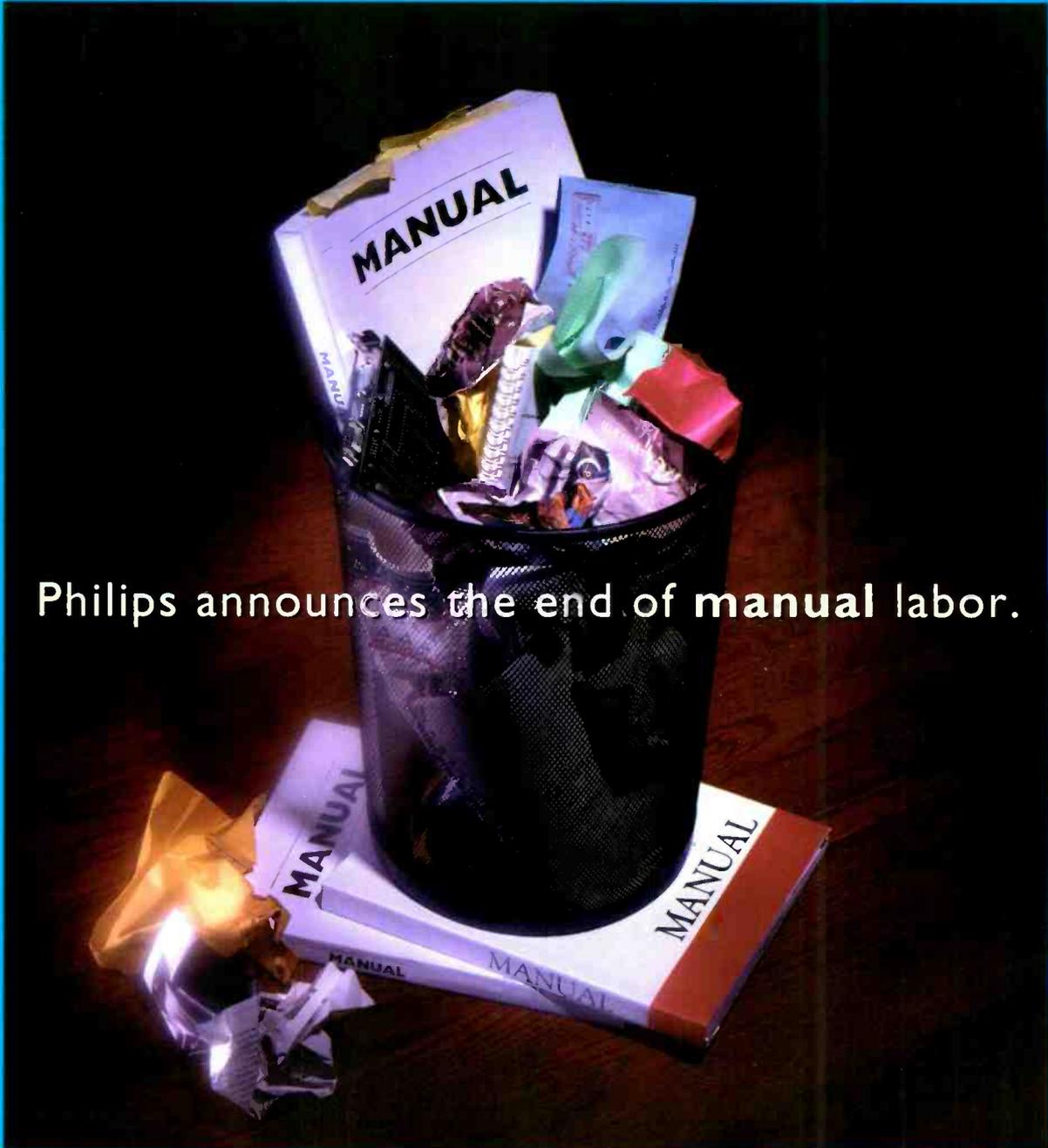


U.S. \$3.00

03 >



0 74470 86667 1



Philips announces the end of manual labor.



Introducing **Force™**, the easy-to-use software that replaces all those service manuals cluttering up your shop. Now you can enjoy instant access to any Force-compatible manual. Once loaded, all the information you need is at your fingertips: drawings, adjustments, parts lists and printed circuit board layouts. For more information, call 1-423-475-0480, and put your old manuals in their proper place.

Let's make things better.



PHILIPS

© 1996 Philips Electronics North America Corporation

Circle (117) on Reply Card

ELECTRONIC

Servicing & Technology

Volume 17, No. 3 March 1997

Contents

FEATURES

- 8 **Motors in consumer electronics**
By The ES&T Staff
In today's consumer electronics, motors are everywhere. This article highlights the drum or cylinder motor of a VCR or camcorder.
- 10 **Some new terms for some of the new products: A technician's glossary**
By The ES&T Staff
With all of the changes taking place in consumer electronics a whole new vocabulary is being generated. Included in this article are some terms that have appeared frequently in the literature in recent days.
- 12 **Servicing RCA's CTC130 start up and shutdown symptoms**
By Homer L. Davidson
Most TV startup and shutdown problems originate in the horizontal and power supply voltage sources. The author explains how you can service problems that can occur with the RCA chassis.

DEPARTMENTS

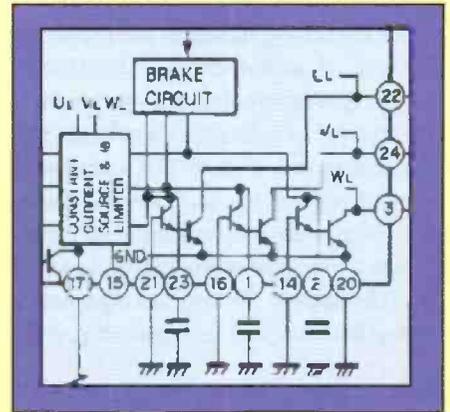
- 2 **Editorial**
- 4 **News**
- 11 **Calendar of Events**
- 17 **Test Your Electronics Knowledge**

- 37 **Profax**
- 71 **Photofact**
- 72 **What Do You Know About Electronics?**
Transformers and equivalent circuits.
- 74 **Literature**
- 75 **Books**
- 78 **Classified/Reader's Exchange**
- 80 **Advertisers' Index**

1997 BUYERS' GUIDE

To run a service center you must command a wide variety of skills and materials. You must have technical skills, management ability, an up-to-date comprehensive library, tools, test equipment, accessories and replacement parts. The ES&T Buyer's Guide contains useful information on hundreds of manufacturers and distributors who make and sell the products you buy. Through all of our research and visits to trade shows throughout the country we have come up with the list you will find in this magazine.

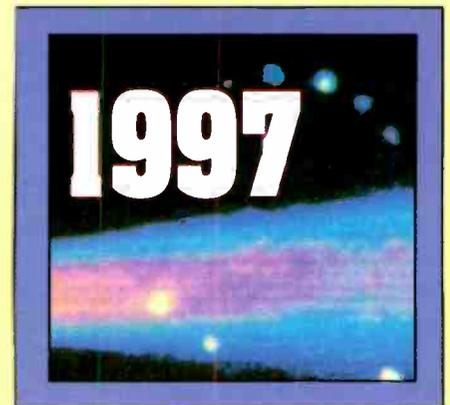
- 19 **Product Directory**
- 47 **Replacement Parts Directory**
- 52 **Software/Services Directory**
- 53 **Association/Educational Directory**
- 54 **Company Mailing Addresses**



page 8



page 12



page 18

ON THE COVER

Sometimes finding a replacement for a faulty part that you've spent hours to track down is difficult or nearly impossible. This annual Buyers' Guide contains listings of hundreds of manufacturers and distributors, one of whom may carry just the replacement part, tool or piece of test equipment you need.

We goofed. In the November/December annual Profax Schematics Issue, we neglected to identify the companies that provided us with those beautiful photos that enhanced the look of our cover. Cooper Tools supplied us with the photo of the blue-handled tools, their Erem Series line of pliers and sockets. Fluke provided us with the photo of the DMM being used to take measurements in a television set. Thanks to Cooper Tools and Fluke for providing us with those photos.

Building the Buyers' Guide

Welcome to the 1997 Annual **ES&T Buyers' Guide**. The *Buyers' Guide* grew out of an idea developed 11 years ago to gather the names, addresses and telephone numbers of manufacturers, distributors and other companies that provide products and services to consumer electronics service centers in one place. For many years a listing such as this one was not necessary. There were only a handful of manufacturers, a handful of products and a handful of distributors carrying test equipment, service literature and replacement parts.

The growth of consumer electronics

Gradually, however, the range of products that came under the heading of "consumer electronics" expanded from merely radios and TVs to include VCRs, microwave ovens, camcorders, CD players, personal computers, video games and more. And the number of manufacturers producing those products grew from a few dozen to a few hundred. The number of distributors of products to the industry that services those products grew as well.

Moreover, some of the companies that seemed to be rooted in one place moved for one reason or other—to enjoy a more benign climate, to have access to a more stable work force, to take advantage of a tax advantage offered by one state or to escape excessively stringent environmental laws. The net result was that the average service center became unable to keep track of who was entering the business, who was leaving it, or who was moving to a new location.

Here's how we do it

So we have developed this annual *Buyers' Guide* issue in which we include the latest information on companies of interest to consumer electronics service centers. For this 11th edition of the *Buyers' Guide* we started back in October. That's when we had question-

naire forms printed up. Next, using the then current database, we printed labels and brought the forms to a mailing house to have them sent out.

For several weeks there was a steady stream of questionnaires, then the stream slowed to a trickle, then stopped. Unfortunately, many of the companies to which we sent questionnaires did not fill them out or return them. We've found that what happens is that the individual to whom the questionnaire was sent received it, but was busy and put it aside, whereupon it disappeared into a stack of papers and never again saw the light of day. So we do a second mailing, to all of the companies that failed to respond to the first mailing. That results in a spate of additional returns.

All of this new information is keyed into the database and then printed out as two files: the company name and address list and the product listings. There's no way that we can force companies to return the questionnaires, so, unfortunately, the listings are almost certainly not 100% accurate. But they're as accurate as we could possibly make them.

Internet addresses

Those of you who have been receiving the *Buyers' Guide* for a while will note a new feature. This year, in addition to the other information in the name and address listings, we have listed Internet information. We included spaces in the questionnaire where companies could add their Internet Web site and an e-mail address. We have included this information for each company that provided it. The Web site address provides yet another way that service centers can find out about the products and services offered by companies listed in the *Buyers' Guide*.

Article coverage changes, too

All of the changes that led us to insti-

tute the *Buyers' Guide* have also lead to changes in the mix of articles in this magazine. During those early years, articles were largely confined to TV servicing. However, since the definition of consumer electronics has changed and many readers are now servicing many other products, the articles we publish now include video, audio, microwave ovens, computers and more.

In December, we included a survey form that asked the following: "So much change and activity has happened in consumer electronics in the past several years, and so much continues to happen, that we'd like to take this opportunity to make sure that the mix of articles in **ES&T** is meeting the information needs of readers." We asked readers to rate their interest in the various subjects on a scale of 1 to 5. Subjects included TV servicing, TV theory, VCR servicing, VCR theory, business, computers, computer peripherals, computer software, the internet, general electronics theory, audio servicing and audio theory.

The results are still trickling in, but in the main there appear to be two schools of thought. First of all, almost everyone still finds TV and VCR servicing of utmost importance. Secondly, the judgment of readers as to the usefulness of computer-related articles seems to be split. A majority of respondents seem to find them extremely useful, but a significant minority seem to have no use whatsoever for computer-related articles. We'll keep these findings in mind when we establish the mix of articles in the future, and we'll provide you with a more detailed report on the results of this survey in a future issue.

Nile Conrad Penam

it's Sunday 3 a.m.

the presentation is in 5 hours...

system's been crashing for 5 hours....

...the biggest client in two years

flying in from out of town...

...knew this would happen someday

...wonder when microDATA opens?

QuickTech^{PRO}

Professional PC Diagnostic Tools
Unconditionally Guaranteed
So what are you waiting for?



I really don't like the looks of that vein on his forehead...



1-800-539-0123



microDATA
WIN THE RACE AGAINST DOWNTIME!!

© microDATA, Inc. 1996

Visit our website at www.quicktech.com
3001 Executive Drive Suite 270 • Clearwater, Florida 34622
Phone: 813.573.5900 • Fax: 813.572.5085

Circle (116) on Reply Card

Bigger is better for September video sales

Sales of video products rose modestly in September and in the first nine months of the year as compared to 1995, according to data from the Consumer Electronics Manufacturers Association (CEMA). Impressive sales of big screen TVs (both direct-view and projection) helped continue the video market's positive momentum from August.

"After a slow start for 1996, the industry is seeing steady growth for video products—four of the last five months," said Jack L. Osborn, president and CEO of Mitsubishi Consumer Electronics America, Inc. "Big screens have anchored this growth, due primarily to improved picture quality and the continuing proliferation of home theaters. The Olympics and the fall sports season have motivated many to invest in a large direct-view or projection television. VCRs—notably the hi-fi stereo models—continue to shine, as do the mini-dish satellite systems.

CEMA data shows that shipments of projection TVs rose a hearty 27 percent in September, pushing the gain in the year to date to 12 percent. Meanwhile, the biggest models—60 inches and over—nearly doubled from September 1995.

Sales of direct-view color TVs with screens 30 inches and larger jumped 34 percent in September, the best monthly gain for the category this year. Meanwhile, slumping sales of mid-sized sets brought the overall TV category down six percent in September.

Sparked by sales of smaller models (13 inches and under), TV/VCR combinations continued to rebound from early sluggishness to post a six percent gain.

A ten percent increase pushed shipments of VCRs past 10 million for the year. The month of September continued the five-month trend in which the VCR market has scored gains over 1995.

Dealers purchased 470,000 camcorders in September—a four percent gain.

The Consumer Electronics Manufacturers Association (CEMA) is sector of the Electronic Industries Group (CEG). CEMA represents U.S. manufacturers of audio, video, consumer information, accessories, mobile electronics and multimedia products.

Consumer electronics accessories sales hold steady for first half of 1996

According to the Consumer Electronics Manufacturers Association (CEMA), sales of audio, video, camcorder and telephone accessories for the first half of 1996 held steady, remaining virtually unchanged from the previous year. Sales for 1996's second quarter totaled \$173 million, off a slight one percent from 1995's second quarter.

"In a recent CEMA consumer survey, only 31 percent of respondents said they got accessories information directly from salespeople, and only three percent of consumers depended on the advice of the salesperson when selecting which accessories to purchase. Manufacturers and retailers need to work together to educate consumers on the value of accessories," said Olin Lippincott, Manager of Zenith/Allegro Accessories Division. "Consumers do see quality as the most important factor to consider when purchasing accessories. However, not only do we as an industry need to impress upon consumers the quality of our products, but also the enhanced quality and value our accessories bring to existing consumer electronics hardware. Accessories help change the functionality of hardware products so that they better match a consumer's individual lifestyle."

Audio Accessories, spurred by strong sales of separate components for home theater use, were up a robust 12 percent in the second quarter, bettering results from the first quarter. In the first half volume rose nine percent. Tape cassette accessories totaled \$15 million in the year-to-date, up 12 percent over 1995. CD accessories were off 13 percent to \$20 million. The big gainer was headphones. Sales of standard and earbud models rose 21 percent in the first half on shipments of \$58 million.

Factory sales of video accessories were down six percent in the quarter to \$68 million and fell five percent in the first half. Nearly all categories were down in the first half, including universal remotes (down 10 percent), and VCR head cleaners (down 23 percent).

Camcorder accessories ended the first half virtually unchanged from the previous year with sales off a scant half percent. Telephone accessories were off sharply in the quarter and were down seven percent in the year-to-date. ■

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.

EDITORIAL

Nils Conrad Persson, *Editor*
(Internet e-mail: cpersedit@aol.com)
Kirstie A. Wickham, *Associate Editor*
(Internet e-mail: kirstiest@aol.com)
Richard S. Moseson, *NW2L, On-Line Coordinator*

CONSULTING EDITORS

Homer L. Davidson, *TV Servicing Consultant*
Victor Meeldijk, *Components Consultant*
John E. Shepler, *Audio Consultant*
Sam Wilson, *Electronics Theory Consultant*

PRODUCTION

Elizabeth Ryan, *Art Director*
Barbara McGowan, *Associate Art Director*
Edmond Pesonen, *Electronic Composition Mgr.*
Dorothy Kahrwieder, *Production Manager*
Emily Kreutz, *Assistant Production Manager*
Pat Le Blanc, *Phototypographer*

BUSINESS

Richard A. Ross, *Publisher*
Diane G. Klusner, *Associate Publisher*
(Internet e-mail: dianekes@aol.com)
Frank V. Fuzia, *Controller*
Catherine Ross, *Circulation Manager*
Melissa Nitschke, *Operations Manager*
Jean Sawchuk, *Data Processing*
Denise Pyne, *Customer Service*

SALES OFFICE

Electronic Servicing & Technology
76 N. Broadway, Hicksville, NY 11801
516-681-2922; FAX 516-681-2926

Diane G. Klusner, *Director of Advertising*
Emily Kreutz, *Sales Assistant*

EDITORIAL CORRESPONDENCE:

P.O. Box 12487
Overland Park, KS 66212
913-492-4857



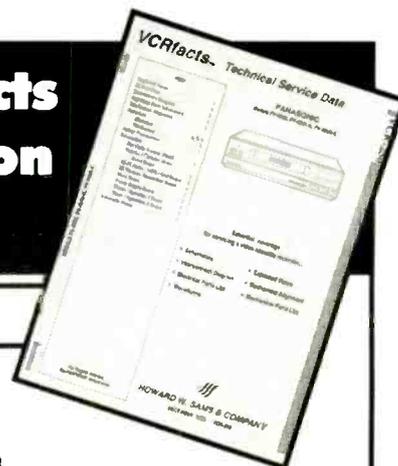
Electronic Servicing & Technology (ISSN 0278-9922) is published 13 times a year by CQ Communications, Inc. 76 N. Broadway, Hicksville, NY 11801. Telephone (516) 681-2922. Periodical class postage paid at Hicksville, NY and additional offices. Subscription prices (payable in US dollars only) Domestic—one year \$24.75, two years \$45. Canadian—one year \$34.95, two years \$65.40. Foreign Air Post—one year \$42.75, two years \$80.75. Entire contents copyright 1997 by CQ Communications, Inc. Electronic Servicing & Technology or CQ Communications, Inc. assumes no responsibility for unsolicited manuscripts. Allow six weeks for delivery of first issue and for change of address. Printed in the United States of America.

Postmaster: Please send change of address notice to Electronic Servicing & Technology, 76 N. Broadway, Hicksville, NY 11801.

CQ Communications, Inc. is publisher of CQ The Radio Amateur's Journal, Popular Communications, CQ Radio Amateur (Spanish CQ), CQ VHF, CQ Contest, and Electronic Servicing & Technology.



**Which of these products
can save you money on
every VCR repair?**



The Answer is Both!

**From our time-tested
VCRfacts® service data to a
brand new release from PROMPT® Publications,
we have what you need to repair VCRs
in a timely and cost-effective manner.**

Complete VCR Troubleshooting & Repair

This book contains sound troubleshooting procedures beginning with an examination of the external parts of the VCR, then narrowing the view to gears, springs, pulleys, belts, and other mechanical parts. It also shows readers how to troubleshoot:

- Tuner Circuits
- Audio and Video Circuits
- Video Heads
- Remote Control Circuits
- TV/VCR Combination Models
- Power Supply Circuits

In addition, *Complete VCR Troubleshooting & Repair* features nine VCR case studies, each focusing on a particular model of VCR with a specific problem.

**\$29.95 • 336 pages
ISBN#: 0-7906-1102-3**

VCRfacts® Service Data

VCRfacts® is the ultimate technicians' tool for VCR service and repair, and is available to you now for a fraction of the price you are paying for manufacturers' information.

Designed by the engineers and editors of PHOTOFACT® television repair data, *VCRfacts®* features both electronic and mechanical information arranged in Sams' standardized format, at less than a third of the price you are paying now for the same data. Other features include:

- Schematics Drawn by Circuit Board
- Parts Lists for Each Board
- Waveforms and Voltages
- IC Functions
- Mechanical Alignment Information

**All VCRfacts® Are Now Just
\$19.95**

A Bell Atlantic Company
Howard W. Sams
800-428-7267

WANTED



\$250
per head
Reward

We Are Putting A Price On Your Heads

All you have to do is purchase any *SK Series* video head between January 1 and March 31, 1997, fill out a redemption form and send it in along with the numbered box top and your invoice. Simple as that. Some restrictions apply. Void where prohibited by law.

See your participating authorized
Thomson Consumer Electronics
distributor for details.



Circle (113) on Reply Card

Visit Your Local Participating Thomson Consumer Electronics Distributors For More Information

Alabama

Forbes Distributing Co Inc Birmingham
Forbes Distributing Co Inc Decatur
Forbes Distributing Co Inc Huntsville
Forbes Electronics Distributors Mobile
Forbes Godfrey TV Elect Inc Montgomery

Arizona

Arizona Wholesale Supply Co Phoenix

California

Jack C Arbuckle Co Bakersfield
Jack C Arbuckle Co Fresno
Martin Distributing Co HuntingtonPk
Martin Distributing Co Los Angeles
Inland Electronics Suppliers Modesto
Inland Electronics Suppliers N Highlands
Cass Electronics Inc Oakland
Chuck Hurley's Electronics Inc Sacramento
Inland Electronics Suppliers San Jose
Andrews Electronics Inc Santa Clarita

Colorado

Fistell's Electronic Denver

Connecticut

Signal Electronic Center Inc West Hartford

Florida

Herman Electronics Miami
Tritronics Inc Miami
Vance Baldwin Inc Miami
Vance Baldwin Inc Pompano Beach
Fouraker Electronics Inc Tallahassee
Dow Electronics Inc Tampa
RES Marketing Inc Tampa
Vance Baldwin Inc Tampa

Georgia

Fouraker Electronics Inc Macon
Dow Electronics Inc Norcross
Wholesale Industrial Elect Inc Norcross
Fouraker Electronics Inc Valdosta

Illinois

Union Electronics Inc Beecher
Deltronics Distributing Co Belleville
Fox International Inc Chicago
North Central Elect Supply Chicago
Laco Electronics Inc Decatur
Tri-State Electronic Corp. Mount Prospect
Laco Electronics Inc Mt Vernon

Indiana

ESP/Electronic Service Parts Indianapolis

Kentucky

Randolph Hale & Meredith Inc Bowling Green
Randolph & Warren Louisville

Louisiana

Pelican Electronic Supplies Inc Houma
Pelican Electronic Supplies Inc Metairie
Southern Electronics Inc Shreveport

Massachusetts

E A Ross Co nc Fall River
Nash Electronic Supply Inc Leominster
Tee-Vee Supply Company Inc Medford
Electronic Distributors Corp North Quincy
Signal Electronic Center Inc Springfield

Maryland

Tritronics Inc Abingdon
Mark Electronics Inc Beltsville
Fairway Electronics Inc Hagerstown
Fairway Electronics Inc Kensington

Michigan

Bursma Electronic Dist Inc Bay City
Bursma Electronic Dist Inc Benton Harbor
Electronic Parts Specialists Inc Flint
Bursma Electronic Dist Inc Grand Rapids
Remcor Electronics Inc Oak Park
Bursma Electronic Dist Inc Traverse City
Bursma Electronic Dist Inc Warren

Minnesota

Ness Electronics Inc Minneapolis

Mississippi

E A Helwick Electronics Inc Gulfport

Missouri

Cititronix Inc St Louis
Deltronics Distributing Co St Louis

North Dakota

S/S Electronics Inc Fargo

New Jersey

Penn-Jersey Electronics Phillipsburg
Panson Electronics Pine Brook

New York

Standard Electronics Inc Amherst
Jayso Electronics Corp Bronx
Mill Electronics Supply Co Brooklyn
Eiger Electronics Inc Deer Park
Fox International Inc Farmingdale
Green Tele Radio Dist Inc Glendale

Ohio

Fox International Ltd Inc Bedford Hts
Excel Distributing Inc Cincinnati
Superior Elect. Parts Co., Inc. Parma

Oregon

Pringle Electronics Dist Inc Milwaukie
Double O Electronics Dist Inc Portland

Pennsylvania

Cumberland Electronics Inc Harrisburg
Moyer Elect Supply Co Inc Hazleton

Clearfield Electronic Supp Co Hyde
Cumberland Electronics Inc Lancaster
H B F Electronics Inc Philadelphia
Jem Electronic Distributors Inc Philadelphia
CRS Electronics Pittsburgh
Mayer Elect Supply Co Inc Pottsville
Mayer Elect Supply Co Inc Sunbury
Cumberland Electronics Inc York

Rhode Island

Jabbour Electronic Supplies Inc Pawtucket

South Carolina

Wholesale Industrial Elect Inc Charleston
Wholesale Industrial Elect Inc Columbia
Wholesale Industrial Elect Inc Greenville
Harley's Wholesale Electronics Spartanburg

South Dakota

S/S Electronics Inc Watertown

Tennessee

Shields Electronics Supply Inc Bristol
Shields Electronics Supply Inc Chattanooga
Townsend Electronic Supply Jackson
Shields Electronics Supply Inc Knoxville
Electrotex Tennessee Inc Memphis

Texas

NLnn Electric Supply Corp Amarillo
Electrotex nc Austin Austin
Electrotex nc Beaumont Beaumont
Electrotex nc Corpus Christi Corpus Christ
Electrotex nc Dallas Dallas
Interstate Electric Co Dallas
Electrotex nc Richmond Houston
NLnn Electric Supply Corp Lubbock
Fox International Ltd Inc Richardson
Electrotex nc San Antonio San Antonio

Utah

Ballard Supply Corporation Salt Lake City

Washington

Pringle Electronic Dist Inc Everett
Pringle Electronic Dist Inc Olympia
Pringle Electronic Dist Inc Spokane

Wisconsin

G M Popkey Co Green Bay
G M Popkey Co New Berlin
G M Popkey Co Wausau



Motors in consumer electronics

By The ES&T Staff

Back in the good old days of consumer electronics, when consumer electronics consisted of radio, TV and phonograph, the only motor that consumer electronics technicians had to contend with was the motor in the turntable. That motor was pretty straightforward, and pretty reliable. It ran on 120V and as long as the ac voltage was close to 60Hz, it ran at the correct speed.

Lots of motors today

In today's consumer electronics milieu, motors are everywhere. When you place a tape in a front-loading VCR, it actuates a switch, and a motor pulls the tape into

place. Once the tape is inside the VCR, a motor pulls the tape through the tape path, while another motor turns the head drum.

In a camcorder, you'll find motors that provide the same functions as those in a VCR, as well as motors that provide focus, zoom and aperture control.

Every tape player, CD player, disk drive and printer has one or more motors. It really helps in servicing these products to have an understanding of the basics of motors and the circuits that drive them.

The drum motor

For the purposes of this article, we'll concentrate on the drum, or cylinder,

motor of a VCR or camcorder. Interestingly, the typical drum motor is actually a three-phase motor. Most technicians have some knowledge of three-phase motors from studies of three-phase motors that are used in industrial plants.

In a three-phase motor, rotation occurs as the result of a rotating magnetic field that is created by the application of three-phase power to the three separate windings of the motor. The three phases of applied power are 120 degrees out of phase as they are applied to each of the windings of the motor.

One of the advantages of a three-phase motor is that it does not require brushes.

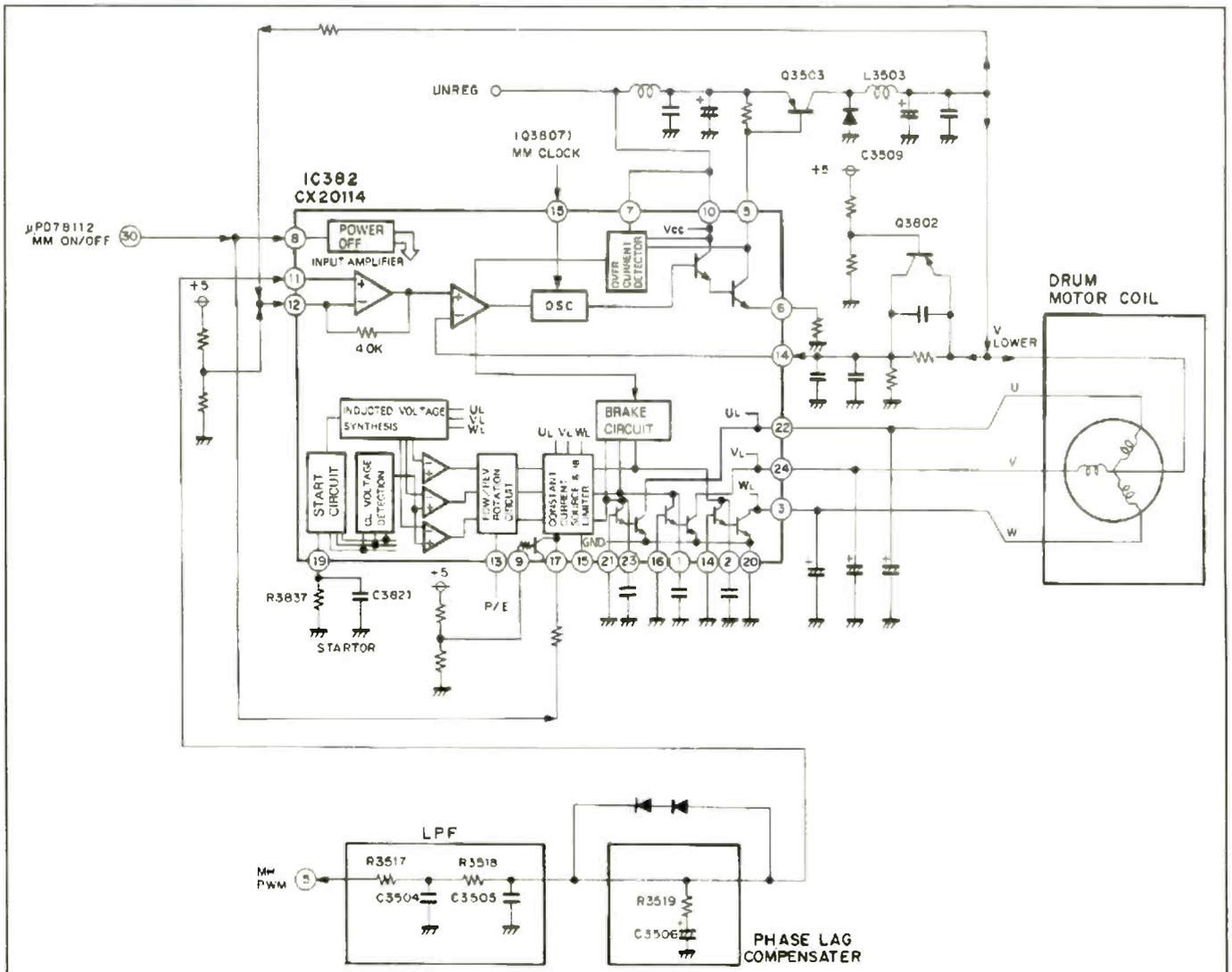


Figure 1. The head drum motor in a VCR is a three-phase motor. The motor drive circuits provide the three-phase alternating current signals needed to generate the rotating magnetic field that spins the motor.

The rotating magnetic field caused by the combination of the individual fields induced in each of the three windings is what creates the rotational force. Another advantage of a three-phase motor is that its speed of rotation is determined by the frequency of the applied power.

Switching to achieve three phases

The following is a generalized description of the manner in which the capstan motor power supply is switched in order to generate the three phase signal that drives the motor.

The switching timing for the power supply to the three motor windings is determined by the windings themselves through detection of the voltage waveform induced by the rotor. No voltage is induced when rotation is stopped, so a device called a ring generator supplies current to each of the windings in turn in order to start the motor. CX20114 (IC382) is the driver for this motor. The starter oscillation frequency is determined by the capacitor and resistor connected to pin 19.

The signal input to pin 11 passes through the internal op amp, is converted to a PWM (pulse-width modulated) wave, output from pin 5 and power amplified by the power transistor (Q3503).

Next, the carrier is eliminated by the LC LPF (low-pass filter) and is connected to the common terminal for motor power supply. Current is supplied to the windings through this terminal and pins 22, 24, and 3 of CX20114. The current only flows in one direction.

The voltage of this common terminal is also fed back to the previous stage op amp (pins 12 and 14) through a resistor. After the signal is converted to a PWM wave, a power amplifier offsets any power loss that was caused by switching.

The frequency of the carrier of the PWM wave is 23.4kHz. After the 23.4Hz MH PWM output from pin 5 of μ PD-78112 (IC351) is converted to a triangular wave (Q4306, 07), it is input to pin 15 as the PWM reference wave. The rotation and stop control signals are input to pin 8 of the integrated circuit.

Troubleshooting one of these motors

Inspection of Figure 1 suggests that if the drum motor appears not to be operating properly, there may be a number of

reasons, so it makes a lot of sense to check the circuits carefully before you order a new drum motor. For starters, check the mechanical condition of the drum motor by rotating the drum gently by hand. If it turns easily and smoothly, it's most likely sound, mechanically.

Next, with the VCR turned on, observe the waveforms at U, V, and W, and see how they compare to the waveforms specified on the schematic. If the waveforms look to be within spec, then the problem

is most likely somewhere in the motor. Check its connections to see if any of the windings are open. If so, the motor will have to be replaced.

If the waveforms are not within spec, the problem is not in the capstan motor, but in the drive circuits. Check to see if the input(s) to the drive circuits are as specified. If they are, you've isolated the problem to the IC and its connected components. If they're not, you'll have to check further upstream. ■



LG Precision offers a comprehensive line of affordable Analog and Digital Storage Oscilloscopes for your diagnostic needs.

- Signal Delay Lines
- TV Sync
- Variable Holdoff
- Max. Sweep Time of 2ns/div.

Digital Storage with CRT Readout and Cursor Control	Analog CRT Readout and Cursor Control	Analog
OS-3020: 20 MHz, 20 MS/s OS-3040: 40 MHz, 20 MS/s OS-3060: 60 MHz, 20 MS/s	OS-902RB: 20 MHz, Delayed Sweep OS-904RD: 40 MHz, Delayed Sweep OS-5100RA: 100MHz, 4CH, 8Trace, Auto Set OS-5100RB: 100MHz, 2CH, 4Trace, AutoSet	OS-5020P: 20MHz, Basic OS-9040D: 40MHz, Delayed Sweep OS-9060D: 60MHz, Delayed Sweep OS-9100P: 100MHz, Delayed Sweep OS-8100A: 100MHz, Delayed Sweep OS-9020G: 20MHz with 1 MHz Function Generator



Don't forget the other sensibly priced instruments available from LG Precision (Sweep Function Generators, Frequency and Universal Counters, Bench Power Supplies, and Bench and Handheld-Digital Multimeters).



LG Precision
New Name of Goldstar Precision

13013 East 166th St., Cerritos, CA 90703 Tel: 562-404-0101 Fax: 562-921-6227
E-Mail: lgpa@koa.pdc.net Home Page: <http://www.oscilloscope.com>

Circle (73) on Reply Card

Some new terms for some of the new products: A technician's glossary

By the ES&T Staff

The old saying goes, "you can't tell the players without a program." When it comes to consumer electronics, it might well be said that "you can't tell the technologies without the right vocabulary." Unfortunately, as the scope of consumer electronics expands, so does the vocabulary necessary to describe it.

There have been a number of developments recently in consumer electronics that have contributed to the vocabulary. For example, the many disparate parts of consumer electronics; TV, video, audio, computers, etc. seem to be converging to a common set of technologies.

There was a time when audio and video were analog and computers were digital. Now, audio and video signals are transmitted via digital signals and stored on disks in digital format, and digitized TV signals are showing up on computer screens. The familiar television set now may very well have internet access.

As all of these changes are taking place, a whole new vocabulary is being generated. The following are some of the terms you'll be seeing in the literature.

Aspect ratio: The ratio of the horizontal dimension of a viewing screen to its vertical dimension. Standard television screens have a 4x3 aspect ratio. That is, if the screen were 20 inches in width, for example, the height would be 15 inches. In contrast, HDTV screens will have an aspect ratio of 16x9, much closer to the aspect ratio of movie screens.

Convergence: This definition of the term, which has only recently entered the vocabulary, has nothing to do with improving the picture on a color TV screen. The new usage of "convergence" that has been introduced by consumer electronics manufacturers describes the current tendency of all consumer electronics to use the same technologies, that is, converging toward a common technology.

DAR: Digital audio radio. A radio broadcast system that will provide CD quality audio via the airwaves.

DBS: Direct broadcast satellite.

DSS: Digital satellite system. A form of direct broadcast satellite.

DVD: Digital video (versatile) disk. This recording technology allows full motion video and stereo high fidelity sound to be recorded on a disk that is the size of a standard compact disk. Because of the high densities of data recording used, along with advanced digital compression techniques, it is possible to record a full length movie on a 4-1/2 inch digital disk.

Electronic organizer: A calculator-like device that can store names addresses and telephone numbers, as well as personal schedules. It is the electronic equivalent of the paper-based personal organizer/scheduler systems.

HDTV: High definition TV.

Home theater: A video/audio system that provides a theater-like experience in the home. According to the Consumer Electronics Manufacturers Association, within the industry it is felt that a home theater should at least include a large-screen (25-inch or larger) color TV, a source for stereo surround sound, front-and rear-channel stereo speakers, and a stereo VCR or videodisc player. The complete home theater system would include the TV display, either a large-tube or projection color set, alternative video-sourced components, and stereo audio components, all hooded into an audio/video (A/V) receiver.

Internet TV: A television set that either contains within it an interface device, or has a separate interface device, so that it may be used to connect to the Internet.

These sets and interfaces are being sold with the notion that the user can connect to the internet without buying a computer. It may be transparent to the user, but there is some kind of reasonably powerful computer in those units.

MPEG: Motion picture experts group. A method of compressing video so that the huge amounts of picture information represented by a motion picture can be stored in a relatively small space.

PCTV: Personal computer/television. Manufacturers, such as Toshiba, are beginning to manufacture high-performance cathode ray tubes (CRTs) specifically designed for emerging PC/TV applications. These new tubes provide the high contrast, high brightness excellent picture sharpness that these applications demand and can be used for both personal computer and TV display.

PDA: Personal digital assistant. A hand-held wireless mobile computer, disguised as an easy-to-use consumer electronics device. Depending on the specific type of product, they can incorporate capabilities associated with electronic organizers, pen-based computers, electronic books, online services, multimedia players, pagers, and cellular telephones.

SmartCard TV: A Philips development that allows the user to select the degree of integration and interactivity that they want in a TV. For example, viewers will be able to simultaneously access the internet, receive telephone calls and watch TV, or use a drag and drop method of programming their VCRs.

SO/HO: Small office/home office. This is a term that is used in the industry to describe the types of electronics products that may be found in a small or home office. It includes such products as personal computers, fax machines, answering machines, cordless telephones, etc. ■

ES&T Calendar

Major Appliance Servicers Convention and Trade show
April 3-4, 1997
Orlando, FL
800-743-0455

CES Mobile Electronics - The 12-Volt Educational Forum
April 4-6, 1997
Atlanta, GA
703-907-7674

EIF '97
Electronic Industries Forum of New England
May 6-8, 1997
World Trade Exhibition Center
Boston MA
800-322-9332
e-mail: summitexh@aol.com

Electronic Distribution Show
May 13-15, 1997
Las Vegas NV
Sponsored by EIA/CG (Components Group)
703-907-7547

Support Systems Expo
May 14-15, 1997
Boston, MA
207-846-0600

Spring Comdex/CES Orlando
May 23-25, 1997
Orlando, FL
703-907-7600

Spring CES '97 co-located with
COMDEX/Spring WINDOWS WORLD
June 2-5, 1997
Atlanta, GA
703-907-7674

National Convention of SDA and ETA International
June 12-15, 1997
Berea, KY
317-653-4301

CES Habitech '97 - The Home Systems Trade & Training Show
June 24-26, 1997
Dallas, TX
703-907-7674

NESDA 47th/ISCET 27th/ and NIAS 5th Annual National
Professional Service Convention and Trade Show
August 4-9, 1997
Las Vegas, NV
817-921-9061

CTIA Breakaway '97
September 18-20, 1997
San Diego, CA
702-268-1818 ext. 310

CES Mexico
October 8-10, 1997
Mexico City Mexico
Sponsored by EIA/CEMA
703-907-7620

Personal Computer & Electronics Expo
October 16-19, 1997
Uniondale, LI, NY
800-886-8000

Networks Expo Dallas/Windows World
October 29-31, 1997
Dallas, TX
201-346-1400, ext. 145

IMAGINE THE BEST VCR TEST INSTRUMENTS! These are EVEN BETTER!

These VCR test instruments will actually HELP your business, by allowing BETTER and FASTER VCR repairs.

It's interesting how veterans of *trial and error* repair, buy our gauges, and suddenly become our BEST supporters.

STOP guessing and wasting valuable service time by continuing TRIAL and ERROR VCR repairs. The RIGHT tools make any job easier to do; these ARE the RIGHT tools for VCR repair!

Get the entire 'ESSENTIAL' check out package at a discounted '1991' price of \$1150! Try these gauges in your own shop, with a 100% satisfaction money back guarantee.



The ONLY Universal gauges for tape tension, guide heights, torques, reel heights, and MORE!



4475 GOLDEN FOOTHILL PKWY. 800-538-6894 / 916-939-4005
EL DORADO HILLS, CA 95762 24 hour FAX line: (916) 939-4114

Circle (82) on Reply Card

Servicing RCA's CTC130 startup and shutdown symptoms

By Homer L. Davidson

Most TV startup and shutdown problems originate in the horizontal and power supply voltage sources. Startup and shutdown conditions in the RCA CTC130, CTC131 and CTC132 chassis are very similar. The CTC130 chassis includes a variable frequency switching power supply (VIPUR), while the CTC131 and CTC132 contain a chopper type power supply. Both types of power supplies are furnished with a raw +150V source from a bridge rectifier circuit.

The variable frequency power supply used in the CTC130 chassis is similar to that used in a previous chassis, except that in the CTC130 the components are mounted on a separate circuit board assembly known as the PW VIPUR. The primary purpose of the VIPUR power supply is to provide a "hot-to-ground" isolation between the primary TV power supply source (hot ground) and the cold ground circuits.

When observing waveforms or measuring voltage and resistance, check to see if the measurement should be made with respect to a hot ground or cold ground. If you make your measurements with respect to the wrong ground, the measurements will not match what you see on the schematic. The primary winding circuits of the VIPUR transformer (T1) contain the hot ground, while the secondary windings have a cold ground. There are several different modifications found in the CTC130 chassis.

The PW VIPUR module also develops the standby voltage sources for the MTT101 tuner and module. DC voltage sources are also developed for the stereo broadcast, video/audio in/out circuits, and stereo power amp circuits.

While the +150V source of the PW VIPUR is regulated, it is also applied to the familiar SCR regulator circuit on the main chassis board to generate the +127V regulated source. The regulated +127V

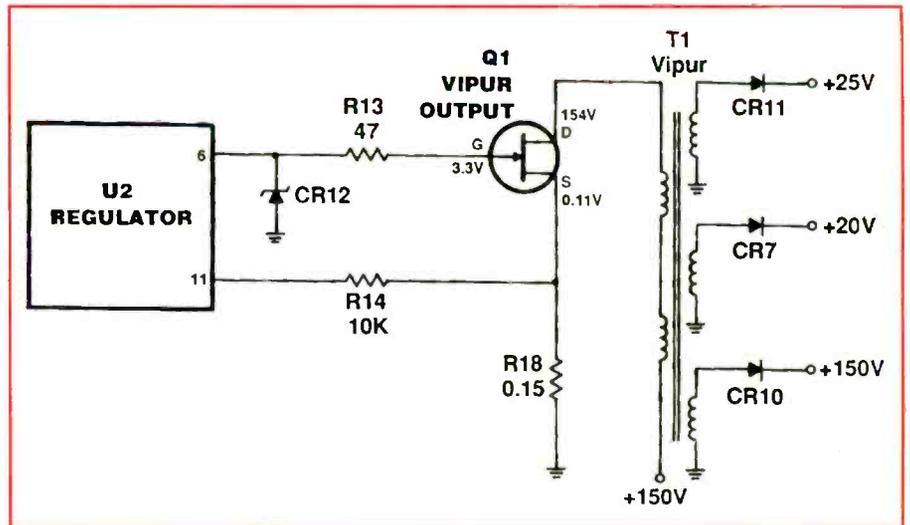


Figure 1. Check Q1, CR11, CR7 and CR10 for defects if the VIPUR power supply appears to be not operating properly.

source is fed through VIPUR (T402) to the horizontal output transistor.

Regulator IC (U2), receives on/off commands from the remote amp circuit (part of MTT module) or the on/off TV button. Transistor Q2 and opto-isolator IC (U1) provide input operation to U2. U1 provides hot and cold ground isolation with the VIPUR transformer T2. The regulator IC U2, provides a drive signal to the gate terminal of MOSFET transis-

tor (Q1). This on/off drive signal switches Q1 on and off causing energy to be stored in and discharged from the primary winding of switching regulator transformer T1. Transformer T2 provides rectified voltage supply sources of +150V, +25V and +20V for the set.

The dead chassis

The dead CTC130 chassis may be caused by defective components within

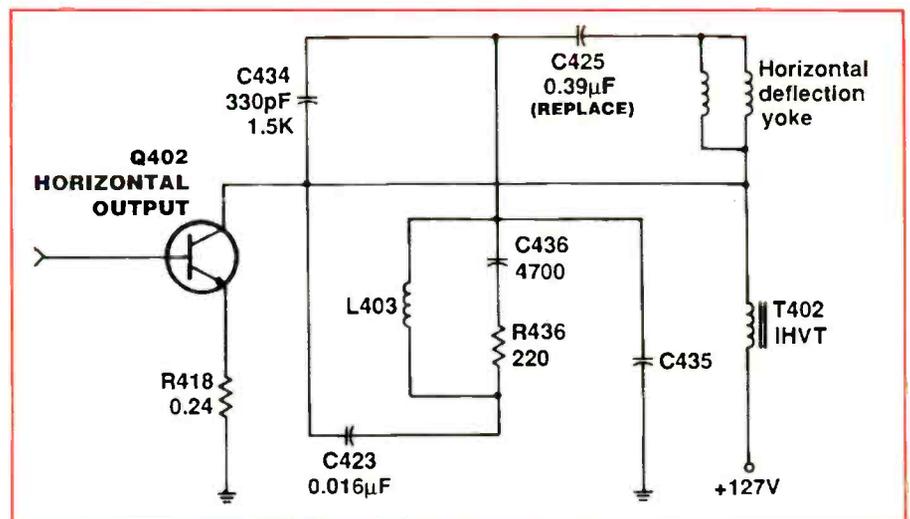


Figure 2. Suspect C425 when Q402 is found to be short circuited.

Davidson is a TV servicing consultant for ES&T.

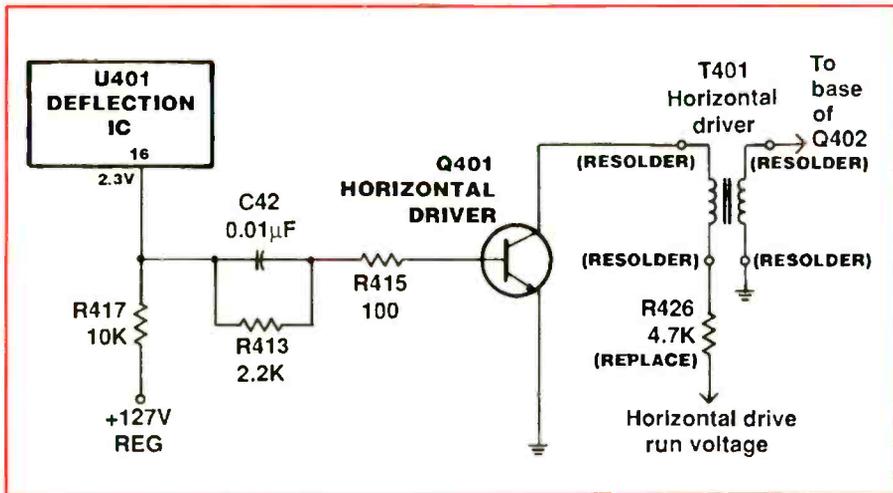


Figure 3. Intermittent start up and shutdown can result from a defective R426, horizontal drive transformer, or poorly soldered T401 contact connections.

the VIPUR power supply sources or horizontal circuits. A blown line fuse may result from a shorted or leaky VIPUR MOSFET output transistor, leaky horizontal output transistor, shorted SCR regulator, or leaky or shorted capacitors in the flyback and yoke circuits.

If you encounter a dead CTC130, check the raw +150V power source from the low voltage filter capacitor C105 (680µF). Next measure the dc voltage applied to the drain element of Q1 (Figure 1). To determine if the VIPUR circuits are functioning, measure the dc voltage at CR11, CR7 and CR10. The most common causes of problems in the VIPUR output circuits are Q1, CR11, CR7, and CR10. A leaky or shorted VIPUR output (Q1) can destroy the line fuse (5A) and source resistor R18 (0.15Ω).

If the set becomes dead, the 5A fuse in

the horizontal circuits may blow. Suspect a leaky SCR101 if there is no regulated +127V applied to the horizontal output transistor (Q402). Check for bad contacts on the SCR socket terminals. Test for a leaky Q402 if you find that the line fuse is blown or of if the supply voltage becomes extremely low.

Improper drive waveform at the base of Q402, caused by poor soldered connections on the driver transformer (T401) or leaky horizontal driver transistor Q401, can destroy Q402. Replace capacitor C425 (0.39µF) in the horizontal deflection yoke lead if the voltage is low, or if the line fuse blows (Figure 2).

Intermittent startup

If the problem is intermittent startup and shutdown, it may be difficult to locate the defective component until you have

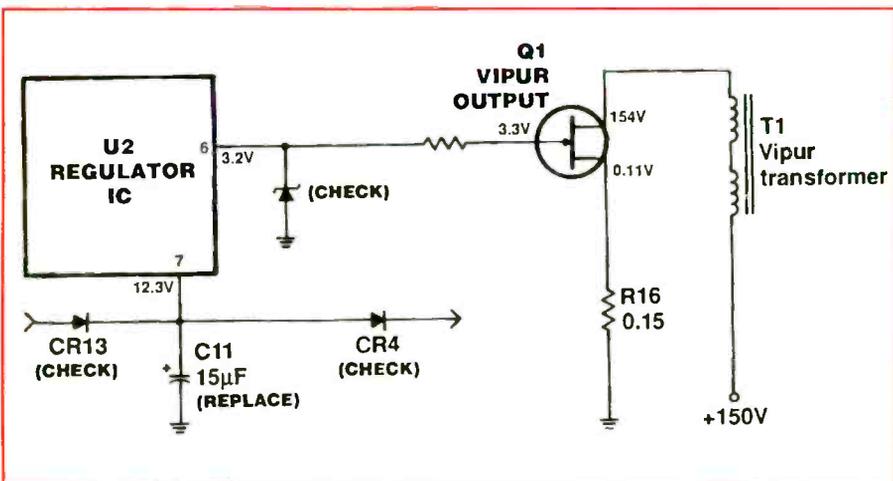


Figure 4. When the problem is intermittent startup and shutdown, check capacitor C11, and diodes CR12, CR13 and CR4.

CMIM Monitor Test Equipment Checker 12e



Now you can repair and test Computer monitors with ease. With sweep rates up to 64Khz., eight step gray scale, white screen, single color mode, Mac II, EGA, CGA support, you can run almost ANY PC monitor. And it is EASY to use. Color front panel displays show just what you should see. Don't let its' small size fool you. It is the most powerful handheld available, and it supports ALL basic VGA modes (some don't). It is suitable for bench or field operations. Battery or AC operation.

PRICE: \$295

Checker Jr.



Looking for a SMALL battery operated monitor test pattern generator that will fit in your pocket? The Checker Jr. is it. It displays a very useful 64 color pattern. You can evaluate size, focus, linearity, color tracking, and balance. It operates in the 640 x 480 mode (31.5Khz x 60Hz.), and is very easy to use. Use it anywhere.

PRICE: \$99.95

Checker IV



Need to check-out or burn-in multiple monitors? The Checker VI is the tool you need. It is a stand-alone (no computer required) 6 output test pattern generator. You can run 1 to 6 monitors from the small (1" x 5" x 6") Checker VI. It operates in the 640 x 480 mode, displaying an 8 x 8 8-color pattern which shifts every 3 minutes to reduce screen burn.

PRICE: \$249

Computer & Monitor Maintenance, Inc.

1-800-466-4411 • 770-662-5633
http://www.computermonitor.com



Circle (63) on Reply Card

**21,034
SERVICE TIPS FOR
JUST \$169.95**

Be like thousands of technicians worldwide & discover how SERVICE TIPS IS THE MOST VALUABLE PIECE OF EQUIPMENT YOU CAN OWN TODAY! SERVICE TIPS uses the knowledge of other servicers to work for you & help you stay ahead of your competition!

SERVICE TIPS alphabetizes over 117 manufacturers' Brands by Model/Chassis and Symptom & includes Part Numbers, Values & Locations on all consumer electronic equipment.

SERVICE TIPS is the ONLY program supported by its creators, customers & approved by NESDA* (the National Electronics Service Dealers Association).

DON'T WAIT! Order SERVICE TIPS with 21,034 tips for \$169.95+s&h

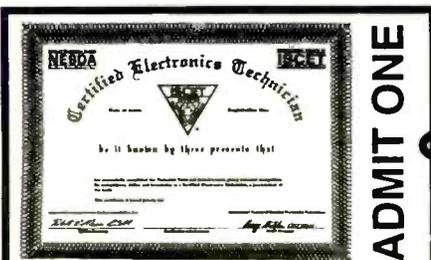
We accept most major credit cards. (*an approval by NESDA recognizes the usefulness and reliability of a product or service and stability of the company.)

FOR MORE INFORMATION ON OUR PRODUCTS:

**CALL
1-800-621-8477
Electronic Software
Developers, Inc.**

826 South Main Street
South Farmingdale NY 11735
e-mail: esd@pb.net
Visit our Web Site at: www.pb.net/vcrtips

Circle (7) on Reply Card



**Your Ticket to
SUCCESS**

More than 40,000 technicians have gained admittance worldwide as certified professionals. Let your ticket start opening doors for you. ISCET offers Journeyman certification in Consumer Electronics, Industrial, Medical, Communications, Radar, Computer and Video. For more information, contact the International Society of Certified Electronics Technicians, 2708 West Berry Street Fort Worth TX 76109; (817) 921-9101

Name _____

Address _____

City _____

State _____ Zip _____

Send material about ISCET and becoming certified

Send one "Study Guide for the Associate Level CET Test."

Enclosed is \$10 (inc. postage).

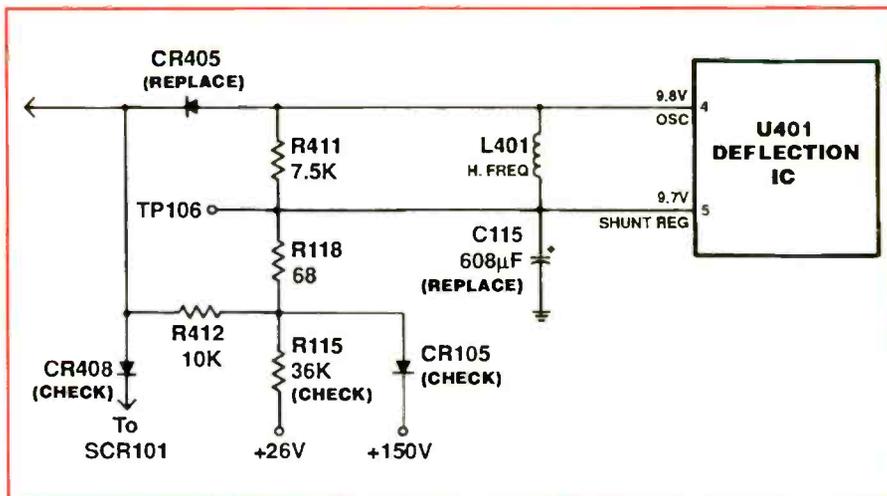


Figure 5. In cases of intermittent start up in the deflection circuits, check C115, CR405, CR105, and CR408 in the oscillator section of integrated circuit U401.

conducted some tests. Try to isolate the defective part in the low voltage sources or in the horizontal circuits. Monitor the low +150V source feeding the VIPUR horizontal circuits. Check and monitor the regulated B+ 127V feeding the horizontal output Q402 from SCR101 source. Scope the base terminal of Q402.

As with all TV chassis, a dirty or defective switch, poor driver transformer terminals, defective driver transformer or voltage dropping resistor can cause intermittent startup (Figure 3). Go directly to the driver transformer and solder all terminals. Check R426 for overheated conditions or a change in value. It is best to replace R426 with another 4.7KΩ, 5W resistor. Measure the primary resistance

of the driver transformer (T401) for a decrease in resistance.

After replacing a leaky horizontal output transistor (Q402) in a dead set, the chassis will sometimes start up and then shut down. If this occurs, suspect R416. The 0.15Ω resistor in the emitter circuit of Q402 can be damaged if the horizontal output transistor is shorted or leaky. An increase in resistance of R416 can produce intermittent start up symptoms.

Off and on problems

Sometimes small electrolytic capacitors and diodes will cause the chassis to turn on and off and then shut down. The CTC130 chassis can cycle on and then off when certain small capacitors dry up or

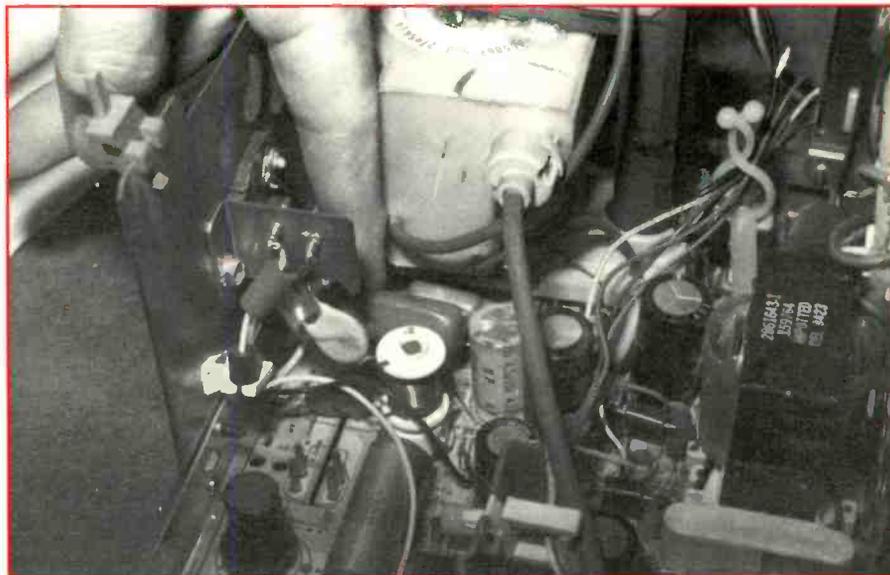


Figure 6. Locate the horizontal output transistor and clip the scope lead to it to monitor the signal at the base terminal.

become lessened in capacitance. Usually, these symptoms do not occur until the chassis has been operating for some time.

Faulty diodes can break down at any time. The zener diodes may take time to become overheated thus delay the onset of the intermittent start up or shut down.

Replace capacitor C11, located off of pin 7 of U2 regulator in the VIPUR power supply circuit if the set cycles off and on. Electrolytic capacitor C11 (15 μ F) can appear open or become leaky causing shutdown and start up problems (Figure 5). Check the voltage on pin 7 of U2 and pin 6 for correct voltage. A low voltage measurement indicates a leaky capacitor or diode. Disconnect one end of C11 and CR12 from the circuit, then check to see if there is leakage through these components. If in doubt, automatically replace C11 and CR12. While in the circuit, check CR13 and CR14 to see if they're normal.

Intermittent deflection circuits

Intermittent start up and shutdown problems may be caused by defects in the deflection IC circuits. IC U401 can become intermittent and shut down or produce intermittent startup problems. De-

fective components tied to the deflection IC U401 have been known to cause intermittent start up problems.

Suspect electrolytic capacitor C115 (68 μ F) tied to pin 5 of the shunt regulator terminal of U401. A leaky C115 can cause intermittent start up conditions. Replace both CR405 and C115 for intermittent start up symptoms (Figure 5). Do not overlook a change in resistance of R115 (36K Ω) start up resistor, and diodes CR408 and CR105 in the same circuit.

Measure the voltage at pins 4 and 5 of U401. If these voltages are lower than specified, the problem may be a leaky capacitor or diode. U401 will not provide vertical or horizontal drive waveforms if there are defective parts within the horizontal oscillator frequency circuits. Monitor the horizontal output drive waveform on pin 16 of U401 for intermittent start up and shutdown problems produced in the deflection IC circuits.

Intermittent turn on and shutdown

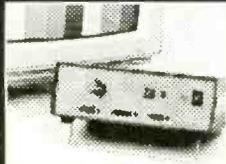
In another CTC130 chassis, sometimes the chassis would operate for days and then shutdown. When the chassis became intermittent, the regulated voltage was

monitored at the SCR101 regulator gate terminal. I suspected the deflection IC (U401) because the voltages on pins 7, 9, 10 and 11 were not within specification.

Before replacing U401, I carefully measured the voltage and resistance at each terminal. Everything seemed normal when the chassis was turned off for resistance tests. When the TV was on and in the intermittent state however, the voltages at pins 9 and 10 were very low, and about the same. The resistance between pins 9 and 10 was around 101K Ω . Perhaps C107 (1500) or C108 (0.022 μ F) were intermittently leaky or became open. Another possible cause of the problem was that the deflection IC might have internal leakage. (Figure 6).

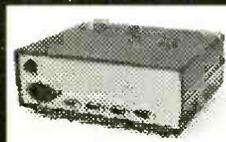
After taking another resistance measurement, which proved normal, I turned the set back on. The chassis operated normally. Suspecting that capacitor C107 was the problem I replaced it. After another day however, the CTC130 chassis was again intermittent in the start up mode. While I was in the process of measuring several voltages, the chassis began to operate normally. Strongly suspecting that the deflection IC (U401) was the

YOUR MONITOR & TV FLYBACK SOURCE



MT802 MONITOR TESTER

Can be used to quickly and easily trouble-shoot, test and align IBM compatible and Macintosh computer monitors.



MT803 MONITOR TESTER

Same functions as the MT802, plus can test up to 5 IBM compatible monitors simultaneously.



TELEVISION TESTER

ATTENTION SERVICE PROFESSIONALS!

If You Fix Monitors:



- Highest Quality Replacement Flybacks
- Fully Guaranteed Flybacks
- Prompt Reply To Your Parts Requests
- Courteous & Efficient Service
- Competitive Pricing



NEC Macintosh

ZENITH WANG

HEWLETT PACKARD COMPAQ

AT&T IBM GoldStar

SAMSUNG

PACKARD BELL

DELL

F.C.C.-I.D. DATABASE PROGRAM \$50.00

On 1.44 disk to help you identify who manufactured the monitor you are trying to repair. Program contains over 60 pages of manufacturers names and addresses.

SCHEMATICS

For over 700 monitors/terminals. Call us with the make, model and F.C.C.-I.D. number of the monitors you need schematics for.

TECHTIP REPAIR PROGRAM FOR WINDOWS®

\$199.95

Lists over 1000 monitor, CPU & power supply failures by symptom & solution.

• BONUS! •

Included at no additional cost is our F.C.C.-I.D. DATABASE program (\$50.00 Value).

™ MICROSOFT CORP

800-748-6232

ICM
INTERNATIONAL COMPONENTS
MARKETING

Call

800-748-6232

310-260-1444

FAX

310-451-8727



ALL BRAND NAMES LISTED ARE REGISTERED TRADEMARKS OF THEIR RESPECTIVE COMPANIES.

Parts Express



Reg. \$118⁰⁰
SPECIAL \$99⁹⁵

Order #ES-391-030

Triplet 4404 DMM

The Model 4404 is an extremely versatile DMM that performs multiple functions. 4000 count digital display with bargraph, frequency measurement from 1Hz to 999.9KHz., 5 capacitance ranges to 40uF, DC Volts: 5 ranges to 1000VDC, AC Volts: 5 ranges to 750 VAC, AC and DC amps to 10A, 6 resistance ranges, diode tester, data hold, auto power off, data memory, and built in stand. One year manufacturer warranty. Net weight: 2 lbs.

CALL TOLL FREE: **1-800-338-0531**

To receive our 228 page full line catalog, use source code ESM when ordering.

340 E. FIRST ST., DAYTON, OHIO 45402-1257
 PHONE: 513-222-0173 FAX: 513-222-4644
 E-MAIL: xpress@parts-express.com
 HOME PAGE: <http://www.parts-express.com>

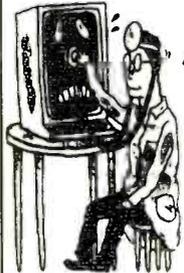
Circle (77) on Reply Card

MONITOR REPAIR SOFTWARE Now Only \$49!

Resolve Monitor Repair Database Starter Version**\$49**
 2,000 repairs on 305 monitors and more!

Version 3.18**\$249**
 2,900 repairs on 659 models, manufacturers cross reference, FCC ID, Component Sources and database editor.

FCC ID List.....**\$19**
 5,437 manufacturers by FCC No. with full addresses.



ANATEK CORPORATION

PO Box 1200
 Amherst, NH 03031
1-800-999-0304
603-673-4342
 info@anatekcorp.com

Operators of the Electronic Repair Center
<http://www.anatekcorp.com>

Circle (61) on Reply Card

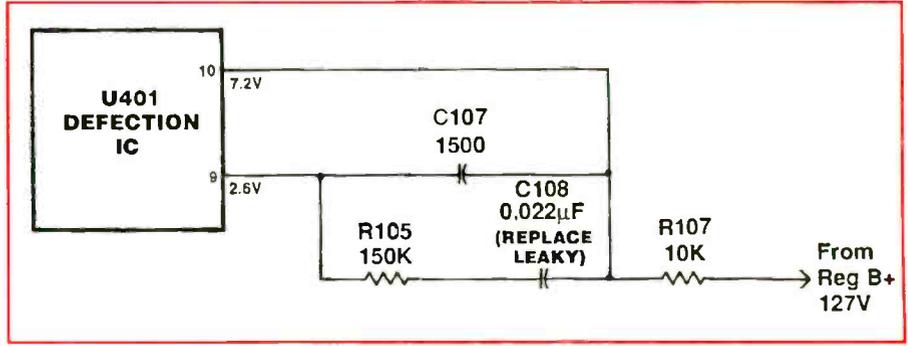


Figure 7. Intermittent turn on and shutdown may be caused by leaky C108.

cause of the problem. I was replaced it with the exact part number. This appeared to solve the problem.

This time the TV chassis played for three days before it acted up. The set acted the same as it had before I began servicing it. The intermittent chassis was set aside for a few days. When I again began working on it, at first it would not start up. I measured resistances, and found that capacitor C108 was shorted. Replacing C108 with a 0.022µF capacitor solved the intermittent start up and shutdown.

Shutdown and damaged horizontal output

When the problem is intermittent start up and shutdown, it may take days or weeks before the chassis will act up. Often, if the intermittent chassis is left to operate until it dies, so to speak, the intermittent part becomes leaky, shorted or open. To save valuable service time it may be best to leave the chassis in the home until it quits altogether.

If the horizontal output transistor has been destroyed, check for improper drive voltage, defective components in the horizontal output circuits, flyback, and over-

loaded components in the secondary winding of the flyback (Figure 7). After replacing Q402, slowly bring up the power line voltage with the variable transformer. Monitor the horizontal output base terminal with the scope and connect a voltmeter to the +127V regulated power source. Notice if the correct waveform is found at the base of Q402 as the line voltage is raised.

If the base waveform is very weak at 80V of line voltage and the regulated voltage is weak, suspect a leaky component within the collector circuits. Shut the chassis down and feel to see if Q402 is hot or warm. Check all components in the output circuits if the output transistor is running abnormally warm.

Suspect C423 (0.016µF), C425 (0.39µF), and C426 found in the yoke and primary winding of the flyback (Figure 8). Check diodes CR411 and CR412, C431, C432, and C433 in the collector circuit of Q402. Next check all diode rectifiers found in the secondary voltage sources of T402. Do not overlook a possible defective yoke winding or flyback for damaged horizontal output transistor and chassis shutdown. ■

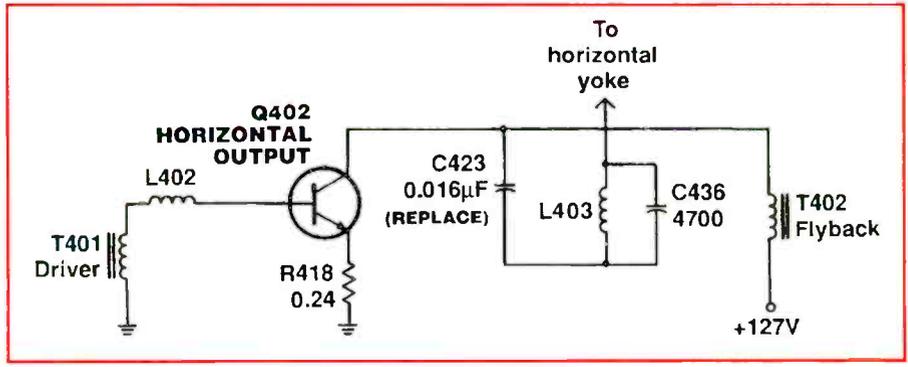


Figure 8. Check C423, C425, C426, CR411 CR412, C431, C432 and C433 if the set has shut down and Q402 was damaged.

Test Your Electronics Knowledge

What are these components/circuits?

By Sam Wilson

Each question is worth 9 points. Add 1 point if you subscribe to ES&T.

1. It looks like a tiny donut. It is slipped onto a wire and it acts like an inductor. It is a(n) _____.
2. It is a linear, bilateral circuit element and it produces heat in response to current flowing through it. It is a(n) _____.
3. It opposes any change in voltage across its terminals. It is a(n) _____.
4. Depending upon how you wire it, it can amplify a signal with or without phase inversion. It is a(n) _____.
5. The correct way to look at it is that it allows the energy of one system to control the energy of another system. It is called a(n) _____.
6. It opposes any change in current through it. It is a(n) _____.
7. It passes an ac signal but does not pass dc. It is a(n) _____.
8. It passes a signal from the input to the output with hundreds of thousands of ohms isolation. It is a(n) _____.
9. It is an electronic circuit that connects a dc to an ac signal. It is a(n) _____.
10. It is used to prevent capacitive coupling in power transformers. It is a(n) _____.
11. By adding three resistors and a capacitor (along with a power supply) it becomes a non-sinusoidal oscillator. It is a(n) _____.

(Answers on page 79)

Wilson is the electronics theory consultant for ES&T.

Your Benefits-Our Mission



- **NCA Professional Reference Guide CD**
CD comes with quarterly upgrades with thousands of parts and accessories. "Point and Click" to find all your computer needs from our **wholesale distributors**. "Search and Print" capabilities.
- **Quarterly Newsletter on CD**
Keep up with **current computer events**, learn about hot new products, and read about all the latest shows.
- **Helpline 800**
Our listing of **hundreds of industry support contacts** alone, is worth the cost of your membership.
- **Enhanced Business Services**
A unique variety of business services. *The power is in membership.*
- **NCA "Members Only" Web Page**
Exclusive access to NCA's **WebSite** with the latest industry news and gossip. This is the place where members share solutions and trade tips
- **Trade Show Updates**
You'll be given **calendars of all major trade shows**, and be eligible for **special show discounts** on hotels, rental cars and many other perks.
- **Use of NCA Logo**
All members have **full use** of the NCA logo for advertising.

Please contact the National Computer Association to receive complete applications.

◆ 800.615.6224 ◆

National Computer Association ◆ 118 S. WestShore Blvd. Suite 223 ◆ Tampa, FL 33609
nca@gte.net ◆ www.nca-net.com

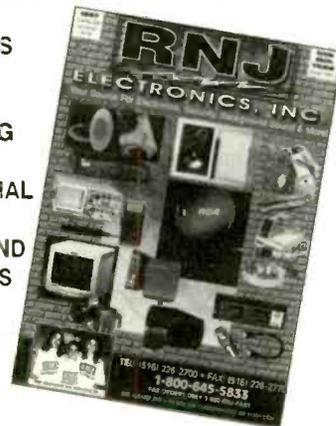
Circle (76) on Reply Card

FREE CATALOG !

RNJ

ELECTRONICS, INC.
YOUR DISCOUNT SOURCE
FOR ALL YOUR
ELECTRONIC NEEDS

- TEST EQUIPMENT
- VIDEO ACCESSORIES
- HOME THEATER ACCESSORIES
- TOOLS & SOLDERING EQUIPMENT
- VCR PARTS - ORIGINAL & GENERIC
- BACKGROUND SOUND
- CABLE CONVERTERS
- SECURITY
- SEMICONDUCTORS
- CHEMICALS
- SPEAKERS
- WIRE & CABLE



RNJ ELECTRONICS, INC.

VISA MC 805 ALBANY AVE. BOX 528 OUR
DISCOVER LINDENHURST, NY 11757 16th
COD 1-800-645-5833 • FAX 516-226-2770 YEAR

Circle (8) on Reply Card

1997 Buyer's Guide

What could be more frustrating than to complete a diagnosis on some consumer electronics product, be exulting in that "eureka" feeling of having determined exactly why the unit won't work right, then to order a replacement from a distributor or manufacturer and find out that the component is listed as NLA (no longer available)? You could simply abandon the job and return the product to the owner. But if you take that route, not only do you disappoint the customer, you also lose the value of whatever time you have spent on diagnosing the problem.

It's just possible that some distributor with whom you don't ordinarily do business has dozens of just the replacement part you need. But where do you find a list of names, addresses and telephone numbers of distributors that might be able to supply you with that elusive part.

One source of that type of information is this annual *ES&T Buyers' Guide*. Every year we send questionnaires to hundreds of companies that have products our readers might find useful. The questionnaire asks the recipient to update all of the vital information that makes it easy for a service center to contact them: name, address, telephone, toll-free and fax numbers.

The questionnaire also includes a list of over 100 products, services, documents, information products, software products, and more that service centers commonly use. The recipients check off those products that apply to them, and, when we receive that information, we enter it into our database.

So what you see in this *Buyers' Guide* is current as of the fourth quarter of 1996, or possibly even January of 1997.

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

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

information was up to date when we published it, but has since gone out of date.

And one other word of caution. These days telephone area codes are changing constantly, so that the area code for any of the companies listed here may have changed since the publication date. If you have a problem with any of the area codes listed here, please check with your local telephone company or with directory assistance. They can provide you with any updated area code information.

Using the Buyers' Guide

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

- Product Directory page 19.
- Replacement Parts/Components Directory page 47.
- Services Directory page 52.
- Association/Educational Sources Directory page 53.
- Company Address Directory page 54.

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; a *MD means that the company is both.

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 on page 45 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 nearly 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 servicing education. It also points you toward sources for service literature and schematics for the products you service. Finally, it lists those companies that produce management software systems that can help you run your business.

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 issue that we can get it into. ■

Product directory

	See Adv. Page
VCR TEST JIG KITS	
Vance Baldwin Inc.*D	
B-B&W Electronics*D	
Bursma Electronic Distrib.*D	
The Current Source*D	
Dalbani Corporation*D	53
East Coast Transistor*D	
Electronic Parts Supply*D	
Electronics Warehouse Corp.*D	
Electronix Corp.*D	80
Foley-Belsaw*D	
Fotronic Corporation*D	52
Herman Electronics*D	73
Hitachi Home Electronics	
Joseph Electronics*D	
Marshall Industries*D	
M.A.T. Electronics*D	
MCM Electronics*D	
Omnitron Electronics*MD	
Parts Express International*D	16
Philips Consumer Electrnics*MD	IBC
Philips ECG	
RNJ Electronics Inc.*D	17
Tentel	11
Test Equipment Depot*D	52
Tritronics, Inc.*D	
Wholesale Electronics Inc.*D	

OTHER TEST EQUIPMENT ACCESSORIES

Accutest Instruments, Inc.*D	
A.P.E.	
Vance Baldwin Inc.*D	
Brunelle Instruments, Inc.	
Bursma Electronic Distrib.*D	
C&S Sales*D	
Chicago Case Company	
Consolidated Elctrnics, Inc.*D	
Contact East, Inc.*D	
CRC Industries, Inc.	
The Current Source*D	
Dalbani Corporation*D	53
Dalco Electronics*D	
East Coast Transistor*D	
E.I.L. Instruments, Inc.*D	
Electro Standards Lab, Inc.	
Electronic Parts Supply*D	
Electronic Software Developers	14
Electronics Warehouse Corp.*D	
Electronix Corp.*D	80
Elenco Electronics, Inc.	
E-Z Hook	
Fluke Corporation	
Fotec Inc	
Fotronic Corporation*D	52
Galco Industrial Electronics*D	
Gemini Inc.	
Global Specialties	
Herman Electronics*D	73
HMC - Hub Material Co.*D	
Hy-Tronix Instruments, Inc.	
Innovative Solutions	
Interconnect Devices, Inc.	
ITT Pomona Electronics	
Jameco Electrn Components*D	
JDR Micro*D	
W.S. Jenks & Son*D	
Joseph Electronics*D	
Kenwood U.S.A. Corp.	
LaserImpact	
L-Com Inc.	
Marshall Industries*D	
M.A.T. Electronics*D	
MCM Electronics*D	
Mouser Electronics*D	
National Instruments Corp.	
Omnitron Electronics*MD	
Philips Consumer Electrnics*MD	IBC
Philips ECG	

	See Adv. Page
Premium Parts+ Electrnics Co*D	
Print Products International*D	
Probe Master, Inc.	
RAG Electronics Inc.*D	
RNJ Electronics Inc.*D	17
RS Electronics*D	
Russell Industries*D	
Sencore Electronics	BC
Simpson Electronic Company	
Specialized Prods Company*D	
Synergetix	
A.G. Tannenbaum*D	
Techni-Tool Inc.*D	
Tektronix, Inc.	
Tentel	11
Test Equipment Depot*D	52
Test Probes, Inc.	
Time Motion Tools*D	
Tritronics, Inc.*D	
Tucker Electronics Co.	
Ultech Corp	
Union Electronics Distrib*D	
Universal Enterprises (UEI)	
Wavetek Corporation	

Circuit damage protective equipment/supplies

GROUNDING SYSTEMS

Arrow Electronics	
Vance Baldwin Inc.*D	
Contact East, Inc.*D	
The Current Source*D	
HMC - Hub Material Co.*D	
Jameco Electrn Components*D	
W.S. Jenks & Son*D	
Joseph Electronics*D	
M.A.T. Electronics*D	
Print Products International*D	
Time Motion Tools*D	
Union Electronics Distrib*D	

POWER LINE MONITORS

Accutest Instruments, Inc.*D	
Amprobe Instrument	
Arrow Electronics	
Vance Baldwin Inc.*D	
Bi-Tronics Inc.	
BMI-Basic Measuring Instrument	
Brunelle Instruments, Inc.	
Computer Power Inc.	
Consolidated Elctrnics, Inc.*D	
The Current Source*D	
Dranetz Technologies, Inc.	
EFI Electronics Corporation	
E.I.L. Instruments, Inc.*D	
Electronics Warehouse Corp.*D	
Global Specialties	
Hosfelt Electronics, Inc.*D	
JDR Micro*D	
W.S. Jenks & Son*D	
Joseph Electronics*D	
MCM Electronics*D	
NCS*D	
Perma Power Electronics, Inc.	
PowerTronics	
Print Products International*D	
RS Electronics*D	
SL Waber, Inc.	
Specialized Prods Company*D	
Techni-Tool Inc.*D	
Time Motion Tools*D	
Tripp Lite	
Tucker Electronics Co.	

	See Adv. Page
Union Electronics Distrib*D	
Vector-VID Inc.	
Wholesale Electronics Inc.*D	

STANDBY POWER SYSTEMS

Alpha Technologies	
American Design Components	
Arrow Electronics	
Vance Baldwin Inc.*D	
Bi-Tronics Inc.	
Bursma Electronic Distrib.*D	
Computer Power Inc.	
Consolidated Elctrnics, Inc.*D	
Controlled Power Co.	
The Current Source*D	
Dalco Electronics*D	
Electronics Warehouse Corp.*D	
Electronix Corp.*D	80
Galco Industrial Electronics*D	
Harco Electronics*D	
Herman Electronics*D	73
HMC - Hub Material Co.*D	
Hosfelt Electronics, Inc.*D	
Jameco Electrn Components*D	
JDR Micro*D	
W.S. Jenks & Son*D	
Joseph Electronics*D	
Kalglo Electronics Co., Inc.	
Meirick, Inc.	
Minuteman UPS	
Parts Express International*D	16
Perma Power Electronics, Inc.	
Print Products International*D	
RNJ Electronics Inc.*D	17
RS Electronics*D	
SL Waber, Inc.	
Sutton Designs, Inc.	
Tripp Lite	
Warner Electic	
Wholesale Electronics Inc.*D	

SURGE/SPIKE PROTECTORS

Alternative Technical Services	
American Design Components	
American Power Conversion Corp	
Arrow Electronics	
Vance Baldwin Inc.*D	
B-B&W Electronics*D	
Best Power	
Bi-Tronics Inc.	
Bursma Electronic Distrib.*D	
Computer Svcs of America*D	
Consolidated Elctrnics, Inc.*D	
Contact East, Inc.*D	
Controlled Power Co.	
The Current Source*D	
Dalbani Corporation*D	53
Dalco Electronics*D	
Delta Warranty	
Digi-Key D*	
EFI Electronics Corporation	
Eiger Electronics*D	
E.I.L. Instruments, Inc.*D	
Electro Standards Lab, Inc.	
Electronic Parts Supply*D	
Electronic Specialists, Inc.	
Electronics Warehouse Corp.*D	
Electronix Corp.*D	80
Electronix Express*D	
Excel Distributing*D	
Galco Industrial Electronics*D	
GC Electronics*D	
Harco Electronics*D	
Herman Electronics*D	73
Hitachi Home Electronics	
HMC - Hub Material Co.*D	
Hosfelt Electronics, Inc.*D	
International Power Tchnlgies	
Jameco Electrn Components*D	
JDR Micro*D	
W.S. Jenks & Son*D	
Joseph Electronics*D	
Kalglo Electronics Co., Inc.	
M.A.T. Electronics*D	
MCM Electronics*D	
Meirick, Inc.	
Minuteman UPS	
Perma Power Electronics, Inc.	
Philips Consumer Electrnics*MD	IBC
Phittek Power Corp.	
Print Products International*D	
RNJ Electronics Inc.*D	17
RS Electronics*D	

	See Adv. Page
JDR Micro*D	
W.S. Jenks & Son*D	
Joseph Electronics*D	
Kalglo Electronics Co., Inc.	
Kasco Distributing*D	
L'il Bitty Tester	
Marshall Industries*D	
MCG Electronics	
MCM Electronics*D	
Meirick, Inc.	
Minuteman UPS	
Mouser Electronics*D	
Omega Engineering, Inc.	
Panamax, Inc.	
Parts Express International*D	16
Perma Power Electronics, Inc.	
Philips Consumer Elctrnics*MD	IBC
Print Products International*D	
RNJ Electronics Inc.*D	17
RS Electronics*D	
Schurter, Inc.	
Shape Electronics	
SL Waber, Inc.	
Specialized Prods Company*D	
Sutton Designs, Inc.	
Tandy National Parts*D	
Techni-Tool Inc.*D	
Time Motion Tools*D	
Tripp Lite	
Tritronics, Inc.*D	
Union Electronics Distrib*D	
Warner Electic	
Wholesale Electronics Inc.*D	

UNINTERRUPTIBLE POWER SUPPLIES

Alpha Technologies	
Alternative Technical Services	
American Design Components	
American Power Conversion Corp	
Arrow Electronics	
Vance Baldwin Inc.*D	
B-B&W Electronics*D	
Behlman Electronics	
Best Power	
Bi-Tronics Inc.	
Bursma Electronic Distrib.*D	
Clary Corp.	
Computer Power Inc.	
Consolidated Elctrnics, Inc.*D	
Contact East, Inc.*D	
Controlled Power Co.	
The Current Source*D	
Dalco Electronics*D	
Delta Warranty	
EFI Electronics Corporation	
Electronics Warehouse Corp.*D	
Electronix Corp.*D	80
Electronix Express*D	
Elgar Corp.	
Galco Industrial Electronics*D	
Harco Electronics*D	
Herman Electronics*D	73
HMC - Hub Material Co.*D	
Hosfelt Electronics, Inc.*D	
International Power Tchnlgies	
Jameco Electrn Components*D	
JDR Micro*D	
W.S. Jenks & Son*D	
Joseph Electronics*D	
Kalglo Electronics Co., Inc.	
M.A.T. Electronics*D	
MCM Electronics*D	
Meirick, Inc.	
Minuteman UPS	
Perma Power Electronics, Inc.	
Philips Consumer Electrnics*MD	IBC
Phittek Power Corp.	
Print Products International*D	
RNJ Electronics Inc.*D	17
RS Electronics*D	

See Adv. Page
 SL Waber, Inc.
 Specialized Prods Company*D
 Staco Energy Products
 Sun Equipment Corporation
 Sutton Designs, Inc.
 Techni-Tool Inc.*D
 Total Power International*MD
 Tripp Lite
 Warner Electric
 Wholesale Electronics Inc.*D

VOLTAGE REGULATORS

Alternative Technical Services
 Arrow Electronics
 Vance Baldwin Inc.*D
 Bi-Tronics Inc.
 Clary Corp.
 Computer Power Inc.
 Compuvideo
 Contact East, Inc.*D
 Controlled Power Co.
 The Current Source*D
Dalbani Corporation*D.....53
 Dalco Electronics*D
 Digi-Key D*
 E.I.L. Instruments, Inc.*D
 Electronic Parts Supply*D
 Electronic Specialists, Inc.
 Electronics Warehouse Corp.*D
Electronix Corp.*D.....80
 Electronix Express*D
 Galco Industrial Electronics*D
 Harco Electronics*D
Herman Electronics*D.....73
 Hosfelt Electronics, Inc.*D
 Jameco Electrnc Components*D
 JDR Micro*D
 W.S. Jenks & Son*D
 Joseph Electronics*D
 Kalgo Electronics Co., Inc.
 Kelvin Electronics*D
 M.A.T. Electronics*D
 MCM Electronics*D
 Minuteman UPS
 Mouser Electronics*D
Parts Express International*D.....16
 Perma Power Electronics, Inc.
Philips Consumer Elctrcns*MD.....IBC
 Print Products International*D
RNJ Electronics Inc.*D.....17
 RS Electronics*D
 Shape Electronics
 SL Waber, Inc.
 Snap-On Incorporated
 Specialized Prods Company*D
 Staco Energy Products
 Time Motion Tools*D
 Tripp Lite
 Warner Electric
 Wholesale Electronics Inc.*D

Electrostatic discharge protection

ANTISTATIC CHEMICALS

Aervo-Pacific Co.
 Alternative Technical Services
 Vance Baldwin Inc.*D
 B-B&W Electronics*D
 Bursma Electronic Distrib.*D
CAIG Laboratories, Inc.....73, 75
 Charleswater
 Chemtronics
 Computer Component Source*D
 Computer Svcs of America*D
 Consolidated Elctrcns, Inc.*D

See Adv. Page
 The Current Source*D
Dalbani Corporation*D.....53
 Desco
 East Coast Transistor*D
 Electro Dynamics, Inc.*D
 Electronic Prod. Specialties*D
Electronix Corp.*D.....80
 Electronix Express*D
 Fox International*D
 Galco Industrial Electronics*D
 GC Electronics*D
 Harco Electronics*D
Herman Electronics*D.....73
 HMC - Hub Material Co.*D
 Hy Tec Dealer Service
 Jameco Electrnc Components*D
 JDR Micro*D
 W.S. Jenks & Son*D
 JIT Resources, Inc.
 Joseph Electronics*D
 Klein Tools, Inc.
 Marshall Industries*D
 M.A.T. Electronics*D
 MG Chemicals
 Micro Cafe Corp.
 Miller-Stephenson Chemical Co.
Philips Consumer Elctrcns*MD.....IBC
 Philips ECG
 Print Products International*D
 Prostat Corporation
RNJ Electronics Inc.*D.....17
 Rogers Anti-Static Chemicals
 RS Electronics*D
 Specialized Prods Company*D
 Syon Corporation
 Tech Spray, Inc.
 Techni-Tool Inc.*D
 3M Electrical Specialties Div
 3M Electronic Prods Division
 Time Motion Tools*D
 Tritronics, Inc.*D
 Union Electronics Distrib*D
 Wescorp
 Wholesale Electronics Inc.*D

ANTISTATIC IONIZATION DEVICES

Vance Baldwin Inc.*D
 Charleswater
 Computer Svcs of America*D
 Contact East, Inc.*D
 The Current Source*D
 Desco
 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
 Print Products International*D
 RS Electronics*D
 Semtronics Corp.
 Simco
 Specialized Prods Company*D
 Techni-Tool Inc.*D
 3M Electrical Specialties Div
 3M Electronic Prods Division
 Time Motion Tools*D
 Union Electronics Distrib*D
 Wescorp

ANTISTATIC MATS/ BENCHTOPS/WRIST STRAPS/OTHERS

Armand Mfg. Inc.
 Vance Baldwin Inc.*D
 B-B&W Electronics*D

See Adv. Page
 Bursma Electronic Distrib.*D
 Charleswater
 Clauss Electronics Div.
 Computer Svcs of America*D
 Contact East, Inc.*D
 The Current Source*D
 Dalco Electronics*D
 Desco
 Digi-Key D*
 Electro Tool, Inc.
 Electronic Prod. Specialties*D
 Electronics Warehouse Corp.*D
Electronix Corp.*D.....80
 Electronix Express*D
 Excel Distributing*D
 Galco Industrial Electronics*D
 Harco Electronics*D
Herman Electronics*D.....73
 HMC - Hub Material Co.*D
 Hosfelt Electronics, Inc.*D
 ITT Pomona Electronics
 Jameco Electrnc Components*D
 JDR Micro*D
 W.S. Jenks & Son*D
 Jim-Pak*D
 JIT Resources, Inc.
 Joseph Electronics*D
 Kasco Distributing*D
 Lista International Corp.
 Marshall Industries*D
 Micro Care Corp.
 Mouser Electronics*D
Parts Express International*D.....16
Philips Consumer Elctrcns*MD.....IBC
 Philips ECG
 Print Products International*D
 Prostat Corporation
 Prostat Corporation
 Richmond Technology Inc.
 Rogers Anti-Static Chemicals
 RS Electronics*D
 Seco Industries
 Semtronics Corp.
 SAT/ A SPIRIG CO.
 Specialized Prods Company*D
 Tandy National Parts*D
 Techni-Tool Inc.*D
 Teclab
 3M Electrical Specialties Div
 3M Electronic Prods Division
 Time Motion Tools*D
 Trace Racks
 Tritronics, Inc.*D
 Union Electronics Distrib*D
 Waldmann Lighting Company
 Wescorp
 Wholesale Electronics Inc.*D

ESD FLEXIBLE PACKAGING

Armand Mfg. Inc.
 Vance Baldwin Inc.*D
 Charleswater
 Consolidated Elctrcns, Inc.*D
 Contact East, Inc.*D
 Desco
 Electronic Prod. Specialties*D
Electronix Corp.*D.....80
 Harco Electronics*D
 HMC - Hub Material Co.*D
 Jameco Electrnc Components*D
 W.S. Jenks & Son*D
 JIT Resources, Inc.
 Joseph Electronics*D
 Marshall Industries*D
 Plato Products, Inc.
 Print Products International*D
 Richmond Technology Inc.
 RS Electronics*D
 Seco Industries
 Semtronics Corp.
 Specialized Prods Company*D
 Techni-Tool Inc.*D

See Adv. Page
 3M Electrical Specialties Div
 3M Electronic Prods Division
 Time Motion Tools*D
 Wescorp
 Wholesale Electronics Inc.*D

STATIC DETECTION METERS

Accutest Instruments, Inc.*D
 Vance Baldwin Inc.*D
 Charleswater
 Computer Svcs of America*D
 Contact East, Inc.*D
 The Current Source*D
 Desco
 E.I.L. Instruments, Inc.*D
 Electronic Prod. Specialties*D
 Galco Industrial Electronics*D
 Harco Electronics*D
 HMC - Hub Material Co.*D
 W.S. Jenks & Son*D
 JIT Resources, Inc.
 Joseph Electronics*D
 Marshall Industries*D
 Print Products International*D
 Prostat Corporation
 RS Electronics*D
 Semtronics Corp.
 Simco
 Specialized Prods Company*D
 Tech Spray, Inc.
 Techni-Tool Inc.*D
 3M Electrical Specialties Div
 3M Electronic Prods Division
 Time Motion Tools*D
 Union Electronics Distrib*D
 Wescorp
 Wholesale Electronics Inc.*D

Supplies/ accessories equipment

BATTERIES

Alpha Technologies
 American Design Components
 Andrews Electronics*D
 Antique Electronic Supply*D
 Arrow Electronics
 Avex Probes, Inc. (API)
 Vance Baldwin Inc.*D
 B-B&W Electronics*D
 Bursma Electronic Distrib.*D
 Compuvideo
 Consolidated Elctrcns, Inc.*D
 Contact East, Inc.*D
 Controlled Power Co.
 The Current Source*D
Dalbani Corporation*D.....53
 Dalco Electronics*D
 Digi-Key D*
 East Coast Transistor*D
 Electro Dynamics, Inc.*D
 Electronic Parts Supply*D
 Electronics Warehouse Corp.*D
 Electronix Express*D
 Entech Corp
 Excel Distributing*D
 Fedco Electronics, Inc.*D
 Harco Electronics*D
Herman Electronics*D.....73
 HMC - Hub Material Co.*D
 Hosfelt Electronics, Inc.*D
 Jameco Electrnc Components*D
 JDR Micro*D
 W.S. Jenks & Son*D
 Joseph Electronics*D

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
<p>Kelvin Electronics*D Marshall Industries*D M.A.T. Electronics*D MCM Electronics*D Mouser Electronics*D Nesco Batteries Omega Engineering, Inc. ORA Electronics Panasonic Industrial Co. Parts Express International*D16 Philips Consumer Elctrcns*MD.....IBC Premium Parts+ Electrncs Co*D RNJ Electronics Inc.*D17 RS Electronics*D Russell Industries*D Specialized Prods Company*D Tadiran Computer Batteries*D TEC Techni-Tool Inc.*D Time Motion Tools*D Tritronics, Inc.*D Union Electronics Distrib*D Wholesale Electronics Inc.*D Zenith Sales Co.</p> <p>BENCHES/CABINETS</p> <p>Arrow Electronics Vance Baldwin Inc.*D Computer Svcs of America*D Contact East, Inc.*D The Current Source*D Dalco Electronics*D East Coast Transistor*D Electronic Prod. Specialties*D Harco Electronics*D Herman Electronics*D73 HMC - Hub Material Co.*D I.A.C. Industries Jameco Electrnc Components*D W.S. Jenks & Son*D Jensen Tools, Inc.*D Joseph Electronics*D Klein Tools, Inc. Lista International Corp. Marshall Industries*D MCM Electronics*D Philips Consumer Elctrcns*MD.....IBC Print Products International*D RS Electronics*D Specialized Prods Company*D Techni-Tool Inc.*D Teclab Time Motion Tools*D Wholesale Electronics Inc.*D Workplace Systems, Inc. Zero Corp., East Div.</p> <p>CHEMICALS</p> <p>Alternative Technical Services Andrews Electronics*D Antique Electronic Supply*D Arrow Electronics Vance Baldwin Inc.*D B-B&W Electronics*D Brunelle Instruments, Inc. Bursma Electronic Distrib.*D CAIG Laboratories, Inc.73, 75 Chemtronics Computer Component Source*D Computer Svcs of America*D Consolidated Elctrcns, Inc.*D CPR Systems Inc CRC Industries, Inc. The Current Source*D Dalbani Corporation*D53 Dynaloy, Inc. East Coast Transistor*D Echelon Industries*D Eiger Electronics*D</p>	<p>E.I.L. Instruments, Inc.*D Electro Dynamics, Inc.*D Electronic Prod. Specialties*D Electronic Parts Supply*D Electronics Warehouse Corp.*D Electronix Corp.*D80 Electronix Express*D Excel Distributing*D Foley-Belsaw*D Four Star Chemical Fox International*D Galco Industrial Electronics*D GC Electronics*D Global Micro-Parts Depot*D Harco Electronics*D Herman Electronics*D73 HMC - Hub Material Co.*D Hosfelt Electronics, Inc.*D Hy Tec Dealer Service Jameco Electrnc Components*D JDR Micro*D W.S. Jenks & Son*D Joseph Electronics*D Klein Tools, Inc. Marshall Industries*D M.A.T. Electronics*D MCM Electronics*D MG Chemicals Micro Care Corp. Miller-Stephenson Chemical Co. Mouser Electronics*D Multicore Solders P.K. Neuses*D Omega Engineering, Inc. Parts Express International*D16 Philips Consumer Elctrcns*MD.....IBC Philips ECG Planned Products Premium Parts+ Electrncs Co*D Print Products International*D Rawn Co. Inc. RNJ Electronics Inc.*D17 Rogers Anti-Static Chemicals RS Electronics*D Specialized Prods Company*D Stoner, Inc. Syon Corporation Tandy National Parts*D Tech Spray, Inc. Techni-Tool Inc.*D The Texwipe Company/CleanTex 3M Electronic Prods Division Tritronics, Inc.*D Union Electronics Distrib*D Wholesale Electronics Inc.*D Zenith Sales Co.</p> <p>CLEANING SUPPLIES</p> <p>Aervo-Pacific Co. Alternative Technical Services Andrews Electronics*D Vance Baldwin Inc.*D Bursma Electronic Distrib.*D CAIG Laboratories, Inc.73, 75 Computer Component Source*D Computer Svcs of America*D Consolidated Elctrcns, Inc.*D Contact East, Inc.*D CPR Systems Inc CRC Industries, Inc. The Current Source*D Dalbani Corporation*D53 East Coast Transistor*D Echelon Industries*D Eiger Electronics*D Electro Dynamics, Inc.*D Electronic Prod. Specialties*D Electronic Parts Supply*D Electronics Warehouse Corp.*D Electronix Corp.*D80 Falcon Safety Products</p>	<p>Foley-Belsaw*D Four Star Chemical Fox International*D Galco Industrial Electronics*D Harco Electronics*D Herman Electronics*D73 HMC - Hub Material Co.*D Hosfelt Electronics, Inc.*D Hy Tec Dealer Service Jameco Electrnc Components*D W.S. Jenks & Son*D Joseph Electronics*D Kasco Distributing*D Klein Tools, Inc. Leland Ltd., Inc. Marshall Industries*D M.A.T. Electronics*D MCM Electronics*D Micro Care Corp. Miller-Stephenson Chemical Co. Multicore Solders P.K. Neuses*D Parts Express International*D16 PC Service Source*D Philips Consumer Elctrcns*MDIBC Print Products International*D Rawn Co. Inc. RNJ Electronics Inc.*D17 Rogers Anti-Static Chemicals RS Electronics*D Specialized Prods Company*D Stoner, Inc. Syon Corporation Tech Spray, Inc. Techni-Tool Inc.*D The Texwipe Company/CleanTex 3M Consumer & Pro Time Motion Tools*D Tritronics, Inc.*D Wholesale Electronics Inc.*D</p> <p>LAMPS</p> <p>Arrow Electronics Vance Baldwin Inc.*D B-B&W Electronics*D Bonkote America, Inc. Bursma Electronic Distrib.*D Computer Svcs of America*D Consolidated Elctrcns, Inc.*D Contact East, Inc.*D The Current Source*D Dalbani Corporation*D53 Dazor Manufacturing Corp. Digi-Key D* East Coast Transistor*D Eiger Electronics*D Electronic Prod. Specialties*D Electronic Parts Supply*D Electronics Warehouse Corp.*D Electronix Corp.*D90 Electronix Express*D Foley-Belsaw*D Global Micro-Parts Depot*D Harco Electronics*D HMC - Hub Material Co.*D Hosfelt Electronics, Inc.*D Jameco Electrnc Components*D Joseph Electronics*D Kelvin Electronics*D Luxe Corp. Marshall Industries*D M.A.T. Electronics*D MCM Electronics*D Mouser Electronics*D O.C. White Parts Express International*D16 Premium Parts+ Electrncs Co*D Print Products International*D RNJ Electronics Inc.*D17 RS Electronics*D Specialized Prods Company*D</p>	<p>Techni-Tool Inc.*D Teclab Time Motion Tools*D Tritronics, Inc.*D Waldmann Lighting Company Wholesale Electronics Inc.*D</p> <p>MAGNIFIERS</p> <p>Vance Baldwin Inc.*D B-B&W Electronics*D Bonkote America, Inc. Consolidated Elctrcns, Inc.*D Contact East, Inc.*D The Current Source*D Dalbani Corporation*D53 Dalco Electronics*D Dazor Manufacturing Corp. Digi-Key D* East Coast Transistor*D Edroy Products Electronic Prod. Specialties*D Electronic Parts Supply*D Electronics Warehouse Corp.*D Electronix Corp.*D80 Foley-Belsaw*D Harco Electronics*D Herman Electronics*D73 HMC - Hub Material Co.*D Hosfelt Electronics, Inc.*D Jameco Electrnc Components*D W.S. Jenks & Son*D Joseph Electronics*D Luxe Corp. The Texwipe Company/CleanTex 3M Consumer & Pro Time Motion Tools*D Tritronics, Inc.*D Parts Express International*D16 Print Products International*D RNJ Electronics Inc.*D17 RS Electronics*D Specialized Prods Company*D Techni-Tool Inc.*D Teclab Time Motion Tools*D Waldmann Lighting Company Wholesale Electronics Inc.*D</p> <p>SHELVES/RACKS/BINS</p> <p>Arrow Electronics Vance Baldwin Inc.*D Bonkote America, Inc. Contact East, Inc.*D The Current Source*D Dalco Electronics*D Electronic Prod. Specialties*D Electronic Parts Supply*D Galco Industrial Electronics*D Herman Electronics*D73 HMC - Hub Material Co.*D Hosfelt Electronics, Inc.*D Hy Tec Dealer Service I.A.C. Industries Jameco Electrnc Components*D W.S. Jenks & Son*D JIT Resources, Inc. Joseph Electronics*D Lista International Corp. Marshall Industries*D M.A.T. Electronics*D MCM Electronics*D Parts Express International*D16 Print Products International*D Snap-On Incorporated Techni-Tool Inc.*D Teclab Tektronix, Inc. Time Motion Tools*D Trace Racks</p>

Product directory

See Adv. Page

See Adv. Page

Joseph Electronics*D
Kelvin Electronics*D
M.A.T. Electronics*D
MCM Electronics*D
Multiplex Technology, Inc.
Pfanstiehl Corp.*D
RF Industries
RNJ Electronics Inc.*D17
Schurter, Inc.
Tritronics, Inc.*D
Union Electronics Distrib*D
Wholesale Electronics Inc.*D

SIGNAL MIXERS

Arrow Electronics
Vance Baldwin Inc.*D
B-B&W Electronics*D
Bursma Electronic Distrib.*D
Compuvideo
The Current Source*D
Dalbani Corporation*D53
East Coast Transistor*D
Eiger Electronics*D
Electronic Parts Supply*D
Electronics Warehouse Corp.*D
Electronix Corp.*D80
Herman Electronics*D73
Joseph Electronics*D
M.A.T. Electronics*D
MCM Electronics*D
Multiplex Technology, Inc.
Pfanstiehl Corp.*D
RNJ Electronics Inc.*D17
Tritronics, Inc.*D
Wholesale Electronics Inc.*D
Zenith Sales Co.

Tools

HEAT GUNS

Arrow Electronics
Vance Baldwin Inc.*D
B-B&W Electronics*D
Bi-Tronics Inc.
Bursma Electronic Distrib.*D
Computer Svcs of America*D
Consolidated Elctrnics, Inc.*D
Contact East, Inc.*D
Cooper Tools
The Current Source*D
Dalbani Corporation*D53
Den-On Instruments (USA), Inc.
Digi-Key D*
East Coast Transistor*D
Eiger Electronics*D
Electro Tool, Inc.
Electronic Prod. Specialties*D
Electronic Parts Supply*D
Electronics Warehouse Corp.*D
Electronix Express*D
The Eraser Company, Wybar Div.
Foley-Belsaw*D
Galco Industrial Electronics*D
Harco Electronics*D
Herman Electronics*D73
HMC - Hub Material Co.*D
Hosfelt Electronics, Inc.*D
Jameco Electric Components*D
JDV Products Inc.
W.S. Jenks & Son*D
Joseph Electronics*D
Kelvin Electronics*D
The Malcom Company
Manhattan/CDT
Marshall Industries*D
M.A.T. Electronics*D
MCM Electronics*D
Mouser Electronics*D
Omnitron Electronics*MD

Parts Express International*D16
Philips Consumer Elctrnics*MD.....IBC
Portasol, Inc.
Print Products International*D
RNJ Electronics Inc.*D17
RS Electronics*D
Snap-On Incorporated
Specialized Prods Company*D
Techni-Tool Inc.*D
Time Motion Tools*D
Tritronics, Inc.*D
Ungar, A Rubbermaid Co.
Union Electronics Distrib*D
Wahl Clipper Corporation
Weidmuller Inc.
Weller/Cooper Tools
Wholesale Electronics Inc.*D
Xytronic

JIGS/FIXTURES/VISES

Andrews Electronics*D
Vance Baldwin Inc.*D
B-B&W Electronics*D
Consolidated Elctrnics, Inc.*D
Cooper Tools
The Current Source*D
Dalbani Corporation*D53
Eiger Electronics*D
Electronic Prod. Specialties*D
Electronic Parts Supply*D
Electronics Warehouse Corp.*D
Electronix Corp.*D80
Electronix Express*D
Excel Distributing*D
Harco Electronics*D
Herman Electronics*D73
Hitachi Home Electronics
HMC - Hub Material Co.*D
Jameco Electric Components*D
JDR Micro*D
JDV Products Inc.
W.S. Jenks & Son*D
Joseph Electronics*D
Kelvin Electronics*D
MCM Electronics*D
Mouser Electronics*D
PanaVise Products
Parts Express International*D16
Philips Consumer Elctrnics*MD.....IBC
Premium Parts+ Elctrnics Co*D
Print Products International*D
RNJ Electronics Inc.*D17
RS Electronics*D
Snap-On Incorporated
Specialized Prods Company*D
Techni-Tool Inc.*D
Time Motion Tools*D
Tritronics, Inc.*D
Union Electronics Distrib*D
Wholesale Electronics Inc.*D

SOLDERING/DESOLDERING EQUIPMENT

Aervo-Pacific Co.
Alternative Technical Services
American Design Components
Andrews Electronics*D
Arrow Electronics
Vance Baldwin Inc.*D
B-B&W Electronics*D
Bonkote America, Inc.
Bursma Electronic Distrib.*D
C&S Sales*D
Clauss Electronics Div.
Computer Component Source*D
Computer Svcs of America*D
Consolidated Elctrnics, Inc.*D
Contact East, Inc.*D
Cooper Tools

Wouldn't it be great if bad parts just lit up and whistled at you?



LeakSeeker 82A can lead you right to the culprit with whistles and flashing lights!



\$149 60 DAY MONEY-BACK GUARANTEE

So you've got a leaky part bringing down the power supply bus and you don't know where the defect is because your meter shows 3 ohms *everywhere* and the supply feeds seven boards stuffed with 4 million parts and now you'll have to hack up the foil and unsolder and check *each and every* part one by one and it'll take *hours*, maybe even *days*, and the customer is getting irate...

-O-

Simply touch **LeakSeeker's** gold-plated probe anywhere on the foil that has a low resistance and **LeakSeeker** will automatically calibrate itself to the resistance of the defect (up to 150 ohms!) and beep higher or lower, and light the nine LED distance indicators as you touch each pad along the foil.

The pad where the beep is highest is the defective part!

ELECTRONIC DESIGN SPECIALISTS

we make test equipment designed to make you money.

4647 Appalachian Street, Boca Raton, FL 33428



(561) 487-6103



Circle (66) on Reply Card

Service the **JUMBO** and **PROJECTION TV's** with **One MAN**



- TAKE CHASSIS ONLY
- AVOID CABINET DAMAGE
- CONSERVE SHOP SPACE
- SAVE MANPOWER AND TRUCKING

Method used by Sears, N.A.P., Sony, Mitsubishi, GE/RCA, Sharp, Toshiba, Emerson, Samsung and other major manufacturers.

More than twenty years; over 50,000 test jigs are now in use.

TELEMATIC'S TEST JIG SYSTEM

Quick to hookup...Easy to use...For all popular makes and models

The Telematic Test Jig System is designed to facilitate TV chassis trouble-shooting without the need for bringing the cabinet and picture tube to the shop. With the trend toward larger-27-, 30- and 35-inch-picture tubes and projection sets, a test jig is needed more than ever!

DESIGNERS & MANUFACTURERS OF COLOR T.V. TEST JIGS AND ADAPTORS

Telematic 108-02 Otis Avenue 718-271-5200
Corona, NY 11368 718-271-5738 (Fax)

Circle (81) on Reply Card

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
CPR Systems Inc	TOOL CASES	Bursma Electronic Distrib.*D	Bi-Tronics Inc.
The Current Source*D	American Design Components	C&S Sales*D	Bursma Electronic Distrib.*D
Dalbani Corporation*D.....53	Andrews Electronics*D	Claus Electronics Div.	C&S Sales*D
Dalco Electronics*D	Arrow Electronics	Computer Component Source*D	Computer Component Source*D
Den-On Instruments (USA), Inc.	Vance Baldwin Inc.*D	Computer Svcs of America*D	Compuvideo
Digi-Key D*	B-B&W Electronics*D	Consolidated Elctrncs, Inc.*D	Consolidated Elctrncs, Inc.*D
East Coast Transistor*D	C&S Sales*D	Contact East, Inc.*D	Contact East, Inc.*D
Eiger Electronics*D	Chicago Case Company	Cooper Tools	Cooper Tools
E.I.L. Instruments, Inc.*D	Computer Component Source*D	The Current Source*D	CPR Systems Inc.
Electro Tool, Inc.	Consolidated Elctrncs, Inc.*D	Dalbani Corporation*D.....53	CRC Industries, Inc.
Electro Dynamics, Inc.*D	Contact East, Inc.*D	Dalco Electronics*D	The Current Source*D
Electronic Prod. Specialties*D	Cooper Tools	Den-On Instruments (USA), Inc.	Dalbani Corporation*D.....53
Electronic Parts Supply*D	The Current Source*D	East Coast Transistor*D	Dalco Electronics*D
Electronics Warehouse Corp.*D	Dalbani Corporation*D.....53	Electro Tool, Inc.	Den-On Instruments (USA), Inc.
Electronix Corp.*D.....80	Dalco Electronics*D	Electro Dynamics, Inc.*D	Digi-Key D*
Electronix Express*D	Den-On Instruments (USA), Inc.	Electronic Parts Supply*D	Dremel
Elenco Electronics, Inc.	Diversified Case Co., Inc.	Electronics Warehouse Corp.*D	East Coast Transistor*D
ESP Inc.	East Coast Transistor*D	Electronix Corp.*D.....80	Eiger Electronics*D
Excel Distributing*D	Electro Tool, Inc.	Electronix Express*D	Electro Tool, Inc.
Foley-Belsaw*D	Electro Dynamics, Inc.*D	Elenco Electronics, Inc.	Electro Dynamics, Inc.*D
Fox International*D	Electronic Prod. Specialties*D	Foley-Belsaw*D	Electronic Prod. Specialties*D
Galco Industrial Electronics*D	Electronic Parts Supply*D	Galco Industrial Electronics*D	Electronic Parts Supply*D
GC Electronics*D	Electronics Warehouse Corp.*D	Willi Hahn Corp U.S.A.	Electronic Software Developers.....14
American Hakko Products	Electronix Express*D	Harco Electronics*D	Electronics Warehouse Corp.*D
Harco Electronics*D	Elenco Electronics, Inc.	Heath Company	Electronix Corp.*D.....80
Heath Company	C.H. Ellis Company, Inc.	Herman Electronics*D.....73	Electronix Express*D
Herman Electronics*D.....73	Fox International*D	HMC - Hub Material Co.*D	Elenco Electronics, Inc.
Hexacon Electric Co.	Galco Industrial Electronics*D	Hosfelt Electronics, Inc.*D	Foley-Belsaw*D
Hitachi Home Electronics	Gemini Inc.	Hy Tec Dealer Service	Galco International*D
HMC - Hub Material Co.*D	Willi Hahn Corp U.S.A.	Jameco Electrnc Components*D	Galco Industrial Electronics*D
Hosfelt Electronics, Inc.*D	Harco Electronics*D	JDR Micro*D	GC Electronics*D
Howard Electrnc Insts Inc.*D	Herman Electronics*D.....73	JDV Products Inc.	The Granite Corp.
Internat'l Components Corp.*D.....80	Highland Products, Inc.	W.S. Jenks & Son*D	Willi Hahn Corp U.S.A.
Jameco Electrnc Components*D	HMC - Hub Material Co.*D	Jensen Tools, Inc.*D	Harco Electronics*D
JDR Micro*D	Hosfelt Electronics, Inc.*D	Jim-Pak*D	Herman Electronics*D.....73
JDV Products Inc.	Hy Tec Dealer Service	Jonard Industries Corp.	HMC - Hub Material Co.*D
W.S. Jenks & Son*D	Jameco Electrnc Components*D	Joseph Electronics*D	Hosfelt Electronics, Inc.*D
Jensen Tools, Inc.*D	JDR Micro*D	Kasco Distributing*D	Hy Tec Dealer Service
Jim-Pak*D	JDV Products Inc.	Kelvin Electronics*D	Jameco Electrnc Components*D
Joseph Electronics*D	W.S. Jenks & Son*D	Klein Tools, Inc.	JDR Micro*D
Kasco Distributing*D	Jensen Tools, Inc.*D	Marshall Industries*D	JDV Products Inc.
Kelvin Electronics*D	Jonard Industries Corp.	M.A.T. Electronics*D	W.S. Jenks & Son*D
Leads Metal Products (ENDECO)	Joseph Electronics*D	MCM Electronics*D	Jensen Tools, Inc.*D
The Malcom Company	Kelvin Electronics*D	Moody Tools, Inc.	Jonard Industries Corp.
Marshall Industries*D	Klein Tools, Inc.	P.K. Neuses*D	Joseph Electronics*D
M.A.T. Electronics*D	Marshall Industries*D	Omega Engineering, Inc.	Kasco Distributing*D
MCM Electronics*D	M.A.T. Electronics*D	Omnitron Electronics*MD	Kelvin Electronics*D
METCAL	MCM Electronics*D	Parts Express International*D.....16	Klein Tools, Inc.
Metric Supply*D	P.K. Neuses*D	PC Service Source*D	Marshall Industries*D
Mouser Electronics*D	Omega Engineering, Inc.	Philips Consumer Elctrncs*MD.....IBC	M.A.T. Electronics*D
Multicore Solders	Omnitron Electronics*MD	Premium Parts+ Electrncs Co*D	MCM Electronics*D
P.K. Neuses*D	Parts Express International*D.....16	Print Products International*D	Micro Care Corp.
M.M. Newman Corporation	Philips Consumer Elctrncs*MD.....IBC	RF Industries	Mouser Electronics*D
O.K. Industries, Inc.	Philips ECG	RNJ Electronics Inc.*D.....17	P.K. Neuses*D
Oldaker Corp.	Platt Luggage, Inc.	RS Electronics*D	O.K. Industries, Inc.
Omega Engineering, Inc.	Premium Parts+ Electrncs Co*D	Russell Industries*D	Omnitron Electronics*MD
Omnitron Electronics*MD	Print Products International*D	Snap-On Incorporated	Parts Express International*D.....16
PACE, Inc.	RNJ Electronics Inc.*D.....17	Specialized Prods Company*D	Philips Consumer Elctrncs*MD.....IBC
Parts Express International*D.....16	RS Electronics*D	Spencer Industries	Philips ECG
Philips Consumer Elctrncs*MD.....IBC	Snap-On Incorporated	Sun Equipment Corporation	Plato Products, Inc.
Philips ECG	Specialized Prods Company*D	Tandy National Parts*D	Portasol, Inc.
Plato Products, Inc.	Spencer Industries	Techni-Tool Inc.*D	Premium Parts+ Electrncs Co*D
Portasol, Inc.	Sun Equipment Corporation	Time Motion Tools*D	Print Products International*D
Premium Parts+ Electrncs Co*D	Tandy National Parts*D	Tucker Electronics Co.	Ripley Company
Print Products International*D	Techni-Tool Inc.*D	Union Electronics Distrib*D	RNJ Electronics Inc.*D.....17
RNJ Electronics Inc.*D.....17	Time Motion Tools*D	Weidmuller Inc.	RS Electronics*D
RS Electronics*D	Tritronics, Inc.*D	Weller/Cooper Tools	Russell Industries*D
Snap-On Incorporated	Tucker Electronics Co.	Wholesale Electronics Inc.*D	Snap-On Incorporated
SAT/ A SPIRIG CO.	Union Electronics Distrib*D		Specialized Prods Company*D
Specialized Prods Company*D	Weller/Cooper Tools		Sun Equipment Corporation
Sun Equipment Corporation	Wholesale Electronics Inc.*D		Tandy National Parts*D
Tandy National Parts*D	Zero Corp., East Div.		Techni-Tool Inc.*D
Techni-Tool Inc.*D			Time Motion Tools*D
Time Motion Tools*D			Tritronics, Inc.*D
Tritronics, Inc.*D			Tucker Electronics Co.
Tucker Electronics Co.			Ungar, A Rubbermaid Co.
Ungar, A Rubbermaid Co.			Union Electronics Distrib*D
Union Electronics Distrib*D			Virtual Industries
Virtual Industries			Wahl Clipper Corporation
Wahl Clipper Corporation			Weller/Cooper Tools
Weller/Cooper Tools			Wholesale Electronics Inc.*D
Wholesale Electronics Inc.*D			Xytronic
Xytronic			
	TOOL KITS	TOOLS, MISCELLANEOUS	
	American Design Components	Aervo-Pacific Co.	
	Andrews Electronics*D	Alternative Technical Services	
	Arrow Electronics	American Design Components	
	Vance Baldwin Inc.*D	AMP	
	Bi-Tronics Inc.	Andrews Electronics*D	
		Antique Electronic Supply*D	
		A.P.E.	
		Arrow Electronics	
		Vance Baldwin Inc.*D	
		B-B&W Electronics*D	

Replacement parts/ components directory

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

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

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
ANTENNAS/ROTORS/ SATELLITE SYSTEMS	Wholesale Electronics, Inc.*D Yamaha Electronics Corp, USA	Diversified Parts*D East Coast Transistor*D Eiger Electronics*D Electro Dynamics, Inc.*D Electronic Parts Supply*D Electronics Warehouse Corp.*D Electronix Corp.*D.....80 Electronix Express*D Excel Distributing*D Foley-Belsaw*D Fox International*D Fox International*D Hitachi Home Electronics Joseph Electronics*D M.A.T. Electronics*D MCM Electronics*D Parts Express International*D.....16 Philips Consumer Elctrncs*MD.....IBC Premium Parts+ Elctrncs Co*D RNJ Electronics, Inc.*D.....17 Russell Industries*D Sony Service Co. Tritronics, Inc.*D Union Electronics Distrib*D Wholesale Electronics, Inc.*D Winegard Co.	Joseph Electronics*D M.A.T. Electronics*D MCM Electronics*D Mouser Electronics*D NTE Electronics, Inc.*D Panasonic Industrial Co. Parts Express International*D.....16 Pfanstiehl Corp.*D Philips Consumer Elctrncs*MD.....IBC Quasar RS Electronics*D Schurter, Inc. Sony Service Co. Technics Tritronics, Inc.*D Union Electronics Distrib*D Wholesale Electronics Inc.*D
Andrews Electronics*D Vance Baldwin, Inc.*D B-B&W Electronics*D Bursma Electronic Distrib.*D Cititronix/Panson*D Computer Component Source*D The Current Source*D Dalbani Corporation*D.....53 Diversified Parts*D East Coast Transistor*D Eiger Electronics*D Electro Dynamics, Inc.*D Electronic Parts Supply*D Electronics Warehouse Corp.*D Excel Distributing*D Fox International*D GC Electronics*D Hitachi Home Electronics Joseph Electronics*D M.A.T. Electronics*D MCM Electronics*D Parts Express International*D.....16 Philips Consumer Elctrncs*MD.....IBC Premium Parts+ Elctrncs Co*D RNJ Electronics, Inc.*D.....17 Russell Industries*D Sony Service Co. Tritronics, Inc.*D Union Electronics Distrib*D Wholesale Electronics, Inc.*D Winegard Co.	BELTS/DRIVE WHEELS Andrews Electronics*D Antique Electronic Supply*D Vance Baldwin, Inc.*D B-B&W Electronics*D Bursma Electronic Distrib.*D Cititronix/Panson*D Computer Component Source*D Compuvideo Consolidated Elctrncs, Inc.*D The Current Source*D Dalbani Corporation*D.....53 Diversified Parts*D East Coast Transistor*D Eiger Electronics*D Electro Dynamics, Inc.*D Electronic Parts Supply*D Electronics Warehouse Corp.*D Electronix Corp.*D.....80 E.M.T. Parts, Inc.*D Excel Distributing*D Foley-Belsaw*D Fox International*D Herman Electronics*D.....73 Hitachi Home Electronics Joseph Electronics*D M.A.T. Electronics*D MCM Electronics*D Parts Express International*D.....16 Pfanstiehl Corp.*D Philips Consumer Elctrncs*MD.....IBC Philips ECG Premium Parts+ Elctrncs Co*D Quasar RNJ Electronics, Inc.*D.....17 Russell Industries*D Sony Service Co. Tandy National Parts*D Technics Tritronics, Inc.*D Union Electronics Distrib*D Warrantech Corp. Wholesale Electronics, Inc.*D Yamaha Electronics Corp, USA	Electronics Warehouse Corp.*D Global Micro-Parts Depot*D Herman Electronics*D.....73 Hitachi Home Electronics Hosfelt Electronics, Inc.*D Jameco Electronic Components*D JDR Micro*D Jim-Pak*D Joseph Electronics*D Kelvin Electronics*D L.J. Enterprises*D.....69 Marshall Industries*D M.A.T. Parts, Inc.*D MCM Electronics*D Microline Mouser Electronics*D NTE Electronics, Inc.*D Panasonic Industrial Co. Parts Express International*D.....16 Philips Consumer Elctrncs*MD.....IBC Philips ECG Premium Parts+ Elctrncs Co*D Quasar Richardson Electronics, Ltd.*D RS Electronics*D Russell Industries*D Sony Service Co. Tandy National Parts*D A.G. Tannenbaum*D Technics Tritronics, Inc.*D Union Electronics Distrib*D Wholesale Electronics, Inc.*D Yamaha Electronics Corp, USA	CONNECTORS/TERMINALS Amcom Corporaton*D American Design Components AMP Amphenol Corporation Andrews Electronics*D Arrow Electronics Vance Baldwin, Inc.*D B-B&W Electronics*D Bursma Electronic Distrib.*D Cititronix/Panson*D Computer Component Source*D Consolidated Elctrncs, Inc.*D The Current Source*D Curtis Mathes Dalbani Corporation*D.....53 Dalco Electronics*D Digi-Key D* Diversified Parts*D East Coast Transistor*D Eiger Electronics*D Electro Dynamics, Inc.*D Electronic Parts Supply*D Electronics Warehouse Corp.*D Electronix Corp.*D.....80 Excel Distributing*D Foley-Belsaw*D Galco Industrial Electronics*D Herman Electronics*D.....73 Hitachi Home Electronics Hosfelt Electronics, Inc.*D Internatl Components Corp.*D.....80 Jameco Elctrnc Components*D Jim-Pak*D Joseph Electronics*D Kasco Distributing*D Kelvin Electronics*D Keystone Electronics Corp. Klein Tools, Inc. Marshall Industries*D M.A.T. Electronics*D MCM Electronics*D Microline Mouser Electronics*D Parts Express International*D.....16 Pfanstiehl Corp.*D Philips ECG Quasar
AUDIO HEADS Andrews Electronics*D Vance Baldwin, Inc.*D B-B&W Electronics*D Bursma Electronic Distrib.*D Cititronix/Panson*D Compuvideo The Current Source*D Dalbani Corporation*D.....53 Diversified Parts*D East Coast Transistor*D Eiger Electronics*D Electronic Parts Supply*D Electronics Warehouse Corp.*D Electronix Corp.*D.....80 Hitachi Home Electronics Joseph Electronics*D M.A.T. Electronics*D MCM Electronics*D Parts Express International*D.....16 Philips Consumer Elctrncs*MD.....IBC Philips ECG Premium Parts+ Elctrncs Co*D Quasar RNJ Electronics, Inc.*D.....17 Sony Service Co. Sprague Magnetics, Inc.*D Technics Tritronics, Inc.*D Trumenco of California, Inc.*D Union Electronics Distrib*D	CAPACITORS American Design Components Andrews Electronics*D Antique Electronic Supply*D Arrow Electronics Vance Baldwin, Inc.*D B-B&W Electronics*D Bursma Electronic Distrib.*D Cititronix/Panson*D Computer Component Source*D Computer Svcs of America*D Compuvideo Consolidated Elctrncs, Inc.*D The Current Source*D Curtis Mathes Dalbani Corporation*D.....53 Digi-Key D*	CIRCUIT BREAKERS American Design Components Andrews Electronics*D Arrow Electronics Vance Baldwin, Inc.*D B-B&W Electronics*D Bursma Electronic Distrib.*D Cititronix/Panson*D The Current Source*D Diversified Parts*D East Coast Transistor*D Eiger Electronics*D Electronic Parts Supply*D Electronics Warehouse Corp.*D Electronix Corp.*D.....80 Fox International*D Galco Industrial Electronics*D Herman Electronics*D.....73 Hitachi Home Electronics Hosfelt Electronics, Inc.*D	

Replacement parts/components directory

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
RF Industries	Diversified Parts*D	Philips Consumer Elctrncs*MD.....IBC	JDR Micro*D
RNJ Electronics, Inc.*D17	East Coast Transistor*D	Philips ECG	Joseph Electronics*D
RS Electronics*D	Eiger Electronics*D	Quasar	MCM Electronics*D
Russell Industries*D	Electro Dynamics, Inc.*D	RS Electronics*D	Microline
Schurter, Inc.	Electronic Parts Supply*D	Russell Industries*D	Mouser Electronics*D
SHOGYO International Corp.	Electronics Warehouse Corp.*D	SMH Electronics Co., Inc.	Panasonic Industrial Co.
Sony Service Co.	Electronix Corp.*D80	Sony Service Co.	Parts Express International*D16
Tandy National Parts*D	Electronix Express*D	A.G. Tannenbaum*D	Quasar
Technics	Excel Distributing*D	Technics	RS Electronics*D
Techni-Tool, Inc.*D	Foley-Belsaw*D	Tritronics, Inc.*D	SHOGYO International Corp.
Tritronics, Inc.*D	Fox International*D	Union Electronics Distrib*D	Sony Service Co.
Trompeter Electronics	Galco Industrial Electronics*D	Wholesale Electronics, Inc.*D	Tandy National Parts*D
Union Electronics Distrib*D	GC Electronics*D	Yamaha Electronics Corp, USA	Technics
Wholesale Electronics, Inc.*D	Global Micro-Parts Depot*D		Tritronics, Inc.*D
Yamaha Electronics Corp, USA	Herman Electronics*D73		Wholesale Electronics, Inc.*D
	Hitachi Home Electronics		Yamaha Electronics Corp, USA
	Hosfelt Electronics, Inc.*D		
FLYBACKS	Internat'l Components Corp.*D.....80	HOLDERS/CLIPS	
American Design Components	Jameco Electrnc Components*D	Andrews Electronics*D	LAMPS/LEDs/INDICATORS
Andrews Electronics*D	Joseph Electronics*D	Arrow Electronics	American Design Components
Vance Baldwin, Inc.*D	Kelvin Electronics*D	Vance Baldwin, Inc.*D	Andrews Electronics*D
B-B&W Electronics*D	L.J. Enterprises*D69	B-B&W Electronics*D	Antique Electronic Supply*D
Bursma Electronic Distrib.*D	M.A.T. Electronics*D	Burma Electronic Distrib.*D	Arrow Electronics
Cititronix/Panson*D	MCM Electronics*D	Cititronix/Panson*D	Vance Baldwin, Inc.*D
Computer Component Source*D	Microline	Computer Component Source*D	B-B&W Electronics*D
Computer Svcs of America*D	Mouser Electronics*D	The Current Source*D	Bursma Electronic Distrib.*D
Consolidated Elctrncs, Inc.*D	Parts Express International*D16	Dalco Electronics*D	Cititronix/Panson*D
The Current Source*D	Philips Consumer Elctrncs*MD.....IBC	Dialight Corporation	Computer Component Source*D
Curtis Mathes	Philips ECG	Digi-Key D*	Consolidated Elctrncs, Inc.*D
Dalbani Corporation*D53	Premium Parts+ Electrncs Co*D	Diversified Parts*D	The Current Source*D
Diversified Parts*D	Quasar	East Coast Transistor*D	Dalbani Corporation*D53
East Coast Transistor*D	RNJ Electronics Inc.*D17	Electro Dynamics, Inc.*D	Dialight Corporation
Eiger Electronics*D	RS Electronics*D	Electronic Parts Supply*D	Digi-Key D*
Electro Dynamics, Inc.*D	Russell Industries*D	Electronics Warehouse Corp.*D	Diversified Parts*D
Electronic Parts Supply*D	Schurter, Inc.	Electronix Corp.*D80	East Coast Transistor*D
Electronics Warehouse Corp.*D	Sony Service Co.	Electronix Express*D	Eiger Electronics*D
Electronix Corp.*D80	Tandy National Parts*D	E-Z Hook	Electro Dynamics, Inc.*D
E.M.T. Parts, Inc.*D	Technics	Hitachi Home Electronics	Electronic Parts Supply*D
Excel Distributing*D	Tritronics, Inc.*D	Hosfelt Electronics, Inc.*D	Electronics Warehouse Corp.*D
Fox International*D	Union Electronics Distrib*D	Jameco Electrnc Components*D	Electronix Corp.*D80
Herman Electronics*D73	Wholesale Electronics Inc.*D	Joseph Electronics*D	Electronix Express*D
Hitachi Home Electronics	Yamaha Electronics Corp, USA	Kelvin Electronics*D	Foley-Belsaw*D
ICM Components*D15		Keystone Electronics Corp.	Galco Industrial Electronics*D
Joseph Electronics*D		Klein Tools, Inc.	GC Electronics*D
M.A.T. Electronics*D	HARDWARE	M.A.T. Electronics*D	Hitachi Home Electronics
MCM Electronics*D	Amcom Corporaton*D	MCM Electronics*D	Industrial Devices, Inc.
Microline	Andrews Electronics*D	Mouser Electronics*D	Jameco Electrnc Components*D
NTE Electronics, Inc.*D	Arrow Electronics	Oldaker Corp.	JDR Micro*D
Panasonic Industrial Co.	Vance Baldwin, Inc.*D	Parts Express International*D16	Jim-Pak*D
Parts Express International*D16	B-B&W Electronics*D	Philips Consumer Elctrncs*MD.....IBC	Joseph Electronics*D
Parts Port Ltd*D	Bursma Electronic Distrib.*D	Philips ECG	Kelvin Electronics*D
Philips Consumer Elctrncs*MD.....IBC	Cititronix/Panson*D	Quasar	M.A.T. Electronics*D
Philips ECG	The Current Source*D	RS Electronics*D	M.C.D. Electronics *D
Premium Parts+ Electrncs Co*D	Dalbani Corporation*D53	Schurter, Inc.	MCM Electronics*D
Quasar	Dalco Electronics*D	SHOGYO International Corp.	Microline
Richardson Electronics, Ltd.*D	Digi-Key D*	Sony Service Co.	Mouser Electronics*D
RNJ Electronics, Inc.*D17	Diversified Parts*D	Synergetix	NTE Electronics, Inc.*D
RS Electronics*D	East Coast Transistor*D	Tandy National Parts*D	Panasonic Industrial Co.
Russell Industries*D	Electronic Parts Supply*D	Technics	Parts Express International*D16
SHOGYO International Corp.	Electronics Warehouse Corp.*D	Tritronics, Inc.*D	Pfanstiehl Corp.*D
Sony Service Co.	Electronix Corp.*D80	Union Electronics Distrib*D	Philips Consumer Elctrncs*MD.....IBC
Sprague Magnetics, Inc.*D	Electronix Express*D	Wholesale Electronics Inc.*D	Philips ECG
Technics	Electroservice Laboratories	Yamaha Electronics Corp, USA	Premium Parts+ Electrncs Co*D
Tritronics, Inc.*D	Excel Distributing*D		Quasar
Truminco of California, Inc.*D	Galco Industrial Electronics*D	INDUCTORS	RNJ Electronics, Inc.*D17
Union Electronics Distrib*D	Herman Electronics*D73	Andrews Electronics*D	RS Electronics*D
Vintage TV and Radio Supply*D	Hitachi Home Electronics	Arrow Electronics	Schurter, Inc.
Wholesale Electronics, Inc.*D	Hosfelt Electronics, Inc.*D	Vance Baldwin, Inc.*D	SHOGYO International Corp.
	Jameco Electrnc Components*D	B-B&W Electronics*D	Sony Service Co.
	JDR Micro*D	Bursma Electronic Distrib.*D	Sprague Magnetics, Inc.*D
	Joseph Electronics*D	Cititronix/Panson*D	Tandy National Parts*D
	Kasco Distributing*D	Computer Component Source*D	A.G. Tannenbaum*D
	Kelvin Electronics*D	Computer Svcs of America*D	Technics
	Keystone Electronics Corp.	The Current Source*D	Tritronics, Inc.*D
	M.A.T. Electronics*D	Digi-Key D*	Union Electronics Distrib*D
	MCD Electronics *D	Diversified Parts*D	Wholesale Electronics, Inc.*D
	MCM Electronics*D	Electro Dynamics, Inc.*D	Yamaha Electronics Corp, USA
	Microline	Electronics Warehouse Corp.*D	
	Mouser Electronics*D	Electronix Corp.*D80	
	National Instruments Corp.	Electronix Express*D	
	Parts Express International*D16	Hitachi Home Electronics	MAGNETRONS
	PC Service Source*D	Hosfelt Electronics, Inc.*D	Andrews Electronics*D
		Jameco Electrnc Components*D	Vance Baldwin, Inc.*D
			B-B&W Electronics*D

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
Cititronix/Panson*D	Electronix Corp.*D80	MCM Electronics*D	Dalbani Corporation*D53
Computer Component Source*D	Electroservice Laboratories	Panasonic Industrial Co.	Data Business Publishing
Consolidated Elctnrcs, Inc.*D	Fox International*D	Philips Consumer Elctnrcs*MDIBC	Digi-Key D*
Dalbani Corporation*D53	Herman Electronics*D73	Philips ECG	Diversified Parts*D
Diversified Parts*D	Hitachi Home Electronics	Quasar	East Coast Transistor*D
Electro Dynamics, Inc.*D	Hosfelt Electronics, Inc.*D	Richardson Electronics, Ltd.*D	Eiger Electronics*D
Electronic Parts Supply*D	Jameco Electrnc Components*D	RS Electronics*D	Electro Dynamics, Inc.*D
Electronics Warehouse Corp.*D	Joseph Electronics*D	SMH Electronics Co., Inc.	Electronic Parts Supply*D
Electronix Corp.*D80	Kelvin Electronics*D	Sony Service Co.	Electronics Warehouse Corp.*D
Fox International*D	M.A.T. Electronics*D	Technics	Electronix Corp.*D80
Global Micro-Parts Depot*D	MCM Electronics*D	Tritronics, Inc.*D	Electronix Express*D
Herman Electronics*D73	Microline	Tucker Electronics Co.	Excel Distributing*D
Hitachi Home Electronics	Panasonic Industrial Co.	Union Electronics Distrib*D	Fox International*D
Internat'l Components Corp.*D80	Parts Express International*D16	Video Display Corporation	Galco Industrial Electronics*D
Joseph Electronics*D	Philips Consumer Elctnrcs*MDIBC	Video Display Corporation	Global Micro-Parts Depot*D
M.A.T. Electronics*D	Philips ECG	Warrantech Corp.	Hitachi Home Electronics
MCD Electronics *D	Premium Parts+ Elctnrcs Co*D	Wholesale Electronics, Inc.*D	Jameco Electrnc Components*D
MCM Electronics*D	Quasar	Zenith Sales Co.	JDR Micro*D
Parts Express International*D16	RNJ Electronics, Inc.*D17		Joseph Electronics*D
Premium Parts+ Elctnrcs Co*D	RS Electronics*D		Kelvin Electronics*D
Q B Products*D	Sony Service Co.		L.J. Enterprises*D69
Quasar	Sprague Magnetics, Inc.*D		M.A.T. Electronics*D
Richardson Electronics, Ltd.*D	Technics		MCD Electronics *D
RNJ Electronics, Inc.*D17	Tritronics, Inc.*D		MCM Electronics*D
Tritronics, Inc.*D	Truminc of California, Inc.*D		Microline
Truminc of California Inc.*D	Union Electronics Distrib*D		Mouser Electronics*D
	Yamaha Electronics Corp, USA		NTE Electronics, Inc.*D
			Parts Express International*D16
			Philips Consumer Elctnrcs*MDIBC
			Philips ECG
			Quasar
			Richardson Electronics, Ltd.*D
			RS Electronics*D
			Tandy National Parts*D
			Technics
			Tritronics, Inc.*D
			Union Electronics Distrib*D
			Wholesale Electronics, Inc.*D
			Yamaha Electronics Corp, USA
MODULES	PHONO CARTRIDGES/STYLI	POTENTIOMETERS	RELAYS
Andrews Electronics*D	Andrews Electronics*D	American Design Components	American Design Components
Vance Baldwin, Inc.*D	Vance Baldwin, Inc.*D	Andrews Electronics*D	Andrews Electronics*D
B-B&W Electronics*D	B-B&W Electronics*D	Antique Electronic Supply*D	Antique Electronic Supply*D
Bursma Electronic Distrib.*D	Bursma Electronic Distrib.*D	Arrow Electronics	Arrow Electronics
Cititronix/Panson*D	Cititronix/Panson*D	Vance Baldwin, Inc.*D	Vance Baldwin, Inc.*D
The Current Source*D	The Current Source*D	B-B&W Electronics*D	B-B&W Electronics*D
Dalbani Corporation*D53	Dalbani Corporation*D53	Bursma Electronic Distrib.*D	Bursma Electronic Distrib.*D
Diversified Parts*D	Diversified Parts*D	Cititronix/Panson*D	Cititronix/Panson*D
East Coast Transistor*D	East Coast Transistor*D	Computer Component Source*D	Computer Component Source*D
Eiger Electronics*D	Eiger Electronics*D	Consolidated Elctnrcs, Inc.*D	Computer Svcs of America*D
Electronic Parts Supply*D	Electronic Parts Supply*D	The Current Source*D	Consolidated Elctnrcs, Inc.*D
Electronics Warehouse Corp.*D	Electronics Warehouse Corp.*D	Dalbani Corporation*D53	The Current Source*D
Electronix Corp.*D80	Electronix Corp.*D80	Diversified Parts*D	Digi-Key D*
Excel Distributing*D	Excel Distributing*D	East Coast Transistor*D	Diversified Parts*D
Fox International*D	Fox International*D	Eiger Electronics*D	East Coast Transistor*D
Galco Industrial Electronics*D	Galco Industrial Electronics*D	Electro Dynamics, Inc.*D	Eiger Electronics*D
Herman Electronics*D73	Herman Electronics*D73	Electronic Parts Supply*D	Electro Dynamics, Inc.*D
Hitachi Home Electronics	Hitachi Home Electronics	Electronics Warehouse Corp.*D	Electronic Parts Supply*D
Jameco Electrnc Components*D	Jameco Electrnc Components*D	Herman Electronics*D73	Electronics Warehouse Corp.*D
Joseph Electronics*D	Joseph Electronics*D	Hitachi Home Electronics	Electronix Corp.*D80
M.A.T. Electronics*D	M.A.T. Electronics*D	Joseph Electronics*D	Electronix Express*D
MCM Electronics*D	MCM Electronics*D	Kelvin Electronics*D	Excel Distributing*D
Module Exchange	Module Exchange	L.J. Enterprises*D69	Galco Industrial Electronics*D
Philips Consumer Elctnrcs*MDIBC	Philips Consumer Elctnrcs*MDIBC	M.A.T. Electronics*D	Global Micro-Parts Depot*D
Philips ECG	Philips ECG	MCM Electronics*D	Herman Electronics*D73
Premium Parts+ Elctnrcs Co*D	Premium Parts+ Elctnrcs Co*D	Mouser Electronics*D	Hitachi Home Electronics
PTS Corporation80	PTS Corporation80	Panasonic Industrial Co.	Hosfelt Electronics, Inc.*D
Quasar	Quasar	Parts Express International*D16	Jameco Electrnc Components*D
RF Industries	RF Industries	Parts Port, Ltd*D	JDR Micro*D
Richardson Electronics, Ltd.*D	Richardson Electronics, Ltd.*D	Philips Consumer Elctnrcs*MDIBC	Jim-Pak*D
Schurter, Inc.	Schurter, Inc.	Philips ECG	Joseph Electronics*D
Synergetix	Synergetix	Sony Service Co.	Kelvin Electronics*D
Tritronics, Inc.*D	Tritronics, Inc.*D	A.G. Tannenbaum*D	M.A.T. Electronics*D
Union Electronics Distrib*D	Union Electronics Distrib*D	Technics	MCD Electronics *D
Wholesale Electronics, Inc.*D	Wholesale Electronics, Inc.*D	Techni-Tool, Inc.*D	MCM Electronics*D
		Tritronics, Inc.*D	Microline
		Union Electronics Distrib*D	Mouser Electronics*D
		Wholesale Electronics, Inc.*D	NTE Electronics, Inc.*D
		Yamaha Electronics Corp, USA	Parts Express International*D16
			Philips Consumer Elctnrcs*MDIBC
			Philips ECG
MOTORS	PICTURE TUBES/CRTs	RECTIFIERS	
Amcom Corporaton*D	American Design Components	American Design Components	
American Design Components	Andrews Electronics*D	Andrews Electronics*D	
Andrews Electronics*D	Vance Baldwin Inc.*D	Antique Electronic Supply*D	
Vance Baldwin, Inc.*D	B-B&W Electronics*D	Arrow Electronics	
B-B&W Electronics*D	Bursma Electronic Distrib.*D	Vance Baldwin, Inc.*D	
Cititronix/Panson*D	Cititronix/Panson*D	B-B&W Electronics*D	
Computer Component Source*D	Computer Svcs of America*D	Bursma Electronic Distrib.*D	
Computer Svcs of America*D	Compuvideo	Cititronix/Panson*D	
The Current Source*D	The Current Source*D	Computer Component Source*D	
Dalbani Corporation*D53	Curtis Mathes	Consolidated Elctnrcs, Inc.*D	
Diversified Parts*D	Diversified Parts*D	The Current Source*D	
East Coast Transistor*D	Eiger Electronics*D	Curtis Mathes	
Eiger Electronics*D	Electronic Parts Supply*D	Diversified Parts*D	
Electro Dynamics, Inc.*D	Excel Distributing*D	Eiger Electronics*D	
Electronic Parts Supply*D	Fox International*D	Electronic Parts Supply*D	
Electronics Warehouse Corp.*D	Herman Electronics*D73	Fox International*D	
	Hitachi Home Electronics	Herman Electronics*D73	
	Joseph Electronics*D	Hitachi Home Electronics	
		Joseph Electronics*D	

See Adv. Page

See Adv. Page

See Adv. Page

See Adv. Page

SOCKETS

American Design Components
AMP
Andrews Electronics*D
Antique Electronic Supply*D
Arrow Electronics
Vance Baldwin, Inc.*D
B-B&W Electronics*D
Bursma Electronic Distrib.*D
Cititronix/Panson*D
Computer Component Source*D
Consolidated Elctrcs, Inc.*D
The Current Source*D
Dalbani Corporation*D.....53
Dalco Electronics*D
Digi-Key D*
Diversified Parts*D
East Coast Transistor*D
Eiger Electronics*D
Electro Dynamics, Inc.*D
Electronic Parts Supply*D
Electronics Warehouse Corp.*D
Electronix Corp.*D.....80
Electronix Express*D
Galco Industrial Electronics*D
Herman Electronics*D.....73
Hitachi Home Electronics
Hosfelt Electronics, Inc.*D
Industrial Devices, Inc.
Interconnect Devices, Inc.
Jameco Electrnc Components*D
JDR Micro*D
Joseph Electronics*D
Kelvin Electronics*D
M.A.T. Electronics*D
MCM Electronics*D
Microline
Mouser Electronics*D
NTE Electronics, Inc.*D
Parts Express International*D.....16
Philips ECG
Quasar
Richardson Electronics, Ltd.*D
RNJ Electronics Inc.*D.....17
RS Electronics*D
Schurter, Inc.
SHOGYO International Corp.
Snap-On Incorporated
Synergetix
Tandy National Parts*D
A.G. Tannenbaum*D
Technics
3M Electronic Prods Division
Tritronics, Inc.*D
Union Electronics Distrib*D
Wholesale Electronics Inc.*D
Yamaha Electronics Corp, USA

SPEAKERS

American Design Components
Andrews Electronics*D
Antique Automobile Radio*D
Vance Baldwin Inc.*D
B-B&W Electronics*D
Bursma Electronic Distrib.*D
Cititronix/Panson*D
Computer Component Source*D
Consolidated Elctrcs, Inc.*D
The Current Source*D
Curtis Mathes
Dalbani Corporation*D.....53
Dalco Electronics*D
Digi-Key D*
Diversified Parts*D
East Coast Transistor*D
Eiger Electronics*D
Electro Dynamics, Inc.*D
Electronic Parts Supply*D
Electronics Warehouse Corp.*D
Electronix Express*D

Fox International*D
GC Electronics*D
Herman Electronics*D.....73
Hitachi Home Electronics
Hosfelt Electronics, Inc.*D
Internat'l Components Corp.*D.....80
Jameco Electrnc Components*D
Joseph Electronics*D
Kelvin Electronics*D
M.A.T. Electronics*D
MCM Electronics*D
Mouser Electronics*D
Panasonic Industrial Co.
Parts Express International*D.....16
Pfanstiehl Corp.*D
Philips Consumer Elctrcs*MD.....IBC
Philips ECG
Premium Parts+ Electrncs Co*D
RNJ Electronics Inc.*D.....17
SHOGYO International Corp.
Sony Service Co.
Tritronics, Inc.*D
Truminco of California Inc.*D
Union Electronics Distrib*D
Wholesale Electronics Inc.*D
Yamaha Electronics Corp, USA
Zenith Sales Co.

SWITCHES

American Design Components
AMP
Andrews Electronics*D
Arrow Electronics
Vance Baldwin Inc.*D
B-B&W Electronics*D
Bursma Electronic Distrib.*D
Cititronix/Panson*D
Computer Component Source*D
Consolidated Elctrcs, Inc.*D
The Current Source*D
Dalbani Corporatlon*D.....53
Dalco Electronics*D
Data Business Publishing
Dialight Corporation
Digi-Key D*
Diversified Parts*D
East Coast Transistor*D
Eiger Electronics*D
Electro Dynamics, Inc.*D
Electronic Parts Supply*D
Electronics Warehouse Corp.*D
Electronix Corp.*D.....80
Electronix Express*D
Excel Distributing*D
Galco Industrial Electronics*D
GC Electronics*D
Global Micro-Parts Depot*D
Herman Electronics*D.....73
Hitachi Home Electronics
Hosfelt Electronics, Inc.*D
Jameco Electrnc Components*D
JDR Micro*D
Jim-Pak*D
Joseph Electronics*D
Kelvin Electronics*D
M.A.T. Electronics*D
MCM Electronics*D
Microline
Mouser Electronics*D
Panasonic Industrial Co.
Parts Express International*D.....16
Parts Port Ltd*D
Pfanstiehl Corp.*D
Philips ECG
Premium Parts+ Electrncs Co*D
RNJ Electronics Inc.*D.....17
RS Electronics*D
Schurter, Inc.
SHOGYO International Corp.
Tandy National Parts*D
Tritronics, Inc.*D

Truminco of California Inc.*D
Union Electronics Distrib*D
Wholesale Electronics Inc.*D
Yamaha Electronics Corp, USA

TRANSFORMERS

American Design Components
Andrews Electronics*D
Antique Automobile Radio*D
Antique Electronic Supply*D
Arrow Electronics
Vance Baldwin Inc.*D
B-B&W Electronics*D
Bursma Electronic Distrib.*D
Cititronix/Panson*D
Computer Component Source*D
Consolidated Elctrcs, Inc.*D
The Current Source*D
Dalbani Corporation*D.....53
Digi-Key D*
Diversified Parts*D
East Coast Transistor*D
Eiger Electronics*D
Electro Dynamics, Inc.*D
Electronic Parts Supply*D
Electronics Warehouse Corp.*D
Electronix Corp.*D.....80
Electronix Express*D
Fox International*D
Galco Industrial Electronics*D
Global Micro-Parts Depot*D
Herman Electronics*D.....73
Hitachi Home Electronics
Hosfelt Electronics, Inc.*D
Jameco Electrnc Components*D
JDR Micro*D
Jim-Pak*D
Joseph Electronics*D
Kelvin Electronics*D
M.A.T. Electronics*D
MCM Electronics*D
Microline
Mouser Electronics*D
Parts Express International*D.....16
Philips Consumer Elctrcs*MD.....IBC
Philips ECG
Premium Parts+ Electrncs Co*D
Quasar
RNJ Electronics Inc.*D.....17
RS Electronics*D
SHOGYO International Corp.
Sony Service Co.
Tandy National Parts*D
Technics
Thordarson-Meissner
Tritronics, Inc.*D
Truminco of California Inc.*D
Union Electronics Distrib*D
Wholesale Electronics Inc.*D
Yamaha Electronics Corp, USA

VACUUM TUBES

Andrews Electronics*D
Antique Automobile Radio*D
Vance Baldwin Inc.*D
B-B&W Electronics*D
Bursma Electronic Distrib.*D
Cititronix/Panson*D
Consolidated Elctrcs, Inc.*D
The Current Source*D
Curtis Mathes
Diversified Parts*D
Eiger Electronics*D
Electronic Parts Supply*D
Electronix Corp.*D.....80
Excel Distributing*D
Galco Industrial Electronics*D
Hitachi Home Electronics
Internat'l Components Corp.*D.....80
Joseph Electronics*D

Kelvin Electronics*D
MCD Electronics *D
MCM Electronics*D
Parts Express International*D.....16
Richardson Electronics, Ltd.*D
RS Electronics*D
Tritronics, Inc.*D
Tucker Electronics Co.
Vintage TV and Radio Supply*D

VIDEO HEADS

Amcom Corporaton*D
Andrews Electronics*D
ASTI Magnetics Corp.
Vance Baldwin Inc.*D
B-B&W Electronics*D
Bursma Electronic Distrib.*D
Cititronix/Panson*D
Computer Component Source*D
Compuvideo
Consolidated Elctrcs, Inc.*D
The Current Source*D
Curtis Mathes
Dalbani Corporation*D.....53
Diversified Parts*D
East Coast Transistor*D
Eiger Electronics*D
Electro Dynamics, Inc.*D
Electronic Parts Supply*D
Electronics Warehouse Corp.*D
Electronix Corp.*D.....80
E.M.T. Parts, Inc.*D
Excel Distributing*D
Foley-Belsaw*D
Fox International*D
Herman Electronics*D.....73
Hitachi Home Electronics
Joseph Electronics*D
M.A.T. Electronics*D
MCM Electronics*D
Parts Express International*D.....16
Pfanstiehl Corp.*D
Philips Consumer Elctrcs*MD.....IBC
Philips ECG
Premium Parts+ Electrncs Co*D
Quasar
RNJ Electronics Inc.*D.....17
Sony Service Co.
Tandy National Parts*D
Technics
Tritronics, Inc.*D
Truminco of California Inc.*D
Union Electronics Distrib*D
Wholesale Electronics Inc.*D

YOKES

Andrews Electronics*D
Vance Baldwin Inc.*D
B-B&W Electronics*D
Bursma Electronic Distrib.*D
Cititronix/Panson*D
Consolidated Elctrcs, Inc.*D
Curtis Mathes
Dalbani Corporation*D.....53
Diversified Parts*D
Eiger Electronics*D
Electronic Parts Supply*D
Fox International*D
Herman Electronics*D.....73
Hitachi Home Electronics
Joseph Electronics*D
MCM Electronics*D
Microline
Panasonic Industrial Co.
Philips Consumer Elctrcs*MD.....IBC
Phipps ECG
Quasar
Sony Service Co.
Technics
Tritronics, Inc.*D
Vintage TV and Radio Supply*D

Software/services directory

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

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

See Adv. Page	See Adv. Page	See Adv. Page	See Adv. Page
COMPUTER DIAGNOSTIC SOFTWARE	Tech Assist, Inc.	Gibson Research Corp.	Tech. Info. Procurement Serv.
Accurite Technologies Inc.	Touchstone Software Corp.	Jameco Electrnc Components*D	TV Man Tech Tips, Inc.
AnaTek Corporation16	Ultra-X, Inc.	Micro 2000, Inc.	
B&B Electronics Manufacturing	Warrantech Corp.	Reset, Inc.	SERVICE MANAGEMENT SOFTWARE
Computer Doctors	Windsor Technologies, Inc.	SMH Electronics Co., Inc.	AnaTek Corporation16
Computer Svcs of America*D		Sprague Magnetics, Inc.*D	Astea International
Dalco Electronics*D	CONSULTANTS	Warrantech Corp.	Automated Systems, Inc.
Data Depot, Inc.	The Computer Industry Almanac		BGI Company, Inc. "AutoTech"
Dranetz Technologies, Inc.	Coordinated Service, Inc.	ONLINE SERVICES	Cahill Electronics
Eagan Technical Services, Inc.	Custom Data Associates	AnaTek Corporation16	Computer Transaction Systems
Electronic Software Developers14	Electronic Software Developers14	Computer Doctors	Core Software
Electronix Corp.*D80	Innovative Solutions	Electronix Corp.*D80	Creative Logics Corporation
EURAS USA, Inc.	JDR Micro*D	EURAS USA, Inc.	Custom Data Associates
Fessenden Technologies	Marshall Industries*D	JDR Micro*D	Data-Basics, Inc.
Gibson Research Corp.	MaxServe, Inc.	MaxServe, Inc.	DataBasic
Higher Intelligence Software71	Micro 2000, Inc.	National Advancement Corp.	DAYTA-CO
International Test Technology	National Advancement Corp.	Parts Express International*D16	Electronic Parts Supply*D
Jameco Electrnc Components*D	Ontrack Data International, Inc.	Philips ECG	Electronic Software Developers14
JDR Micro*D	Ontrack Data Recovery, Inc.	SBS Direct	Electronix Corp.*D80
MCM Electronics*D	Philips Software Dev.*MDIFC	Sony Service Co.	EURAS USA, Inc.
Micro 2000, Inc.	SBS Direct	SwiftLink	Foley-Belsaw*D
Microcode Engineering	SMH Electronics Co., Inc.	PC BOARD REPAIR/REWORK	Good-Lyddon Data Systems
Microline	Sprague Magnetics, Inc.*D	Amcom Corporation*D	Higher Intelligence Software71
Omega Engineering, Inc.	DISC DRIVE/HEAD REFURBISHMENT	Computer Doctors	Magic Solutions, Inc.
Ontrack Data International, Inc	Computer Svcs of America*D	CSTS Inc.	MaxServe, Inc.
Philips Software Dev.*MDIFC	Fessenden Technologies	Dalco Electronics*D	Merlin Software
Sonera Technologies		Datech Depot, Inc.	Metrix, Inc.
Sony Service Co.		Den-On Instruments (USA), Inc.	NESDA
		Eagan Technical Services, Inc.	PD Software
		Electroservice Laboratories	Philips Software Dev.*MDIFC
		Fessenden Technologies	Plaza Distributing*D
		Hosfelt Electronics, Inc.*D	RAM Software Enterprises
		Hy Tec Dealer Service	Sage Data Systems
		Jameco Electrnc Components*D	SBS Direct
		JDR Micro*D	Sencore ElectronicsBC
		W.S. Jenks & Son*D	Service Management Software
		KDM Associates	ServiceWare Corporation
		LaserImpact	Servicing Systems
		Microline	Sirius Software, Inc.
		PACE, Inc.	DW Smith & Associates
		PTS Corporation80	SwiftLink
		Service Electronics, Inc.	SyncPulse Software
		SMH Electronics Co., Inc.	TV Man Tech Tips, Inc.
		Softdesk Retail Products	Warrantech Corp.
		Sprague Magnetics, Inc.*D	
		3E Corp.	TEST EQUIPMENT REPAIR/CALIBRATION
			Accutest Instruments, Inc.*D
		RENTAL/LEASING EQUIPMENT	Advanced Electronic Applications
		Accutest Instruments, Inc.*D	Brunelle Instruments, Inc.
		Amcom Corporation*D	Computer Svcs of America*D
		Custom Data Associates	Compuvideo
		Fotronic Corporation*D52	Fluke Corporation
		SBS Direct	Fotronic Corporation*D52
		Techni-Tool, Inc.*D	Fox International*D
		Test Equipment Depot*D52	Galco Industrial Electronics*D
			W.S. Jenks & Son*D
		SERVICE BULLETIN SOFTWARE	RS Electronics*D
		Cahill Electronics	Sencore ElectronicsBC
		Electronic Software Developers14	Tech Assist, Inc.
		Electronics Warehouse Corp.*D	Techni-Tool, Inc.*D
		High Tech Electronic Services	TEKSERV
		Higher Intelligence Software71	Test Equipment Depot*D52
		ICM Components*D15	Wavetek Corporation
		Jameco Electrnc Components*D	
		M.I. Technologies	TUNER/MODULE REPAIR
		Philips Software Dev.*MDIFC	B-B&W Electronics*D
		Philips Technical Training	Bursma Electronic Distrib.*D
		Philips ECG	Electronic Software Developers14
		RAM Software Enterprises	Electronics Warehouse Corp.*D
		Sony Service Co.	Higher Intelligence Software71
			PTS Corporation80

New and Pre-Owned Test Equipment

Sales • Rentals • Service • Buy Surplus

- B+K Precision
- Fluke
- Hewlett Packard
- Goldstar
- Leader
- LG Precision
- Tektronix
- and more

Pre-Owned Oscilloscope Specials

Tektronix 465	100 MHz	\$599.00
Tektronix 465B	100 MHz	\$699.00
Tektronix 475	200 MHz	\$799.00
Tektronix 475A	250 MHz	\$899.00

Professionally Refurbished
Aligned & Calibrated to Original Specifications
6 Month Warranty

Full Line of Oscilloscopes, Analyzers,
Meters, and Audio & Video Test Equipment

1-800-99-METER
1-800-996-3837



On The Web!

www.fotronic.com

P.O. BOX 708, Medford, MA 02155

email: afoti@fotronic.com 617-665-1400 FAX 617-665-0780

Company mailing addresses

A

Abbot, Langer & Associates

548 First Street
Crete, IL 60417
708-672-4200
E-mail: Slanger@abbot-langer.com

ACCSCIT

750 First Street N.E.
Suite 905
Washington, DC 20002-4242
202-336-6850
Fax: 202-842-2585

Accurite Technologies Inc.

48460 Lakeview Blvd
Fremont, CA 94538
510-668-4900
Fax: 510-668-4905

Accutest Instruments, Inc.*D

PO Box 130
Clarksburg, NJ 08510
609-259-0460
800-524-0747
Fax: 609-259-0227

Adaptive Research

665 King St. East, #3
Hamilton, ON
905-577-6936

Addison-Wesley Publishing Co.

One Jacob Way
Reading, MA 01867
617-944-3700 X2714
800-822-6339 Order

Advanced Electronic Applications

PO Box C2160
Lynnwood, WA 98036
206-774-5554
Fax: 206-775-2340

Advanced Technology Group, Inc

205 Regency Executive Park Dr.
Suite 306
Charlotte, NC 28217
704-521-8113

AeroAstro

550 East Rogers Road
Longmont, CO 80501
303-651-7552

Aervo-Pacific Co.

1198 Sawmill Rd.
PO Box 485
Gardnerville, NV 89410
800-227-0196 Order
Fax: 702-782-4027

Air 1 USA Inc.

Micro Services Division
PO Box 3035
Pueblo, CO 81005
719-566-0018
Fax: 719-566-0024

Aiwa America, Inc.

800 Corporate Drive
Mahwah, NJ 07430-2048
201-512-3600

Alfa Electronics*D

P.O. Box 8089
Princeton, NJ 08543
609-520-2002
800-526-2532
Fax: 609-520-2007

Allison Technology Corporation

8343 Carvel
Houston, TX 77036
713-777-0401
800-980-9806
Fax: 713-777-4746

Alpha Technologies

3767 Alpha Way
Bellingham, WA 98226
360-647-2360 Fax: 360-671-4936

Alternative Technical Services

17853-107 Santiago Blvd #505
Villa Park, CA 92861
714-633-8231
800-343-3530
Fax: 714-744-3870

Amcom Corporatn*D

6205 Bury Drive
Eden Prairie, MN 55346
612-949-9400
800-328-7723
Fax: 612-949-9400

American Design Components

PO Box 2601
Secaucus, NJ 07096-2601
201-601-8999
800-776-3700
Fax: 201-941-7480

American Megatrends, Inc.

6145-F Northbelt Parkway
Norcross, GA 30071
770-246-8600
800-U-BUY-AMI
Fax: 770-246-8790

American Power Conversion Corp

132 Fairgrounds Road
West Kingston, RI 02892
401-789-5735
800-800-4080
Fax: 401-789-3710

American Reliance

11801 Goldring Road
Arcadia, CA 91006-5880
818-303-6688
800-654-9838
Fax: 818-358-3838
E-mail: sandra@amrel.com
Web site: <http://www.amrel.com>

Ames Supply Co.*D

2537 Curtiss St
Downers Grove, IL 60515
800-323-3856

America West Communications

And Electronics, Inc
1900 Elk Street
Rock Springs, WY 82901
307-382-5663
800-542-9378
Fax: 307-382-7323

AMP

PO Box 3608
Harrisburg, PA 17105-3608
717-564-0100
800-522-6752
Fax: 717-986-7575

Amphenol Corporation

Comm. and Network Prods. Div.
One Kennedy Avenue
Danbury, CT 06810
203-743-9272
800-825-5577
Fax: 203-796-2091

Amprobe Instrument

630 Merrick Rd.
PO Box 329
Lynbrook, NY 11563-2348
516-593-5600
800-477-8658
Fax: 516-593-5682

Analog Technology Center Inc

62 Route 101A
Amherst, NH 03031
603-673-0404

Analogic Corp.

8 Centennial Drive
Peabody, MA 01960
508-977-3000
Fax: 508-977-6814
Web site: <http://www.analogic.com>

AnaTek Corporation

PO Box 1200
100 Merrimack Rd
Amherst, NH 03031
603-673-4342
800-999-0304
Fax: 603-673-5374

Andrews Electronics*D

PO Box 914
Santa Clarita, CA 91380-9014
805-257-7700
800-289-0300
Fax: 800-289-0301

Anritsu Meter Co. of America

P.O. Box 193
Franklin Lakes, NJ 07417
201-848-0033
800-457-2999
Fax: 201-848-1845

Antique Automobile Radio*D

700 Tampa Rd
Palm Harbor, FL 34683-5454
813-785-8733
800-933-4926
Fax: 813-789-0283

Antique Electronic Supply*D

6221 South Maple Ave.
Tempe, AZ 85283-2856
602-820-5411
Fax: 602-706-6789

Antique Radio Classified*D

P.O. Box 802-C12
Carlisle, MA 01741
508-371-0512
Fax: 508-371-7129

A.P.E.

142 Peconic Ave
Medford, NY 11763-3244
516-654-1197
888-DSOLDER
Fax: 516-289-4735

Apollo Wholesale

1944 W. Shady Grove
Irving, TX 75060

ARDIS

300 Knightsbridge Parkway
Lincolnshire, IL 60069
708-913-4229

Aristo Computers, Inc.

6700 S.W. 105th Avenue
Suite 300
Beaverton, OR 97008-5484
503-626-6333
800-327-4786
Fax: 503-626-6492

Armand Mfg. Inc.

2399 Silver Wolf Drive
Henderson, NV 89015
702-565-7500
Fax: 800-669-9811

ASC Capacitors

301 West "O" Street
Ogallala, NE 69153
308-284-3611

Arrow Electronics

25 Hub Drive
Melville, NY 11747-3503
516-391-1300
Fax: 516-391-1640

ASG Division of Jergens Inc.

19520 Nottingham Rd
Cleveland, OH 44110-2730
216-486-6163

ASTEA International, Inc.

100 Highpoint Drive
Chalfont, PA 18914
215-822-8888

Astea International

55 Middlesex Turnpike
Bedford, MA 01730
617-275-5440
Fax: 617-275-1910

ASTI Magnetics Corp.

45 W Broad St
Bergenfield, NJ 07621-2866
201-501-8900
800-221-1828
Fax: 201-385-1702

Audio Parts Co.*D

1070 South Orange Drive
Los Angeles, CA 90019
213-933-2141

AudioVisual Inc.*D

dba AVI Systems
6253 Bury Drive
Eden Prairie, MN 55346
612-949-3700
Fax: 612-949-6000

Automated Systems, Inc.

4827 Pioneer Blvd Suite 100
Lincoln, NE 68506
402-489-2717
800-279-7312
Fax: 402-489-2370

Aven Tools, Inc.

4676 Freedom Drive
Ann Arbor, MI 48108
313-973-0099

Avex Probes, Inc. (API)

1683 Winchester Road
PO Box 1026
Bensalem, PA 19020
215-638-3300
800-877-7623
Fax: 215-638-9108

AVO International

510 Township Line Road
Blue Bell, PA 19422-2795
215-646-9200
800-723-AVO1
Fax: 215-643-2670
Web site: <http://www.avointl.com>

Company mailing addresses

B

B&B Electronics Manufacturing

707 Dayton Road
PO Box 1040
Ottawa, IL 61350-9545
815-434-0846
Fax: 815-434-7094

Vance Baldwin Inc.*D

2701 W McNab Rd
Pompano Beach, FL 33069-4802
954-969-1811
800-432-8542
Fax: 954-969-0226

B-B&W Electronics*D

2137 S. Euclid Ave.
Berwin, IL 60402
708-749-1710
800-722-9684
Fax: 708-749-0325

Behlman Electronics

2021 Sperry Ave. Suite 18
Ventura, CA 93003
805-642-0660
800-456-2006
Fax: 805-642-0790

Belden Wire & Cable Company

PO Box 1980
Richmond, IN 47375
317-983-5200
800-235-3361
Fax: 317-983-5294
E-mail: Info@belden.email.com

Bel Merit Corporation

26242 Dimension Dr. Suite 110
Lake Forest, CA 92630-7802
714-586-3700
800532-3221
Fax: 714-586-3399

Benedict Computer

220 Felton Drive
Menlo Park, CA 94025
415-323-0148
800-346-5186
Fax: 415-323-0156
E-mail: sales@benedictcommunications.com
Web site: <http://www.benedictcommunication.com>

Best Power

A Unit of General Signal
PO Box 280
Necedah, WI 54646
608-565-7200
800-356-5794
Fax: 608-565-2221

BGI Company, Inc. "AutoTech"

50509 Hollyhock Road
South Bend, IN 46637
219-277-8762
Fax: 219-277-8762

Bibliodata

PO Box 61
Needham Heights, MA 02194-0001
617-444-1154
Fax: 617-449-4584
E-mail: ina@bibliodata.com
Web site: <http://www.bibliodata.com>

Bird Electronics Corp.

30303 Aurora Blvd.
Cleveland (Solon), OH 44139
216-248-1200
Fax: 216-248-5426

Bi-Tronics Inc.

76 Main Street
PB Box 125
Tuckaheo, NY 10707-2904
914-961-2004
800-666-0996
Fax: 800-569-4244
E-mail: info@bi-tronics.com
Web site: <http://www.bi-tronics.com>

B&K Precision

Maxtec International Corp.
6470 W. Cortland St.
Chicago, IL 60635-4011
773-889-1448
Fax: 773-794-9740

Blue Fin Technologies Inc.*D

55 Green Street
Portsmouth, NH 03801-3735
603-433-2223
Fax: 603-433-6437

BMI-Basic Measuring Instrument

3250 Jay Street
Santa Clara, CA 95054-3309
408-970-3700
800-876-5355
Fax: 408-970-3720
E-mail: bmisales@bmi.electrotek.com
Web site: <http://www.electrotek.com/bmi>

Boadhus Corporation

1400 East Broadway
P.O. Box 660
Monticello, MN 55362-9347
612-295-2162
800-328-8310
Fax: 612-295-4440

Bonkote America, Inc.

Bridge St., PO Box 278
Three Rivers, MA 01080-0278
413-289-1343
Fax: 413-289-1754

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 05855-1010
819-563-9096
800-567-3506
Fax: 819-569-1408
E-mail: brunelle@multi-medias.ca
Web site: <http://www.channeli.com/brunelle>

Bullfrog

87 Quail Street
Mahtomedi, MN 55115
612-426-0971
800-362-3192

Burks, P.I.*D

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

Bursma Electronic Distrib.*D

2851 Buchanan S.W.
Grand Rapids, MI 49548
616-831-0080
800-777-2604
Fax: 616-831-9400
E-mail: vanran@iserv.net

Butterworth Heinemann

313 Washington St
Newton, MA 02158-1626
617-928-2629
800-366-2665
Fax: 617-928-2630

C

C&S Sales*D

150 W. Carpenter Ave
Wheeling, IL 60090
847-541-0710
800-292-7711
Fax: 847-541-9904
E-mail: cs_sales@elenco.com
Web site: http://www.elenco.com/cs_sales

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
800-CAIG-123
Fax: 619-451-2799
E-mail: caig123@aol.com
Web site: <http://www.caig.com>

Calrad Electronics

819 N. Highland Avenue
Los Angeles, CA 90038
213-465-2131
Fax: 213-465-3504

Casio Technical Info Center

570 Mount Pleasant Avenue
Dover, NJ 07801-1620
201-361-5400
800-458-0212

CEDIA

9202 N Meridian #200
Indianapolis, IN 46260-1810
317-571-5602
800-669-5329
Fax: 317-571-5603
E-mail: member@cedia.org
Web site: <http://www.cedia.org.cedia>

Cerplex Group, Inc

1382 Bell Avenue
Tustin, CA 92780
714-258-5600
Fax: 714-259-1944

Champion Technologies Inc.

2553 North Edginton St
Franklin Park, IL 60131
708-451-1000

Channel Master Div of Avnet

1315 Industrial Park Drive
P.O. Box 1416
Smithfield, NC 27577
919-934-9711
Fax: 919-989-2200
Web site: <http://www.channelmaster.avnet.com>

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 30152
770-424-4888
800-645-5244
Fax: 770-424-4267

Chicago Case Company

4446 South Ashland Ave.
Chicago, IL 60609-3141
312-927-1600
800-927-2602
Fax: 800-333-8172

Chip Quik

3 Second St
Framingham, MA 01701-7115
508-879-7727
800-836-2447

Cititronix/Panson*D

1260 Karl Court
Wauconda, IL 60084-1094
847-487-5170
800-726-0146
Fax: 800-726-0142

Cititronix/Panson*D

180 & Maple Ave.
PO Box 2003
Pinebrook, NJ 07058
201-244-2400
800-225-5229
Fax: 800-332-3922

Clary Corp.

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

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

The Component Exchange

5-7 Ray Avenue
Burlington, MA 01803-4720
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
E-mail: support@idbnet.com
Web site: [idbnet.com/vamstar](http://www.idbnet.com/vamstar)

Company mailing addresses

The Computer Industry Almanac

PO Box 600
Glenbrook, NV 89413
702-749-5053
800-377-6810
Fax: 702-749-5864
E-mail: cialmanac@aol.com

Computer Maintenance Training

241 Boston Post Road W
Marlboro, MA 01752
508-624-7708
800-952-5977
Fax: 508-624-4179

Computer & Monitor Maintenance

6649 Peachtree Ind. Blvd
Suite N1
Norcross, GA 30092-4302
770-662-5633
800-466-4411
Fax: 770-840-8814

Computer Parts Unlimited*D

5069 Maureen Lane
Moorpark, CA 93021
805-532-2500
Fax: 805-532-2599

Computer Power Inc.

124 W. Main St.
High Bridge, NJ 08829-1707
908-638-8000
800-526-5088
Fax: 908-638-4931

Computer Products

Power Conversion
7 Elkins St
South Boston, MA 02127
617-464-6639
Fax: 617-464-6612

Computer Svcs of America*D

1050 Perimeter Road
Manchester, NH 03103
603-644-5005
800-255-7815
Fax: 603-644-4645

Computer Transaction Systems

15 Bayview St
PO Box 56
North Weymouth, MA 02191
617-331-6968
800-331-6968
Fax: 617-331-6969
E-mail: ctsysinc@concentric.net

Computer Connection

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

Computing Technology Ind. Asso

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

Compuvideo

3861 Oceanview Ave.
Brooklyn, NY 11224
718-372-8630

Connector Corporation

4720 Yender Ave
Lisle, IL 60532
630-969-3400
Fax: 630-969-3545

Consolidated Elctrnics, Inc.*D

705 Watervliet Ave.
PO Box 20070
Dayton, OH 45420-0070
937-252-5662
800-543-3568
Fax: 937-252-4066
E-mail: scoy@dmapub.dma.org

Contact East, Inc.*D

335 Willow Street
North Andover, MA 01845-5995
508-682-2000
800-225-5334
Fax: 508-688-7829
E-mail: sales@contact-east.com
Web site:
<http://www.contact-east.com>

Controlled Power Co.

1955 Stephenson Highway
Troy, MI 48083
810-528-3700
800-521-4792
Fax: 810-528-0411
E-mail: rich-d@controlledpwr.com
Web site:
<http://www.controlledpwr.com>

Conway Engineering, Inc.

8393 Capwell Drive
Oakland, CA 94621-2113
510-568-4028
800-626-6929
Fax: 510-568-1397

Cook's Inst. of Elec. Engrg.

4251 Cypress Drive
Jackson, MS 39212
601-371-1351

Coordinated Service, Inc.

20 A Court St
Groton, MA 01450
508-448-3800
Fax: 508-448-0060

Core Software

26303 Oak Ridge Drive
Spring, TX 77380-1918
713-292-2177
Fax: 713-298-1492
Web site:
<http://www.corsoftware.com>

Cooper Tools

PO Box 30100
Raleigh, NC 27622-0100
919-362-7510

CPR Systems Inc

1947 Tenth Avenue North
Lake Worth, FL 33461
561-547-3383
Fax: 561-547-1113
E-mail: rgc@aol.com

CRC Components*D

186 University Parkway
Pomona, CA 91768
800-822-1272
800-858-4880 (DOM)
Fax: 909-594-4761

CRC Industries, Inc.

885 Louis Drive
Box C-5000
Warminster, PA 18974-0586
215-674-4300
800-556-5074
Fax: 215-674-2207

CRC Press, Inc.

2000 Corporate Blvd NW
Boca Raton, FL 33431
407-994-0555

Creative Logics Corporation

1100 Jorie Blvd Suite 221
Oak Brook, IL 60521
630-574-9025
888-564-4737
Fax: 630-574-9026
E-mail:
75343,2575@compuserve.com

Creative Electronics

1417 N. Selfridge
Clawson, MI 48017
810-435-8916

CSI/SPECO

1172 Route 109
Lindenhurst, NY 11757-0624
516-957-8700
800-645-5516
Fax: 516-957-9142

CSTS Inc.

4123 East La Palma
Anaheim, CA 92807-1802
714-777-2787
Fax: 714-777-2360

CUI Stack

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

The Current Source*D

5159 Glenwood
Boise, ID 83714
208-323-9692
Fax: 208-323-9691

Curtis Mathes

10911 Petal
Dallas, TX 75238
214-503-8880
Fax: 214-503-8515

Custom Data Associates

2535 Putty Hill Ave
Baltimore, MD 21234-4307
410-668-9594
800-451-0137
Fax: 410-661-3942



Dactronix

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

D&D Enterprises

27W937 Commercial Avenue
Barrington, IL 60010
708-381-0789
800-445-7949

Dak Tech*D

4900 Ritter Road
Mechanicsburg, PA 17055
717-795-9544
800-325-3238
Fax: 717-795-9420

Dak Tech*D

4025 9th Avenue SW
Fargo, ND 58103
701-282-6686

Dalbani Corporation*D

4225 NW 72nd Avenue
Miami, FL 33166-6841
305-716-1016
800-325-2264
Fax: 305-594-6588

Dalco Electronics*D

275 South Pioneer Blvd
Springboro, OH 45066-1180
513-743-8042
800-445-5342
Fax: 513-743-9251
Web site: <http://www.dalco.com>

Dandy Mfg. Co.

2323 Gibson St.
Muskogee, OK 74403
918-682-4286

Data Business Publishing

15 Inverness Way East
MSB 203
Englewood, CO 80112-5776
303-799-0381
800-447-4666
Fax: 303-799-4082
E-mail: data.sales@ihs.com
Web site: <http://www.data.ihs.com>

Data Depot, Inc.

1710 Drew Street, Suite 1
Clearwater, FL 34615-6213
813-446-3402
800-275-1913
Fax: 813-443-4377

D.A.T.A.

15 Inverness Way East
PO Box 6510
Englewood, CO 80155-6510
303-799-0381
800-447-4666
Fax: 303-799-4082

Data-Basics Inc.

9450 Midwest Ave
Garfield Heights, OH 44125
216-663-5600
800-837-7574
Fax: 216-663-5454

DataBasic

120 Judd St
Bristol, CT 06010
800-967-5924

Datacomm Distribution

2490 Black Rock Turnpike #403
Fairfield, CT 06432
203-367-7767
Fax: 203-367-7040

Datatech Depot, Inc.

1871 North Miller St.
Anaheim, CA 92806
714-996-7500
Fax: 714-970-1670

DAYTA-CO

PO Box 30191
Mesa, AZ 85275
602-835-2243
Fax: 602-835-2243

Dazor Manufacturing Corp.

4483 Duncan Avenue
St. Louis, MO 63110-1111
314-652-2400
800-345-9103
Fax: 314-652-2069
E-mail: info@dazor.com
Web site: <http://www.dazor.com>

Company mailing addresses

Delta Warranty

1775 12th Ave
Issaquah, WA 98027
206-391-2000
800-733-3358
Fax: 206-450-1311

Den-On Instruments (USA), Inc.

2580 Corporate Pl., Ste F-103
Monterey Park, CA 91754-7633
213-266-5960
800-397-5960
Fax: 213-266-5963

Depot America

1345 Campus Parkway
Neptune, NJ 07753
800-648-6833

Desco

761 Penarth Avenue
Walnut, CA 91789
909-598-2753
Fax: 909-595-7028
E-mail: dberman@desco.com
Web site:
<http://www.desco.com/desco>

DeVry

1 Tower Lane
Oak Brook Terr, IL 60181
708-571-7700

Diagsoft, Inc.

5615 Scotts Valley Drive
Suite 140
Scotts Valley, CA 95066
408-438-8247
Fax: 408-438-7113

Dialight Corporation

1913 Atlantic Ave
Manasquan, NJ 08736-1005
908-223-9400
Fax: 908-223-8788

Digi-Key D*

701 Brooks Ave. S.
PO Box 677
Thief River Falls, MN 56701
218-681-6674
800-344-4539
Fax: 218-681-3380
E-mail: sales@digikey.com
Web site: <http://www.digikey.com>

Diversified Case Co., Inc.

50 Harbor Point
Utica, NY 13502
315-797-2725
Fax: 315-797-5231

Diversified Parts*D

2114 S.E. 9th Ave.
Portland, OR 97214-4615
503-236-6140
800-379-7737
Fax: 800-373-2987

Dolch Computer Systems

3178 Laurel View Court
Fremont, CA 94538
800-538-7506

Dot Shop, The

12025 NE Summer St.
Portland, OR 97220
503-256-7585
800-487-6025
Fax: 503-256-7588

Dranetz Technologies, Inc.

1000 New Durham Road
PO Box 4019
Edison, NJ 08817-2216
908-287-3680
800-DRANTEC
Fax: 908-248-1834

Dremel

4915 21st Street
Racine, WI 53406
414-554-1390
800-437-3635
Fax: 414-554-7654

Dymax

51 Greenwoods Rd
Torrington, CT 06790
860-496-0608

Dynaloy, Inc.

7 Great Meadow Lane
Hanover, NJ 07936-1703
201-887-9270
Fax: 201-887-3678

Dynamic Learning Systems

PO Box 282
Jefferson, MA 01522-0282
508-829-6744
Fax: 508-829-6819
Web site: <http://www.dlspubs.com/>

E

Eagan Technical Services, Inc.

1408 Northland Drive
St Paul, MN 55120
612-688-0098
800-285-1873
Fax: 612-688-7829

East Coast Transistor*D

2 Marlborough Road
West Hemstead, NY 11552-1712
516-483-5742
800-645-3516
Fax: 800-733-5904
E-mail: ectd@aol.com

Echelon Industries*D

20681 E. Truss Court
Walnut, CA 91789
714-594-1891
Fax: 714-598-3810

Edroy Products

P.O. Box 988
Nyack, NY 10960
914-358-6600
800-223-8803

EFI Electronics Corporation

2415 South 2300 West
Salt Lake City, UT 84119-2028
800-729-3496
Fax: 801-977-0200

Eiger Electronics*D

70A E. Jefryn Blvd.
Deer Park, NY 11729
516-242-2583/84
Fax: 516-242-2586

E.I.L. Instruments, Inc.*D

10946A Golden West Drive
Hunt Valley, MD 21031-1320
410-584-7400
800-345-4678
Fax: 410-584-7561
Web site: <http://www.eilinst.com>

Electro Tool, Inc.

9103 Gilman
Livonia, MI 48150
313-422-1221
800-772-3455
Fax: 313-422-3432

Electro Dynamics, Inc.*D

EDI
135 Eileen Way
Syosset, NY 11791-9022
516-496-4000
800-426-6423
Fax: 800-873-2948

Electrohome

181 Cooper Ave, Suite 100
Tonawanda, NY 14150
716-874-3630

Electro Standards Lab, Inc.

Data Comm Prods Div
36 Western Industrial Drive
Cranston, RI 02921
401-943-1164
Fax: 401-946-5790
E-mail: eslab@ids.net
Web site:
<http://www.electrostandards.com>

Electronic Design Specialists

4647 Appalachian St
Boca Raton, FL 33428-4104
561-487-6103

EIA/CEMA Product Services

2500 Wilson Blvd
Arlington, VA 22201-3834
703-907-7500
Fax: 703-907-7968
Web site: <http://www.cemacity.org>

Electronic Prod. Specialties*D

W140 N5084 Lily Rd
Menomonee Falls, WI 53051
414-783-6300
800-783-3337
Fax: 414-783-6707

Electronic Parts Supply*D

4071 Emery Street
Emeryville, CA 94608
510-420-1040
800-227-0104
Fax: 510-420-0812
E-mail: mlmlid@aol.com
Web site:
<http://www.gen.com/wondarl>

Electronic Software Developers

826 South Main Street
South Farmingdale, NY 11735-4152
516-221-6403
800-621-8477 (TIPS)
E-mail: esd@pa.net
Web site: <http://www.pa.net/vcrtips>

Electronic Specialists, Inc.

171 South Main Street
Natick, MA 01760
508-655-1532
800-225-4876
Fax: 508-653-0268

Electronic Systems

624 Cedar St.
Rockford, IL 61101
815-968-1040
Fax: 815-962-1495

Electronics Warehouse Corp.*D

1910 Coney Island Ave.
Brooklyn, NY 11230-6590
718-375-2700
800-221-0424
Fax: 718-375-2796

Electronix Corp.*D

313 West Main Street
Fairborn, OH 45324-5036
513-878-1828
800-223-3205
Fax: 513-878-1972
E-mail: sales@electronix.com
Web site: <http://www.electronix.com>

Electro-Tech Systems, Inc.

115 East Glenside Avenue
Glenside, PA 19038
215-887-2196

Electronix Express*D

365 Blair Road
Avenel, NJ 07001-2201
908-381-8020
800-972-2225
Fax: 908-381-1572

Electroservice Laboratories

6085 Sikorsky St.
Ventura, CA 93003
805-644-2944
Fax: 805-644-5006
E-mail: info@esl.com
Web site: <http://www.esl.com/>

Elenco Electronics, Inc.

150 West Carpenter Avenue
Wheeling, IL 60090
847-541-3800
Fax: 847-520-0085

Elgar Corp.

9250 Brown Deer Road
San Diego, CA 92121
619-450-0085
800-733-5427
Fax: 619-458-0267
E-mail: sales@elgar.com
Web site: <http://www.elgar.com>

C.H. Ellis Company, Inc.

2432 Southeastern Ave.
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

Emerson Radio Corp.

One Emerson Lane
North Bergen, NJ 07047
201-854-4800
800-695-0095 Order

E.M.T. Parts, Inc.*D

2031 East Via Burton St.
Suite J
Anaheim, CA 92806
714-758-8769
800-448-7892
Fax: 714-758-8768

Entech Corp

2486 Dunwin Drive
Mississauga, ON L52 1J9
905-820-3030

Equus C/O Unistar

13562 Pawnee
Tustin, CA 92680
714-730-7936

Company mailing addresses

The Eraser Company, Wybar Div.

Oliva Drive
PO Box 4961
Syracuse, NY 13221-4961
315-454-3237
800-724-0594
Fax: 315-454-3090
E-mail: eraser@dreamscape.com

ESP Inc.

14 Blackstone Valley Place
Lincoln, RI 02865-1145
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, Ste 300
Waterloo, IA 50703-4643
319-236-2000
800-453-8727
Fax: 319-236-2020

Electronic Technicians Assn.

602 N. Jackson
Greencastle, IN 46135-1035
317-653-8262
800-288-3824
Fax: 317-653-8262
E-mail: eta@indy.tdsnet.com
Web site:
<http://www2.fwi.com/~n9pd/eta.html>

Excel Distributing*D

1819 Mentor Ave
Cincinnati, OH 45212
513-531-3989
800-733-3329
Fax: 800-735-8007

Extech Instruments Corp.*D

335 Bear Hill Road
Waltham, MA 02154
617-890-7440
Fax: 617-890-7864
E-mail: extech@extech.com
Web site: <http://www.extech.com>

E-Z Hook

225 North Second Avenue
PO Box 450
Arcadia, CA 91066
818-446-6175
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 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
800-542-9761
Fax: 414-922-6750
E-mail: fedco@attmail

Federal Warranty Service Corp.

PO Box 3490
Cerritos, CA 90703
800-223-1025

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 92835
714-992-1239
Fax: 714-992-6541

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
816-483-2700
800-821-3452
Fax: 816-483-5010
E-mail: electronics@foley-belsaw.com
Web site:
<http://www.foley-belsaw.com>

Forefront Direct

18820 US Hwy 19N Suite 215
Clearwater, FL 34624
813-539-7283
Fax: 813-531-0200

Fotec Inc

151 Mystic Ave
Medford, MA 02155-4615
617-396-6155
800-537-8254
Fax: 617-396-6395
E-mail: info@fotec.com
Web site: <http://www.std.com/fotec>

Fotronic Corporation*D

PO Box 708
Medford, MA 02155-0006
617-665-1400
800-996-3837
Fax: 617-665-0780

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 44146-1712
216-439-8500
800-321-6993
Fax: 800-445-7991
E-mail: foxintl@aol.com
Web site:
<http://www.fox-international.com>

Fox International*D

241A Central Ave
Farmingdale, NY 11735
516-694-0596
800-874-1765
Fax: 800-635-0595

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

Future Active

41 Main St
Bolton, MA 01740
800-655-0006
Fax: 800-645-2953

G

Galco Industrial Electronics*D

26010 Pinehurst Drive
Madison Heights, 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

GE Remarketing Services*D

2912 Pacific Dr
Norcross, GA 30071
404-263-5984
800-431-7671
Fax: 404-263-5780

Gemini Inc.

103 Mensing Way
Cannon Falls, MN 55009
507-263-3957
800-533-3631
Fax: 507-263-3129
E-mail: geminii4@ix.netcom.com

Genicom Corporation

1 Genicom Drive
Waynesboro, VA 22980-1999
800-535-4364
Fax: 703-949-1500

GEnie Services

C/O Radio & Electronics
21 Madison Plaza #149
Madison, NJ 07940-2354
800-638-8369

Geotest, Inc

18242 McDermott St Suite A
Irvine, CA 92714-6719
714-263-2222
800-886-1201
Fax: 714-263-1203

Gibson Research Corp.

27071 Cabot Rd
Suite 105
Laguna Hills, CA 92653-7009
714-348-7100
800-736-0637
Fax: 714-348-7110

Global Communications, Inc.

Global One Center
472 Capital Circle NW
Tallahassee, FL 32304
904-574-6633
800-659-8659
Fax: 904-574-6663

Global Micro-Parts Depot*D

11151 Denton Drive
Dallas, TX 75229-4707
214-241-9470
800-325-8488
Fax: 800-433-2060

Global Specialties

A Division of Interplex
70 Fulton Terrace
New Haven, CT 06512
203-466-6103
800-572-1028
Fax: 203-468-0060

Goldstar Products Company

14555 N Hayden Rd Suite 101
Scottsdale, AZ 85260
602-922-3922
800-541-6808

Good-Lyddon Data Systems

6879 Sard Street
Rancho Cucamonga, CA 91701
909-980-4563
E-mail: joseph_lyddon@eee.org

Gore Laboratories, Inc.

3 Northern Blvd
Amherst, NH 03031
606-672-4673
Fax: 603-672-5652

Gould Instrument Systems Inc.

8333 Rockside Road
Valley View, OH 44125-6100
216-328-7000
800-468-5365
Fax: 216-328-7417

Greenlee Textron, Inc.

4455 Boeing Drive
Rockford, IL 61109
815-397-7070
Fax: 815-397-8289

Guardian Computer Support, Inc

1177 Quarry Lane, Suite F
Pleasanton, CA 94566
510-846-3649
800-752-8733 X102

H

Willi Hahn Corp U.S.A.

1348 Dundas Circle
Monticello, MN 55362
612-295-6591
800-494-6104
Fax: 800-494-7456
E-mail: paul@wihatools.com
Web site: <http://www.wihatools.com>

Company mailing addresses

American Hakko Products

25072 Anza Drive
Santa Clarita, CA 91355
805-294-0090
800-884-2556
Fax: 805-294-0096

Hameg Instruments, Inc.

266 East Meadow Avenue
East Meadow, NY 11554-2437
516-794-4080
800-247-1241
Fax: 516-794-1855

Harco Electronics*D

Rte 22 Carsins Run
Aberdeen, MD 21001
410-838-7990
800-638-7616
Fax: 410-734-7288

Harris Publishing

2057 Aurora Road
Twinsburg, OH 44087-1999
216-425-9000
800-888-5900
Fax: 216-425-4328

Heath Company

455 Riverview Drive
Benton Harbor, MI 49022
800-444-3284 Catal
800-253-0570 Order
Fax: 616-982-5577

Heath/Zenith

Hilltop Road
PO Box 167
St. Joseph, MI 49085

Herman Electronics*D

7350 N.W. 35th Terrace
Miami, FL 33122-1241
305-477-0063
800-938-4376
Fax: 800-938-4376
E-mail: hermanelec@aol.com
Web site:
<http://gatintl.com/hermanelec>

Hewlett-Packard Company

Personal Measurements Operatio
1900 Garden of the Gods Road
Colorado Springs, CO 80907
719-590-2053
719-590-1900
Fax: 719-590-2193

Hexacon Electric Co.

161 W. Clay Ave.
P.O. Box 36
Roselle Park, NJ 07024-1946
908-245-6200
Fax: 908-245-6176
E-mail: hexaconusa@aol.com

High Tech Electronic Services

1623 Aviation Boulevard
Redondo Beach, CA 90278
310-379-2026
800-289-3001
Fax: 310-379-9608

Higher Intelligence Software

60 Farmington Lane
Melville, NY 11747-4019
516-643-7740
800-215-5081

Highland Products, Inc.

P.O. Box 794
Dover, NJ 07801
201-366-0156
Fax: 201-366-6665

Richard Hirschmann of America

Industrial Row Box 229
Riverdale, NJ 07457
201-835-5002
Fax: 201-835-8354

Hitachi Denshi America Ltd

371 VanNess Way
Suite 120
Torrance, CA 90501-6226
310-328-6116
Fax: 310-328-6252

Hitachi Home Electronics

905 E South Street
Anaheim, CA 92805
213-537-8383 X509
800-369-0422

Hitachi Service Company

3890 Steve Reynolds Boulevard
Norcross, GA 30093
770-279-5600
800-241-6558
Fax: 770-279-5692

High Tech Electronics

203 Highway 79N
Henderson, TX 75652
903-657-6320
Fax: 903-655-0280

Hi-Techniques, Inc.

2515 Frazier Ave
Madison, WI 53713
608-221-7500
Fax: 608-221-7509

HI-TEK Services, Inc.

1595 Crocker
Hayward, CA 94544
510-489-8909
800-285-3508
Fax: 510-489-5908

HMC - Hub Material Co.*D

33 Springdale Avenue
Canton, MA 02021-3200
617-821-1870
Fax: 617-821-4133

Hosfelt Electronics, Inc.*D

2700 Sunset Boulevard
Steubenville, OH 43952-1158
614-264-6464
800-524-6464
Fax: 614-264-5414

Howard Electric Insts Inc.*D

6222 North Oliver
Wichita, KS 67220-3518
316-744-1984
800-394-1984
Fax: 316-744-1994

Hunter Products, Inc.

792 Partridge Drive
PO Box 6795
Bridgewater, NJ 08807
908-526-8440
800-524-0692
Fax: 908-526-8348

Huntron Instruments, Inc.

15720 Mill Creek Blvd
Mill Creek, WA 98012
206-743-3171
800-426-9265
Fax: 206-743-1360
E-mail: huntron@huntron.com

Hy Tec Dealer Service

4548 Parkbreeze Ct
Orlando, FL 32801-1045
407-297-1001
Fax: 407-297-4310

Hy-Tronix Instruments, Inc.

P.O. Box 827
Newton, KS 67114
316-283-5730
Fax: 316-283-6662

I.A.C. Industries

895 Beacon Street
Brea, CA 92821
714-990-8997
Fax: 714-990-0557

ICM Components*D

1226 3rd St Promenade, #206
Santa Monica, CA 90401
310-260-1444
800-748-6232

IBM Education

1500 Riveredge Parkway
Marietta, GA 30067
770-644-4059

IC Master

Hearst Business Pub./UTP Div
645 Stewart Avenue
Garden City, NY 11530-4709
516-227-1314
Fax: 516-227-1453
E-mail: gamsler@hearst.com
Web site: <http://icmaster.com>

Ideal Computer Systems

206 Collins Road, NE
Cedar Rapids, IA 52402
319-373-2001

Ideal Industries, Inc.

117 Fern St
Santa Cruz, CA 95060
408-427-3122
Fax: 408-427-3134

IET Labs, Inc.

534 W. Main St
Westbury, NY 11590
516-334-5959
800-899-8438

Image Network, Inc.

2001 Ruppman Plaza
Peoria, IL 61614

Industrial Devices, Inc.

260 Railroad Ave.
Hackensack, NJ 07601
201-489-8939
Fax: 201-489-6911

Industrial Electric Supplies*D

2101 N. Fairview St.
Santa Ana, CA 92706
714-971-2292
800-4-HURLLEY
Fax: 714-971-5033

Innovative Solutions

416 Stewart Hollow Road
Portsmouth, OH 45662
614-574-4304
Fax: 614-574-4304

Instek Corp.*D

1205 John Reed Court
City of Industry, CA 91745
818-336-6537
Fax: 818-369-1748

Integrity Design & Research

296 West Ferry Street
Buffalo, NY 14213
716-885-0011
Fax: 716-882-9699

Intelligent Business Solutions

1720 Jane Ave S
Minneapolis, MN 55403-2825
612-377-4819

Intellisystems

10930 Fullbright
Chatsworth, CA 91311
818-341-1634

Interactive Image Technologies

111 Peter St Suite 801
Toronto, ON M5V2H1
416-977-5550
Fax: 416-977-1818

Interconnect Devices, Inc.

5101 Richland Ave
Kansas City, KS 66106
913-342-5544
Fax: 913-342-7043
E-mail: products@idinet.com
Web site: <http://www.idinet.com>

Intermatic Incorporated

Intermatic Plaza
Spring Grove, IL 60081-9698
815-675-2321
312-282-7300

Intn'l Correspondence Schools

925 Oak Street
Scranton, PA 18515
717-347-1625
Fax: 717-343-8172

Internat'l Components Corp.*D

107 Maxess Road
Melville, NY 11747-3836
516-293-1500
800-645-9154
Fax: 516-293-4983

International Disk Svcs, Inc.

1530 Montague Expwy
San Jose, CA 95131
408-432-0537
Fax: 408-434-1015

International Light, Inc.

17 Graf Road
Newburyport, MA 01950-4092
508-465-5923
Fax: 508-462-0759
E-mail: ilsales@intl-light.com
Web site: <http://www.intl-light.com/>

International Power Tchnlgies

538 South 1400 West
Orem, UT 84058
801-224-4828

International Test Technolog

4th Floor, 37 College Green
Dublin 2,
+353-1-6718533
800-200-0010
Fax: +353-1-6718860
E-mail: ittdub@iol.ie
Web site: <http://www.iol.ie/ittdub>

Interplex Electronics, Inc.

70 Fulton Terrace
New Haven, CT 06512
203-466-6103
Fax: 203-468-0060

Company mailing addresses

IS CET

2708 W. Berry
Fort Worth, TX 76109-2356
817-921-9101
Fax: 817-921-3741

ITT Power Systems Corporation

3400 East Britannia, Suite 122
Tucson, AZ 85706
602-889-7600
Fax: 602-294-1808

ITT Pomona Electronics

1500 East Ninth Street
PO Box 2767
Pomona, CA 91766-3835
909-623-3463
Fax: 909-629-3317

J

Jameco Electrnc Components*D

& Computer Products
1355 Shoreway Rd.
Belmont, CA 94002
415-592-8097
800-831-4242
Fax: 415-592-2503

Javelin Electronics

ATAPCO Security & Comm. Group
19831 Magellan Drive
Torrance, CA 90502-2033
310-327-7440
800-421-2716
Fax: 310-327-5405

JVC Svc & Engrg Co of America

107 Little Falls Rd.
Fairfield, NJ 07004-2105
201-808-2100

Jayso Electronics

3210 White Plains Rd.
Bronx, NY 10467
718-798-1050
Fax: 718-655-1196

JDR Micro*D

1850 S Tenth Ave
San Jose, CA 95112
408-494-1400

JDV Products Inc.

2-05 Banta Place
Fair Lawn, NJ 07410
201-796-1720
Fax: 201-796-9399

W.S. Jenks & Son*D

1933 Montana Ave. N.E.
Washington, DC 20002
202-529-6020
Fax: 202-832-3411

Jensen Tools, Inc.*D

7815 South 46th Street
Phoenix, AZ 85044-5313
602-968-6241
800-528-7405
Fax: 602-438-1690
Web site: <http://www.jensentools.com>

Jim-Pak*D

1355 Shoreway Rd
Belmont, CA 94002
415-595-5936
Fax: 415-592-2503
E-mail: info@jameco.com

JIT Resources, Inc.

139 E. Arrow Hwy
San Dimas, CA 91773
909-599-6090
Fax: 909-592-9960

Jonard Industries Corp.

134 Marbledale Rd
Tuckahoe, NY 10707
914-793-0700
Fax: 914-793-4527

Joseph Electronics*D

8830 N. Milwaukee Avenue
Niles, IL 60714-1794
847-297-4200
800-323-5925
Fax: 800-446-8366
E-mail: joseph@shoga.www.com

K

Kalamazoo Technical Furniture

405 W Michigan Ave
Suite 115
Kalamazoo, MI 49007-3747
616-344-1412

Kalglo Electronics Co., Inc.

5911 Colony Drive
Bethlehem, PA 18017-9348
610-837-0700
800-524-0400
Fax: 610-837-7978
E-mail: kalglo@kalglo.com
Web site: <http://www.kalglo.com>

Kasco Distributing*D

12336 Martin Alexander Rd
Sardinia, OH 45171
513-446-2562
800-575-2726
Fax: 513-446-2609

KDM Associates

20 W 345-D 101 Street
Lemont, IL 30439
708-739-3337
800-536-6160
Fax: 708-739-9169

Keithley Instruments

28755 Aurora Road
Cleveland, OH 44139
216-248-0400
800-552-1115
Fax: 216-248-6168

Kelvin Electronics*D

10 Hub Drive
Melville, NY 11747
516-756-1750
800-535-8469
Fax: 516-756-1763

Kenwood U.S.A. Corp.

2201 E. Dominguez St.
Long Beach, CA 90810-5745
213-639-4200

Kester Solder

515 E. Touhy Ave.
Des Plaines, IL 60018
847-297-1600
800-2-KESTER
Fax: 847-390-9338

KeyPrestige

11065 Knott Ave., Suite B
Cypress, CA 90630-5135
714-893-1111
Fax: 714-893-7997

Keystone Electronics Corp.

31-07 20th Road
Astoria, NY 11105-2017
718-956-8900
Fax: 718-956-9040

Key Tek Instrument Corp.

260 Fordham Road
Wilmington, MA 01887-2170
617-658-0880
Fax: 508-657-4803

Kikusui International Corp.

1980 Orizaba Avenue
Signal Hill, CA 90804-1203
310-986-1677
800-545-8784
Fax: 310-986-1624

Klein Tools, Inc.

P.O. Box 599033
Chicago, IL 60659-9033
847-677-9500
Fax: 847-677-4476

Knight Business Systems, Ltd.

266 Middle Island Road
Bldg. 2-13
Medford, NY 11763
516-736-4440
Fax: 800-333-5642

Knowledge Industry Publication

701 Westchester Avenue
White Plains, NY 10604

Kobetron, Inc.

2271 Arbor Blvd.
Dayton, OH 45439
513-298-8244

L

LaserImpact

10435 Burnet Rd Suite 114
Austin, TX 78758
512-832-9151
800-777-4323
Fax: 512-832-9321
E-mail: sales@laserimpact.com
Web site: <http://www.laserimpact.com>

Laser Products Company*D

1821 Macon Street
Kansas City, MO 64116
816-421-7830
800-786-8897
Fax: 816-421-8053

Laser Wizard

705 General Washington Ave.
Valley Forge Business Ctr.
Norristown, PA 19403
610-539-4708
Fax: 610-539-1096

Leader Instruments Corp.

380 Oser Avenue
Hauppauge, NY 11788-3608
516-231-6900
800-645-5104
Fax: 516-231-5295

Leads Metal Products (ENDECO)

P.O. Box 441186
Indianapolis, IN 46244-1186
317-631-7200
Fax: 317-631-7200

The Learning Curve, Inc.

4707 140th Avenue N., Ste 112
Clearwater, FL 34622
813-525-0244
800-736-2295
Fax: 813-522-4038

Learning Group International

1805 Library Street
Reston, VA 22090
703-709-9019
800-421-8166
Fax: 703-709-6405

LeCroy Corporation

Test & Measurement/NY Division
700 Chestnut Ridge Road
Chestnut Ridge, NY 10977-6437
914-578-6020
914-425-2000
Fax: 914-425-8967

Leland Ltd., Inc.

PO Box 382
Bedminster, NJ 7921
908-668-1008
Fax: 908-668-7716

LEM Instruments Inc

1711 Elmhurst Road
Elk Grove Village, IL 60007
847-437-6444
800-536-6781
Fax: 847-437-6466

L'il Bitty Tester

3154 Main St.
Chula Vista, CA 91911
619-425-1472
Fax: 619-284-4567

L.J. Enterprises*D

11 McMillan Way
Delaware Industrial Park
Newark, DE 19713
302-369-1590
800-627-8755
Fax: 302-369-1594
E-mail: lee@ljent.com
Web site: <http://www.ljent.com/>

LG Precision

13013 East 166th St
Cerritos, CA 90703-2201
310-404-0101
Fax: 310-921-6227
E-mail: lgpa@kaol.com
Web site: <http://www.oscilloscope.com>

Lista International Corp.

106 Lowland St.
Holliston, MA 01746
508-429-1350
800-722-3020
Fax: 508-429-8653
Web site: <http://www.listaintl.com>

Loctite Corp

1001 Trout Brook Crossing
Rocky Hill, CT 06067-3910
203-571-5418

Luxo Corp.

36 Midland Ave.
Port Chester, NY 10573
914-937-4433
800-222-5896
Fax: 914-937-7016

M

3M Black Watch C/O Ginther Grp

One Apple Tree Square
Suite 1031
Bloomington, MN 55425
800-762-2241
800-762-2241
Fax: 800-232-4941

Mac Shack

28 Willow Pond Way Suite LL3
Penfield, NY 14526
716-377-9230
Fax: 716-377-9573

MacMillan Publishing

Front and Brown Streets
Riverside, NJ 08075
800-257-5755

Magic Solutions, Inc.

180 Franklin Turnpike
Mahwah, NJ 07430
201-529-5533
Fax: 201-529-2955

Magnetic Data Inc.

6754 Shady Oak Road
Eden Prairie, MN 55344
800-328-3441

The Malcom Company

25 Abbot St.
Andover, MA 01801
800-289-7505
Fax: 508-475-7242

Main Source Electronics

9260 Owensmouth Ave
Chatsworth, CA 91311
818-882-7500
800-882-1238
Fax: 818-882-7785

Manhattan/CDT

Cole-Flex
203 Progress Drive
Manchester, CT 06040
860-643-3547
800-228-6322
Fax: 860-643-3556

Marconi Instruments/Kikusui

2301 Horizon Drive
Ft. Worth, TX 76177
817-224-9200
800-233-2955
Fax: 817-224-9201

Marshall Industries*D

9320 Telstar Ave.
El Monte, CA 91731
818-307-6000

M.A.T. Electronics*D

400 Pike Road
Huntingdon, PA 19061
215-364-7667
800-628-1118
Fax: 800-628-1005

Matrix Components

13581 Pond Springs Rd Ste 315
Austin, TX 78729
512-258-7590
800-726-1503
Fax: 512-219-0021

Matsushita Services Company

20421 84th Avenue South
Panazip: 2B-6
Kent, WA 98032
206-872-7616
Fax: 206-872-6512

MaxServe, Inc.

8317 Cross Park Drive
Austin, TX 78754
512-834-8341
Fax: 512-834-1137

McAfee Associates, Inc.

2710 Walsh Avenue
Santa Clara, CA 95051-0963
408-988-3832

MCD Electronics *D

2301 Yale S.E. Unit A5
Albuquerque, NM 87106
505-246-8000
800-949-4623
Fax: 505-246-9101

MCG Electronics

12 Burt Drive
Deer Park, NY 11729
516-586-5125
800-851-1508
Fax: 516-586-5120
E-mail: mcginfo@specdata.com
Web site: <http://www.mcgsurge.com>

McGraw-Hill

Professional Book Group
13311 Monterey Ave
Blue Ridge Summit, PA 17294-0850
717-794-2191
800-233-8158 Order
Fax: 717-794-2080

MCM Electronics*D

650 Congress Park Drive
Dayton, OH 45459-4072
513-434-0031
800-543-4330
Fax: 513-434-6959

Meirick, Inc.

420 South Hickory
Mount Vernon, MO 65712
417-466-3941

Meltek, Inc.

3 Victor Square
Scotts Valley, CA 95066
408-438-4986
Fax: 408-438-3459

Mendelson Electronics*D

340 East First Street
Dayton, OH 45402
513-461-3525
Fax: 800-344-6324

Merlin Software

15735 Barranca Pkwy Ste B108
Irvine, CA 92618
714-453-9563
Fax: 714-753-0501
E-mail: merlin@merlinsoft.com
Web site: <http://www.merlinsoft.com>

Mesa Systems, Inc.

420 Leisure St.
Livermore, CA 94550
510-443-9491
Fax: 510-443-9499

METCAL

1530 O'Brien Drive
Menlo Park, CA 94025-1434
415-325-3291
800-776-1778
Fax: 415-325-5932
E-mail: smartheat@metcal.com
Web site: <http://www.metcal.com>

Metric Supply*D

21029 Itasca Street, Unit C
Chatsworth, CA 91311-4924
818-701-9911
800-289-8953
Fax: 818-701-6011

Metrix Inc.

20975 Swenson Drive
Waukesha, WI 53186
414-798-8560
800-543-2130
Fax: 414-798-8573

Metrotek Industries, Inc.

33 West Main Street
Elmsford, NY 10523-2413
914-347-4112
Fax: 914-347-4203

M.I. Technologies

3310 E. Peterson Road
Troy, OH 45373
513-335-4560
Fax: 513-339-6344

MG Chemicals

9347-193 St
Surrey, BC V4N 4E7
604-888-3084
800-201-8822
Fax: 800-708-9888

Micro 2000, Inc.

1100 East Broadway Suite 301
Glendale, CA 91205
818-547-0125
800-864-8008
Fax: 818-547-0397

Micro Medics

6625 Jarvis
Niles, IL 60714
847-647-1010
800-678-5300

Micro Care Corp.

34 Ronzo Road
Bristol, CT 06010-7790
860-585-7912
800-638-0125
Fax: 860-585-7378
E-mail: info@microcare.com
Web site: <http://www.microcare.com>

Microcode Engineering

573 West 1830 North, Suite 4
Orem, UT 84057-2030
801-226-4470
800-419-4242
Fax: 801-226-6532

Micro Data

3001 Executive Dr #270
Clearwater, FL 34622-2260
813-573-5900
Fax: 813-572-5085

Micro Dimensions, Inc.*D

89K Washington Ave.
Natick, MA 01760
508-650-9008
Fax: 508-650-9207

Micro Electronic Systems, Inc.

3 Quarry Road
Brookfield, CT 06804
203-775-1440
800-243-7254

Micro House

2477 55th St
Suite 101
Boulder, CO 80301-5703
303-443-3388
Fax: 303-443-3323

Microline

89 Parke Ave
Flemington, NJ 08822
908-782-6047
800-215-0049
Fax: 908-782-5877
E-mail: lduca@microline.com
Web site: <http://www.microline.com>

Micron Meters

4509 Runway Street
Simi Valley, CA 93063-3479
805-522-0683
800-638-3770
Fax: 805-522-1568

Micro Semi

Power Technology Components
2830 S Fairview Street
Santa Ana, CA 92704-5948
714-979-8220
Fax: 714-557-5989

Microwave Filter Company, Inc.

6743 Kinne Street
East Syracuse, NY 13057
315-438-4700
800-448-1666
Fax: 315-463-1467
E-mail: mfc@ras.com
Web site: <http://www.ras.com/mwfilter/mwfilter.htm>

Milgray Electronics

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

Miller-Stephenson Chemical Co.

PO Box 950
Danbury, CT 06813
203-743-4447
800-992-2424
Fax: 203-791-8702

Mindshare, Inc.

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

Minitool, Inc.

1334F Dell Ave
Campbell, CA 95008
408-374-1585

Minuteman UPS

P.O. Box 815-188
Dallas, TX 75381
214-446-7363
800-238-7272
Fax: 214-446-9011

Module Exchange

706 Space Way
Duncanville, TX 75137
972-298-1212
800-632-6637
Fax: 972-283-1778
E-mail: jji@flash.net
Web site: <http://www.flash.net/~jji/mx>

Montgomery Ward

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

Montgomery Ward*D

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

Moody Tools, Inc.

42-60 Crompton Ave.
PO Box 230
East Greenwich, RI 02818-0230
401-885-0911
800-866-5462
Fax: 401-885-4565

Moore Business Products

701 Woodlands Parkway
Vernon Hills, IL 60081
847-913-3265
Fax: 847-913-3293

Mouser Electronics*D

958 N. Main St.
Mansfield, TX 76063
817-483-4422
800-346-6873
Fax: 817-483-0931

Mueller Electric Company

1583 E. 31st St.
Cleveland, OH 44114-4354
216-771-5225
800-955-2629
Fax: 216-771-3068

Multicore Solders

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

Multidyne Inc

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

Multiplex Technology, Inc.

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

N

National Advancement Corp.

2730-J South Harbor
Santa Ana, CA 92704
714-754-7110
800-832-4787
Fax: 714-754-7166
E-mail: sales@tech-training.com
Web site: <http://www.tech-training.com>

National Computer Association

118 S. Westshore Blvd. #223
Tampa, FL 34609
813-556-2775 Ext 6
800-615-6224
Fax: 813-556-2783

Nat'l Assoc. of Svc Dealers

Division of NARDA
10 E 22nd St
Lombard, IL 60148-4977
630-953-8950
800-621-0298
Fax: 630-953-8957
E-mail: nardahdq@aol.com

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

National Instruments Corp.

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

NCS*D

PO Box 1200
Newfields, NH 03856-1200
603-773-5500
800-767-2554
Fax: 603-773-9789

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 11224-5495
800-242-5556
800-239-6349

Nesco Batteries

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

NESDA

2708 W. Berry
Fort Worth, TX 76109-2356
817-921-9061
Fax: 817-921-3741

Network Technologies Inc.

1275 Danny Drive
Aurora Falls, OH 44022
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

Nikko

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

Nintendo America

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

Northeast Audio

425 Fenn St
Pittsfield, MA 1201
413-447-8333

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 55424
612-591-0009
800-969-0009
Fax: 612-591-0029

NRI Training for Professionals

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

NRI School of Electronics

4401 Connecticut Ave., N.W.
Washington, DC 20008
202-244-1600
800-321-4634 X2173
Fax: 202-244-2047

NTE Electronics, Inc.*D

44 Farrand Street
Bloomfield, NJ 07003
201-748-5089
800-631-1250
Fax: 201-748-6224
E-mail: maillist@nteinc.com
Web site: <http://www.nteinc.com>

Numeridex, Inc.

241 Holbrook Dr.
PO Box 11000
Wheeling, IL 60090
847-541-8840
800-323-7737
Fax: 847-541-8392

Nutronix Inc.

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



O.C. White

2039-2041 Bridge St.
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 Ogmet Group

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

O.K. Industries, Inc.

4 Executive Plaza
Yonkers, NY 10701-6803
914-969-6800
Fax: 914-969-6650

Oldaker Corp.

301 N. Main St.
Dunkirk, OH 45836
419-759-3551
Fax: 800-227-8024

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*MD

280 North Midland Ave.
Saddle Brook, NJ 07663
201-703-9800
800-379-6664
Fax: 201-703-9804

Ontrack Data International Inc

6321 Bury Drive
Eden Prairie, MN 55346-1739
612-937-1107
800-752-1333
Fax: 612-937-5815
E-mail: sales@ontrack.com
Web site: <http://www.ontrack.com>

OPTOelectronics Inc.

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

ORA Electronics

9410 Owensmouth Ave.
Chatsworth, CA 91311
818-772-2700
Fax: 818-718-8626
E-mail: ora@oraus.com
Web site: <http://www.oraus.com>

Orion Instruments, Inc.

180 Independence Drive
Menlo Park, CA 94025
415-327-8800
800-729-7700

Company mailing addresses

P

PACE, Inc.

9893 Brewers Court
Laurel, MD 20723-1990
301-490-9860
Fax: 301-498-3252
Web site: <http://www.paceusa.com>

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

7540 Colbert Drive
Reno, NV 89511
702-850-2900 EXT19
800-759-7535
Fax: 702-850-2929

Parts Express International*^D

340 East First Street
Dayton, OH 45402-1257
937-222-0173
800-338-0531
Fax: 937-222-4644

Parts Port Ltd*^D

1801 Walthall Cr Dr
Colonial Heights, VA 23834
804-530-1233
800-253-0515
Fax: 800-253-5640

PBS Software

490 W Arrow Hwy Suite F
San Dimas, CA 91773
909-592-1880
Fax: 909-599-5428

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
972-406-8583
800-727-2787
Fax: 972-406-9081
Web site: <http://www.pcservice.com>

PD Software

7320 Louetta Rd
Spring, TX 77379
281-370-0600
Fax: 281-251-9300
E-mail: pallen@infohwy.com
Web site:
<http://www.infohwy.com/~pallen>

The Peak Technologies Group

9200 Berger Rd
Columbia, MD 21046-1602
410-312-7660
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

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

Peripheral Parts Support*^D

219 Bear Hill Road
Waltham, MA 02154
617-890-9191
Fax: 617-890-7767

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 Elctrnics*^{MD}

Service Parts
Old Andrew Johnson Highway
Jefferson City, TN 37760
800-851-8885
Fax: 800-535-3715

Philips ECG*^D

4 Foxx Drive
Lincoln, RI 02865
401-726-1884

Philips ECG*^D

2715 Cherry Hill Drive
Byron, CA 94514
510-634-9879

Philips Technical Training

Service Co.
P.O. Box 555
Jefferson City, TN 37760
423-475-0044
Fax: 423-475-0221

Philips ECG Company*^D

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

Philips Service Company

Old Andrew Johnson Highway
PO Box 555
Jefferson City, TN 37760
423-475-0329
Fax: 423-475-0258

Philips Software Development

P.O. Box 555
Jefferson City, TN 37760-0555
423-475-0393
Fax: 423-475-0038

Philek Power Corp.

4320 Sweet Rd., Unit B
Blaine, WA 98230-9110
360-332-7252
800-727-4877
Fax: 360-332-7253
E-mail: info@philek.com
Web site: <http://www.philek.com>

Pioneer Research

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

Planned Products

5467 Tesoro Ct
San Jose, CA 95124-6133
408-459-8088
Fax: 408-459-0426

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 60632-4211
773-838-2000
800-222-1555
Fax: 773-838-2010

Plaza Distributing*^D

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

G. M. Popkey Company, Inc.

2035 Larsen Rd.
PO Box 12237
Green Bay, WI 54307-2237
414-497-0400
800-444-5920
Fax: 414-497-4894

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
800-746-9586
Fax: 603-483-5938
Web site:
<http://www.powertronics.com>

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
800-2251923
Fax: 713-895-6885

Premium Parts+ Elctrnics 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
E-mail: smprodint@aol.com

Pro-Services

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

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

Progressive Electronics

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

Prostat Corporation

1072 Tower Lane
Bensenville, IL 60106
630-238-8883
Fax: 630-238-9717
Web site: <http://www.prostatcorp.com>

Company mailing addresses

Protek

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

PTS Corporation

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

PTS Corporation Branch Locations

Tustin, CA: 800-380-2521
Arvada, CA: 800-331-3219
Longview, TX: 800-264-5082



Q B Products*D

Microwave Parts Div
1260 Karl Court
Wauconda, IL 60084-1094
847-487-3333
800-323-6856
Fax: 847-487-2689

Quantum Data

2111 Big Timber Road
Elgin, IL 60123
847-888-0450
Fax: 847-888-2802
Web site:
<http://www.quantumdata.com>

Quarterdeck

PO Box 18049
Clearwater, FL 34622-1049
813-443-1331
800-683-6696
Fax: 813-443-6603



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

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

2950 Lake Emma Rd
Lake Mary, FL 32746
407-333-8900
800-223-6009

Rehart Engineering

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

Reset, Inc.

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

RF Industries

7610 Miramar Rd
San Diego, CA 92126-4202
619-549-6340
800-233-1728
Fax: 619-549-6345
E-mail:
net.102061.2261@compuserve.com

RF Parts*D

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

RG Software, Inc.

7430 E. Stetson Drive
Suite 205
Scottsdale, AZ 85251
602-423-8000
Fax: 602-423-8389

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 Technology Inc.

1897 E Colton Ave
Redlands, CA 92374
909-794-2111
800-829-2942
Fax: 909-794-4003

Ripley Company

Miller Tool Products
46 Nooks Hill Rd.
Cromwell, CT 06416
860-635-2220
800-528-8665
Fax: 860-635-3631
E-mail: info@ripley-tools.com
Web site: <http://www.ripley-tools.com>

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: 516-226-2770

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
800-555-5312
Fax: 800-773-5320
Web site:
<http://www.rselectronics.com>

Russell Industries*D

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



Sage Data Systems

Division of America West C&E
1900 Elk St.
Rock Springs, WY 82901-4005
307-382-5663
800-542-9378
Fax: 307-382-7323

Salen Enterprises*D

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

Howard W. Sams & Company

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

Sargent Tool Company

30 East Industrial Road
Branford, CT 06405

SBS Direct

123 NW 13th St, Suite 213
Boca Raton, FL 33432
561-394-8771
800-603-9000
Fax: 561-361-9774
E-mail: service@sbsdirect.com
Web site: <http://www.sbsdirect.com>

Schematic Solutions, Inc.

13043 Hunters Ridge St
San Antonio, TX 78230-2847
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

Satellite Dealers Association

602 N. Jackson St.
Greencastle, IN 46135
317-653-4301
800-288-3824
Fax: 317-653-8262
E-mail: Ital30a@prodigy.com
Web site:
<http://www2.fwi.com/~n9pdt/eta.html>

Seco Industries

6909 E. Washington Blvd.
Montebello, CA 90640
213-726-9721
Fax: 213-726-9776
E-mail: seco2@aol.com

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

ServiceWare, Inc.

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

ServiceWare Corporation

200 Montcalm Suite R8
Hull, Quebec J8Y 3B5
819-770-4000
Fax: 819-770-1795
E-mail: info@serviceware.ca
Web site: <http://www.serviceware.ca>

Company mailing addresses

Servicing Systems

132 Lamplighter Drive
Manchester, CT 06040
860-647-9124
Fax: 860-647-9124
E-mail: 72570,237@compuserve.com

Shape Electronics

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

Sharp Electronics Corp

1300 Naperville Drive
Romeoville, IL 60446
630-226-2502
Fax: 630-759-2101

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

Simco

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

SiliconSoft

5131 Moorpark Ave, Suite 303
San Jose, CA 95129
408-446-4521
Fax: 408-446-5196

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
937-228-4849
800-788-4849
Fax: 937-228-1159
E-mail: sales@siriusacct.com
Web site: <http://www.siriusacct.com>

SL Waber, Inc.

520 Fellowship Rd.
Mount Laurel, NJ 08054
609-866-8888
800-634-1485
Fax: 609-866-1945
Web site: <http://www.waber.com>

SMH Electronics Co., Inc.

21 Pattersons Brook Rd.
West Wareham, MA 02576
508-291-7447
Fax: 508-291-7449
E-mail: ekozak@smhelectronics.com

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

2301 30th Street
Kenosha, WI 53141-1410
414-656-5701
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

Softdesk Retail Products

10725 Ambassador Drive
Kansas City, MO 64153-1216
816-891-1040
Fax: 816-891-8018

SAT/ A SPIRIG CO.

Solder Absorbing Tech. Inc.
144 Oakland St
Springfield, MA 01108-1787
413-788-6191
800-628-8862
Fax: 413-788-0490
E-mail: info@spirig.com

Sonera Technologies

PO Box 565
Rumson, NJ 07760
908-747-6886
800-932-6323
Fax: 908-747-4523
E-mail: sonera@displaymate.com
Web site: <http://www.displaymate.com>

Sony Service Company

123 Tice Blvd MST1-4
Woodcliff Lake, NJ 07675
201-930-1000

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

Specialized Prods Company*D

3131 Premier Drive
Irving, TX 75063
214-550-1923
800-866-5353
Fax: 800-234-8286

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

12806 Bradley Ave
Sylmar, CA 91342
818-364-1800
800-553-8712
Fax: 818-364-1810

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

Standard Electronics, Inc.*D

215 John Glenn Drive
Amherst, NY 14228
800-333-1519

Star Tech

900 Road 170
Carbondale, CO 81623
970-963-1969
Fax: 970-963-3969

Statics-End

761 Penarth Avenue
Walnut, CA 91789
800-895-0555

Herman H. Sticht Co., Inc.*D

57 Front St.
Brooklyn, NY 11201
718-852-7602
800-221-3203
Fax: 718-852-7915

Stoner, Inc.

PO Box 65
Quarryville, PA 17566
800-227-5538
Fax: 800-515-5150
E-mail: stoner@epix.net
Web site:
<http://www.stonersolutions.com>

Sun Equipment Corporation

PO Box 97903
Raleigh, NC 27624-7903
919-870-1955
800-870-1955
Fax: 919-870-5720

Support Systems International

Cables & Accessories Div.
150 S. Second St.
Richmond, CA 94804
510-234-9090
800-777-6269
Fax: 510-233-8888

Sutton Designs, Inc.

Computer Power Division
215 N. Cayuga
Ithaca, NY 14850
607-277-4301
800-326-8119
Fax: 607-277-6983

Swiftlink

600 Emerson
Suite 410
Saint Louis, MO 63141
800-794-3854

Symantec Corp.

10201 Torre Avenue
Cupertino, CA 95014-2132
800-554-4403

SyncPulse Software

PO Box 4503
Sunland, CA 91041
818-353-9595
Fax: 818-353-7016
E-mail:
102654,1665@compuserve.com

Synergetix

310 South 51st St
Kansas City, KS 66106
913-342-0404
Fax: 913-342-6623
E-mail: products@synerget.com
Web site: <http://www.synerget.com>

Synetics Corporation

540 Edgewater Drive
Wakefield, MA 01880
617-245-9090
Fax: 617-245-6311

Syon Corporation

280 Elliot Street
Ashland, MA 01721
508-881-8852
Fax: 508-881-4703

T

Tab Books

Blue Ridge Summit, PA 17294-0850
717-794-2191

Tadiran Computer Batteries*D

21303 Sherman Way
Canoga Park, CA 91303
818-887-3337
800-234-2444
Fax: 818-887-1686

Taiko International

2272 Marina Blvd
San Leandro, CA 94577
510-895-2929
800-435-8518
Fax: 510-895-2947

Tandberg

Fields Lane, Bldg 2
Brewster, NY 10509
914-277-3320
Fax: 914-277-3995

Company mailing addresses

Tandy National Parts*D

900 East Northside Drive
Fort Worth, TX 76102
817-870-5600
800-322-3690
Fax: 817-870-5626

A.G. Tannenbaum*D

P.O. Box 386
Ambler, PA 19002
215-540-8055
Fax: 215-540-8327

Team Systems, Inc.

2934 Corvin Drive
Santa Clara, CA 95051
408-720-8877
800-338-1981
Fax: 408-720-9643
E-mail: teamsys@cerfnet.com
Web site:
<http://www.team-systems.com>

TEC

83 East Central Avenue
Pearl River, NY 10965
914-735-7878
Fax: 914-735-1000

Tech Assist, Inc.

11350 66th St #105
Largo, FL 33773
813-547-0499
800-274-3785
Fax: 813-547-0768
E-mail: info@toolsthatwork.com
Web site:
<http://www.toolsthatwork.com>

Tech Spray, Inc.

PO Box 949
Amarillo, TX 79105-0949
806-372-8523
800-858-4043
Fax: 806-372-8750
Web site: <http://www.techspray.com>

Tech Support BBS

PO Box 6235
Akron, OH 44312-6235
216-733-0750

Tech-M

9400 4th St N Suite 116
St. Petersburg, FL 33702
813-576-1884
800-576-1881
Fax: 813-577-7207
E-mail: techm@cent.com
Web site: <http://www.cent.com/techm>

Technics

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

Techni-Tool Inc.*D

5 Apollo Road
PO Box 368
Plymouth Meeting, PA 19462-0368
610-941-2400
Fax: 610-828-5623
E-mail: techtool@interserv.com
Web site: <http://www.techni-tool.com>

Technology Programs

13 James St
Putnam Valley, NY 10579
914-528-3774
Fax: 914-526-3558

Teclab

Kalamazoo Technical Furniture
P.O. Box 1165
Kalamazoo, MI 49005
616-372-6000
800-832-5227
Fax: 616-372-6116

Tegam Inc.

7230 N. Ridge Road
Madison, OH 44057
216-428-7505
Fax: 216-428-1068

TEKSERV

127 Riverneck Road
Chelmsford, MA 01824
508-459-9480
Fax: 508-453-6336
E-mail: brianbjg@tekserv.com
Web site: <http://www.tekserv.com>

Tektronix, Inc.

Electronic Service Tools
PO Box 500, Mail Sta. 47-100
Beaverton, OR 97077
503-627-4066
Fax: 503-627-5622

Tektronix, Inc.

Portable Test Instruments Div
PO Box 500, Mail Sta. 47-847
Beaverton, OR 97077
503-627-2879

Tektronix, Inc.

Personal Test Instruments Div
PO Box 500, Mail Sta 47-678
Beaverton, OR 97077
503-627-4990

Tektronix, Inc.

Measurement Business
PO Box 500
Beaverton, OR 97077
800-426-2200
Fax: 413-448-8033

Tektronix Test & Meas. Group

P.O. Box 1529
Pittsfield, MA 01202
800-246-2200

Teledata Systems

68 Reservoir Road
New Milford, CT 06776
203-355-8285
Fax: 203-355-8285

Telematic

5513 Van Cleef St
Corona, NY 11368
718-271-5200

Telogy*D

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

Telulex, Inc.

2455 Old Middlefield Way S
Mountain View, CA 94043
415-938-0240
Fax: 415-938-0241
E-mail: sales@telulex.com
Web site: <http://www.telulex.com>

Tempronix Corp.

55 Chapel St.
Newton, MA 02158
617-969-2501
800-558-5080
Fax: 617-969-2475
Web site: <http://www.tempronix.com>

Ten-Lab

2217 Malcolm Avenue
Los Angeles, CA 90064
310-474-6909
Fax: 310-441-1807
E-mail: info@tenlab.com
Web site: <http://www.tenlab.com>

Tentel

4475 Golden Foothill Parkway
El Dorado Hills, CA 95762
916-939-4005
800-538-6894
Fax: 916-939-4114

Test Equipment Depot*D

PO Box 708
Medford, MA 02155-0006
617-665-1400
800-996-3837
Fax: 617-665-0780
E-mail: afoti@fotronic.com
Web site: <http://www.fotronic.com>

Test Probes, Inc.

9178 Brown Deer Road
San Diego, CA 92121
619-552-2090
800-368-5719
Fax: 619-535-1260

The Texwipe Company/CleanTex

650 East Crescent Avenue
PO Box 575
Upper Saddle River, NJ 07458
201-327-9100
800-648-9473 Ext 292
Fax: 201-327-5945

Thomson Consumer Electronics

PO Box 1976
Indianapolis, IN 46206
317-267-5799

Thomson Consumer Electronics

7225 Winton Drive, INH 915
Indianapolis, IN 46268
317-415-2568
Fax: 317-587-9647

Thomson Consumer/Svc Eng

600 N Sherman
Indianapolis, IN 46201
317-587-4347

Thordarson-Meissner

628 Belmont Street
Mount Carmel, IL 62863
618-262-5121
Fax: 618-263-3150
E-mail: xformers@aol.com

3E Corp.

Monitor Repair
165 Front Street
Chicopee, MA 01013
413-594-2772
Fax: 413-594-7283
E-mail: 3e-corp@worldnet.att.net

3M Company

5 North 3M Center Bldg 223
Saint Paul, MN 55410
612-733-8872

3M Consumer & Pro

Video & Audio Markets Div.
3M Center, Bldg 233-5N-01
St. Paul, MN 55144-1000
612-733-1082

3M Electrical Specialties Div

A130-3N-56
6801 River Place Blvd
Austin, TX 78726-9000
800-665-7862
Fax: 319-395-9719
Web site: <http://www.mmm.com>

3M Electronic Prods Division

MS 130-3N-27
PO Box 2963
Austin, TX 78769
512-984-1800

3M Electronic Products Div

ESM Business Unit
6801 River Place Blvd
Austin, TX 78726-4599
512-984-3363

3M Magnetic Media Division

Building 223-5N-01, 3M Center
St. Paul, MN 55144-1000

TIF Instruments, Inc.

9101 N.W. Seventh Ave.
Miami, FL 33150
305-757-8811
800-327-5060
Fax: 305-757-3105

Time Motion Tools*D

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

Tech. Info. Procurement Serv.

P.O. Box 1681
Forest Park, GA 30051-1681
770-968-3715
Fax: 770-968-3715
E-mail: tipsinc@mcenter.com
Web site:
<http://www.mcenter.com/tips/>

The Tool Resource*D

PO Box 1106
W. Dundee, IL 60118
708-468-0849
708-468-0849

Topline

PO Box 5100
Garden Grove, CA 92645
310-433-7000
Fax: 310-498-0490

TOPS Computer Company*D

461 Boston Street, E-2
Topsfield, MA 01983
508-887-5915
Fax: 508-887-9216

Toshiba America Info Sys, Inc.

9740 Irvine Boulevard
PO Box 19724
Irvine, CA 92713-9724
714-587-3000
Fax: 714-587-6849

Toshiba America Consumer Prod.

Service Division
1420 Toshiba Drive
Lebanon, TN 37087
615-449-2360
Fax: 615-444-7520

Company mailing addresses

Total Power International*MD
418 Bridge St.
Lowell, MA 01850
508-453-7272
Fax: 508-453-7395
E-mail: tpi@total-power.com
Web site: <http://www.total-power.com>

Tote Vision
969 Thomas Street
Seattle, WA 98109

Touchstone Software Corp.
2130 Main Street, Suite 250
Huntington Beach, CA 92648
714-969-7746
Fax: 714-969-1555
Web site: <http://www.checkit.com>

Trace Racks
P.O. Box 970
El Segundo, CA 90245
310-322-7673
800-358-1400
Fax: 310-322-3247

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

Triplett Corp.
1 Triplett Drive
Bluffton, OH 45817
419-358-5015
800-874-7538
Fax: 419-358-7956
E-mail: www@triplett.com
Web site: <http://www.triplett.com>

Tripp Lite
500 N. Orleans St.
Chicago, IL 60610
312-755-5401
Fax: 312-644-6505

Tritronics, Inc.*D
1306 Continental Drive
Abingdon, MD 21009
410-676-7300
800-638-3328
Fax: 800-888-3293

Trompeter Electronics
31186 La Baya Drive
Westlake Village, CA 91362-4047
818-707-2020
800-982-COAX
Fax: 818-706-1040

Trumenco of California Inc.*D
1875 Century Park E Suite 1880
Los Angeles, CA 90067-2519
818-891-2345
800-331-0088
Fax: 818-891-5251

Tucker Electronics Co.
P.O. Box 551419
Dallas, TX 75355-1419
214-348-8800
800-527-4642
Fax: 214-348-0367
E-mail: sales@tucker.com
Web site: <http://www.tucker.com>

TV Man Tech Tips Inc.
8614 State Road 84
Fort Lauderdale, FL 33324
954-723-1977
800-474-3588

TVPRO
Zenith Module Repair Manual
807 Queen Palm Lane
Sarasota, FL 34243
941-351-6803

U

UBM Corp
544 Weddell Drive, Suite #1
Sunnyvale, CA 94089
408-541-0151
Fax: 408-541-0153

Ucando VCR Educational Prod Co
P.O. Box 928
Greenville, OH 45331
513-548-6113
800-678-6113
Fax: 513-548-6124

Ultech Corp
28C Great Hill Road
Seymour, CT 06483
203-735-5805
Fax: 203-735-6653

Ultra-X, Inc.
1765 Scott Blvd Suite 101
Santa Clara, CA 95050-4138
408-261-7090
800-722-3789
Fax: 408-261-7077
E-mail: pcdiag@ultra-x.com
Web site: <http://www.ultra-x.com>

Underwriters Laboratories, Inc
333 Pflingsten Road
Northbrook, IL 60062-2096
847-272-8800
Fax: 847-272-0919

Ungar, A Rubbermaid Co.
5620 Knott Ave.
Buena Park, CA 90621
714-994-2510
Fax: 714-523-7790

Union Electronics Distrib*D
311 E. Corning Road
Beecher, IL 60401
708-946-9500
800-648-6657
Fax: 708-946-9200
Web site: <http://www.unionel.com>

United Servicers Association
P.O. Box 626
Westmont, IL 60559
630-968-6752
Fax: 630-968-6752
E-mail: usainc2@aol.com

Universal Electronics
6138 Riverview Rd.
Peninsula, OH 44264

Universal Enterprises (UEI)
5500 S.W. Arctic Drive
Beaverton, OR 97005
503-644-8723
800-547-5740
Fax: 503-643-6322

Uptime Service Association
14450 NE 29th Place #116
Bellevue, WA 98007
206-869-6668
Fax: 206-869-6229

LJ Enterprises 1-800-627-8755

THE MASTER OF JAPANESE ICs

DISTRIBUTOR OF JAPANESE, EUROPEAN AND AMERICAN DIODES, ICs AND TRANSISTORS

Advanced Micro Devices	Isocom	Samsung
Allegro	Sanrex	KEC
JRC (New Japan Radio)	Sanken	Avantek
Bourns	Kodenshi	Sanyo
Brooktree	Ledtech	SGS Thomson
Burr Brown	Sharp	CDIL
Linear Technology	Lite On	Siemens
Ciie	MIC	Signetics
Chips & Technology	Matsushita	Siliconix
DC Components	Mitel	SONY
Daewoo	Mitsubishi	Stanley
Exar	Motorola	Taiwan Semi
Fagor	National	Takamisawa
Frontier	Tesla	Fuji
National Semiconductor	NEC	Telefunken
Fujitsu	PEC	TI
General Instrument	Phillips	Toshiba
Goldstar	Phillips ECG*	Toyocom
Harris	Powerex	TYH-OHM
Hewlett Packard	RCA	Western Digital
Hi Sincerity	RFT	Zilog
Hitachi	Raytheon	Hutson
Rectron	IR	Rohm
Intersil	Rubycon	Weltrend*
Hardwood Products*	Sun Electric*	Easy Braid*
Rite-Off*	Capacitor Wizard*	Monitor Wizard*

* New Franchises & Authorized Lines

Manufacturer	Products
Sun Electric Company	GMA Glass Fuses
Easy Braid	Solder Wicks and Solders
Hardwood Products	Cotton and Foam Tipped Swabs
Rite-Off Chemicals	Electronic Cleaners, Freezes & Solvents
Weltrend Semiconductor	Integrated Circuits for Computer Monitors
Philips ECG	Replacement Semiconductors
Capacitor Wizard	Testing and Measurement Device
Monitor Wizard	Testing and Measurement Device



WT8042N32 WT8041N16 WT8043N202 WT8048N1
WELTREND SEMICONDUCTORS
WT8045N243 WT8043N204 WT8045N282 WT8043N208



11 McMillan Way, Delaware Industrial Park, Newark, DE 19713

Phone: 1-302-369-1590 • Fax: 1-302-369-1594 or 369-1595

VISIT US ON THE WORLDWIDE WEB: <http://www.ljent.com> • EMAIL: lee@ljent.com



ICs for COMPUTER MONITORS and CONSUMER ELECTRONICS

Company mailing addresses

Utilimaster
65266 State Road 19
PO Box 585
Wakarusa, IN 46573
219-862-4561
800-582-3454
Fax: 219-862-2071



VAC Service Corp
253 Broadway
Lynbrook, NY 11563
800-843-3624

Valtron Technologies
28309 Avenue Crocker
Valencia, CA 91355
805-257-0333
800-2-VALTRON
Fax: 805-257-0114

Vast Solutions Inc.
845 South Ninth Street
Louisville, KY 40203
502-583-8278
800-226-9153
Fax: 502-588-6204

Vector-VID Inc.
189 Horsham Road
Horsham, PA 19044
215-672-6702
Fax: 215-672-3411

Velco Electronics
611 Wangum Rd
Fishers, NY 14453
716-924-2073
Fax: 716-924-2136

Video Display Corporation
1868 Tucker Industrial Drive
Tucker, GA 30084
404-938-2080
800-241-5005
Fax: 404-493-3903

Vintage TV and Radio Supply*D
3498 West 105th Street
Cleveland, OH 44111
216-671-6712

Virtual Industries
2130 Victor Place
Colorado Springs, CO 80915
719-572-5566
800-530-8377
Fax: 719-572-5504

V-M Corporation
305 Territorial
PO Box 426
Benton Harbor, MI 49023
616-925-8841

VRS Electronics
681 St. Mary's Rd.
Suite D
Winnipeg, MM R2M 3MB
204-253-9559



Wahl Clipper Corporation
2900 North Locust Street
PO Box 578
Sterling, IL 61081-0578
815-625-6525
800-435-7748
Fax: 815-625-0091

Waldmann Lighting Company
9 West Century Drive
Wheeling, IL 60090
847-520-1060
800-634-0007
Fax: 847-520-1730
E-mail: walico@ix.netcom.com

Walker Scientific
Rockdale St.
Worcester, MA 01606
508-852-3674
800-962-4638
Fax: 508-856-9931

Warner Electric
Bristol Plant
383 Middle St
Bristol, CT 06010
860-585-4500
800-787-3532
Fax: 860-584-1483

Warrantech Corp.
300 Atlantic St.
Stamford, CT 06901
203-975-1100
800-544-9510

Waterloo Industries
P.O. Box 2095
Waterloo, IA 50704

Wavetek Corporation
9045 Balboa Avenue
San Diego, CA 92123
619-279-2955 X332
Fax: 619-565-9558

Waytek Inc.*D
P.O. Box 690
Chanhausen, MN 55317
800-328-2724
Fax: 800-858-0319

Weidmuller Inc.
Paladin Tools
3543 Old Conejo Rd Suite 101
Newbury Park, CA 91320
805-499-0318
800-272-8665
Fax: 805-498-3697

WEKA Publishing, Inc.
PO Box 4510
Greenwich, CT 06830
203-622-4117
800-222-WEKA
Fax: 203-622-4187

Weller/Cooper Tools
3535 Glenwood Ave
Raleigh, NC 27612-4934
919-781-7200
Fax: 919-783-2116
Web site: <http://www.coopertools.com>

Wescorp
144 S. Whisman Rd.
Mountain View, CA 94041
415-969-7717
800-537-7828
Fax: 415-969-6130

Wholesale Electronics Inc.*D
P.O. Box 1011
Mitchell, SD 57301-7011
605-996-2233
800-351-2233
Fax: 605-996-4300
E-mail: wei@weisd.com
Web site: <http://www.weisd.com>

Windsor Technologies, Inc.
130 Alto Street
San Rafael, CA 94901
415-456-2200
Fax: 415-456-2244
E-mail: pcdiags@windsortech.com
Web site: <http://www.windsortech.com>

Winegard Co.
3000 Kirkwood St.
Burlington, IA 52601-2000
319-754-0600
Fax: 319-754-0787

Red Wing/Winona Technical Coll
1250 Homer Road
PO Box 409
Winona, MN 55987
507-454-4600
800-372-8164

Workplace Systems, Inc.
562 Mammoth Road
Londonderry, NH 03053-2101
603-622-3727
800-258-9700
Fax: 603-622-0174

World College
5193 Shore Drive, Suite 113
Virginia Beach, VA 23455-2500
804-464-4600
800-696-7532
Fax: 804-464-3687



Xytronic
4330 24th St Suite 1A
Sacramento, CA 95822
916-733-0533
800-468-9263
Fax: 916-733-0539
E-mail: xyttool@ns.net



Yamaha Electronics Corp, USA
6660 Orangethorpe Avenue
Buena Park, CA 90620
714-522-9888
800-492-6242
Fax: 800-634-0355
E-mail: parts@yamaha.com
Web site: <http://www.yamaha.com>

York Chemical
2112 Southmore
Pasadena, TX 77502



Zack Electronics
2514 Channing Ave.
San Jose, CA 95131
408-324-0551
Fax: 408-324-1110

Zenith Sales Co.
A Div of Zenith Electronics Co
1900 N. Austin Avenue
Chicago, IL 60639
312-745-2000
Fax: 312-745-2546

Zero Corp., East Div.
288 Main St.
Monson, MA 01507
413-267-5561
Fax: 413-267-5569



The Professional
**Electronics
Technicians
Association**
and the **Satellite Dealers
Association**

Join Us

CET Certification - FCC License Exams

At all cities and military bases. Study materials on disk, paper and video. Free retake if you do not pass CET 1st time. Test Review available. **Option areas:** Consumer, Industrial, Computer, Satellite, Biomed, Radar, Wireless and Telecommunications, RF Video Distribution, Fiber Optics, Customer Service, Satellite Installation.

Employment Help

Join ETA-SDA. Send your resume - We can help. Employers: Call us for highly skilled Certified Electronics Technician staff workers.

Membership includes Technical Tips; Technician Assn News journal, Employment assistance; Help line, Technical and business monographs; Seminars on site or via satellite; Participation on tech committees for CET and skills standards. Leadership training; Annual Convention; Student Chapters; Industry recognition; Networking; discounts and a lot more.

THE ASSOCIATE CET Exam Books

New Study Guides for the Associate Level CET exams. Book 1 contains 248 sample CET Exam Quiz questions and answers. Multiple CET authors. Book 2 different sample quizzes - latest exam topics plus complete listing of over 380 CET exam test sites. Written by CETs, electronics instructors and working technicians. Great study material for every professional electronics technician.

317-653 4301
602 N Jackson
Greencastle, In 46135

<http://www2.fwi.com/~n9pdt/eta.html>

PHOTOFACTS

CROSLEY	
CC3262A103	3789
CC3262A2	3789
32R504-00BB	3789
32V507	3789

DAEWOO	
CN-695	3778
DTQ-2975FC	3778

FISHER	
G5F-65250	3783
G5F-65251	3783
G6D-65200	3787
PC-6520	3787
PC-6525	3783

JVC	
AV-27730	3786
C-13710	3788
C-13711	3788

MAGNAVOX	
TS2582C	3776
25R505-00AA	3776

MTX	
FH195	3779

RCA	
CTC185B	3781
F19240GYTX1	3781

SAMSUNG	
KCT52A	3785
TXE2745	3785
TXE2746	3785

SANYO	
AVM-2756	3782
AVM-2756U	3782
G3Y-2756U0	3782
G3Y-27560	3782

SEARS	
CTC185AA	3784
274.43448690	3784

SHARP	
27H-S60	3780
27H-S80	3780

TOSHIBA	
CE32F15	3777
CE35F15	3777
CF32F50	3777
TAC9619	3777
TAC9622	3777

FREE DEMO 18,200 Technical TIP Repairs

FREE DEMO
TV's, VCR's, Projection TV's,
CAMCORDER's, CD Players, Audio
& other repairs organized in an EASY
to use Computer Program:

The TECHNICAL TIP REPAIR program.

- PROFESSIONAL BOARD & COMPONENT LEVEL REPAIRS.
- ADD your own repairs.
- PRINT repairs.
- BACKUP & save your own repairs.

Have your own tips? Ask about our
TIP EXCHANGE policy with **FREE**
Updates. Works on IBM compatible
computers with a hard drive (Also works
on some Apple Macintosh computers).
NEW VERSION works in DOS, WINDOWS
3.1 & WINDOWS '95.

FREE SHIPPING
HIGHER INTELLIGENCE SOFTWARE, INC.



60 Farmington Lane
Melville, NY 11747
1-800-215-5081 / 1-516-643-7740

Circle (70) on Reply Card

ORGANIZE AND PROTECT YOUR COPIES OF

Electronic Servicing & Technology

Now there's an easy way to organize and keep copies of your favorite magazine readily available for future reference.

Designed exclusively for *ES&T* by Jesse Jones Industries, these custom-made titled cases and binders provide the luxury look that makes them attractive additions to your bookshelf, desk or any location in your home or office.

Whether you choose cases or binders, you'll have a storage system that's durable and well organized to help protect your valuable copies from damage.

Quantity	Cases	Binders
One	\$ 8.95	\$11.25
Three	\$24.95	\$31.85
Six	\$45.95	\$60.75

Add \$1.50 per case/binder for postage and handling. Outside USA \$3.50 per case/binder. (U.S. funds only)

- Cases and binders designed to hold a year's issues (may vary with issue sizes).
- Constructed of reinforced board, covered with durable red leather-like material.
- Cases V-notched for easy access.

- Free personalization foil for indexing year.
- Binders have special spring mechanism to hold individual rods which easily snap in. This allows magazines to be fully opened for easy readability.
- Title hot-stamped in gold.

Call TOLL FREE 7 days, 24 hours **1-800-825-6690**

Electronic Servicing & Technology Jesse Jones Industries, Dept. 95 EST, 499 East Erie Avenue, Philadelphia, PA 19134

What Do You Know About Electronics?

Transformers and equivalent circuits

By Sam Wilson

Here is a quick question that needs a quick answer. If you have studied basic theory you should be able to answer it.

The primary-to-secondary turns ratio of a certain transformer is 1:2. The current in the primary winding is 1A. Calculate the secondary current. I'll wait at this point until you get it done.

Are you ready? Did you use the equation that is given in many books?

$$\frac{N_P}{N_S} = \frac{I_S}{I_P}$$

If so, you set the product of the means equal to the product of the extremes and solve for I_S .

$$N_S I_S = N_P I_P$$

$$I_S = \frac{N_P I_P}{N_S} = \frac{1 \times 1}{2} = \frac{1}{2} \text{ A}$$

That's very clever, isn't it? The only problem is that it is incorrect. The truth is that the secondary current must be obtained by using Ohm's law.

$$\text{secondary current} = \frac{\text{secondary voltage}}{\text{secondary circuit resistance}}$$

The primary-to-secondary voltage ratio is the same as the primary-to-secondary turns ratio:

$$\frac{N_P}{N_S} = \frac{V_P}{V_S}$$

That equation is correct. So, using the same transformer as before, and, assuming a primary voltage of 2V, the voltage across the secondary winding (disregarding losses):

$$\frac{\text{Primary turns}}{\text{Secondary Turns}} = \frac{V_P}{V_S}$$

Wilson is the electronics theory consultant for ES&T.

So,

$$V_S = \frac{N_2 V_P}{N_1} = \frac{2 \times 2}{1} = 4V$$

Now, if the resistance across the secondary winding is 1Ω , then, by Ohm's law we can find the current:

$$I = \frac{V_S}{R} = \frac{4}{1} = 4A$$

What is wrong here?

Using the equation

$$\frac{V_P}{V_S} = \frac{I_S}{I_P}$$

you can get a *calculated* secondary current. That may not be anywhere near the actual secondary current. It is the short circuit current that *could* flow if the manufacturer of the transformer used wire for the secondary winding that can withstand the actual current.

A black box problem

Regie Felps decided to sleep late because it was his day off. When he got up at 5:00 a.m. he found the following note under his door: "Good morning, Mr. Felps: Here is your assignment for today. The black box in Figure 1 has only linear resistors inside. The resistors are interconnected, but the resistance between terminals B and D is 0Ω .

Your mission, should you decide to accept it, is to design an equivalent cir-

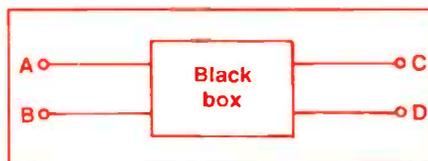


Figure 1. This black box has only linear resistors inside. They are interconnected, but the resistance between terminals B and D must be zero ohms.

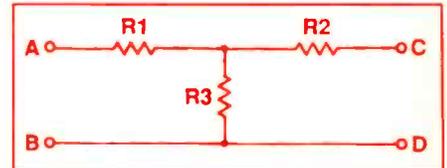


Figure 2. If you know the input resistance with output terminals open, the input resistance with output terminals shorted, the output resistance with input terminals open and the output resistance with input terminals shorted of a circuit that you know is made up only of linear resistors, you can design an equivalent T circuit such as the one shown here.

cuit consisting only of linear resistors. The circuit you design can be substituted for the black box in Figure 1 such that there will be no change in external voltages, currents and resistances.

As always, if you fail to find the correct answer to this problem, we will deny any knowledge of your existence."

The solution

Here is Regie's Solution. His ohmmeter measurements are also shown.

The circuit has four possible ohmmeter measurements:

- Input resistance with output terminals open (R_{AB}) = 40Ω
- Input resistance with output terminals shorted (R'_{AB}) = 22Ω
- Output resistance with input terminals open R_{CD} = 50Ω
- Output resistance with input terminals shorted R'_{CD}

With those measurements and with the stated conditions, it is possible to design an equivalent "T" circuit. See Figure 2.

Regie had saved his notes from school and knew he could design the equivalent circuit using the following three equations:

$$R_3 = \sqrt{(R_{AB})(R_{CD})} - (R_{AB})(R_{CD})$$

$$R_2 = R_{CD} - R_3$$

$$R_1 = R_{AB} - R_3$$

(Note: The resistance R'_{CD} is not needed to find the solution.)

Regie plugged the values (given above) into the three equations; here are the values he got for R_1 , R_2 and R_3 :

$$R_3 = 30\Omega$$

$$R_2 = 20\Omega$$

$$R_1 = 10\Omega$$

Figure 3 illustrates the equivalent circuit. This does not mean that the circuit inside the black box is a T circuit. The T circuit can be substituted for whatever circuit is inside.

$$R'_{AB} = 10 + \frac{20 \times 30}{20 + 30} = 10 + 12 = 22\Omega$$

$$R_{AB} = 10 + 30 = 40\Omega$$

$$R_{CD} = 20 + 30 = 50\Omega$$

Where did those equations come from? The resistors in the equivalent T circuit are the three unknowns to be determined. There are four possible equations. See Figure 1. If you have three equations and four unknowns, or four equations and three unknowns, a solution is very doubtful. So, you pick three of the four equations and the three unknowns and go after it. (If you have moxie you will pick the first three equations.)

I know what some of you readers are thinking: you have got enough problems of your own without reading this column to get another one. Other readers will see it as fun and try to develop the equations just to check their math memory.

OK. Now listen up. If you want the derivation for any reason, just send a note to me in care of this magazine:

ES&T
P.O.Box 12487
Overland Park, KS 66282-2487.

I'll send the derivation, free of course. Some readers will probably send a stamp, but, if you don't have one write for the solution anyway. If you do that, I'll also send you the EQUATIONS for designing a minimum loss pad of the type used for matching an amplifier to a speaker. (I'm NOT going to send a bunch of charts and graphs that usually work if you have certain values to work with.)

Anyway, the equivalent T circuit is shown in Figure 3.

Dis-like-its

Here are some things that I don't like to see in a book:

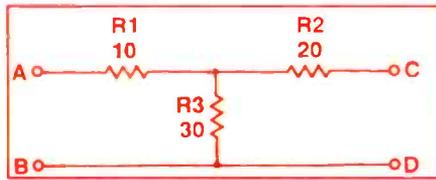


Figure 3. This circuit is equivalent to the circuit of Figure 1. This does not mean that the circuit inside the black box is a T circuit. The T circuit can be substituted for whatever circuit is inside.

"The proof is left to the reader." Translation: The author couldn't work the problem either.

"...and, as they say: 'Naka putsnik fumph trashnik!'" Translation: The author is living in a foreign country to avoid

paying income tax and is losing the ability to speak English.

"The answers to selected problems are given in Appendix A." Translation: The author could only work a few of the problems given in the book.

"The author assumes the reader is familiar with the simple solution of a simple 6 by 8 matrix." Translation: There is no such thing as a simple 6 X 8 matrix solution, and, if there were a simple solution, there are only three people in the world who understand it.

"The method of solving this equation is detailed in Volume 1 of the author's book." Translation: Volume 1 didn't sell very well, let's try to sell a few more. ■



Get online with ES&T on GENie®
Look for us in the Radio & Electronics Roundtable

To join GENie, use your computer & modem to call 1-800-638-8369.

At the U# prompt, type JOINGENIE And for a special introductory offer, At the key/offer code prompt, type MEG528

Circle (89) on Reply Card



WIN A FREE ProGold Maintenance Kit

Visit our Web Site at:
<http://www.caig.com>

See ProGold on Page 75



To Order Back Issues

When ordering back issues include the following information: Name, address, city, state & zip. Please make a list of the issues you're requesting. When paying by credit card send the number along with the expiration date. Check, Money Order, Mastercard, VISA, Discover and AMEX accepted.

For Faster Service
Fax 1-516-681-2926
Electronic Servicing & Technology
76 North Broadway, Hicksville, NY 11801

Only \$3.50 Per Issue



IF YOU NEED IT... WE HAVE IT!

THE HERMAN ADVANTAGE

- All In-Stock Orders Placed Before 4:00 PM EST Are Shipped the Same Day.
- FREE or DISCOUNTED Air Freight Program
- RAPID RESPONSE to All Research Requests.
- PROFESSIONAL Customer Service Representatives to Serve Your Every Need.
- CONSOLIDATE YOUR BUYING and purchase all the major lines from ONE SOURCE.
- NO MINIMUM ORDER.

Phone: 800•938•4376 Fax Order Line: 800•938•4377

ORIGINAL REPLACEMENT PARTS & ACCESSORIES

SONY KENWOOD Panasonic RCA
3M LANSBURG ELECTRONICS TOSHIBA Technics
Quasar ONKYO PROSCAN

Test Equipment, Tools, Soldering Equipment, Chemicals, and Service Accessories

BK PRECISION GoldStar FLUKE HAKKO
HITACHI KENWOOD LEADER
WAVETEK GC 3M Welky Xcelite

7350 HERMAN WAY, MIAMI, FL 33122
Internet E-Mail Address: hermanelec@aol.com

Web Page: <http://gateintl.com/hermanelec>

Circle (69) on Reply Card



Catalog features expanded product line and web version

Jameco Electronics has released a new catalog with more than 150 new products, including: PIC chips, EPROM and micro-processor programmers, a PC-based oscilloscope, industrial rack-mount products, multimedia accessories and much more! All 5,000 products are now available on the World Wide Web at <http://www.jameco.com>

Circle (91) on Reply Card



Electronics replacement parts/accessories

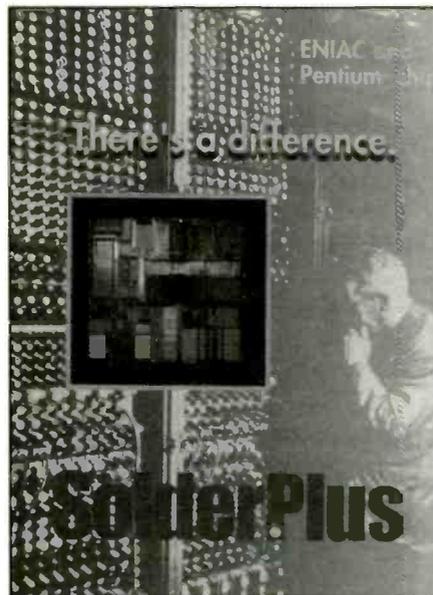
MCM Electronics announces their newest catalog - number 38.

This catalog is supported by over 6,000 new items. The additions include project accessories, semiconductors, connectors, test equipment, computer products, au-

dio, and hundreds of original OEM and generic TV/VCR repair parts. The new introduces new sections titled, Computer Software, Data Comm, Gaming and Amusement, Office Supplies, Printer Parts, and Safety.

New franchised lines introduced for the first time in this catalog include Lexmark, ECG/Philips, and Sencore.

Circle (92) on Reply Card



Solder paste catalog

EFD, Inc. offers a color catalog describing the benefits of SolderPlus a new flux/alloy mixture that increases output, eliminates rework and improves joint reliability in manual and automated soldering operations.

Packaged in convenient 35 and 75 gram syringes, the paste is easily applied with manual or air-powered dispensing equipment. It will not clog, skip or separate and provides faster, more consistent deposits than flux-core wire or standard stencil-grade solder pastes.

The new material is available in popular flux/alloy combinations and can be reflowed with any common heating method in use.

Circle (93) on Reply Card

Tools catalog

The new Time Motion Tools catalog features 172 pages of tools for the service industry, including a variety of hand tools,

power tools, soldering tools, lighting and magnification tools, telecommunication, co-axial, test and measurement meters, and tool kits and cases. Specially featured in the fall catalog are the new Fluke meters, including the new Fluke 7-300. This low voltage (up to 300V ac or dc) meter automatically decides between measuring volts, continuity, or ohms.

Circle (94) on Reply Card

Brochure on high performance oscilloscopes

A new technical brochure is available from LeCroy Corporation for design/test engineers who would like information on high performance digital oscilloscopes. The brochure features numerous samples of real world signals and gives examples of how the engineer can capture, view and diagnose electronic circuits more accurately and more quickly. In addition to the application oriented information the brochure contains detailed technical specifications of a variety of oscilloscopes. The company also has a website at <http://www.lecroy.com>.

Circle (95) on Reply Card

Capacitor catalog detailing DynaCap series double layer capacitors offering highest capacitance density in industry

ELNA America, Inc., has published a new 16-page catalog detailing its ELNA DynaCap series of electric double layer capacitors, which are used for IC memory back-up or related energy storage.

Delivering capacitance densities (50F at 2.5V with $\leq 0.08\Omega$ resistance in a package measuring only 25mm diameter x 40mm long), the series is available in seven lines ranging from DC series coin cells rated at 2.4V or 2.5V and 0.18F to 2.2F to the powerful DZ series, delivering from 0.33 to 50F at 2.5V.

According to the company, the DynaCap Series is ideal as an energy storage device. In addition to integrated circuit memory back up, they are used as actuators for motors and electronic coils, in personal computers, cell phones and measurement devices, and can even function as a simple power supply.

Circle (96) on Reply Card

The Associate CET, Electronics Technicians Association, 22 Chapters, paperback \$24.95, five-disk tutorial \$50.00

New study material for technicians preparing for the Certified Electronics Technician Examinations is now available from the Electronics Technicians Association International, Inc. The two-book set is entitled *The Associate CET*.

Eleven authors, of whom six are electronics technology instructors, contributed to the texts, which contain materials closely related to the new CET Examinations. Major topics are: Electronics math and formulas; Inductance, capacitance and resistance; Power sources; ac/dc circuits; Power supply filtering and regulation; Antennas, transmissions lines and basic radio; Modulation; Block diagrams and schematics; Troubleshooting; Digital concepts, Computer basics; Test equipment; Safety; Semiconductors and integrated circuits; Signal processing; Amplification, conversion and compression; Basic controls, PLCs and programming; Hand tools and soldering; Technical writing, and new topics on Customer and co-worker relations, and Personal behavior. The two-book set contains over 500 practice quiz questions for the Associate CET.

The Associate CET, Books 1 and 2, contain a complete listing of ETA's 368 examination locations across the U.S., as well as many off shore sites.

ETA is also distributing a 5-Disk Computer Program (CET Tutorial) containing over 1,100 practice electronics questions, similar to those on the CET exams. While most of these practice quiz questions are related to actual questions on the Associate CET exams, also covered is advanced materials applicable to the Journeyman Option exams.

The practice computer quiz set contains four disks applicable to the CET exams, and one disk aimed at preparing technicians for the FCC General Radiotelephone Operator License exams. The diskettes are DOS based for IBM PCs and compatible personal computers. They are in color and are interactive.

The study guides can help students, on their own time, to fill in areas of their elec-

tronics education for which there is not time in many classes. The practice quizzes can easily be used for pre-employment examinations for companies who hire electronics technicians.

ETA, 602 N Jackson, Greencastle, IN 46135

FPGAs and Programmable LSI: A Designer's Handbook, by Geoff Bostock, Newnes, 240 pages, paperback \$47.95

This is the most comprehensive practical guide to designing with field programmable gate arrays (FPGAs) and programmable LSI. Programmable logic devices (PLDs) have been in general use for over 20 years. The demands of modern electronic design have caused traditional PAL technology to give way to a powerful new approach: FPGA technology.

The design process for an FPGA needs to be far more rigorous than for PAL since troubleshooting is far harder to perform. There are, moreover, a dozen or more manufacturers of FPGAs, each with a different architecture and performance, so choosing the right device for any particular application is a critical part of the design process. Similarly, there are various design methods, each with particular features. This book shows a designer how to choose the appropriate FPGA and design method for any application. It also gives hints and tips, based on the author's wide experience in the field, to allow designers to optimize performance of any particular family of devices.

Newnes, 313 Washington Street, Newton, MA 02458-1626

Embedded Microprocessor Systems: Real World Design, by Stuart Ball, Newnes, 184 pages, paperback \$29.95

Embedded Microprocessor Systems: Real World Design covers many microprocessor families while enumerating practical tips and pitfalls to avoid. This book is an introduction to the design of embedded microprocessor systems from concepts through debugging.

Unlike many microprocessor books, this book is not limited to any specific processor family, but describes interfaces and operations of several families, with emphasis on cost and design trade-offs. Two complete embedded systems are used throughout to illustrate specific concepts.

**IMPROVE & PROTECT
Metal, Conductive Plastic, &
Carbon-based Connections!**

ProGold™

**Enhancer & Protector
for metal connections.**



- Improves Conductivity
- Reduces Noise & Distortion
- Improves Definition & Clarity
- Extends Dynamic Range
- Seals & Protects Surfaces



"Corrosion problems on very sensitive connectors have been an annoying problem for us. We have tried many products without success until we tried CAIG's ProGold & DeoxIT. ProGold & DeoxIT are the only products that have worked perfectly. We highly recommend them." Xerox Corp.

"The ProGold works great. I used it on some old tube equipment and it eliminated a loud hum that I thought was something more serious. ProGold also got rid of the recurring contact noise in a rotary control that usually returned after using other sprays. Even works on keeping oxidation from metal panels and knobs!"

News/Studio Sessions Editor, RADIO WORLD

**NEW
CalLube MCL™**

**Enhancer & Protector for conductive
plastics & carbon-based connections.**



- Lubricates Sliders, Switches, Pots,
& other Sliding Surfaces
- Maintains Optimum Signal Quality
- Reduces Wear & Abrasion
- Maintains Tactile Feel
- Improves Conductivity



"This service group here at RANE has found, to date, the CAIG CalLube MCL formula to be the most effective lubricant for preserving electrical properties of potentiometers. CAIG developed this product, in part, by researching samples that were provided from high-use commercial applications. This thorough consideration of real world application problems insures that the MCL product will be the standard for some time to come." RANE Corporation

CAIG Products ... used by those who demand the best!

Ampex	General Electric	Intertek Labs	Tektronix
Diebold, Inc.	Hewlett-Packard	Microdot	Texas Inst.
Dolby Lab	Honeywell	RANE Corp.	Wayne-Dresser
Fluke Mfg. Co.	IDI, Inc.	Switchcraft	Xerox Corp.

CAIG
LABORATORIES, INC.

16744 West Bernardo Drive
San Diego, CA 92127-1804
TEL: 619/451-1799
FAX: 619/451-2799
E-Mail: caig123@aol.com
URL: http://www.caig.com

1-800-CAIG-123

The text includes numerous examples, tips, and pitfalls, which can help prevent time-consuming and expensive mistakes. Particularly important is the chapter on interrupts, with detailed descriptions of possible problems and warnings on what actions to avoid.

Stuart Ball is a Senior Electrical Engineer at Oregon Teknika, an Oklahoma City manufacturer of medical electronic equipment, and has worked for the past 15 years in the field of embedded microprocessor control systems.

Newnes, 313 Washington Street, Newton, MA 02158-1626

Inside PC Card: CardBus and PCMCIA Design, by Faisal Haque, Newnes, 254 pages, hardcover \$49.95

This new designer's guide to PCMCIA covers Release 2.1 and PC Card '95, offering both design and software implementation examples. The book offers the first detailed look at CardBus and multi-function PC Cards.

PC Card (or PCMCIA) technology

allows computers to interface with each other using less space than conventional interfaces. Currently, most applications are in the personal computing market to enhance peripheral capabilities. As the industry changes, the applications will grow outside of the PC arena, into areas such as medical instrumentation and digital cameras, where peripheral expansion was previously unavailable.

Newnes, 313 Washington Street, Newton, MA 02158-1626

"EDN Design Ideas" (CD-ROM), Newnes, CD-ROM \$39.95

The "EDN Design Ideas" CD-ROM contains the articles from *EDN's* "Design Ideas" section and related articles from *EDN's* "Bulletin Board." The "Design Ideas" section of *EDN* consists of articles submitted by *EDN* readers to give hints to designers who are troubleshooting or who need ideas to solve circuit design problems. Powerful key word search allows you to quickly find all articles of interest. This CD-ROM has cut and paste

capability to export design ideas to other programs. The bookmark and notes functions also help users adapt the information to their specific needs.

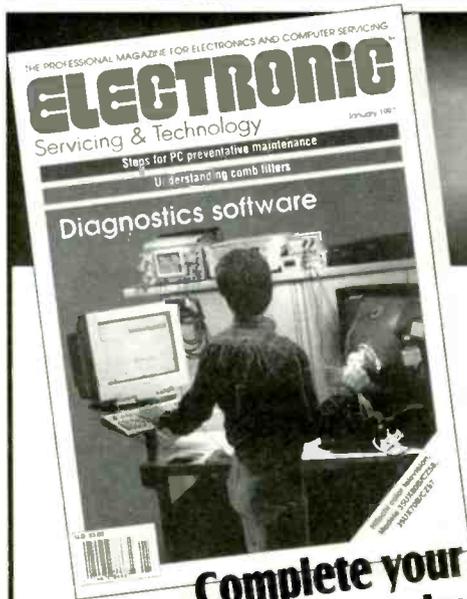
This new CD-ROM contains hundreds of design ideas. It also has new features like search capabilities, cut and paste capabilities, and excellent display graphics.

Newnes, 313 Washington Street, Newton, MA 02158-1626

Linear IC Applications: A Designer's Handbook, by Joe Carr, Newnes, 356 pages, paperback \$47.95

Linear IC Applications: A Designer's Handbook is about practical applications of linear IC circuits. Although most of the circuits are based on the universal operational amplifier, other devices are examined as well. The material in this book will allow you to design circuits for the applications covered. But more than that, the principles of design for each class of circuit are transferable to other projects that are similar in function, if not detail.

Newnes, 313 Washington Street, Newton, MA 02158-1626



Complete your collection today!

When ordering back issues include the following information: Name, address, city, state, zip & phone. Please make a list of the issues you're requesting. When paying by credit card send the number along with the expiration date. Check, Money Order, Mastercard, VISA, Discover and AMEX accepted.

To Order Back Issues

Only \$3.50 Per Issue

A great way to save your issues of *Electronic Servicing & Technology* is with a case or binder. These cases or binders are manufactured by *Jesse Jones Industries* and will help keep your valuable copies from damage so they can be read time and time again.

(To order cases or binders See Jesse Jones' ad on page 71)

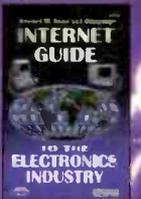
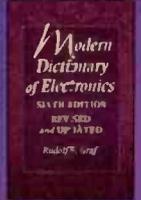
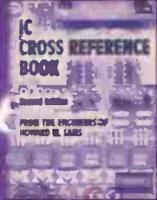
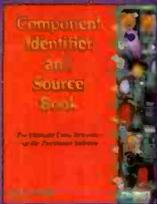
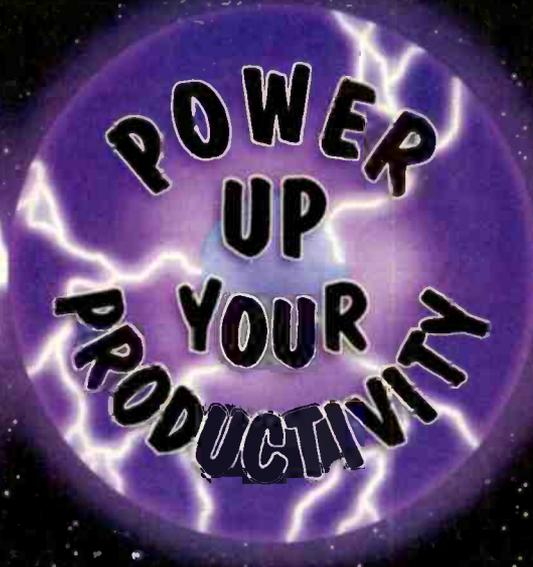


**TO ORDER BACK ISSUES
For Fastest Service**

Call 1-516-681-2922

**Electronic Servicing & Technology
76 N. Broadway, Hicksville, NY 11801
Fax 1-516-681-2926**

ES&T Book Shop



Component Identifier and Source Book
by Victor Meeldijk
This book was written to assist technicians to identify components from prefixes and logos, as well as find sources for various types of microcircuits and other components.
Order # 61088 \$24.95

Semiconductor Cross Reference Book, 4/E
by Howard W. Sams & Company
This newly revised and updated reference book is the most comprehensive guide to replacement data available. With more than 490,000 part numbers listed, technicians will have no problem locating the replacement or substitution information they need.
Order # 61080 \$24.95

ES&T Presents TV Troubleshooting & Repair
by ES&T Magazine
This book presents information that will make it possible for technicians and electronics hobbyists to service TVs faster, more efficiently, and more economically.
Order # 61086 \$18.95

ES&T Presents Computer Troubleshooting & Repair
by ES&T Magazine
Computer Troubleshooting & Repair features information on repairing Macintosh computers, monitors, hard drives and much more.
Order # 61087 \$18.95

The Howard W. Sams Troubleshooting & Repair Guide to TV
by Howard W. Sams & Company
This book is the most complete and up-to-date television repair book available. With timesaving features that even the pros don't know and extensive coverage of common TV symptoms.
Order # 61077 \$29.95

Internet Guide to the Electronics Industry
by John Adams
Whether it's programs that calculate Ohm's Law or a schematic of a satellite system, electronics hobbyists and technicians can find a wealth of knowledge and information on the Internet.
Order # 61092 \$16.95

Optoelectronics, Volume #1
by Vaughn D. Martin
This book is the first in a three-part series on optoelectronics. It is the introductory self-teaching text and includes descriptions of basic concepts, photometrics, and optics.
Order # 61091 \$29.95

IC Cross Reference Book, 2/E
by Howard W. Sams & Company
The engineering staff of Sams assembled the IC Cross Reference Book to help readers find replacements or substitutions for more than 35,000 ICs and modules.
Order # 61096 \$19.95

The Complete RF Technician's Handbook
by Gotter W. Sayre
This book will furnish the working technician or student with a solid grounding in the latest methods and circuits employed in today's RF communications gear.
Order # 61095 \$24.95

PC Hardware Projects, Volume 1
by James Barbarello
Using commonly available components and standard construction techniques, this book will guide readers through the construction of a logic analyzer and a multipath continuity tester.
Order # 51104 \$24.95

Modern Dictionary of Electronics, 6/E
by Rudolf F. Graf
This book is a classic, comprehensive reference book for engineers, technicians, students, and hobbyists.
Order # 57002 \$49.95

Understanding & Servicing CD Players
by Ken Clements
Written specifically with service technicians and engineers in mind, this book is designed as a bench-side companion and guide to the principles involved in repairing and adjusting CD players.
Order # 67057 \$49.95

YES! I want to learn from the experts. Rush me my book(s) right away!

Please add \$4 shipping & handling. **FREE shipping & handling for orders \$50 and over.**
Please make your check or money order payable to: Electronic Servicing & Technology

**To Order Call
516-681-2922**

Qty	Order#	Description	Price	Total Price
Shipping/Handling				
New York Residents add applicable sales tax				
Total				

Name _____

Address _____

City _____ State _____ Zip _____

MC/VISA/AMEX/Discover # _____ Expires _____

Form of payment: MC VISA AMEX Discover Check Money Order

Please mail your orders to: **Electronic Servicing & Technology, 76 North Broadway, Hicksville, New York 11801-9962 FAX 516-681-2926**

CLASSIFIED

Classified advertising is available by the word or per column inch.

By-the word. \$1.65 per word, per insertion, pre-paid Minimum charge is \$35 per insertion. Initials and abbreviations count as full words. Indicate free category heading (For Sale, Business Opportunities, Miscellaneous, Wanted). Blind ads (replies sent to ES&T for forwarding) are \$40 additional. No agency discounts are allowed for classified advertising by the word. Contact Kirstie Wickham at 516-681-2922 to place your classified ad (by-the-word). Mastercard, VISA, American Express and Discover are accepted for FAX or mail orders.

Per column Inch (classified Display): \$235 per column inch, per insertion, with frequency discounts available, 1" minimum, billed at 1/4" increments after that 10" maximum per ad. Blind ads are \$40 addition. Reader Service Number \$25 additional to cover processing and handling costs. (Free to 4-inch or larger ads.) For more information regarding classified display advertising please call 516-681-2922. Optional color (determined by magazine) \$150 additional per insertion.

Send your order, materials and payments to:

Electronic Servicing & Technology, 76 N. Broadway, Hicksville, N.Y. 11801 Attn: Classified Department
Phone: 516-681-2922 FAX: 516-681-2926

FOR SALE

TEST EQUIPMENT FOR SALE: Quality reconditioned Tektronix, HP, Boonton, Fluke, Wavetek, etc. Call **AST Global Marketing**, 11365 Airport Road, Meadville, PA 16335. Ph 814-336-2138. Fax 814-337-7920. E-mail astmrktg@wrench.toolcity.net.

CRT ADAPTER KIT - Hooks your CRT tester to ALL picture tubes. Win the "socket war". Obsolete proof! \$59.00. **DANDY** 2323 Gibson, Muskogee, OK 74403. 918-682-4286.

IN-CIRCUIT CAPACITOR ESR CHECKER - Find bad caps FAST and RELIABLY with the new Capacitor Wizard in-circuit ESR Tester! Great for monitors, switching power supplies, TVs, etc. Only \$179.95. **MC/VISA Independence Electronics Inc., 800-833-1094.**

Computer monitor service information. Windows Tech-Tips service program. Over 700 monitor schematics, ESR in-circuit capacitor tester. Visa, MC, Amex. **MI Technologies Inc., 513-335-4560, Fax 513-339-6344.** E-mail: mit335@bright.net, Web: http://www.bright.net/~mit335.

Large collection of antique 1940's radios. Must sell, moving. \$600.00 or best offer takes all. **Call, John 703-536-4442.**

Sams Photofacts: Consecutive from 1800-2830, over 1,000 folders all for \$1900.00. **Factory Service manuals,** TV, VCR & Camcorder for years 1985-92 + more, 10 different brands, \$900.00 for all. Shipping extra. **Call Mark, 908-685-4180.**

Sencore model CR70 CRT rejuvenator, beam builder 2 years old. Contact **Gary Smith at 801-973-9779,** 9:00 AM to 5:00 PM Monday through Friday mountain time or 801-966-7296.

Sencore VA62, VC63, PR57. B&K video pattern generator, oscilloscope 60MHz. TV/VCR service manual. **Call 609-641-2818.**

TV CASE HISTORIES: Booklet with 2,825+ histories. Satisfaction assured. Only \$56 (plus \$3.00 for priority mail). **Mike's Repair Service,** P.O. Box 217, Aberdeen Proving Ground, MD 21005. Same mailing address 33 years. Send SASE for samples. 410-272-4984, 1-800-2-FIX TVS 11am-9pm.

SENCORE, TEKTRONICS, HEWLETT PACKARD (all models). We **BUY, SELL, & TRADE**. Please call "CHOICE ELECTRONICS" for all of your test equipment needs. Complete financing options available. Call 1-800-609-0677, ask for Lance Tople.

TEST EQUIPMENT BOUGHT & SOLD: OSCILLOSCOPES, ETC. 510-706-0177. FAX: 510-706-0156.

FOR SALE

SERVICE DATA & HARD TO FIND PARTS previously-owned SAMs, manufacturers data, books, **FREE catalog.** **AG Tannenbaum,** Box 386, Ambler, PA 19002, 215- 540-8055, fax 215- 540-8327.

FURTHER PRICE REDUCTION. Diehl Mark III \$49, Diehl Mark V Horizontal circuit tester \$169. New. Conductive coating for remote control keypads \$9.99 ppd. **WEEC,** 2411 Nob Hill Road, Madison, WI 53713. 608-238-4629, 608-273-8585.

***** FREE DEMO *** TECHNICAL REPAIRS *** THOUSANDS & THOUSANDS of VALUABLE REPAIRS** for TVs, VCRs, Projection TVs, Camcorders, CD Players, Audio & other electronics organized in an EASY to use Computer Program - **The TECHNICAL TIP REPAIR Program. PROFESSIONAL BOARD LEVEL & COMPONENT LEVEL REPAIRS.** ADD your own tips. **PRINT tips. BACKUP & save your own tips.** Have your own tips? Ask about our **TIP EXCHANGE** policy with ****FREE Updates****. Works on IBM compatible computers with a hard drive (Also on some Apple Macintosh). **ONLY \$150.00 **FREE SHIPPING**.** **NEW VERSION works in DOS, WINDOWS 3.1 & WINDOWS 95. ***FREE DEMO***. HIGHER INTELLIGENCE SOFTWARE. 60 FARMINGTON LANE, MELVILLE, NY 11747. *****CALL 1-800-215-5081/1-516-643-7740 *******

NAP Tuner 340309 RCA Tuner TCHRIA or TCCRIA. Snowy picture? Will repair for \$25.00, Free Shipping. **Tip Top TV & VCR,** 18441 Sherman Way, Reseda, CA 91335, 818-345-1974.

*******FREE ZENITH REPAIR TIPS*******
SAVE \$\$\$ Repair Zenith TV modules found in over 1,000 models, 1983-1995. Symcure manual shows you how. \$89.95 or send SASE for **FREE** samples. **TVPRO,** 807 Queen Palm Lane, Sarasota, FL 34243.

•••21,034 SERVICE TIPS!•••THE MOST PREFERRED CONSUMER ELECTRONICS COMPUTERIZED TECHNICAL TIPS DATABASE IN USE TODAY covering over 117 Manufacturer/Brands all in one easy to use program. Look for our display ad on **PAGE 14.** **ELECTRONIC SOFTWARE DEVELOPERS INC 1-800-621-8477.**

WANTED

WANTED: USED TEST EQUIPMENT. **AST Global Marketing.** Ph 814-336-2138. Fax 814-337-7920. E-mail astmrktg@wrench.toolcity.net.

READERS' EXCHANGE

Readers' Exchange is a free service.

The following restrictions apply to Readers' Exchange:

• Only individual readers may use Readers' Exchange, and items must be restricted to those that are ordinarily associated with consumer electronics as a business or hobby. If you're in business to sell the item(s) you want to offer for sale, the appropriate place for your message is in a paid advertisement, not Readers' Exchange.

- Readers' Exchange items must be restricted to no more than three items each for wanted and for sale.
- All submissions must be typed or printed clearly!

Send your Readers' Exchange submissions to:

Readers' Exchange, Electronic Servicing & Technology

76 N. Broadway, Hicksville, NY 11801 Phone: 516-681-2922 FAX: 516-681-2922

FOR SALE

Sencore VA62A universal video analyzer, PRVC63, PR57, B&K oscilloscopes model 2160, B&K pattern generator, TV, VCR service manuals and parts. *Contact: 609-641-2818 or 609-383-5134.*

Full line of Sencore equipment 40% off. Equipment purchased 6/94 like new in boxes with manuals and cables. Loan assumable. *Contact: David Escobar, 4174 Tonga Drive, Sarasota, FL 34231, 941-377-8900.*

Radios, test equipment, tubes, literature, Sams Photofacts. Send large SASE with \$.84 for list. *Contact: Paul Williams, 2364 Beaver Valley Pike, New Providence, PA 17560-9622, 717-786-3803.*

Tentel VCR instruments. Complete set with all gauges, torque meters, video head wear gauge, etc. \$600.00. Sencore VA48A, complete with all cables and manuals, in box, \$250.00. *Contact: George, 805-948-4144, 4445 13th Street East, Lancaster, CA 93535.*

Hitachi model V-212 oscilloscope, with two probes and owner's manual. \$175.00 includes shipping. *Contact: Don Hicke, 4131 Mt Everest Blvd., San Diego, CA 92111, 619-569-4908.*

RCA service data books, 1967 to 1978. Tube caddy full of RCA modules. *Contact: Ann Bichanich, 15 1/2 W Lake Street, Chisholm, MN 55719, 218-254-4421.*

Fluke ac current clamp, model 80i-400 (400 amps). Never used. List \$83.00, sell for \$50.00 including shipping. *Contact: Warren Shukis, 1479 Prince Edward Way, Sunnyvale, CA 94087, 408-739-2709.*

Sencore VC93 VCR analyzer, like new, barely used. All cables and manuals, in original box, \$1300.00. Circuit Maker Program, brand new, never used, still in package, \$249.00. *Contact: Gary 508-442-5118, 7AM-2PM.*

Sencore VC63, \$1200.00, with manuals, cables. In original box. B&K portable color bar generator, model 1211B, \$150.00. *Contact: George, 805-948-4144.*

WANTED

Zenith module 9-535-08 or 9-535-12R SYS III - working with ICs included. *Contact: George Schierer, 2125 N.E. 63 Court, Ft. Lauderdale, FL 33308, 954-771-0406.*

VHF channel selector knob (p/n 7K-939) for Sharp model C-1321 color table model TV (alternate, UHF channel; selector knob, p/n 7K-937). *Contact: Warren Shukis, 1479 Prince Edward Way, Sunnyvale, CA 94087, 408-739-2709.*

JVC VCR model HR-D150U, need schematic. No longer available from JVC or any supplier. Will pay for copy and postage or will copy and return. *Contact: Bill Risko, BRS Electronics, 1329 Twining Road, Dresher, PA 19025, 215-659-2349.*

CRT green 180ACB22 (G) for RCA big screen model PJR500SR. *Contact: Joe, 219-931-5652, leave message.*

Sony model KV-2782R, GB module power supply. *Contact: Arnold C. Fantauzzi, Rolling Drive Road #2, Belle Vernon, PA 15012, 412-929-9070.*

Western Electronic audio equipment 1930's-1960's, amplifiers, speakers, and vacuum tubes. *Contact: Sumner McDaniel, 800-251-5454.*

10 CD holder clip for Sony CD player/changer CDP-C10. *Contact: Rich Balder, PO Box 33, Onamia, MN 56359, 320-532-3469.*

Cannon model 161, antique calculator schematic and/or operating manual. Late 60's, early 70's. Willing to pay big bucks. *Contact: Donald Dupre, 401-737-7118 or 401-886-3910.*

JVC receiver model R-S33 and Fisher amplifier model CA262, in desperate need for service manuals. *Contact: Todd McLaughlin, 16189 Snyder Road, S. Russell, OH 44023, Phone/Fax 216-338-3429.*

Tubes, tube tester Hickok or Precise 111M. Sencore test equipment, LC102, PR570, CRT70, etc. *Contact: 612-869-4963.*

Operating instructions for Heath trainer ET3400. *Contact: S. Goldhor, 2147 Trombas, San Leandro, CA 94577.*

Test Your Electronics Knowledge

Answers to test

(from page 17)

1. ferrite bead
2. resistor
3. capacitor
4. op amp
5. transducer
6. inductor
7. transformer
8. optical coupler
9. oscillator
10. Faraday shield
11. UJT

READER SERVICE CARD



Use Your Free Reader Service Card For More Information On Companies Advertising In This Issue

Improved Foreign Distribution—

All foreign *Electronic Servicing & Technology* subscribers are now receiving their copies via a new Air Post system. Copies are picked up, polybagged (in environmentally friendly wrap) and air freighted to various international distribution points. This new system does cost a bit more, but the expedited delivery is well worth it.

In most cases international delivery will be only one week later than domestic USA. We hope you'll enjoy this new expedited service. Let us know how it's working—send your comments to CQ Communications, Inc., 76 North Broadway, Hicksville, NY 11801, Attention Melissa.



Sperry Tech's Pricing Guide
 Updated new 6th edition, a framework for setting rates that apply to Hi-Tech products, a formula that guarantees SUCCESS!
 Call Toll Free for details 1-800-228-4338

Circle (80) on Reply Card

TUBES • TUBES • TUBES
World's Largest Range
 Over 2,000 Types, Domestic & Foreign

 **UP TO 85% OFF** Ask for price list


International Components Corporation
 Toll Free 800-645-9154 • N.Y. State 516-293-1500
 107 Maxess Road, Melville, New York 11747

Circle (72) on Reply Card

The Ultimate WWW Service Site
www.electronix.com
The One-Stop Service Site for Electronic Technicians
 Electronix Corp 313 W Main St Fairborn, OH 45324
 (513) 878-1828 Fax (513) 878-1972 sales@electronix.com

Circle (68) on Reply Card



MOVING?

If you're planning a move in the near future, don't risk missing an issue of Electronic Servicing & Technology. Please give us 6-8 weeks notice if you're planning on changing your address. Just write your new address and mail it, WITH YOUR SUBSCRIPTION MAILING LABEL, to:

Electronic Servicing & Technology
 76 North Broadway, Hicksville, NY 11801

PTS Electronics
 Visit Our Web Site At
www.ptscorp.com

Circle (84) on Reply Card

National Computer Association, Inc.
 The National Computer Association brings together computer professionals to promote matters of importance to you. We want to make the computer industry a better place for our members to work, while increasing the confidence of the public that buys from them.

Please See Our Ad on Page 17 or Visit Our Website at www.nca-net.com
1-800-615-6224

ADVERTISERS' INDEX

Company	Page Number	Reader Service Number	Advertiser Hotline
AnaTek Corporation	16	61	800/999-0304
CAIG Laboratories	73,75	62	800/CAIG-123
Computer & Monitor Maintenance	13	63	800/466-4411
Dalbani Corporation	53	53	800/325-2264
Electronics Technicians Asso.	70	65	317/653-4301
Electronic Design Specialists	33	66	561/487-6103
Electronic Software Developers	14	7	800/621-8477
Electronix Corporation	80	68	513/878-1828
GEnie Radio & Elec. RoundTable	73	89	800/638-8369
Herman Electronics	73	69	800/938-4376
Higher Intelligence	71	70	800/215-5081
ICM Components	15	71	800/748-6232
ISCET	14		817/921-9101
International Components Corp.	80	72	800/645-9154
LG Precision	9	73	562/404-0101
LJ Enterprises	69	74	800/627-8755
MicroData	3	116	813/573-5900
NCA/National Computer Assn.	17,80	76	800/615-6224
PTS Electronics	80	84	800/844-7871
Parts Express	16	77	800/338-0531
Philips Software Development	IFC	117	423/475-0480
Philips Consumer Electronics	IBC	118	800/851-8885
RNJ Electronics	17	8	800/645-5833
Sams & Company, Howard	5	119	800/428-7267
Sencore	BC	1	800/SENCORE
Sperry Tech	80	80	800/228-4338
Telematic	33	81	718/271-5200
Tentel	11	82	800/538-6894
Test Equipment Depot	52	52	800/99-METER
Thomson Consumer Electronics	6,7	113	800/336-1900

We'd like to see your company listed here too. Call Diane Klusner at 516/681-2922 or E-Mail her at dianekest@aol.com to work out an advertising program tailored to suit your needs.



SALES OFFICE
PHONE (516) 681-2922
FAX (516) 681-2926

**Smart
Accessories**
The Intelligent Choice

**What Separates Us
From The Animals
Is Our Ability
To Accessorize.**



MAC5784

Give your customers Philips Smart Accessories, and they'll go ape. With a complete line of accessories, customers get the "extras" they want, while you make the sales you want.

When you want to raise your bottom line, think smart and buy smart. Buy Philips Smart Accessories—your one-stop shopping for parts, accessories, and service aids.



We sell more than just products; we provide the accessories that make life a little more human. Call us to I-free at: **1-800-851-6885.**

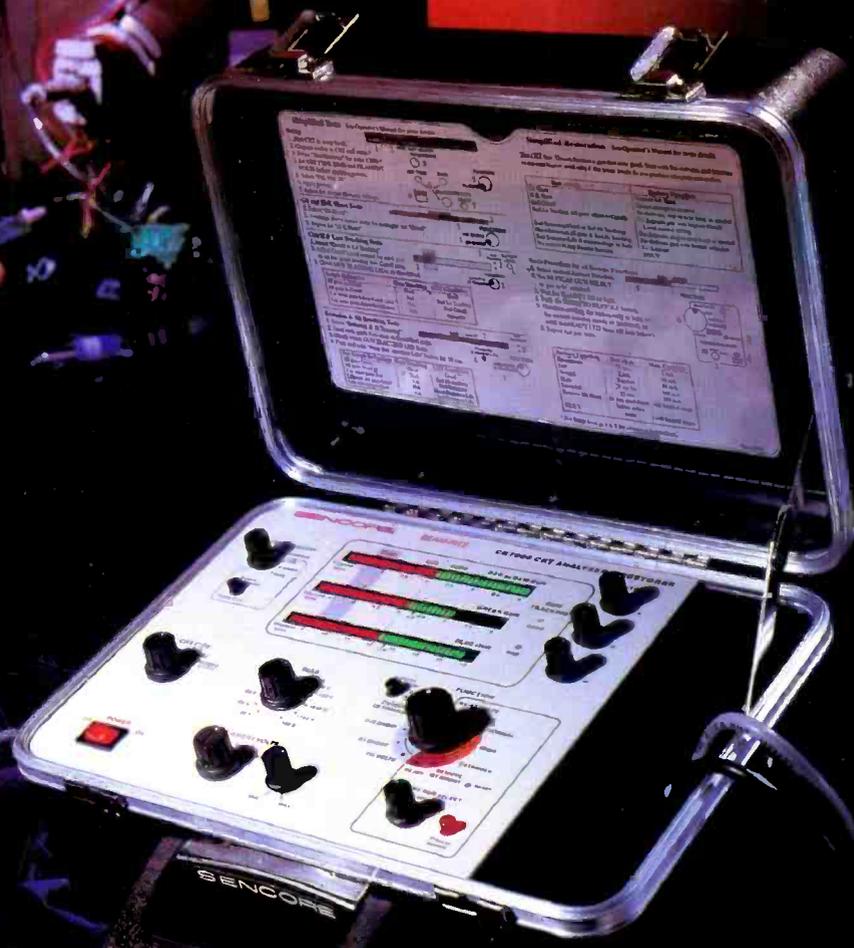
Let's make things better.



PHILIPS
Circle (113) on Reply Card

Introducing A **New** Way To Test & Restore CRTs!

Easily Test And Restore
CRTs With The Most
Complete Tests
Available For Added
Profit And Security!



New! CR7000 "BEAM-RITE"TM CRT Analyzer & Restorer



We've taken the experience of over 33 years of designing CRT analyzers and summed it up into our new CR7000 "BEAM-RITE."TM

The new "BEAM-RITE"TM is the only analyzer to provide a simultaneous display of all guns tested with new testing parameters that closely duplicate normal operation of the CRT.

- Tests for all CRTs, including: computer monitors, video displays, televisions, projection TVs, scopes, and special application CRTs
- The easiest to use CRT tester on the market
- The most accurate and thorough tests of any CRT tester
- The safest and most effective restoration techniques available
- Newly designed sockets allow easy connection to hard-to-reach CRTs

*Try A Head-to-Head Comparison To Your Current CRT Tester.
We Guarantee The NEW CR7000 "BEAM-RITE"TM Will Outperform It!*

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

Call 1-800-SENCORE (736-2673) For Your FREE 10 Day Trial Of The CR7000 "BEAM-RITE"TM

Circle (1) on Reply Card