

THE PROFESSIONAL MAGAZINE FOR ELECTRONICS AND COMPUTER SERVICING

ELECTRONICTM

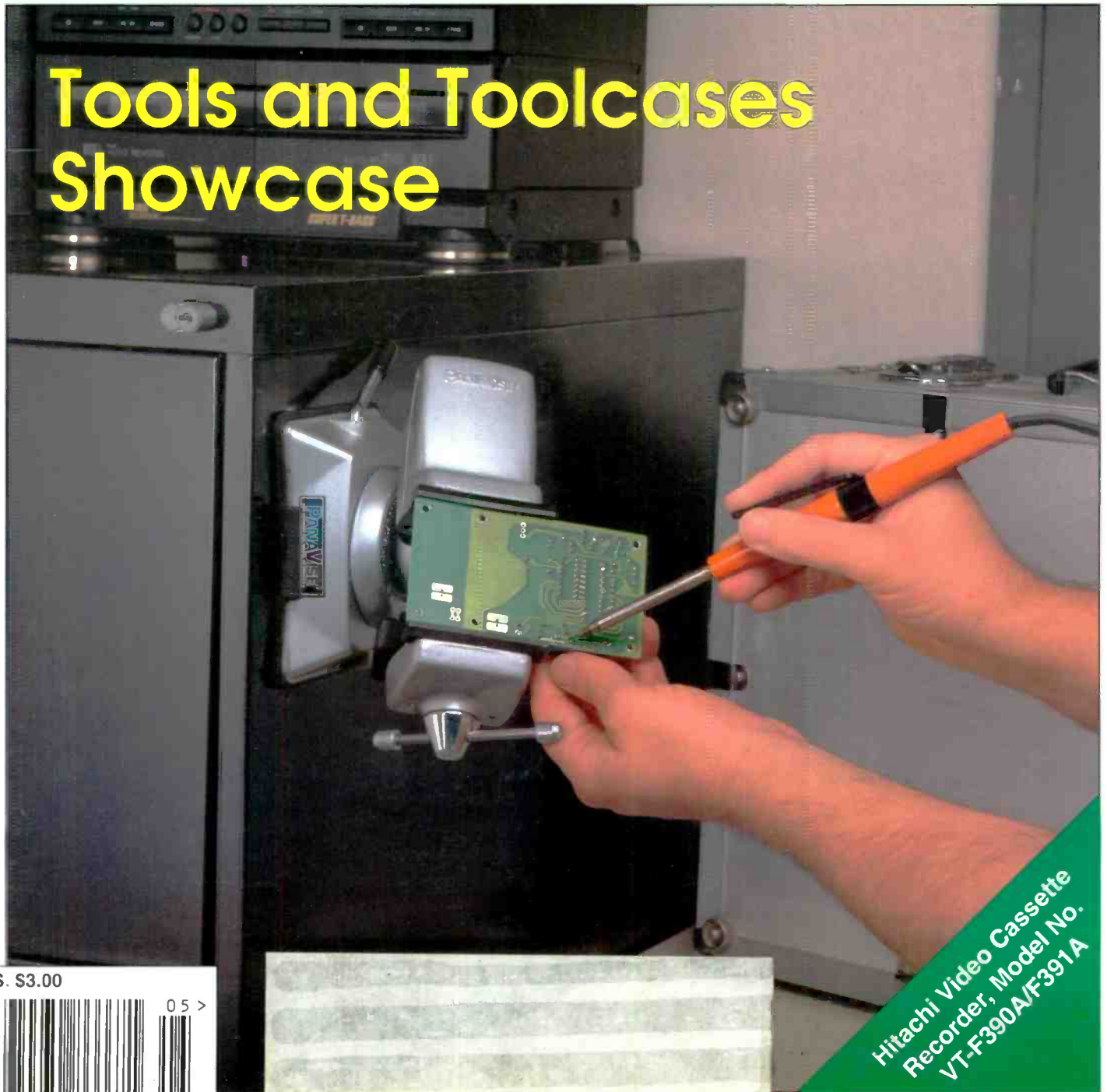
Servicing & Technology

May 1997

Camcorder servicing

Troubleshooting tips on the web

Tools and Toolcases Showcase



Hitachi Video Cassette Recorder, Model No. VT-F390A/F391A

U.S. \$3.00



Unexplainable

Force



Schematic Over LOAD



the future of electronics servicing

Finish the job faster—and make sense of all those hard-to-read schematics—with FORCE. It's the easy-to-use, innovative computer system that gives you instant access to the schematic you're looking for, and lets you zoom in and out to make it easy to read. Plus, FORCE displays current parts information, troubleshooting tips and simplified training drawings at the click of a button. Which makes it easy to explain how you're getting so much done so quickly.

For complete information call **(423)475-0393** today.
401 E. Old Andrew Johnson Highway, P.O. Box 555, Jefferson City, TN 37760

Let's make things better.



PHILIPS

Circle (117) on Reply Card

ELECTRONIC

Servicing & Technology

Volume 17, No. 5 May 1997

Contents

FEATURES

12 Servicing television directly coupled circuits

By Homer Davidson

Direct coupling results in some unique problems. Solutions to these problems are discussed in detail in this article.

16 Camcorderservicing: Understanding chroma and burst preemphasis and deemphasis

By The ES&T Staff

This article describes the operation of chroma and burst preemphasis and deemphasis in camcorders.

18 Troubleshooting tips on the web

By Victor Meeldjick

This article presents the URLs for several websites where you can find some helpful consumer electronics troubleshooting tips.

24 Is it hardware or is it software

By John Kull

When it comes to computers, a problem may be either hardware or software related. This article helps you determine which is which.

50 Correcting a tape backup problem

By Sheldon Fingerman

Repairing a tape backup system is not only simple, it is also profitable.

52 Space command

By John Hanson

This article covers the history of remote controls and describes how to repair them.

DEPARTMENTS

4 Editorial

8 News

10 Literature

11 Calendar of Events

23 Test Your Electronics Knowledge
Numbers and math and stuff.

29 Profax

48 Books

49 Photofact

54 What Do You Know About Electronics?
Conversions.

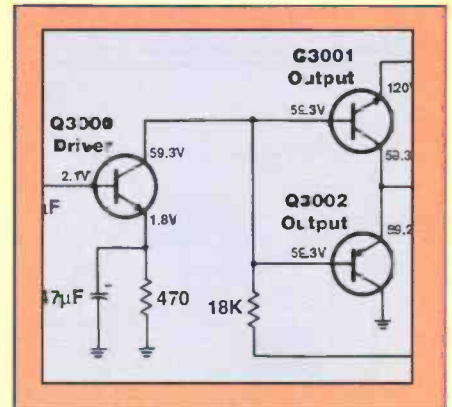
62 Classified/Reader's Exchange

64 Advertisers' Index

ADVERTISING SUPPLEMENT

39 Tools and Toolcases Showcase

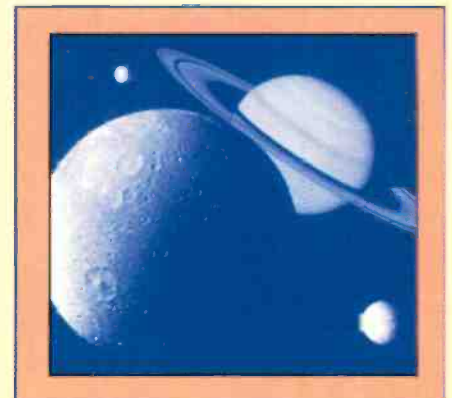
In order to perform their job, a technician must begin by getting the right tools and the right toolcases to carry them in. This showcase gives our readers the chance to see from the advertisers what the latest tools and toolcases are on the market.



page 12



page 39



page 52

ON THE COVER

Every profession, skill, or trade requires its own special tools. The best place to buy those tools is from a company that understands the special needs of the professionals to whom they sell, and who stock the tools they need. This Tools and Toolcases Showcase provides readers with some information on the capabilities of providers of tools to electronics technicians. (Photo courtesy Panavise)

WANTED

Your Universal Replacement Part Business

THE SK SERIES GANG



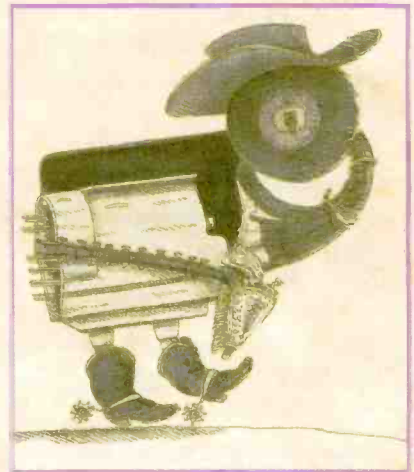
"CURLEY"

Video Head



"TEX"

Laser Pickup



"SLIM"

Flyback Transformer

\$250
per unit
REWARD

All you have to do is purchase any SK Series video head, laser pickup, or flyback between April 1 and June 30, 1997, fill out a redemption form and send it 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.

See Your Participating Authorized
Thomson Consumer Electronics
Distributor For Details.

Circle (113) on Reply Card

SK
Series

Visit Your Local Participating Thomson Consumer Electronics Distributors For More Information

Arizona

Arizona Wholesale Supply Co Phoenix

California

Jack C Arbuckle Co Bakersfield
Jack C Arbuckle Co Fresno
Martin Distributing Co Huntington Pk
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

Iowa

Ness Electronics, Inc Des Moines

Kansas

G M Popkey Co Lenexa

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 Inc Fall River
Nash Electronic Supply Inc Leominster
Tee-Vee Supply Company Inc Mecford
Electronic Distributors Corp North Quincy
Signal Electronic Center Inc Springfield

Maryland

Tritronics Inc Abingdon
Mark Electronics Inc Beltsville

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

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
Clearfield Electronic Supp Co Hyde
Cumberland Electronics Inc Lancaster
H B F Electronics Inc Philadelphia
Jem Electronic Distributors Inc Philadelphia
CRS Electronics Pittsburgh
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

Tennessee

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

Texas

Nunn Electric Supply Corp Amarillo
Electrolex Inc Austin Austin
Electrolex Inc Beaumont Beaumont
Electrolex Inc Corpus Christi Corpus Christi
Electrolex Inc Dallas Dallas
Interstate Electric Co Dallas
Electrolex Inc Richmond Houston
Nunn Electric Supply Corp Lubbock
Fox International Ltd Inc Richardson
Electrolex Inc 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 Pcpkey Co Green Bay
G M Pcpkey Co New Berlin
G M Pcpkey Co Wausau
Ness Electronics Inc Milwaukee



Creativity in servicing

If asked if they were creative, most consumer electronics servicing technicians and service managers would probably respond with a negative answer. They simply manage a service business, or service consumer electronics products. Nothing creative there, right?

Well, maybe. But on the other hand, they just might be very creative. And just possibly, if they recognized their creativity, they might possibly become even more creative and improve their service techniques, or make their business even more efficient and profitable.

For example, operating a business can be a very creative pursuit. In these difficult times, of people throwing away a VCR because they can buy a new one for under \$200, of increasingly complex consumer electronics products, or extreme competition for the services of electronics technicians from the local high-tech manufacturers, most managers of consumer electronics businesses have to be creative just to stay in business.

And creativity applies to the servicing technicians, as well. In fact, the pages of this magazine often reflect the creativity of the technicians who write articles for it. As an example, an article that was published a few years ago described how one technician had devised a way to use simple-to-construct transformers to solve the problem of short circuits between the heater and the cathode of a CRT, thus saving many picture tubes that would otherwise have been thrown away.

Another creative solution presented in this magazine described construction of a device using an infrared detector and assorted other components to easily test the infrared remote control transmitters used in TVs, VCRs and audio equipment.

Troubleshooting is creative too

The mere act of troubleshooting is a creative act. The technician has data in the form of manufacturers' literature and his own knowledge of electronics theory.

When he encounters a problem in a given product, the technician compares the symptoms with what information he has available and, based on that, arrives at a tentative determination of what the problem might be. Then he tests his theory and sees if that solves the problem. If it does, he has completed the troubleshooting process. If not, he considers the problem again, and again comes up with a theory as to what the problem might be. He continues along in that vein until the corrective action he applies eliminates the problem. This entire process may be considered to be a very creative one.

Another example of creativity on the part of some technicians is evident in some of the diagnostic procedures and aids that some technicians have devised. For example, you have all heard of, and probably used the 100W lightbulb trick. When the problem in a TV set is such that the line fuse blows instantly, insertion of a lightbulb in the power line limits the current into the set, and the brightness of the bulb provides an indication of the amount of current drawn. Whoever came up with that idea was creative indeed.

And another technician came up with the idea of isolating a circuit and using an outside power supply and a signal generator to substitute for a signal input that would ordinarily come from another circuit. Thus isolated, if the circuit provided a normal output, the technician knew that something in the set other than this circuit was the cause of the problem. If the isolated circuit did not operate properly, it was the cause of the problem.

Becoming more creative

If creativity is an important ingredient in running a servicing business, and servicing technicians and managers recognize that it is, they would be able to use certain techniques to increase their productivity. One technique that has been described by an expert on the subject, Edward de Bono, is called "lateral thinking."

De Bono has authored several books on the subject of creativity, including "Lateral Thinking," and "Serious Creativity."

Rather than try to summarize the idea of lateral thinking, I will paraphrase it. At least part of the idea is to generate a number of alternate avenues to achieve a desired objective. Let's take the example of the light bulb trick. Several ways to attempt to capitalize on this idea would be to throw out a number of ideas/questions. For example:

- Are there other ways to limit the current and get an indication of current draw while troubleshooting a TV that keeps blowing fuses?
- Is there a different approach to this problem that might work even better?
- Can a technique similar to this be devised that would work for other difficult servicing problems?

It's important during the phase of creativity during which you're generating ideas not to evaluate them. For example, you might come up with a good idea, but decide that it wasn't safe, or it would be too expensive. If you immediately kill this idea for that reason, you put a damper on the whole process, and kill any other ideas that might have sprung from the idea you squelched.

What you should do instead is to just generate ideas without evaluating them in any way, then evaluate, cull and discard ideas in another part of the process.

Creativity works anywhere

Creativity can work in any phase of the business, from dealing with customers to generating more business, to servicing the product more efficiently. If nothing else, attempts at being creative will help you focus on your business, rethink what it is that your business is all about, and give you some fresh insights.

Nile Conrad Penner

You Shouldn't Have To Mortgage Your Business To Get The Tools Of The Trade!

The difference between success and failure is strictly determined by your bottom line. The service center that can best contain their costs while providing excellent service at affordable repair rates will survive these tough times and eventually succeed. Providing affordable and reasonable repair rates to your customers is ultimately determined by the costs of your operation. Leader Instruments Corporation has been providing the worldwide electronics production and service markets with high quality, high reliability instruments at affordable prices. Listed below you will find a small sample of our products — loaded with features at prices you can afford. Call 1 800 645-5104 (in NY State call 1 516 231-6900) for a copy of our full line catalog.

\$1,995

**MODEL 8104
100-MHZ 3-CHANNEL
CRT READOUT OSCILLOSCOPE**



Loaded with features, the Model 8104 boasts 100-MHz bandwidth with cursors and CRT readout of all critical waveform parameters for ease-of-use. 1 mV/div sensitivity, 3-channel operation, extensive video triggering and dual timebase are standard. All 3 channels can be monitored simultaneously along with their second timebase and the difference (CH1-CH2) can also be displayed — providing 8-trace display capabilities for extensive troubleshooting. The Model 8103, priced at \$1,760, includes all of the features of the 8104 except for CRT readout.

\$525

**LS 1020
20-MHZ 2-CHANNEL
OSCILLOSCOPE**



Developed specifically for the electronics production and service industries, the LS 1020 is equipped with features typically found only on higher bandwidth scopes. It is ideal for use on the audio bench, and can be used as a second scope for video troubleshooting as well. The unit is equipped with TV-V and TV-H coupling, has a 5 mV/div sensitivity (0.5 mV/div with X10 on), and includes both CHOP and ALT vertical mode functions. Rugged and reliable, the LS 1020 provides service professionals with an affordable choice without compromising features or quality.

\$395

**LTC-905
SEMICONDUCTOR
CURVE TRACER**



STOP REPLACING GOOD PARTS!

Use this handy semiconductor curve tracer with any oscilloscope (must be equipped with X-Y mode) and test transistors, triacs, UJTs, SCRs, FETs, MOSFETs, as well as zener, signal and rectifier diodes. The LTC-905 will measure (both in and out of circuit) gain (beta), cutoff, leakage and output admittance. Affordably priced and full featured, the LTC-905 is a "must have" for any serious repair center.

Starting at \$345

**700 SERIES
DIGITAL DISPLAY
POWER SUPPLIES**



A wide variety of power supplies are available from Leader. The 700 Series single output digital display power supplies can be operated in constant voltage or constant current modes. Digital readout of voltage and current is provided. Triple output power supplies are also available from Leader. For a detailed listing of our DC power supplies call 1 800 645-5104 (in NY State call 1 516 231-6900.)

LEADER
FOR PROFESSIONALS WHO KNOW
THE DIFFERENCE

1 800 645-5104 IN NY STATE
CALL 1 516 231-6900

Leader Instruments Corporation, 380 Oser Avenue, Hauppauge, New York 11788
Regional Offices: Chicago, Dallas, Los Angeles, Atlanta. In Canada call Omnitronix Ltd., 905 828-6221
Circle (111) For Product Information Circle (112) For Product Information & Demonstration

January video product sales advance in most categories; larger screen sizes continue to show strength

Beginning the new year on a positive note, January sales of video products posted gains virtually across the board, the Consumer Electronics Manufacturers Association (CEMA) reported today. Video cassette recorder (VCR) decks, camcorders and color TV/VCR combinations all registered unit sale increases in the 20-percent range, as compared with the same month a year ago.

Projection TV sales to dealers also continued to expand at a robust rate, rising 8 percent in January. And while sales of direct-view color TV receivers grew only fractionally last month, the larger screen sizes again enjoyed strong double-digit expansion. Sales of color television sets measuring 25 inches and above increased 13 percent, and sales of those 30 inches and larger jumped 26 percent.

William J. Sims, President of Zenith Sales Company, said, "Taken together, the solid industry growth numbers for large screen, direct-view receivers and projection TVs confirm our belief that consumers continue to embrace home theater, which has become a dominant force in today's video marketplace."

Coming off an all-time record year in 1996, during which some 14.6 million were sold, VCR deck sales last month totaled nearly 984,000 units, a 20.4 percent improvement over January a year ago. Color TV/VCR combinations reported healthy growth as well, rising 19.4 percent to more than 141,000 units, although within that category the results were mixed. Combination sets with TV screen sizes 20 inches and smaller surged 35 percent and accounted for 93 percent of sales, while those with larger screens tumbled 51 percent.

Camcorders, another record-setting category last year, enjoyed strong growth in January. More than 213,000 camcorders were shipped to dealers last month, up nearly 21 percent relative to January 1996's 177,000 units.

In the industry's flagship category, direct-view color television unit sales to U.S. dealers totaled nearly 1,174,000 last

month, a 0.6 percent improvement over January 1996. In addition to vigorous growth in the large and very large screen sizes, the 19- and 20-inch market showed welcome signs of stabilizing. Sales of these mid-sized receivers, which have been soft in recent months, increased a modest but significant one percent in January on volume of 393,000 units.

Dealer purchases of laserdisc players continued to decline, dropping 42 percent in January to some 7,600 units.

Small office/home office use to increase over the next few years, CEMA survey reveals

Many home office users plan to spend more time in their home offices in the next two to three years - according to a survey released today by the Arlington, Virginia-based Consumer Electronics Manufacturers Association (CEMA). Forty-five percent said they will spend "a lot" or "somewhat" more time in their home offices, while 41 percent indicated "the same amount of time".

"As exciting new computing and communication technologies open the doors to a full range of business opportunities at home, and online banking and shopping proliferate, we see home offices continuing to find their way into more and more American households," said Gary Shapiro, CEMA president. "The Internet,

(Continued on page 61)

CORRECTION

April's Distributor Showcase contained the wrong telephone number for Thomson Consumer Electronics.

For more information on Thomson OEM parts and SK Series Universal parts please call 1-800-336-1900

ELECTRONIC

Servicing & Technology

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

EDITORIAL

Nils Conrad Persson, *Editor*
(Internet e-mail: cpersedit@aol.com)
Kirstie A. Wickham, *Associate Editor*
(Internet e-mail: kirstieest@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 Kehrwieler, *Production Manager*
Emily Kreutz, *Assistant Production Manager*
Pat Le Blanc, *Phototypographer*

BUSINESS

Richard A. Ross, *Publisher*
Diane G. Klusner, *Associate Publisher*
(Internet e-mail: dianekest@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.

it's Sunday 3 a.m.

the presentation is in 5 hours...

system's been crashing for 6 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

Spring 1997 catalog test equipment, tools, and supplies

This 56-page catalog supplement from Contact East features test instruments and tools for engineers, managers, technicians, and hobbyists, for testing, repairing, and assembling electronic equipment. Product highlights include DMMs and accessories, soldering tools, custom tool kits, EPROM programmers, power supplies, "create your own" tool kits, ELF meters, milliammeters, megohmmeters, wavemeters, breadboards and reference books. Also included are communication test equipment, scopemeters, datacom tools and testers, adhesives, measuring tools, precision hand tools, portable and bench top digital storage scopes, solder-

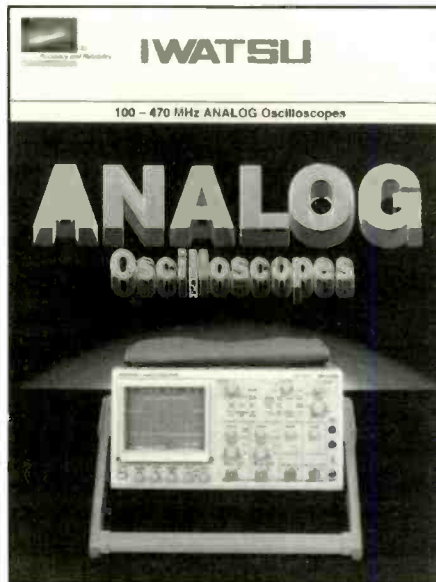


ing/desoldering systems, static protection, ozone-safe cleaners, magnifiers, inspection equipment, tool bags, workbenches, cases and more.

Circle (37) on Reply Card

Oscilloscope catalog

A new multi-colored, 16-page catalog from Iwatsu incorporates detailed call-outs of key features to clearly delineate the operating potential of the company's oscilloscopes. The units include the Model 7840H, 470MHz, 4-CH, 10 trace scope; the Model 7840, 400MHz, 4-CH, 10 trace scope; the Model 7821, 200MHz, 3-CH, 8 trace scope; and the Model 7811, 100MHz, 3-CH, 8 trace instrument. Key characteristics include: TV triggering,



frequency counter operations, cursor measurements, high-speed automatic setup, unique box lens CRT, DC offset function, TV pedestal clamping, input event triggering, multi-function control, and FET probe power and probe offset.

The publication utilizes actual CRT signal pattern readouts to illustrate applications ranging from: video head frequency modulation signal observation; "eye-pattern" observations used in the development and manufacture of optical discs and telecom ATM switches; wide bandwidth noise on magneto-optical discs; and observation of radar burst.

Circle (38) on Reply Card

Torx tool catalog

Wiha Tools has published a new, four-color catalog featuring their extensive line of Torx tools. This 12 page catalog details the company complete line of over 250 Torx tools in 23 different styles all designed for Torx fasteners. These tools are ergonomically designed and manufactured of hardened CVM tool steel.

Sizes of these tools range from T5 to T60. Also available are screwdrivers and bits for tamper resistant Torx.

Circle (39) on Reply Card

Supplemental catalog

The latest 72-page, full-color Jensen supplemental catalog is now available. It joins the company's comprehensive master catalog in listing tool kits and cases.



Among the new items featured are several economy tool kits available for a number of industrial applications, including: service and repair of electronic and electrical equipment; telecom installation; PC service, repair and upgrades; standard field service; and for general purpose equipment work. A wide range of test instruments is also offered.

Circle (40) on Reply Card

Repair capabilities manual

Galco Industrial Electronics has released a new Repair Capabilities Manual, a detailed listing of over 34,000 different products from more than 2,000 manufacturers of circuit boards and electronic controls that can be repaired or retrofitted by the company. A list repair price is given, as well as detailed listings of instrument calibration capabilities that are traceable to NIST standards, and a listing of available remanufactured controls that are kept on hand to assist customers in getting out of a "down" situation quickly.

Repair capabilities featured in the manual include ac and dc variable speed drives, counters and timers, CNC controls, encoder devices, power supplies, printed circuit boards, programmable logic controllers, servo and spindle drive systems, temperature controllers, test equipment and video display monitors.

Circle (41) on Reply Card

ES&T Calendar

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

VPEA (VA) Annual State Convention/
Mid-Atlantic Assoc. Conference
June 6-8, 1997
Williamsburg, VA
804-874-8818

T-E-A (TX)/G-SPEC Convention
June 12-15, 1997
San Antonio, TX
512-476-3551

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

CEMA Manufacturer/Retailer Summit
June 25-27, 1997
Bermuda
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

Internationale Funkausstellung/
USA Pavillion
August 30-September 7, 1997
Berlin, Germany
540-372-1414

PSC 97 (Pers. Communications
Industry Association)
September 10-12, 1997
Dallas, TX
703-739-0300

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

ASEA (AZ) Annual State Convention
October 10-12, 1997
Casa Grande, AZ
602-937-3241
e-mail: Lunncet@aol.com

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

TeleCon XVII (ABC/Applied
Business teleCommunications)
November 5-7, 1997
510-606-5150

Easily Test And Restore CRTs!



CR7000 "BEAM-RITE"
CRT Analyzer & Restorer

Easily Test And
Restore CRTs With The
Most Complete Tests
Available For Added
Profit And Security!

The Easiest To Use CRT Tester On The Market - Guaranteed

- Simply connect one of the six supplied adapters to test virtually all new CRTs without adjusting setup switches
- All three guns of color CRTs are tested, and results displayed, simultaneously
- All gun tests are displayed with interpretation-free "Good/Bad" results

We'll prove it!

Compare the new CR7000
to your current CRT tester.
Call 1-800-SENCORE
for a free 10 day trial.

SENCORE

3200 Sencore Drive, Sioux Falls, SD 57107
Direct: (605)339-0100 Fax: (605)339-0317

Circle (75) on Reply Card

Servicing television directly coupled circuits

By Homer Davidson

Direct coupling is a method by which one circuit is connected to another to transfer the signal without benefit of a coupling capacitor or transformer. In early TV sets, transformer coupling was used in the tube circuits. Capacitors are used to couple circuits together while keeping dc voltages in one circuit from affecting the circuit to which it is coupled. Today, direct-coupling of circuits is found in transistor and IC circuits.

Direct circuit coupling is a different and economical method of connecting circuits together. Directly coupled circuits are found in the vertical, horizontal, luma, chroma, color output, power supply, and audio output circuits of the TV chassis. In directly coupled transistor circuits, dc voltages found on the collector terminal may be applied to the base terminal of the next transistor stage. Directly coupled circuits tend to be more difficult to service as a defective transistor might cause changes in voltages in the circuits to which it is coupled.

Directly coupled circuits

Many types of circuits transfer signals besides those that are directly coupled. Frequently capacitors are used to couple two stages together. Capacitor coupling transfers ac energy between two different circuits, while blocking any dc. For example, a capacitor may be used to couple two audio stages together so that the audio signal will be transferred, but dc voltages will be blocked.

Electrolytic capacitance coupling is found between the audio output IC and the speaker. Capacitor coupling is used in many stages of the audio, video, horizontal, vertical and CRT circuits.

Transformer coupling uses electromagnetic induction to transfer electrical energy from one circuit to another. In-

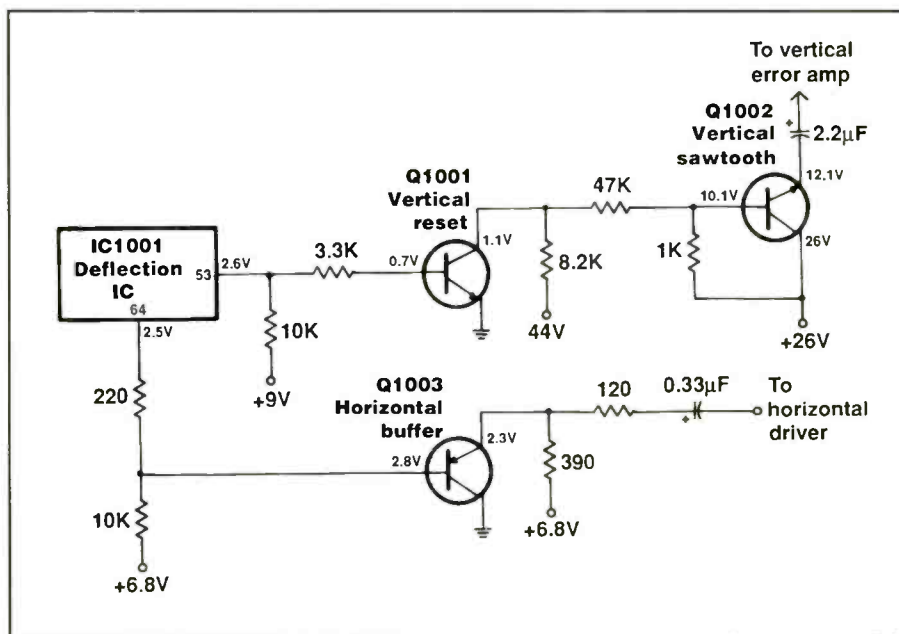


Figure 1. In this set, the horizontal and vertical deflection circuits are directly driven from terminals of the deflection IC.

terstage and output transformers were used in the early audio stages between the af or driver transistors and from the output transistor to the speaker to transfer the audio signal. Transformer coupling is found between the horizontal driver and horizontal output transistor in the horizontal circuits of the TV chassis.

Inductive coupling is sometimes used in radio and TV if transformer circuits. Transformer coupling is much more expensive than direct coupling of circuits. "Link coupling" uses a low impedance coil that couples RF circuits together. The impedance-coupled amplifier uses a coupling capacitor and single-wound transformer for output load coupling.

Horizontal and vertical directly coupled circuits

In early TV sets, transistors were used throughout the vertical circuits, and in some horizontal circuits as well. Today's deflection IC provides both vertical and horizontal drive signals. Two or three

transistors were found in the early vertical output circuits.

Present-day vertical circuits may consist of a vertical deflection IC with direct coupling between the vertical reset and sawtooth transistors (Figure 1). In this circuit, the vertical sawtooth waveform is coupled with a 2.2μF capacitor to the error amp and output circuits.

When either of the transistors in this directly-coupled circuit becomes open or develops leakage, voltages on both transistors will be affected. If Q1001 becomes leaky, higher voltages will appear on its base and emitter terminals. In most cases, a transistor that has developed leakage will have nearly the same voltage on all three terminals.

Notice the voltage measurements during normal operation of the vertical sawtooth transistor (Q1002). When leakage occurs between the collector and emitter terminals, higher voltages are found on all three elements of Q1002. The higher base voltage of Q1002 is applied through

Davidson is a TV servicing consultant for ES&T.

the 47 Ω resistor to the collector terminal of transistor Q1001.

When transistor Q1002 appears open, the voltage at the emitter terminal will be very low, possibly 0V, while the voltages at the collector and base terminals will be higher than normal. Again a higher collector voltage is found on Q1001.

A leaky vertical reset transistor, Q1001, will reduce the voltage on the collector terminal with the 8.2 Ω resistor operating quite warm. When Q1001 becomes open, higher dc voltage will be found on the collector terminal. Naturally, when either transistor becomes defective, the vertical sweep signal at the vertical output IC will be weak or totally absent, resulting in improper vertical sweep, or, in extreme cases, horizontal white line in the center of the screen.

Service the directly-coupled transistor vertical circuit

To quickly service the vertical directly coupled transistor circuits, observe the waveform at pin 53 and at the input terminal of the output IC. Scope each stage to locate the defective component. If the vertical deflection waveform is normal at pin 53 and not normal at the input terminal of the output IC, measure the voltages on each transistor.

Suspect a leaky transistor if the voltages are lower than specified and quite close to the same on all three elements. Check for an open transistor if the voltages on the base and collector terminals are higher than specified, and the voltage at the emitter terminal is very low. If there is any doubt, test each transistor out of the circuit.

In the circuit of Figure 2, the horizontal waveform on pin 64 of the deflection IC drives the horizontal buffer, driver and output transistors. The buffer base terminal is directly tied to pin 64 through a 220 Ω resistor. If Q1003 became shorted between collector and emitter, the 6.8V would be applied across the 390 Ω resistor. This voltage at the emitter terminal would be very low, which would cause a different voltage on the base terminal and at pin 64 of IC1001.

A quick forward bias voltage measurement between emitter and base will indicate a leaky transistor. If the voltage difference between these two elements is not 0.5V, suspect that Q1003 has developed

leakage. If Q1003 becomes open, the voltage at the emitter will be 6.8V.

In deflection circuits where the supply voltage (Vcc), for the deflection IC is derived from the flyback source, if the horizontal circuitry is defective, the flyback voltage source will be dead, thus there will be no supply source from the flyback circuits. In such a case, an external voltage must be supplied to the IC so that you can check the vertical and horizontal output waveforms with the scope. Horizontal and vertical drive circuits are more easily serviced when the supply voltage is supplied by the low voltage power supply circuit.

Direct coupled luma amp circuits

A black screen or insufficient brightness can result from the luma amp circuits (Figure 2). In this circuit, three different transistors are used as luma (brightness) amplifiers. Transistors Q1501 and Q1503 are directly coupled with a delay line and an 820 Ω resistor between the collector of Q1501 and the base terminal of Q1503. Transistor Q1504 is directly coupled from the base terminal to the collector of Q1501. Switch Q1502 is controlled by a logic signal from the system control IC (U3101).

If any of the luma transistors become shorted or develop leakage, the voltages will change on all of the transistors. Leakage between the collector and emitter of Q1504 will cause the emitter and base voltages to increase. If Q1504 opens internally, the voltage at the emitter terminal will be very low. Check the forward bias voltage between the emitter and base terminals to confirm whether or not the transistor is defective.

If luma amp Q1501 develops leakage, its collector and emitter voltages will increase. Moreover, the base voltage on Q1504 will slightly rise in voltage. If Q1501 opens between collector and emitter, the voltage at the emitter terminal will be very low and the collector voltage will be just about equal to the supply voltage (11.4V). Scope the luma circuits for correct waveforms. Check and test each transistor with the greatest change in voltage on all three terminals. Compare your findings to the schematic.

Directly coupled chroma circuits

Often, one or two transistors can be

Accurately Test All CRTs!



CR7000 "BEAM-RITE"
CRT Analyzer & Restorer

**Test All CRTs, Including:
Computer Monitors, Video
Displays, Televisions,
Projection TVs, Scopes, and
special application CRTs—**

- The CR7000 now has full dynamic range to test older CRTs and the new ones
- The most accurate and thorough tests of any tester
- Full bias ranges with a sliding "good/bad" scale
- Exclusive "Lo Level" and "High Level" emission tracking
- Detects all gun element shorts or leakage

We'll prove it!

**Compare the new CR7000
to your current CRT tester.
Call 1-800-SENCORE
for a free 10 day trial.**

SENCORE

3200 Sencore Drive Sioux Falls, SD 57107
D rest: (605)339-0100 Fax: (605)339-0317

Circle (76) on Reply Card

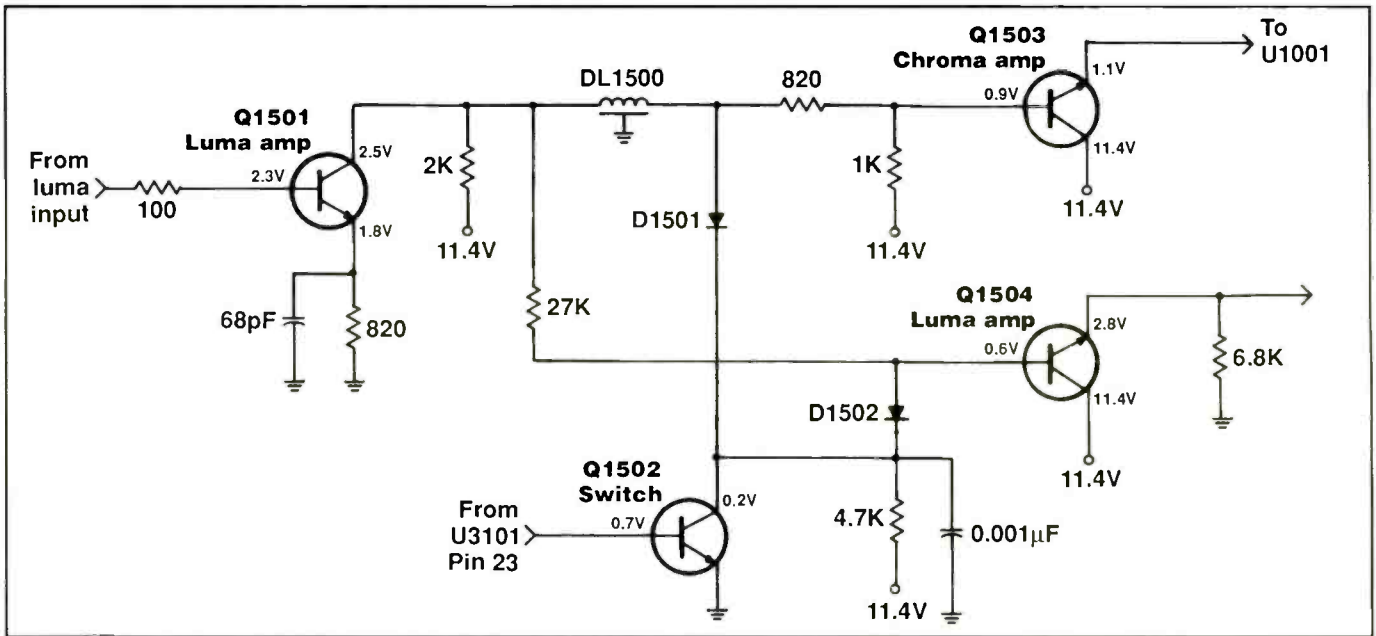


Figure 2. Directly-coupled transistor circuits may be used in the luma (brightness) circuits.

found in the chroma circuits of the present day TV chassis. In the circuit of Figure 3, chroma amps Q750 and Q751 operate in a directly coupled color circuit from the emitter of Q750 to the base of Q751. The 270Ω resistor connects the two chroma amps together. Both chroma transistors are connected in the emitter-follower configuration with the collector terminals tied to the supply source which has a voltage level of 11.2V.

Notice that Q750 has a forward bias of only 0.2V between base and emitter, while Q751 has a 0.7V bias voltage. If leakage occurs between the collector and emitter of Q750, the bias voltage on Q751 would increase. Furthermore, both base and emitter voltages on Q750 would increase and the voltages on all three elements would be very nearly equal. In most

cases, when a transistor develops a leakage or a short circuit, it occurs between collector and emitter terminals.

If Q751 develops leakage between its emitter and collector terminals, the voltage will rise on both emitter and base terminals. In such an event, the emitter voltage will be higher than the base voltage. Higher voltage will be applied across the 10Ω emitter resistor. In most cases, careful measurement of voltages on the transistor elements, measurement of the forward bias voltage, and in-circuit transistor checks can locate a defective transistor. If in doubt, replace both transistors.

CRT directly coupled circuits

The red, blue and green color drive transistor circuits connect to the respec-

tive cathodes in the picture tube and work in a directly driven circuit. The red drive transistor (Q560) in, drives the red color output transistor (Q561) with Q562 as the red bias transistor. The collector terminal of Q560 connects directly to the base terminal of output transistors Q561 and Q562. All three transistors operate at higher voltages than do most transistors in the TV chassis.

When the red color output transistor becomes leaky, higher dc voltage is found on the base and emitter terminals of both Q561 and Q562. The voltage at the collector terminal of the red bias transistor will also increase. Since the collector of Q560 is connected directly to the base terminal of Q561, the voltage on Q560 will increase (Figure 4). In such a case, you will find an increase in voltage on pin 8 of the picture tube.

Since the color output transistor may break down if its dc operating voltage becomes excessive, test Q561. Perform this test out of the circuit, as Q561 and Q562 base and emitter terminals are in parallel, which might produce an erroneous in-circuit reading. Test Q560 and Q562 with in-circuit tests while Q561 is out of the CRT board.

Do not overlook a leaky or open drive and bias transistor that may destroy the color output transistor. Overheated collector resistors may change in value with a shorted output transistor.

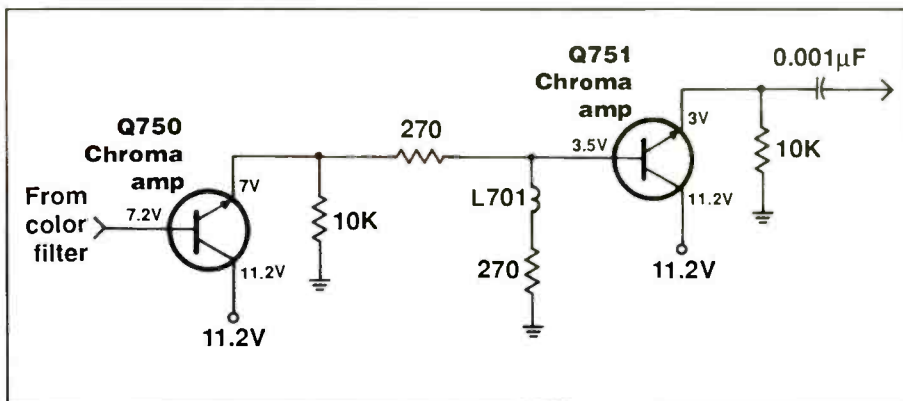


Figure 3. In many cases in today's TV sets, one or two directly coupled transistors are found in the chroma (color) circuits.

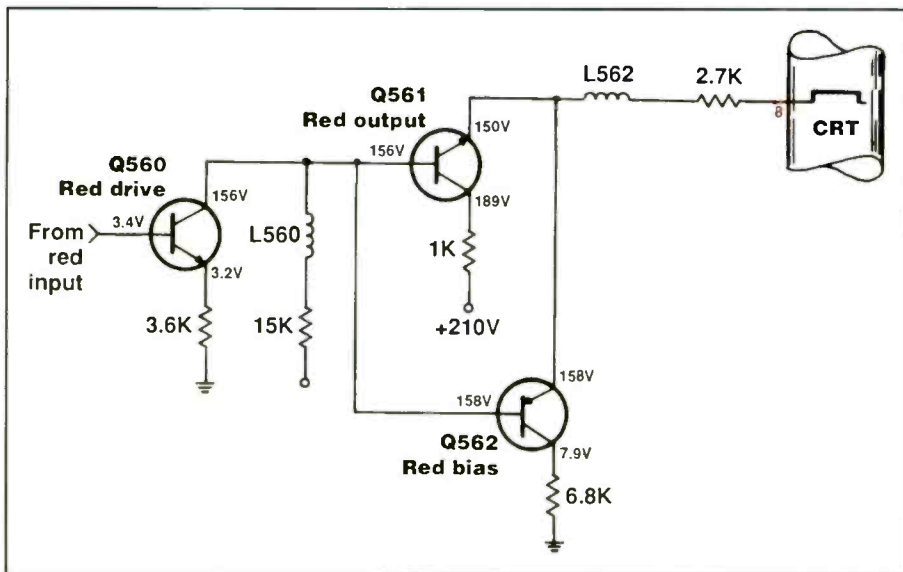


Figure 4. The color output transistors operate in directly coupled circuits.

Directly connected audio output circuits

Today in inexpensive television sets you may find directly coupled transistors in the vertical and audio output circuits. When one or more transistors in such a configuration become leaky or shorted, the sound will be weak and distorted. Distortion may be heard when one of the output transistors in a push-pull configuration opens up. It is best to replace both output transistors when one is found leaky or open. Sometimes one transistor is found open and the other is found leaky.

In the circuit of Figure 5, if audio output transistor Q3001 becomes leaky, the supply voltage may lower, and you may measure higher than normal voltages on the base and emitter terminals of Q3001. The emitter and bias voltages on Q3002 will rise. Since the collector terminal of

Q3000 is directly coupled to Q3001, voltages will rise on transistor Q3000. If Q3001 becomes open between emitter and collector, the voltage at the emitter terminals of Q3001 and Q3002 will be very low. Besides weak and distorted audio, a leaky audio driver transistor (Q3000) can cause lower than normal dc voltages on the base terminals of both Q3001 and Q3002.

Notice that the supply voltage is very high in this audio circuit. Transistors Q3001 and Q3002 can easily break down under higher voltages. Remember to replace any one of these transistors with a higher operating voltage transistor. Test the other two transistors while one is out of the circuit. Remember in this circuit, there is a speaker coupling transformer, which supplies voltage to the base terminals of Q3002. Q3001, and the collector voltage to Q3000, from a 120V supply. ■

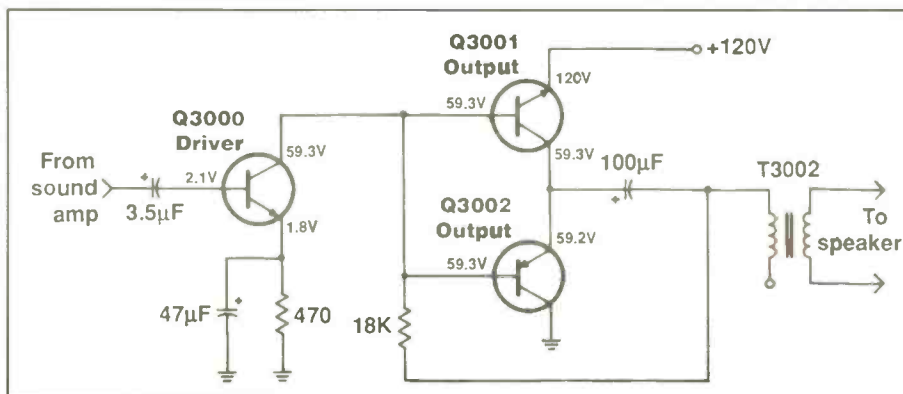


Figure 5. Transistor Q3000 provides directly coupling of the audio to the Q3001 and Q3002 audio output transistors.

Safest And Most Effective Restoration!



NEW!

CR7000
"BEAM-RITE"[™]
CRT Analyzer &
Restorer

Easily Test And
Restore CRTs With
The Most Complete Tests
Available For Added
Profit And Security!

The Safest And Most Effective Restoration Techniques Available

- The multiple levels of restoration guarantee the safest possible restoration
- Six levels of "Progressive Restoration"
- Self-limiting shorts removal function
- Three times the restoration range of other testers

We'll prove it!

Compare the new CR7000 to your current CRT tester. Call 1-800-SENCORE for a free 10 day trial.

SENCORE

3200 Sencore Drive, Sioux Falls, SD 57107
Direct: (605)339-0100 Fax: (605)339-0317

Circle (77) on Reply Card

Camcorder Servicing: Understanding chroma and burst preemphasis and deemphasis

By The ES&T Staff

Camcorders are incredibly complex devices. They consist of not only a fully operational VCR, but a complex optical system and a great deal of signal correction circuitry. Because of this complexity, it's very easy to completely skip over some of the more unfamiliar circuit functions in trying to understand them enough to service them. This article will consider the need for chroma and burst preemphasis and deemphasis, and describe their operation. We hope this information proves useful to readers who may sometime in the future encounter a problem in these circuits.

Preemphasis

Every electronic circuit generates some amount of noise that obscures the desired signal that is being processed by that circuit. If the amplitude of the desired signal is large by comparison with that of the noise, there is no problem. If, on the other hand, the desired signal is small in comparison to the noise, the signal will be obscured by the noise. In the worst case, the desired signal will be drowned out by noise. Anyone who has ever tried to carry on a conversation while a loud band or orchestra is playing nearby will understand the principle at work here.

In cases where noise is a problem because it's amplitude is large with respect to that of the desired signal, one way to improve the situation is to increase the level of the desired signal before it is introduced into the (relatively) noisy circuitry. The result of this amplification, if properly done, is that when the signal exits the circuitry, the noise will be small relative to the desired signal.

The process of increasing the level of the desired signal so that it will not be obscured by noise is commonly known as "preemphasis."

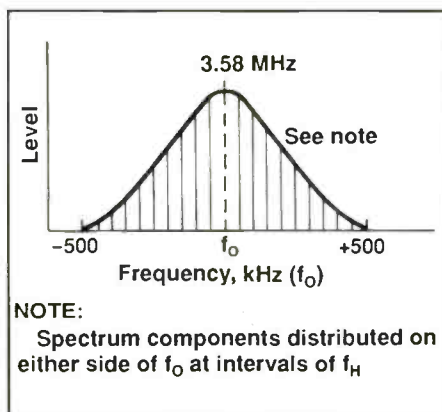


Figure 1. The chroma signal spectrum has its center frequency at 3.58MHz, and extends 500kHz above and below that frequency. The amplitude of the portion of the signal is relatively high, but the amplitude of the signal as the signal approaches the extreme frequencies falls off to zero. Noise is, therefore, a problem.

Deemphasis

Preemphasis does a nice job of keeping the desired signal intact in spite of noise

in the circuits. It also, however, introduces another problem. When the signal that has been preemphasized reaches the circuits where it is to be converted to some useful output, or to operate with or on some other signal component, it's amplitude is now not in proportion to those of the other signals.

The solution to this problem is to reduce the amplitude of the signal by the same factor by which it was increased. This process is known as "deemphasis."

Chroma emphasis

In a camcorder, the chroma, or color signal generated by the video camera section, consists of a range of frequencies of ± 500 kHz, with its center at the chroma signal frequency of 3.58MHz (Figure 1). The frequency spectrum components nearest to the 3.58MHz center frequency are relatively large in amplitude. As the frequencies in the chroma signal spectrum range above and below 3.58MHz,

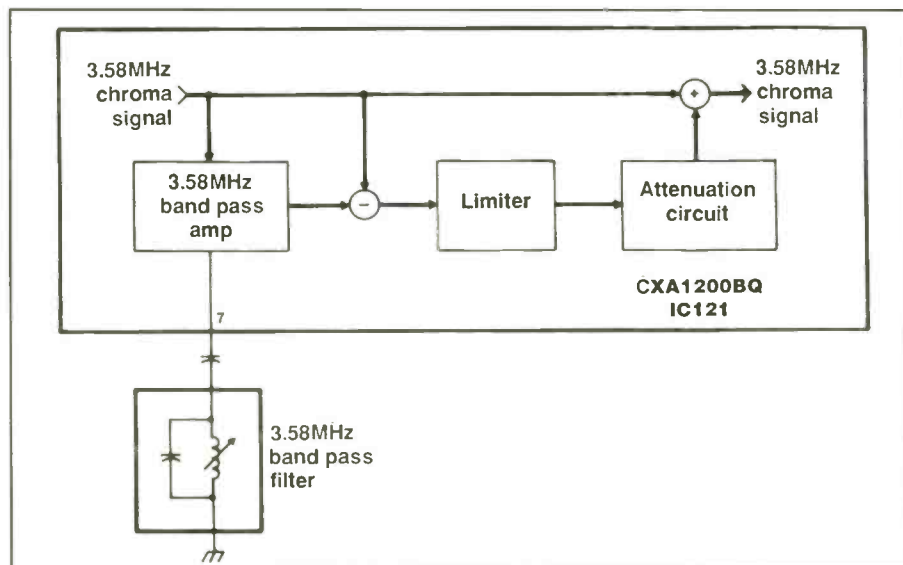


Figure 2. A chroma emphasis circuit increases the amplitude of the chroma signal nonlinearly. The frequencies near the center get little emphasis, while the frequencies at the upper and lower extremes are emphasized significantly.

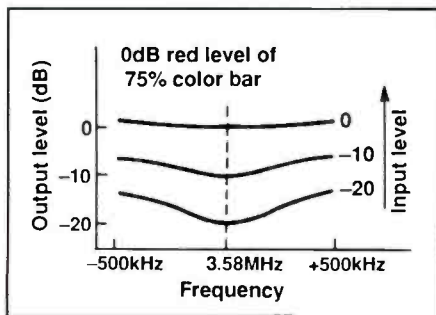


Figure 3. This chart shows the characteristics of the chroma emphasis circuit.

their amplitudes decrease, until at 500-kHz above 3.58MHz and 500kHz below 3.58MHz, the amplitudes are zero.

Because the chroma signal, especially at the upper and lower ends of the band, are susceptible to deterioration by noise because of their low amplitudes, the engineers who design camcorders have designed circuits (Figure 2) that increase the amplitude of the chroma signal to improve its signal-to-noise ratio.

In the circuit of Figure 2, the frequency components near the center frequency receive little emphasis because their amplitudes are relatively high, while the amount of emphasis increases as the frequencies move away from the center.

Operation of the chroma preemphasis circuit

In the chroma preemphasis circuit (Figure 2), the 3.58MHz chroma signal follows a path that has several branches. At the first branch, the signal continues straight toward the summing point (+), but also branches to the 3.58MHz band-pass amplifier. The output of the band-pass amplifier is only the 3.58MHz center frequency signal.

The 3.58MHz signal is fed to the subtracter (-) where it is subtracted from the chroma signal spectrum, leaving only the sideband components. The sideband

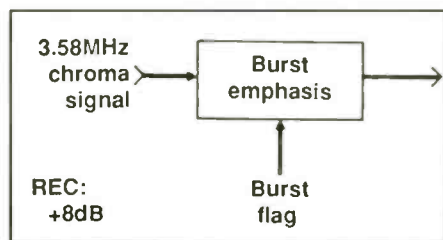


Figure 4. The burst signal must also be pre-emphasized, by an amplifier that increases in gain during the period of the burst signal.

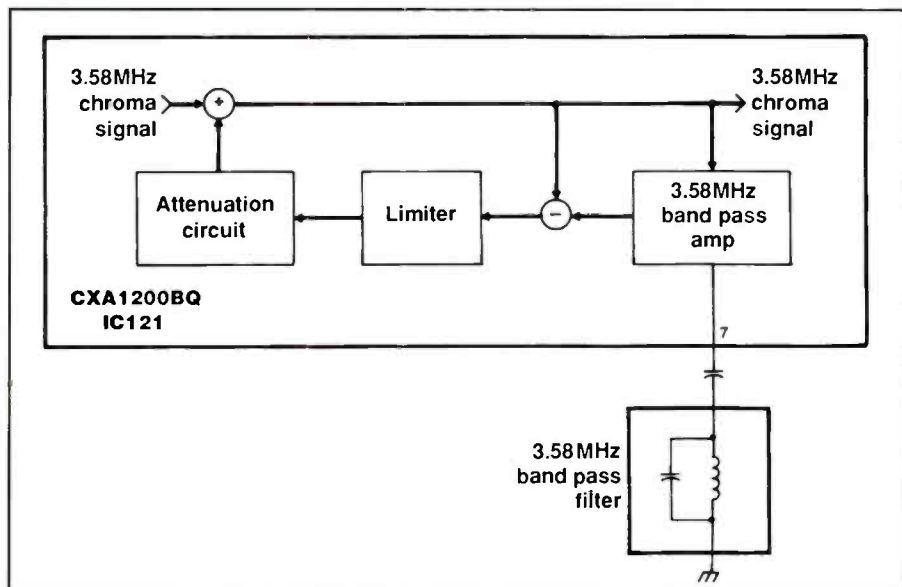


Figure 5. The chroma deemphasis circuit has an effect on the chroma signal that is equal to and opposite that of the emphasis circuit.

components are then fed to the limiter, then to the attenuator, and finally to the summing circuit where they are added to the original signal. The emphasis that results is shown in Figure 3.

Burst emphasis

Noise that might have a deleterious effect on the burst signal is compensated for by boosting the level of the burst signal by using the burst flag to key the amplifier, increasing its gain during the burst period (Figure 4).

Chroma deemphasis

The chroma signal is restored to its original level by a chroma deemphasis circuit (Figure 5), which has an effect that is equal and opposite on the chroma signal to that of the emphasis circuit.

Burst deemphasis

The burst deemphasis circuit (Figure 6) has an effect on the burst signal that is equal and opposite to that of the preemphasis circuit. This circuit lowers the level of the burst relative to the rest of the chroma signal by reducing the gain of the amplifier during the burst signal period.

Chroma problems

Any problems in the color of the picture produced by a tape made on a camcorder, such as color distortion, should raise the suspicion that the cause may be

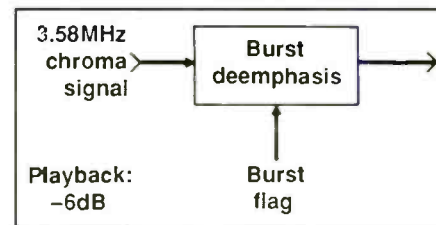


Figure 6. The burst deemphasis circuit decreases the gain of the amplifier during the period of the burst signal to a degree that is equal to the increase during preemphasis.

in the preemphasis or deemphasis circuits. Standard waveform and resistance checks in these circuits should reveal the component(s) that are the cause.

For example, excessive color saturation on a tape from a camcorder may be a result of improper operation of the chroma deemphasis circuit while the preemphasis circuit is operating properly.

Theory can help troubleshooting

If a technician is unfamiliar with the theory of operation of a complex circuit such as a camcorder, he will have to rely to a great extent on guesswork and troubleshooting tips generated by the manufacturer or other technicians. The greater the knowledge of theory possessed by a technician, on the other hand, the easier it is to relate symptoms to specific circuits, and thus be able to troubleshoot without guesswork and only a limited reliance on troubleshooting tips. ■

Troubleshooting tips on the web

By Victor Meeldijk

There is information of just about every kind on the Internet. Want to know what the weather is in just about any city? Check the net. Want to find out more about comet Hale-Bopp? Internet. Want tips on how to invest what's left of your hard earned money after you've paid your bills. Net.

It should come as no surprise, then, that you can also find tips on how to troubleshoot problems in consumer electronics products on the net. This brief article presents the URLs (universal resource locators) for several websites where you can find information on servicing of consumer electronics products.

Elmswood

<http://elmswood.guernsey.net/>

Tips and hints on repairing VCRs and TVs. Users can submit tips or request help on a particular problem by contacting pad@guernsey.net.

Meeldijk is the Reliability/Maintainability Engineering Manager Diagnostic/Retrieval Systems, Inc. Oakland, NJ.

File's home page, Main Table of Contents Page 1

Greetings

Welcome to Fil's World Wide Web Page. Each highlighted phrase (in color or underlined) is a hyper-link to another document or information resource here or elsewhere on the internet.

[Document Version: 3.02] [Last Updated: 11/7/96]

This site is **Optimized for ANY Browser** and **NOT SCALABLE** guaranteeing that **ANYONE** with **ANY** browser will benefit from it! Gee, what a concept...

Table of Contents (Nov. 7, 1996) (78KB)
Browse the Coarse Structure of this Site Not Ready Yet!
Fil's Virtual House V1.00 (10/19/96)
Intuitive access to this whole site - [Eternal Project] Not Ready Yet!
SearchSite V2.00 (11/24/96)
Search for ANY pattern on this WWW node! Restricted
Sci.Electronics.FAQ V2.23 (9/24/96)
Everything you wanted to know about electronics - [Eternal Project]
Sci.Electronics.Repair.FAQ V2.50b (1/19/97)
Featuring Samuel M. Goldwasser's "Notes on Troubleshooting and Repair of ..." and a LOT of other repair information [RE:ALDME] V2.50b (1/19/97) (17KB) [Mirrors]
Fil's FAQ-Link-In Center V3.0b (9/24/96)
Assorted FAQs on electronics in HTML
RC Stuff and links to... V4.00 (5/17/96)
Remote Control information, links, FAQs, more!
Fil's Auto Center V2.01 (5/20/96)
Everything I know about cars... or would like to
Deltastrata V2.01 (9/29/95)
News/Change/Info about this site
Stuff that Fil wrote V1.20 (10/6/95)
Various Personal scribbblings... and link to my Opinions

JEM: private space

This article was written by filipg@paranoia.com [Feedback Form] [mailto]. The most recent version is available on the WWW server <http://www.paranoia.com/~filipg/> [Copyright] [Disclaimer]

Figure 1. When you access the electronics servicing page of the Paranoia website <http://www.paranoia.com/~filipg/>, you will see this page. Clicking on any of the highlighted (underlined here) items will allow you to access any of those pages.

Sci.Electronics.Repair.FAQ: Table of Contents (ToC) Page 1

[Mirrors]

Sci.Electronics.Repair.FAQ: Table of Contents (ToC) V2.50b (2/12/97)

Are you accessing the closest [Mirror](#)?


Note: If you know of something that is incorrect or missing from these pages or if you have any additions, please [send me your feedback](#)! Thanks!

Looking for something specific? Try the [Search Form](#)!

[Document Version: 2.50b] [Last Updated: 2/12/97]

PLEASE READ THE OFFICIAL... READ ME *** V2.50b (1/19/97) (17KB)
For information on this site, where to get text-prints, CHANGELOG, where to find mirrors, and other topics, Many FREQUENT questions are answered therein. Please read at least once!

Please note that I'm back in college... and while I wouldn't call my self dumb, I'm not a genius... and I forgot all my previous Calc which I'm expected to know for my Differential Equations class... so don't expect any major changes until, oh, May. Minor updates and fixes will be attempted, when required. Thanks, Fil.

You may get  if you don't read these [Notes on Safety](#) V1.20 (12KB)

Samuel M. Goldwasser's "Notes on Troubleshooting and Repair of...":

- Introduction to the Notes... V1.11 (10KB)
- Small Household Appliances V1.41 (Sub-ToC)
- Audio equipment and other Miscellaneous Stuff V2.53 (Sub-ToC)
- CD players and CDROM drives V2.63 (Sub-ToC)
- Computer and Video Monitors V2.52 (Sub-ToC)
- TeleVision (TV) Sets V2.42 (Sub-ToC)
- Video Cassette Recorder (VCR) V2.55 (Sub-ToC)
Read VCR First! And if you must remove a tape in an emergency... V1.11 (21KB)
- small SwitchMode Power Supplies (SMPS) V2.23 (Sub-ToC)
- Microwave Ovens V2.21 (Sub-ToC)
- [Hand-held IR] Remote Control V2.20 (28KB)
- Electronic Flash Units and Strobe Lights V1.45 (Sub-ToC)
- Small Engines and Lawn Mowers V1.31 (Sub-ToC)
- Printers and Photocopiers V1.10 (Sub-ToC)

"Other Information"

Figure 2. Clicking on the item "Sci.Electronics.Repair FAQ" on the first page of the electronics servicing page of the Paranoia website brings up this page on which you may make choices.

Paranoia

<http://www.paranoia.com/~filipg/> (Figure 1)

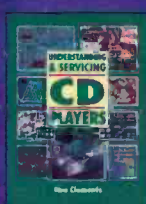
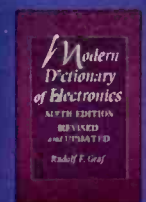
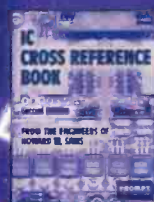
VCR Repairs and troubleshooting tips by Sci.Electronics (Figure 2). This site is a complete VCR troubleshooting book written by Samuel M. Goldwasser. It includes SONY VCR error codes. See the older site: http://filp.unina.it:80/pub/electronics/REPAIR/F_vcr_repair7.html.

Ndirect

<http://www.ndirect.co.uk/~nsmith/index.html> (Figure 3) (formerly <http://www.users.dircon.co.uk>), then select N, then nsmith:uk Television, VCR & Electronics Service Guide. It is A Direct Connection Member Web page that contains the "Television, VCR & Electronics Service Guide". It is written

ES&T Book Shop

POWER
UP
YOUR
PRODUCTIVITY



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 Cotter 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 # 61085 \$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 # 61104 \$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 # 67002 \$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 # _____

Form of payment: MC VISA AMEX Discover Check Money Order

Expires _____

Please mail your orders to: **Electronic Servicing & Technology, 76 North Broadway, Hicksville, New York 11801-9962 FAX 516-681-2926**

Recommended Browser: 

Pages best viewed with Java enabled

Because many of these pages are updated frequently, please make sure that your browser network preferences are set appropriately. (i.e. to check for new documents and NOT to use the cache.) This will ensure the latest version.

In Microsoft Internet Explorer this may be set by going to pulldown menu "view/options/advanced/settings" and changing the settings to "Everytime you start Internet Explorer"

I am trying to provide, a database of common, and not so common, faults on UK televisions and video cassette recorders, with perhaps Audio and Satellite receivers in the future. Included will be information on parts suppliers, latest service information, briefs from all the manufacturers, and much more. You can help by sending any faults with their remedies, together with any articles that you may have authored. This site is what you make it, so please keep the information coming.

If anyone thinks computer monitors should be added then please email me with suggestions on what makes would be best added.

TV & VCR FAULT INDEX

TELEVISIONS

| | | | |
|-----------|------------|------------------|--------------|
| Akura | Alba | Amstrad | R & O |
| Bush/Rank | Contec | Ferguson/Thomson | Fidelity |
| Finlux | Goldstar | Goodmans | Grundig |
| Hitachi | ITT | JVC | Saisho |
| Salora | Samsung | Sony | Fatung/Decca |
| Matsui | Mitsubishi | Network (NEI) | Panasonic |
| Philips | Pye | Toshiba | Wahnam |

VIDEO CASSETTE RECORDERS

| | | | |
|---------|----------|----------|----------|
| Akai | Alba | Amstrad | Akura |
| Baird | Ferguson | Goldstar | Goodmans |
| Grundig | Hinari | Hitachi | JVC |
| Matsui | Samsung | Sharp | Sony |

Have you tried the internet version of the UK Yellow Pages



CAUTION: Servicing of electronic equipment can be dangerous! All servicing should be performed by a trained electronic professional only. Lethal voltages and hazardous materials exist in most electronic equipment. A person who is unfamiliar with these hazards and safe service procedures risks serious injury to himself and others.

Useful FAQ's

FAQ for Professionals

Questions and Answers posed by electronic professionals active in electronic repair.

FAQ for Users

Questions and Answers posed by consumers, electronic hobbyists and students.

My Telephone Number is (44) 01279 466574, this also being the FAX number.

Please Fax or email any information or Fault listings 

Snailmail address:
83 Plawburgh Close
DUNDEE CROSSROAD
Herts
MK23 5DL

May I suggest the following for spares:

Willow Vale Electronics Limited
11 Arkwright Road
READING
Berks
RG2 0SU

Sales: Tel. 0118 9876444
Sales Fax: Fax. 0118 9867180
Accounts Dept: Tel. 0118 9860159

Willow Vale have a reputation for being fast, efficient and courteous. They have an online computer ordering system which they call "COPS" which works relatively well. The company can supply a CD ROM with all the spares and current prices together with many illustrations. The "Cuplink" software supplied, will allow you to store orders and upload via a file transfer system making for a fast efficient means of ordering.

SEME Limited
Head Office and Despatch
Unit 2
Sandy Road Industrial Estate
WELTON, NORTHAMPTON
LEICESTERSHIRE
LE13 1BB

Tel: 01664 45352
Fax: 01664 63976



Seme now have a computer ordering system, entitled TUSK. Their web site is still young and progress seems

Figure 3. When you access the website at <http://www.ndirect.co.uk/~nsmith/index.html>, this page comes up.

The editors of **ES&T** have discovered a couple of other sites where you may or may not be able to find information on troubleshooting of consumer electronics equipment. Both sites are forums where someone can list a problem they have and if someone has a solution, they send it in. Anyone visiting the site may have access to the problem statements, as well as any answers that may have been provided. And, of course, visitors may list their own problems for solution.

Newsgroup sci.electronics.repair

One of these sites is a "Newsgroup." It is called "The Repair of Electronics," and is located at sci.electronics.repair. Once you have accessed this newsgroup, you can scan a list of problems that have been posted to the newsgroup, and any replies that the posting has prompted. If there's nothing there that's applicable to any of the problems you have in your service center, you can post any of the problems you do have and check back from time to time to see if anyone has answered you.

For example, one problem read this:

"Zenith 25" TV, Don't have model number available.

"Symptom: Purplish raster; even with all drives at minimum. Voltages and signals at drive transistors on CRT board are identical. What should I normally see at the RGB transistor outputs? Every now and then when switching channels I'll see a quick bright green screen with bright retrace lines. But only for a split second.

"This set is a little over a year old, so I doubt a CRT malfunction is the cause. Any suggestions will be appreciated."

Two people provided suggestions. Sam Goldwasser, who has written for **ES&T** suggested the following.

"It isn't the drives but the bias/background you should be adjusting for dark/ shadow areas of the picture. The voltages should be nearly identical, but not necessarily exactly.

"You should see over 100V on the cathodes if the picture is totally black, possibly higher during retrace for blanking.

"For the bright green screen, a CRT malfunction (intermittent green cathode to heater short) is one of the possibilities. You would have to catch it in the act and do the tests suggested in the FAQ (a list of answers to frequently asked questions) or isolate the filament and see if the malfunction still happens."

Another person responded thus.

Hitachi tv fault listing Page 1

Hitachi TV Fault Listing

Hitachi Sales (UK) Limited
 Hitachi House
 Station Road
 Hayes
 Middlesex
 UB3 4DB
 Telephone: 0181 569 1975
 Fax: 0181 569 1441
 For spares, contact Chas. Hyde & Son Limited


Notes regarding Hitachi

Hitachi are another company who only offer technical backup to engineers holding an account. I personally deprecate this attitude. It accomplishes little and suggests that they care little if their sets are kept working or not.

| | |
|---|---|
| C14P216 | |
| <p>Power Dead - stuck in standby <i>Misc</i> Bright raster with flyback lines No on screen display</p> | <p>Check R902/3 (82k ohms) C711 or dry jointed Check R008 (470k ohms)</p> |
| C14P218 | |
| <p>Power Dead - stuck in standby <i>Sound</i> Distorted sound <i>Video</i> Brightness increases then set trips No on screen display</p> | <p>Check R902/3 (82k ohms) IC201 (TA8691N) C711 (47uf) Check R008 (470k ohm)</p> |
| C21P819 | |
| <p><i>Sound</i> No sound Low sound, no Nicam</p> | <p>R4063 o/c IC1501 (T900477-021)</p> |
| C2118 | |
| <p>Power Dead - 112V H1 reads high Dead - tripping</p> | <p>Dry joint on R716 Check R909 for high resistance</p> |
| C2514F | |
| <p>Power Dead - except for a bright raster displayed for a few seconds at switch on (Q80)</p> | |
| CAP162E | |

Figure 4. Clicking on the name of one of the products on the first page of the N. Smith UK site brings up a page that provides the UK address of the manufacturer and a list of troubleshooting tips such as this.

The Electronic Repair Center Page 1




Welcome to Electronic Repair Center

You will find here.....

- Answers to Electronic Repair Questions
- Lists of Electronic Repair Shops
- Electronic Repair FAQ
- Electronic Repair Bookstore
- Articles on Electronic Repair Subjects
- Classified Ads for Electronic Equipment, Parts and Data
- Monitor and Terminal Repair Software NEW RELEASE UPDATED 3/12/97!
- Sources for Electronic Parts and Components
- FAQ for Radio and Television Broadcast Professionals

Click on the Yer-Net logo to visit the Yoshi Electronics and Research site featuring information and data on electronics in English and Japanese.



CONGRATULATIONS! ERC WAS ACCESSED 168,000 TIMES IN FEBRUARY 1997

Support the **ERC Sponsors**

Digi-Key Corporation

RAF Electronic Hardware

Yoshi Electronics and Research (YER)

Figure 5. When you access the AnaTek website, this is the first page that comes up on your screen.

"I've replaced many Zenith CRTs within the two-year manufacturer's warranty period. And from your description it sounds like the CRT because the purple background that you have tells me that the green gun may be weak, as does the moment of bright green raster with retrace lines. Very typical of your description.

"You may want to contact Zenith or have an authorized service center take a look at it. If it's a little over a year old, you should still be under the manufacturer's warranty."

Consumer Electronics on AOL

Another site is one that's available only to subscribers to AOL. To access this site, a member clicks on the category "Life, styles & interests." There are many choices within the category, including "Consumer Electronics." This category contains more than servicing information, including the opinions of other subscribers on a host of subjects within consumer electronics.

Clicking on Consumer Electronics, several subcategories become available: Video & Home Theater (V&HT), Cellular Technologies/Paging, etc. Clicking on V&HT gets the sub-

scriber to "Satellite," "DBS," and more. Within each sub-sub-category are message boards which contain the questions of subscribers and answers of other subscribers, including questions on problems and solutions in servicing of consumer electronics products.

Access to any of these sites may or may not get you the information you need for servicing, but whether it's of any value to a service center in terms of servicing, it might provide service centers a forum through which to educate consumers about consumer electronics service.

Some other sites

There are other sites on which you may find troubleshooting information, some that offer free troubleshooting information, and some that will cost you a monthly fee. Here are two additional sites that we know of. If any readers know of other sites that offer similar information, please let us know about them.

Electronix Corp: <http://www.electronix.com>

LaserImpact: <http://www.laserimpact.com>

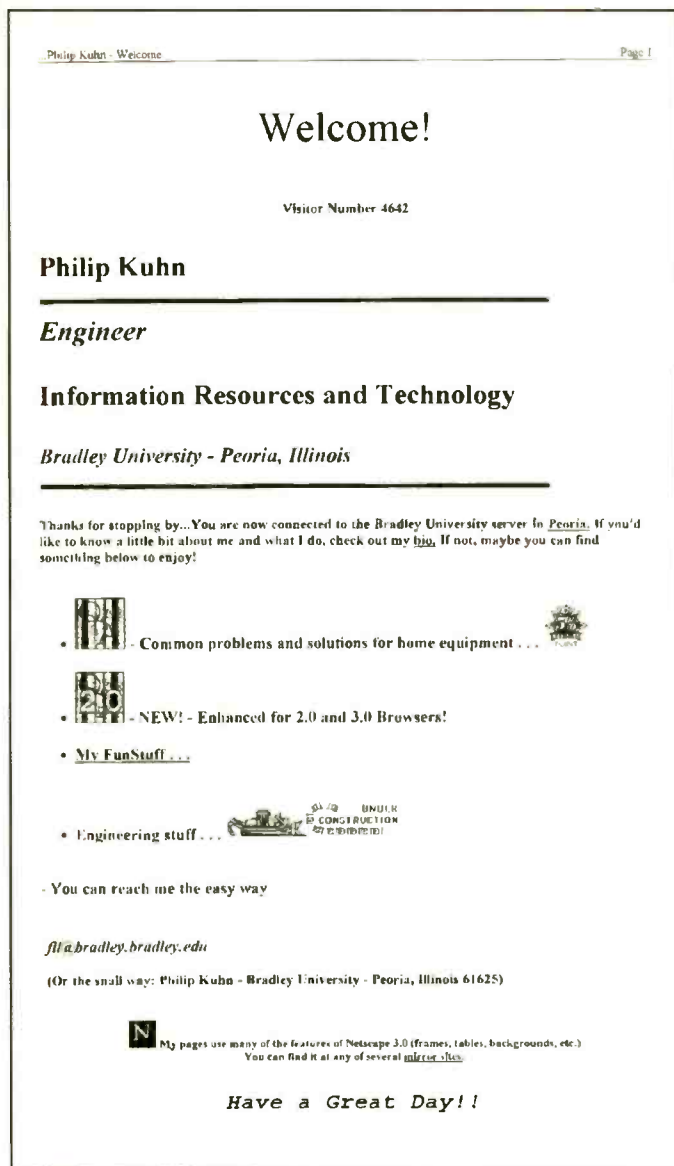


Figure 6. When you access the Bradley University website, this is the opening screen that you will see.

by Nigel Smith (nsmith@dircon.co.uk). (Note, this is a web page originating from England). It has listings by manufacturer and model numbers (Figure 4) and contains tips on TV/VCRs not found in the US (i.e., Salora, Amstrad, Fidelity, Ferguson, Goodmans, etc.). It also has repair articles that have appeared in magazines.

AnaTek

<http://www.anatekcorp.com> (Figure 5)

This is a Repair Tips and Procedures database for many consumer electronics products, with over 24,000 repair procedures. You can search through the database by manufacturer and model numbers.

Bradley University

<http://bradley.bradley.edu/~fil/> (Figure 6)

Bradley University, Peoria, IL has a Question and Answer



Figure 7. Clicking on the button marked "Common problems and solutions for home equipment" on the opening screen of the Bradley University website brings up this page. Clicking on an area of the VCR on this page provides tips on dealing with problems in that area.

Site on common problems and solutions for home equipment. A useful site for your customers to access as it explains in common language what problems such as "What does it mean when I hear squealing noises in rewind?" (Figure 7) This site is by Philip Kuhn (fil@bradley.bradley.edu)

The evanescence of web sites

Web sites may be relatively permanent, or they may be as fleeting as a summer's day. It's not uncommon that a website is set up and then not maintained, and eventually disappears. On the other hand, some web sites are carefully thought out, well constructed, and assiduously maintained. Please keep that in mind when you try to access any of these sites. There is a chance that they might not be there.

Similarly, the Internet is a somewhat flaky place. It's possible that today you will not be able to access a web site, and tomorrow it will be there and accessible in all its glory. ■

Test Your Electronics Knowledge

Numbers and math and stuff

By Sam Wilson

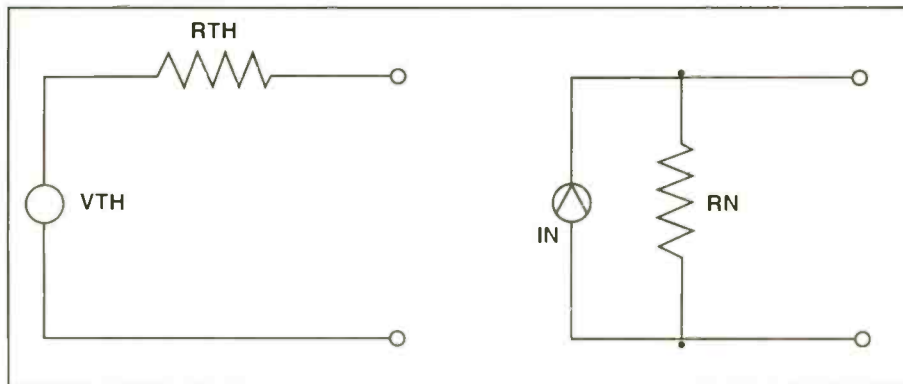


Figure 1. Any linear two-terminal network can be represented by a voltage source in series with a resistor (Thevenin's theorem) or by a current source in parallel with a resistor (Norton's theorem).

1. Write the number 37_{10} as a binary number.

2. Convert 100101_2 to a decimal number.

3. "Unwanted disturbances superimposed upon a useful signal that tend to obscure its information content." That is the definition of _____

4. It is a good idea to know all of the rules of Boolean algebra. Here are four of the rules. Write the value of each:

- A. $(A)(1) = \underline{\hspace{2cm}}$
- B. $A + 0 = \underline{\hspace{2cm}}$
- C. $(A)(A) = \underline{\hspace{2cm}}$
- D. $A + A = \underline{\hspace{2cm}}$

5. Write the equation for converting the Thevenin Resistance of a circuit to the

Norton Resistance of the same circuit.

$$R_{TH} =$$

6. What kind of detector is needed for a suppressed carrier transmission?

7. How long (in seconds) does it take a $0.01\mu\text{F}$ capacitor to charge through a $500\text{k}\Omega$ resistor to 2 time constants?

8. Is the following statement correct? A toggle flip flop changes state every two input cycles.

- A. Correct
- B. Not correct

9. The time constant for $500\mu\text{sec}$ inductor and a 500Ω resistor is _____ seconds.

10. The gain of an amplifier is 5dB. If the input power is 2.5W, what is the output power?

SBS DIRECT

Store Management Software

Designed Exclusively For
Electronics & Appliance
Sales & Service Stores

STORE-TRAK, Release 3.22

An easy-to-use menu-driven system that organizes every aspect of your business more effectively, using state of the art programming technology.

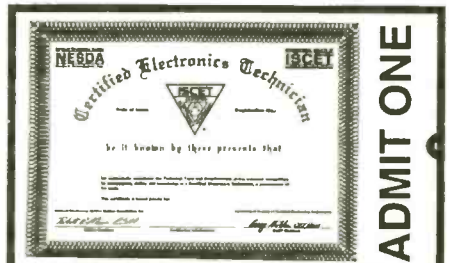
Turnkey Hardware/Software Systems Available!

Financing Options!

- ✦ Eliminates Paperwork & Filing
- ✦ Detailed Business Summaries
- ✦ Fully Networkable

1-800-603-9000 Ext. 99
123 N.W. 13th Street, Suite 213
Boca Raton, Florida 33432
<http://www.sbsdire.com>

Circle (74) 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).

Is it the hardware, or is it the software?

By John Kull

As technicians in the 90's, we are faced with many new challenges. When working with computers, one challenge we often face is deciding whether a problem is hardware or software related. Before you break out the tool case and grab the screwdriver, you need to make sure the problem isn't software related. A recent experience with a monitor problem drove this point home for me.

A video compatibility problem

I received a call from a customer who had just installed a color VGA monitor. He was having problems getting the company's primary software to run in color. He explained that the system originally had a monochrome monitor and he wanted to use a color monitor to make the program easier to view. I began to ask him questions. "Did you install a VGA video board?" "No, I just plugged the new monitor in!" he answered. I was beginning to worry. VGA monitors use a 15-pin high density "D Sub" connector, while the older monochrome monitors used a 9 pin standard "D Sub" connector. The connector size and gender is the same, but the pin spacing is different. I was afraid he had possibly forced the connector on and had gotten lucky enough to get a picture.

He went on to tell me that the start up logo on his network software was displayed in color, but all software run after that was in black and white. At this point my curiosity was aroused. Most motherboards have a "color/mono" jumper that must be set in order for the video card to operate properly. I asked him if he had changed this jumper. "No," he replied "but I tried to change the monitor setting in the CMOS setup." I soon realized this was not a problem that was going to be solved over the telephone.

A video compatibility problem

I arrived at his office and examined the

Kull is a Biomedical Technician and a frequent contributor to ES&T.

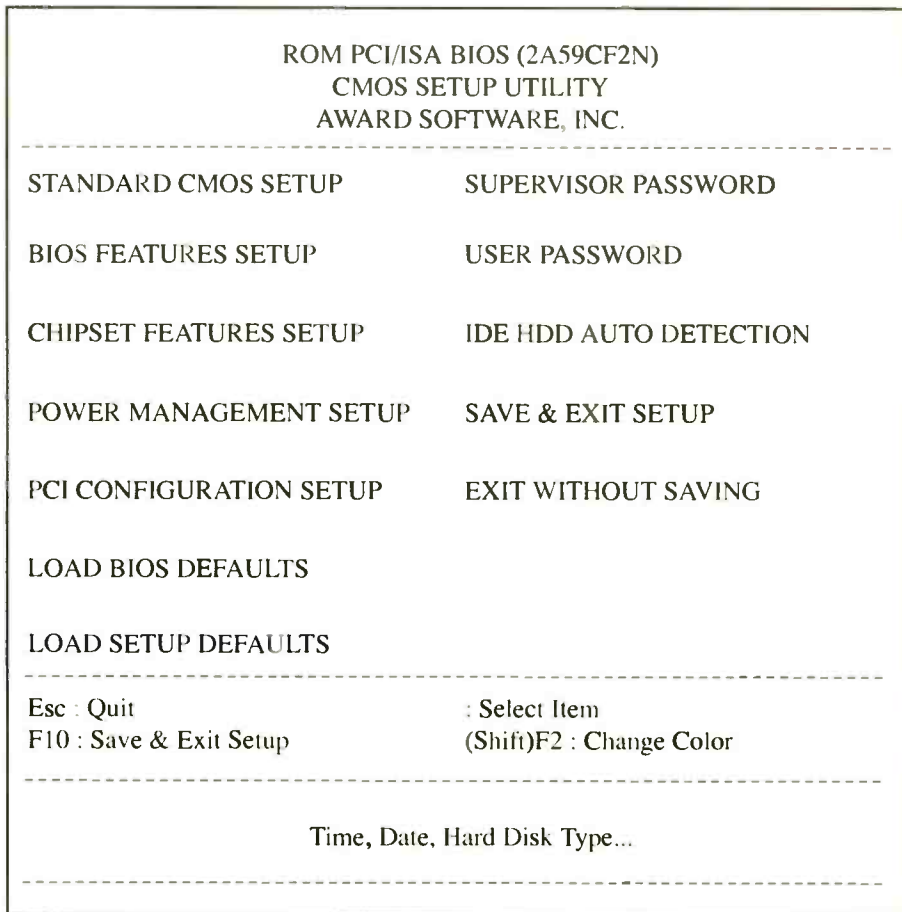


Figure 1. When you need to update the CMOS memory, you use a setup program from the system BIOS and enter or verify the proper information. You activate this program by pressing the delete key when prompted at bootup, or by entering a special keystroke sequence.

system. The monitor and video card were both high density D-Sub connectors. The original monochrome monitor used a high density D-Sub connector as well, - something I had never seen before. Upon booting up the system, a "display type mismatch error" was occurring. This is a common error when the video card is changed and the CMOS setup has not been changed.

The CMOS memory is a battery backed RAM memory that holds the information on the hardware configuration, such as hard drive parameters, floppy drive type, amount of installed memory and monitor type. When the computer boots up it executes a startup program contained in the

motherboard BIOS ROM called the POST (Power On Self Test.) A part of the POST routine reads the information in the CMOS memory to properly set up the hardware. If a parameter does not match the hardware that is installed, it generates a CMOS "type mismatch error." (The actual message displayed on the monitor will vary depending on the manufacture of the system BIOS.)

When a value needs to be updated in the CMOS memory, a special setup program is run from the system BIOS and the proper information is entered or verified (Figure 1). The setup program is activated by pressing the delete key when prompted at bootup, or by entering a spe-

cial keystroke sequence. From the main menu, the "Standard CMOS Setup" is selected. This menu is used to modify the hardware parameters (Figure 2). After the changes are made, the Standard CMOS Setup menu is exited and the option of "Save and Exit Setup" is selected from the main menu.

Many people make the mistake of not saving the changes after they have made them. After a change is made you must select the option that allows you to save the changes. If you exit the setup program without saving, you will continue to get the error. Some setup software will automatically select the proper monitor type, but it is up to you to save the changes.

Saving the changes to the CMOS memory

In this case the customer had entered the CMOS setup, but had not saved the changes. I selected "Save changes and exit" from the CMOS setup menu. The error went away, but my problem did not. The program still refused to run in color.

Next I turned my attention to the motherboard. I began to look for the "color/mono" jumper. I found one two-pin jumper, but it had no labeling, and of course my customer had no documentation on the system. Left to trial and error, I switched the jumper and rebooted the system. There was no change.

I scratched my head and forged on. Since he told me he had not changed the video card, I decided to pull it out and check for configuration jumpers or switches. The card had a set of DIP switches for selecting the various video modes. On the card was a silk screen legend detailing the switch configuration. According to the legend, the card was already set for color operation. The card had several color modes of operation. One at a time I tried them. One at a time the problem returned.

Was it the video card?

I was beginning to suspect the video card. Although the monitor displayed color briefly while his network software loaded, I wondered if all the modes of the card were working properly. Since it was a multi-mode card, the network software may have activated one mode while his software was using another mode that did

not function. Not having a spare video card with me, I installed the suspect card in another system to determine if the card was at fault. The card worked fine running the same program. Well, it wasn't the video card. Could it be the software?

Was it the software?

Often times a program will require a "switch" in the command line to enable monochrome operation. For example, the command "dosshell/bw" enables the dos-shell program to run in monochrome mode. He said the command to start the program on the computer was just "hecs3" with no switches. OK, I thought, but often a program will be executed from a batch file. A batch file is a special file used to execute a set of DOS commands, frequently containing commands or switches to enable or disable certain features. Batch files are identified by the three character extension, "bat," on the filename. Reviewing the directory in which the program was located did not turn up any batch file named "hecs3.bat."

It was the AUTOEXEC.BAT file

Every IBM PC or compatible makes use of one batch file upon startup, called AUTOEXEC.BAT. This file is executed at bootup and contains a series of commands to automate the startup process, by starting other programs or configuring a piece of hardware. I remembered there was a DOS command called "mode" that is used to set up default parameters for different hardware items such as input/output ports and monitor types. I pulled up the DOS help system on the mode command and reviewed its syntax. (By typing the command and then "/" in DOS 5, or "help" and then the command in DOS 6 and above, you can pull up an on-line help system. The help system can be an invaluable tool when troubleshooting configuration problems.)

I decided to add the command "MODE CO80" to the AUTOEXEC.BAT file to force the system in the color 80 column mode. I reviewed the AUTOEXEC.BAT file for the system and quickly found my problem: The AUTOEXEC.BAT file contained a line that read "MODE BW." The system was being forced to monochrome display by the "MODE" command. I didn't need to ADD the "MODE CO80," command, I needed to *remove* the

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 VI



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 (62) on Reply Card

25

ROM PCI/ISA BIOS (2A59CF2N)
STANDARD CMOS SETUP
AWARD SOFTWARE, INC.

Date (mm:dd:yy) : Tue, Dec 31 1996
Time (hh:mm:ss) : 20 : 8 : 15

| HARD DISKS | TYPE | SIZE | CYLS | HEAD | PRECOMP | LANDZ | SECTOR | MODE |
|-------------------|------|------|------|------|---------|-------|--------|------|
| Primary Master: | User | 1083 | 525 | 64 | 0 | 2099 | 63 | LBA |
| Primary Slave: | None | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Secondary Master: | Auto | 0 | 0 | 0 | 0 | 0 | 0 | AUTO |
| Secondary Slave: | None | 0 | 0 | 0 | 0 | 0 | 0 | - |

Drive A : 1.44M, 3.5 in.
Drive B : 1.2M , 5.25 in

Video: EGA/VGA
Halt On : All Errors

Base Memory: 640K
Extended Memory: 31744K
Other Memory: 384K

Total Memory: 32768K

ESC : Quit: :Select Item PU/PD/+/- : Modify
F1 : Help (Shift)F2 : Change Color

Figure 2. This is what you see in the case of one setup program, after selecting the "Standard CMOS Setup" from the main menu. This menu is used to modify the hardware parameters. After the changes are made, exit the Setup menu and select the option of "Save and Exit Setup" from the main menu.



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 in your new address and send along with your **SUBSCRIPTION MAILING LABEL, to:**

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

"MODE BW" command! I removed the command from the AUTOEXEC.BAT file and resaved the file. After rebooting the system the software ran in color.

Always look for a software problem first

After looking back at my notes to write this article it became more apparent I should have suspected a software problem when the customer told me the network programs startup banner ran in color. However, I figured the video card was failing to work in the particular video mode that the program needed, since the card could be configured for any one of several modes of operation.

Unless the problem is obviously hardware related, review the software settings in the CONFIG.SYS and AUTOEXEC.BAT files as well as WIN.INI and SYSTEM.INI for Windows operating systems before tackling the hardware.

Personal computer service repair presents a unique challenge to the electronics technician. Although many "repairs" are often software related, two things

remain the same: We still go through a troubleshooting process, and we still use tools; only in the case of computers the tools may be in the form of software commands or diagnostic programs.

Some technicians do not pursue computer servicing because many customers do their own basic repairs and installations to try to save money. However, most do-it-yourselfers will at some point require the skills of a professional technician. I offer support over the phone to help a customer when I can.

When a problem can't be resolved over the phone, a service call is in order. Customers appreciate the phone support and are usually more understanding of the cost of an on-site repair.

Computers are no different from any other consumer electronic product. They will usually require service at some point. As consumer products come and go, so do new servicing opportunities. We live in an age of disposable electronic products. Widening your servicing horizons to include computer repair could add the extra revenue needed to stay in business.

★ ★ ★ SHOWCASE OF TOOLS & TOOLCASES ★ ★ ★

The right tool helps a craftsman get the job done properly, whether it's a mason laying up a brick wall, or a shoemaker putting a new sole on a worn shoe. The same thing is true of a consumer electronics service technician putting a new video head drum in a VCR, or replacing the EEPROM in a 27-inch television set.

Here is an example of a situation where using the right tool can make a big difference. You have to remove a pc board from some product; say a VCR. You look in your tool box and find that somehow, your nutdriver set isn't there. Perhaps you left it on the bench when you left the service center, or at the site of your last job.

There are some other tools that might get the job done. You might be able to get a small adjustable wrench on the nut, but that can become tedious because you are only able to turn it a half inch at a time because of obstructions. So you turn the nut, and turn it, and turn it, in small increments until you're sure it's been loosened enough to be "hand tight".

But, what seemed like only hand tight is a little tighter than the finger strength you can muster in those tight quarters. So you get the wrench back out and turn the nut a few more times. Finally it comes free. But what should have taken less than a minute, if you had the right tool, has taken several minutes, and there are still three more identical nuts holding the board in place that you have to remove.

This is not an uncommon occurrence, and this doesn't even fall under the label of "high tech". All you're trying to do is remove a few nuts so you can get a pc board out of the chassis. If the task was removing a multileaded pc, the problem really becomes difficult, and you had better have the right equipment if you're going to avoid damaging the circuit traces on the board, or overheating and ruining the replacement IC.

Selecting a vendor

Tools can be purchased almost everywhere, from the hardware store to the do-it-yourself store. You can buy screwdrivers, nutdrivers, pliers, wrenches,



soldering and desoldering products and more. But the exacting work performed technicians frequently requires specialized tools, the kinds of tools you're unlikely to find in the general-line hardware store, or the hardware department of a department store.

As a general rule, therefore, it makes more sense for a technician to purchase most if not all of his tools from a vendor who specializes in tools for the electrical and electronic skills.

The showcase

This Tool and Toolcase Showcase is designed to provide readers with a little more information than is ordinarily available about tool vendors. Each advertiser in this showcase has been given an additional amount of space to tell readers about their company in the hope that it will help in the process of determining who is most likely able to carry the kinds of tools most targeted to

consumer electronics service, and to provide technicians with assistance in tool and toolcase selection.

As you read the descriptions of these companies, written in their own words, you might want to keep these important questions in mind:

- How long has the company been in business?
- How often are they able to fill orders from stock?
- What payment options does the company offer—open order account, credit card, cash?
- How soon after receipt of an order to they ship?
- Do they add a shipping surcharge?
- Do they have a toll free number?
- What ordering options do they offer?
- What is their return policy?
- Do they offer a warranty?
- Is there a minimum order amount?
- What shipping options do they offer?
- What special services do they offer?

MCM Electronics

650 Congress Park Drive
Centerville, OH 45459
Phone: 800-543-4330
Fax: 937-434-6959

Your Source For Service Parts and Accessories

For over 20 years, MCM has been a leading supplier to the electronics service industry. Stocked is a wide variety of original OEM and generic repair parts used in all aspects of consumer electronics repair. As authorized distributors for RCA/ GE, Panasonic, Technics, Quasar and now ECG, Philips and Magnavox, we have the exact replacement items you need.

Your Source For All of Your Benchtop Requirements

Tools

MCM stocks a broad selection of tools and technician aids specifically designed for the consumer electronics service industry. Trusted names such as Xcelite, Crescent, Ideal, Klein, Weller and Hakko are just a few of the popular tool lines stocked at MCM. Additionally, MCM works directly with tool manufacturers all over the world to bring you the best values in generic and application specific tools.

Technicians Chemicals

MCM stocks the highest quality technicians chemicals. Commonly used dusters, freeze sprays, defluxers, contact cleaners, plastic and glass cleaners and adhesives are all stocked. Brand names include Chemtronics, Tech Spray, Caig, Rite Off, Rawn, LPS, 3M, and Loctite/ Permatex.

Test Equipment

MCM can meet your test equipment needs. From simple pocket multimeters, to oscilloscopes, spectrum analyzers, cable testers and more are available from Tenma, Fluke, BK Precision, Hitachi, Sencore, Leader, Triplett, Simpson and Tektronix.

Discover The MCM Electronics Difference

MCM publishes two full-sized catalogs annually. The latest issue boasts over 6500 new products, and features over 100 pages devoted solely to semiconductors, repair parts and accessories. In all, MCM stocks over 35,000 items essential to the service industry.

Sales flyers are mailed regularly featuring specially priced items and new product additions keeping the customers up to date on the latest available products.

Superior Customer Service

The MCM staff is trained to answer all calls fast, friendly and efficiently. All sales representatives are professionals who are available on toll-free lines to provide immediate information on stock availability and pricing. They are available Monday through Friday 7:00 a.m. to 9:00 p.m. EST, and Saturday 9:00 a.m. to 6:00 p.m. EST. Faxed orders are also accepted 24 hours a day, seven days a week. MCM also provides highly trained electronics technicians to answer customers product questions. With a separate toll-free "Tech Line," customers receive prompt answers to their questions by calling 1-800-824-TECH (8324).

Fast Delivery From Two Distribution Facilities

MCM is committed to providing superior customer service. Distribution centers are strategically located near Reno, NV and Dayton, OH. This enables fast delivery at ground rates throughout the U.S. In addition, with over 35,000 items stocked, 99% of all orders are shipped within 24 hours. In fact, all in stock orders received by 5:00 p.m. (your time) are shipped the SAME DAY!

For more information and a free catalog, call 1-800-543-4330, in Dayton, OH, call 937-434-0031.

MCM ELECTRONICS®

Your Headquarters for TV/VCR Repair Parts



TENMA Grounded tip and 340-875°F temperature control make this ideal for most applications including SMD.
Regular price \$119.00
Sale **\$79.95**

TENMA Ideal for handling all surface mount components. Includes four vacuum cups and probes.
Regular price \$29.95
Sale **\$25.50**



Clarke Great for soldering equipment, hand tools and small test equipment. Attractive black finish holds up after years of use. Measures 19" x 14" x 6".
Regular price \$49.95
Sale **\$34.95**



Prices effective from May 1, 1997 through June 13, 1997



MCM's comprehensive line of tools, test equipment and other products are engineered specifically for the consumer electronics repair industry. A wide variety of OEM and generic parts, passive components and over 10,000 semiconductors are all stocked and ready to ship.

Authorized Original Parts Distributor
Panasonic / Quasar / Technics
PHILIPS / Magnavox / ECG
RCA / 36 Premier Distributor

FREE CATALOG
1-800-543-4330

VISIT MCM'S WEBSITE AT www.mcmelectronics.com

Hours: M-F 7 a.m. - 9 p.m., Sat. 9 a.m. - 6 p.m. EST.



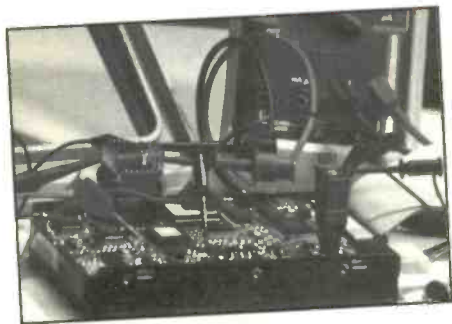
MCM ELECTRONICS®
650 CONGRESS PARK DR.
CENTERVILLE, OH 45459
A PREMIER FARNELL Company

Same Day Shipping!

In stock orders received by 5:00 p.m. (YOUR TIME), are shipped the same day.

CODE: ES94

★ ★ ★
**SHOWCASE OF
 TOOLS &
 TOOLCASES**



**ITT Pomona
 Electronics**

**Providing High
 Performance Tools and Tool
 Cases for Test &
 Measurement**

**1500 East Ninth Street
 Pomona, CA 91766-3835
 Phone: (800) 241-2060, (909) 623-3463
 Fax: (909) 629-3317
 Web site: <http://www.ittpomona.com>**

**DOUBLE-ENDED ULTRA-THIN
 MICROGRABBER® TEST CLIPS**

ITT Pomona has introduced a versatile new tool to meet today's testing challenges on densely packed circuit boards. Model 6091 Ultra-Thin Micrograbber® test clips are designed for secure, reliable connection between individual leads on high density IC leads. They can be used as a "jumper" between two ICs, enabling modification without the risk or expense associated with soldering wires to device leads. The double-ended test clip lead comes in black or red with flexible, silicone-insulated connecting wire in 10", 20" or 30" lengths.

The Model 6091 Ultra-Thin Micrograbber® is the newest addition to ITT Pomona's Grabber® series of testing tools which also includes other Micrograbber®, Minigrabber®, and SMD Grabber® test clips with plunger-type action and comfortable, finger grip operations.

ITT Pomona also offers specialized Test Companion™ toolcases which are outfitted with accessories specifically designed for use with Fluke, Hewlett-Packard, Tektronix and Wavetek DMMs and oscilloscopes, as well as LAN Test Kits with BNC cables, breakouts, terminations and adapters for LAN testers and Fluke LAN test meters.

For more information and a free copy of the 1997 Test & Measurement Accessories Catalog, contact ITT Pomona Electronics at 1500 East Ninth St., Pomona, CA 91766-3835. For technical assistance call 1-800-241-2060, fax (909) 629-3317, or look up our web site, <http://www.ittpomona.com>.



**DMM Test Leads
 Designed to
 IEC1010 Standards**

Designed for comfort yet ruggedly durable, Pomona's latest test leads feature silicon insulated wire for enhanced voltage protection and longer service life. Precision manufacturing and the best materials assure accurate contact. Available in Pomona's Test Companion™ Kits, and test probe and lead sets.

**Rated For 1000 Volts,
 Ready For Anything**



Engineered to the latest international safety standards, a complete selection of test probes, Maxigrabber® test clips and insulated alligator clips are ready to plug-on to most test leads. They're ready to do the job in either heavy-duty industrial applications or testing low-voltage devices on circuit boards. Included in many of Pomona's newest test accessory kits or available in individual sets.

Ask for your FREE copy of Pomona's New Test & Measurement Accessories Catalog. See your Pomona Distributor or call us. And visit us anytime at www.ittpomona.com

Circle (66) on Reply Card

ITT Pomona Electronics
 1500 E. Ninth Street
 Pomona, CA 91766-3835
 (909) 623-3463
 FAX (909) 629-3317

ITT Pomona Electronics
 AN LTT CANNON COMPANY

PanaVise Products, Inc.

**7540 Colbert Drive
Reno, NV 89511
Phone: 702-850-2900
Fax: 702-850-2929**

The PanaVise tradition of innovative quality began over 40 years ago with tool and die maker Otto Colbert. Otto was looking for a way to make his job easier: he wanted a vise head that could move easily without the need to continuously remove and reposition his work. After some time at the drafting table, he invented the now famous "split ball," an ingenious device that allows a vise head to "tilt, turn and rotate," then lock into position with a single control knob. The PanaVise product line began with this simple, yet very useful, invention.

Today, our line includes the original Model 301 which features the "split ball," a full range of Circuit Board Holders, our IDC Bench Assembly Press, the very popular PVJr. Model 201, and a wide variety

of heads, bases, base mounts and accessories. Create your own vise combination, or simply select a ready-to-go vise which best meets your workbench needs.

PanaVise is currently distributed throughout the world and represents superior quality in design, materials and workmanship. In late 1996, we completed and moved into a new 58,000 square foot facility which has allowed us to continue to expand our product line. From simple beginnings over 40 years ago, we've become the solid leader in work holding devices.

If you would like more information, see your local PanaVise distributor and ask for our 24-page, full color catalog which includes plenty of technical information. You may also send us \$1 and request the



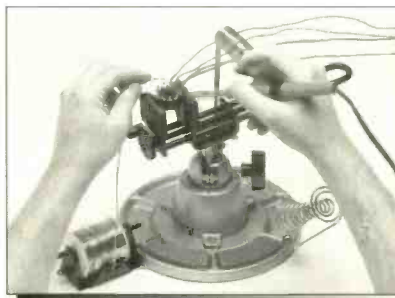
catalog from PanaVise Products, Inc., 7540 Colbert Drive, Reno, NV 89511, Tel: 702-850-2900, Fax: 702-850-2929, or visit our website at www.panavise.com.

For all your service and repair workbench needs, remember PanaVise.... ask for it by name! ■

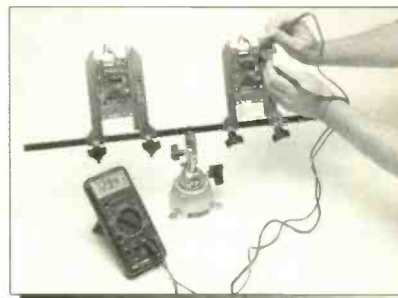
PanaVise makes your repair jobs easier!

From small pagers to large circuit boards, a PanaVise can make your job easier. Full "tilt, turn and rotate" in every vise means you can position your work where you need it and lock it into position with a single control knob. Demand the best. Demand PanaVise.

Ask for it by name!



Repair work is quick and easy with the right combination of PanaVise heads, bases and base mounts! Your PanaVise dealer has more information.



We added an extra pair of circuit board arms to a Model 372 so we could easily test two boards at once. PanaVise holders make it easy to work on circuit boards from 1/8" to 12" wide.

A note to our friends who already use PanaVise



Interchangeable heads are available for all 300 series bases! Add versatility to your current vise by selecting another head. Your PanaVise dealer has the details.



Send \$1 for our 24-page catalog!

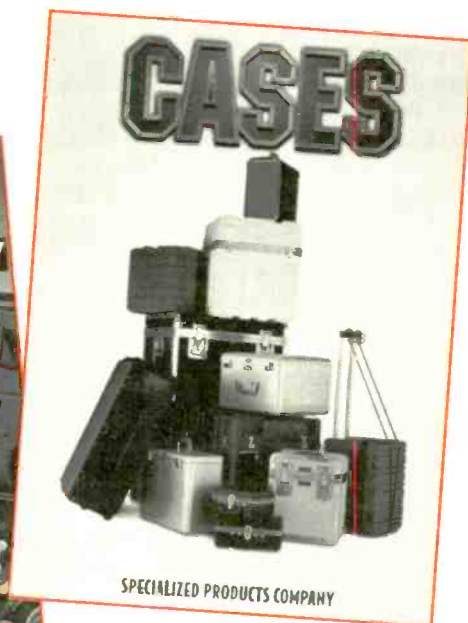
PANAVISE®

PanaVise Products, Inc.
7540 Colbert Drive • Reno, NV 89511
Tel: 702.850.2900 Fax: 702.850.2929
www.panavise.com

★ ★ ★ SHOWCASE OF TOOLS & TOOLCASES ★ ★ ★

Specialized Products

3131 Premier Drive
Irving, TX 75063
Phone: 800-866-5353
Fax: 800-234-8286



Specialized Products Company, an international supplier of tool kits and test equipment, has released its new comprehensive Case Catalog. The 32-page collection features a multitude of cases designed for virtually every application in every service-related field. SPC offers the largest selection available of high-density, reusable shipping containers in over 100 configurations plus styles for many other uses. Choose from cases for carrying, storing, protecting and shipping tools, instruments, laptop and notebook computers, sensitive and expensive equipment, circuit boards, catalogs and more.

Some cases have watertight hard shells while others are soft-sided padded styles. Others are specially designed to prevent dust contamination in cleanroom environments. For added versatility, you will find stackable styles for space-saving storage plus reversed versions for more storage space in the lid than in the base. Many containers give you a choice between 2-inch foam lining for a uniform interior cushion and 2-inch layers of full foam to create a custom fit for your contents. For easily pushing and pulling heavy loads, choose the convenience of rolling tool chests, cases with wheels or luggage carts. This impressive collection of cases ranges from

economical to top-of-the-line models for virtually every need and budget.

Case selection is easy with this new user-friendly catalog. Complete product descriptions are enhanced by large color photographs of both case exteriors and interiors with the main features clearly indicated. Detailed charts list sizes, weights, interior options and prices to simplify model comparison. Use the Order Form included in the catalog for easy mail ordering. For fastest service, place your order by toll-free telephone or FAX. All cases are shipped surface freight only because of their price-to-weight ratio. Entire case inventory is off-the-shelf for immediate delivery!

With over 30 years of sales experience, SPC is one of the nation's largest and best-known suppliers of tools, customized tool kits, cases and test equipment. A wide range of over 5000 specialized products includes everything needed for basic cable installation to board level component repair. Customers include electronic, computer and telecom technicians, engineers and managers plus virtually anyone else involved in the installation and/or repair of any type of technology. To receive your free copy of Specialized Products Company's Case Catalog, call (800) 866-5353 or FAX (800) 234-8286 toll free. ■

THE INDUSTRY'S LARGEST OFF-THE-SHELF CASE SELECTION

Free detailed catalog offers models for the industry's largest off-the-shelf selection of cases for immediate delivery. Models for virtually every service-related application are designed to carry, store, protect and ship tools, instruments, laptop and notebook computers, sensitive and expensive equipment, trade show displays and more.



Pick from reusable shipping containers, watertight instrument cases and soft-sided carry-alls. Features include telescoping handles, recessed rubber wheels and hardware plus foam-filled or foam-lined versions.

Immediate Delivery!



Specialized Products

C O M P A N Y

Telephone (800) 866-5353
FAX (800) 234-8286

Parts Express

**340 E. First Street
Dayton, OH 45402-1257
Phone: 800-338-0531
Fax: 937-937-4644**

Parts Express is a full line distributor of electronic parts, tools, test equipment, and accessories geared toward the consumer electronics industry and the technical hobbyist. In business since 1986, Parts Express has quickly established itself as a leader in the industry by consistently providing quality products, first rate customer service, low prices, and toll-free technical support.

Parts Express stocks an impressive array of CATV and VCR repair parts, tools, semiconductors, test equipment, chemicals, computer accessories, adhesives, telephone products, educational materials, pro sound equipment, raw loudspeaker drivers for home, car, and home theater applications, crossover parts, specialized connectors, batteries, cellular accessories, and a huge selection of wire and cable. Parts Express stocks over 15,000 items and

strives to continually expand its product line to offer the customer a wide and diverse selection of sometimes hard to find products and accessories. Some of the items stocked are from names like 3M, Fluke, Tripplett, Littelfuse, Klein, Goldstar, Mueller, Electro-Voice, Catamount, NTE, Motorola, Pioneer, Eminence, Pyle, Pyramid, Celestion, Audax, Vifa, Morel, Monster Cable, Sherwood, Dynamat, Ultimate, Kester, Neutrik, Augat, Cambridge, GC Electronics, Tech Spray, Rite Off, Caig, GB, Lisle, Phoenix Gold, Easypower, Mag-Lite, Weller/Ungar, Panavise, Carol, Ferrofluidics, and many more. All of these products are stocked and ready for immediate shipment (most orders shipped within 24 hours).

The sales department at Parts Express prides itself on offering fast, friendly, dependable service and complete customer satisfaction. The phone representatives can provide information about current pricing and availability and the technical support staff is happy to provide answers on a wide variety of questions. Orders can be placed 8:00 A.M. - 8:00 P.M. ET Monday through Friday, and 9:00 A.M. - 5:00 P.M. ET on Saturday.

Each year Parts Express produces a full line catalog, showcasing the complete



product offering plus detailed descriptions and specifications. This catalog is supplemented with numerous sales flyers during the year, offering special bargains and hot deals. For more information or to request a free 244 page full line catalog, please call 1-800-338-0531.

Parts Express™

**FREE
244 PAGE
CATALOG**



- ◆ Original Japanese semiconductors.
- ◆ Test equipment from Fluke, Goldstar, and Tripplett.
- ◆ Audio/Video accessories.
- ◆ Original VCR replacement parts.
- ◆ Microwave oven parts, flybacks, and chemicals.
- ◆ Wire and connectors.
- ◆ Tools and soldering equipment.
- ◆ Same day shipping.

Source Code: ESM

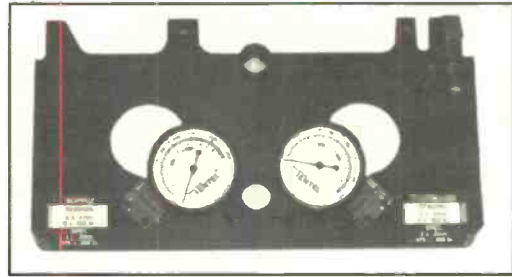
CALL TOLL FREE

1-800-338-0531

Parts Express 340 E. First St. Dayton, Ohio 45402-1257 Phone: 937-222-0173 Fax: 937-222-4644

Tentel

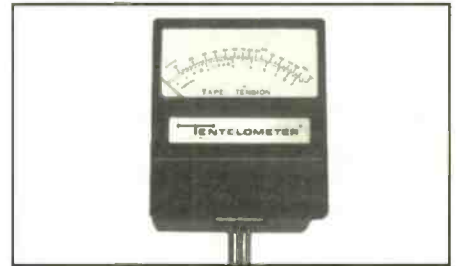
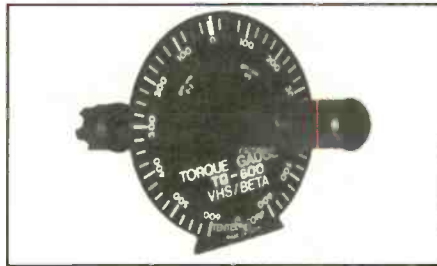
4475 Golden Foothill Pky.
El Dorado Hills, CA 95762
Phone: 916-939-4005, 800-538-6894
Fax: 916-939-4114



Any Job is EASY with the RIGHT tools!

Over 90% of VCR and camcorder problems are due to mechanical malfunctions. Mechanical components fail due to wear, oxidation, and abuse. There are literally dozens of mechanical parameters in a typical machine. These mechanical problems can be categorized as 1) carriage alignment, 2) tape hold back tension, 3) guide and reel table heights, and 4) video head wear problems. Most TV shops only guess about VCR problems since they have thousands of dollars in electronic testing equipment but virtually no tools for the critical mechanical VCR parameters.

Tentel manufactures the only univer-



sal test tools to provide fast, accurate measurement of these mechanical tests. Elimination of guessing provides better repairs without costly and embarrassing call backs, while actually cutting down the time spent on VCR service.

Tentel has been providing test tools to the video repair and maintenance

marketplace for over 24 years, and is recognized throughout the world as the leader in supplying easy to use powerful test tools for the mechanical measurements on video transports. Over 70,000 TENTEL test tools are currently in use for testing and repairing video transports. ■

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* VCR repair, *suddenly* become our BEST supporters.

EVERY VCR service manual shows a method of performing critical mechanical tests which cause the majority of VCR problems. TENTEL offers the ONLY Universal gauges for tape tension, guide heights, torques, video head wear, reel table heights, and MORE.

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.



® 4475 GOLDEN FOOTHILL PKWY.
EL DORADO HILLS, CA 95762

800-538-6894 / 916-939-4005

24 hour FAX line: (916) 939-4114

DEN-ON INSTRUMENTS (U.S.A.), Inc.

The Difference is Dependability

DEN-ON INSTRUMENTS has provided the industry with top of the line soldering, desoldering and rework equipment worldwide for over 15 years. Quickly building its reputation as an industry leader with its invention of the first truly 100% portable electric desoldering tool. Manufactured in Japan and committed to producing high quality, state of the art equipment, DEN-ON continues to achieve top sales and notability over all competitors in the Asian and European markets.

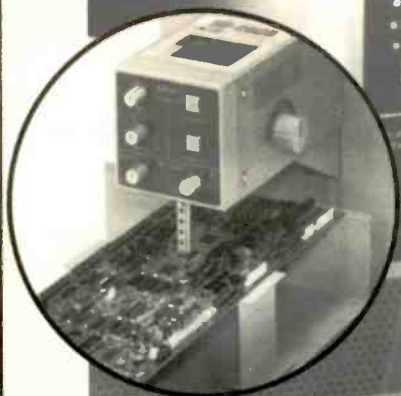
DEN-ON INSTRUMENTS first introduced into the U.S. market in 1988 the SC-5000 desoldering tool which generated a quite loyal and devoted following. Since then, there has been two model upgrades and nothing but praise for the quality and efficiency of the improved tools. The newest generation of the high performance desoldering

tool is the **SC-7000Z**. A gun type desoldering tool that is ergonomically designed, compact, and self contained. Combination of a 100W ceramic heater and sensor-feedback temperature control circuit allows the unit fast heat build up and prompt recovery. Dial type temp. control and LED indicator lamp displays an accurate operating temperature range of 350°C–500°C. The direct in line connection between diaphragm pump and desoldering tip provides high vacuum efficiency. The vacuum attains a genuine 26"Hg in 0.2 seconds, which is the most important factor when desoldering thru-hole components. What makes our tools truly versatile and unique is that with just a switch of a lever, the unit is converted into a **hot air gun** for removal of surface mounted components. The SC-7000Z suggested list price is \$475.00.

Committed to making the highest quality products, *the DEN-ON Difference is Dependability*. Maximizing efficiency and life expectancy and minimizing down time is paramount to us. By staying on the leading edge of technology and innovation, DEN-ON has developed the **SD-3000 SMD Rework Station**. The SD-3000 can remove and replace any type and size of SMD up to 50mm sq. with a single revolving hot air nozzle. Simple X and Y axis knob controls configure and adjust the movement of the nozzle to trace over the leads or soldered points of the component, thus also making it possible to rework connectors, PLCC sockets, BGA, PGA, etc. without ever changing the nozzle or any hot attachments. Microprocessor controlled, built-in timer and temperature control for job repeatability and SMD/PCB damage prevention. This truly versatile and compact rework station comes complete and has a suggested list price of \$6000.00. ■

NEW REWORK TECHNOLOGY FROM DEN-ON

SD-3000 SMD REWORK STATION



Able to remove and/or reflow any size and type of SMD up to 50MM square with a **SINGLE** adjustable hot air nozzle. Demo videos available.

SC-7000Z DESOLDERING TOOL



Compact and self contained with a built in lever to convert suction to hot air blow for SMD removal

DEN-ON INSTRUMENTS, INC.



Monterey Park, CA
(800) 397-5960

Circle (83) on Reply Card

★ ★ ★ SHOWCASE OF TOOLS & TOOLCASES ★ ★ ★

Jensen Tools

7815 South 46th Street
Phoenix, AZ 85044-5399
Phone: 800-426-1194
Fax: 800-366-9662

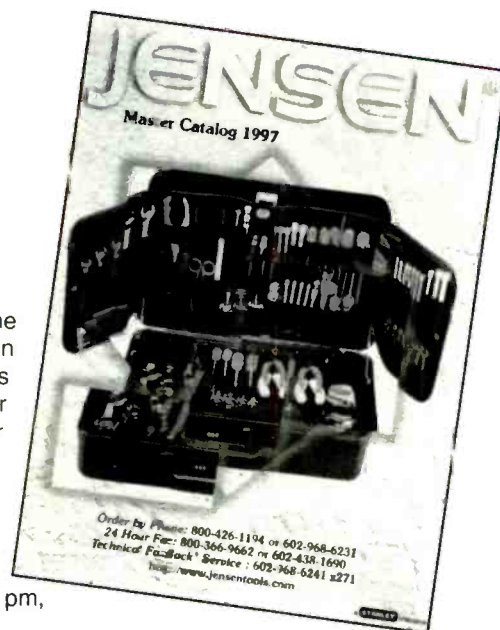
Jensen Tools Inc., major worldwide supplier of tool kits, specialty tools, test instruments, diagnostics, and other related equipment to the electronics industry, announces the operation of their 24-hour, 7-days a week FaxBack® system as a service for inquiries who need information about products in Jensen catalogs.

According to John Tucker, Jensen Technical Support Specialist, "FaxBack provides the latest catalog pages, detailed technical specifications and special promotions around-the-clock. We are constantly expanding and updating the information available to benefit our customers."

To access Jensen's FaxBack 24 hours a day, 7 days a week, phone 602-968-6241, ext. 271. An easy-to-follow voice

prompt guides the caller through the procedure. The requested information will be delivered through the inquirer's fax machine in mere minutes. For further information, suggestions or comments about the FaxBack system, or to reach a specialist for answers to product questions, requests for technical advice, or for possible solutions to problems, call 601-968-6241, ext. 256 (9 am to 5 pm, MST, Mon-Fri).

Because of customer response, technical support has become a Jensen tradition. The addition of FaxBack is part of a Company commitment to enhance and expand this service by providing the latest technological advances to back it up.



If you haven't bought from Jensen lately, you can request a free catalog by calling 800-426-1194, or faxing 800-366-9662. Visit our Web site: <http://jensentools.com>.

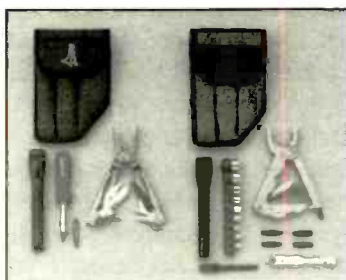
What's New at Jensen?



Fluke Scopemeter



Telephone Test Set



Multi-Tool Kits

JTK®-32 Electronic Equipment Installation & Service Kit



JTK®-88 Inch/Metric Tool Kit



Stereo Microscope

Tektronix DMM



Push Down Tool



JENSEN TOOLS

7815 S. 46th St., Phoenix, AZ 85044
Tel: 800-426-1194 or 602-968-6231
Fax: 800-366-9662 or 602-438-1690
<http://www.jensentools.com>

and lots more
new stuff in
each new
Jensen catalog!

Free Catalog - call 800-426-1194, Dept. 82

Circle (67) on Reply Card

To Order Back Issues



Only
\$3.50
Per
Issue



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
CALL 1-516-681-2922
Fax 1-516-681-2926
Electronic Servicing
& Technology
76 North Broadway
Hicksville, NY 11801

BOOKS

Newnes Data Communications Pocket Book, Third Edition, by Mike Tooley, Newnes, 256 pages, hardcover \$24.95

Written by the Dean of Technology at Brooksland College in Surrey, England, this new edition of the Pocket Book is for technicians and engineers involved with the installation and maintenance of data communications equipment.

This latest edition of the *Newnes Data Communications Pocket Book* has been substantially updated to keep abreast with the rapid developments in data communications technology. New topics have been introduced—data compression, the Internet and World-Wide Web, HyperText Mark-up Language and existing material has been updated—and expanded.

Newnes, 313 Washington Street, Newton, MA 02158-1626

Encyclopedia of Electronic Circuits on CD-ROM, By Rudolf Graf and William Sheets, McGraw Hill, \$99.00

Adapted from the best-selling five-volume reference by Rudolf Graf and William Sheets, McGraw-Hill announces the release of the *Encyclopedia of Electronic Circuits on CD-ROM*. Containing 1,000 circuit designs from industry leaders such as Motorola, Texas Instruments, General Electric, RCA, National Semiconductor, and others, this tool lets users locate specific circuits, review them on PC, and print them on a laser printer.

The user can quickly find circuit designs by category, or alphabetically. There are 142 circuit categories that include audio circuits, display circuits, measurement circuits, power supplies, radio circuits, signal-generation circuits, and others. Once a topic is found, a text description of the circuit is provided, and the user can view the circuit diagram using a built-in schematic viewer, as well as print it out. Many schematics also include mechanical details of parts and IC packages, and waveform diagrams.

Additionally, users may call an 800 number for access to four locked CAD products available on the CD-ROM: *SuperCAD* (a full-featured schematic editor), *SuperSIM* (a digital simulator), *SuperSPICE* (an analog simulator), and *SuperPCB* (creates printed circuit

boards). Free demo software is included for both SuperCAD and SuperPCB.

McGraw Hill, 11 West 19th Street, New York, NY 10011

Developing Java Entertainment Applets, By John Withers, John Wiley & Sons, Inc., 448 pages, \$29.95 US, \$41.95 Canada

Developing Java Entertainment Applets by professional games designer John Withers arms readers with all the know-how needed to develop interactive multimedia Java applets complete with 2D and 3D graphics, animation, sound effects, and music. This book also provides readers with: An introduction to Java programming fundamentals and more advanced techniques; A comprehensive breakdown of design elements as illustrated in seven popular games; and The tools needed to design and implement a card game in Java.

John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158-0012

High Performance Audio Power Amplifiers, By Ben Duncan, Newnes, 288 pages, hardcover \$56.95

Power amplifiers and their performance lie at the heart of audio engineering and provide some challenging problems for the engineer. Ben Duncan's experience, as an audio consultant, analog electronics designer and author, give him an unique insight into this difficult but rewarding field. This handbook is the distillation of the state of the art, says the publisher.

The contents of the book include: Introduction; Overview of requirements; The input port; The power stage, Topologies, classes and modes; The power supply; Audio specification and test; Real world testing - rationale and procedures; Choice, application, installation and setup; Maintenance and surgery; The future; Index.

Since 1977, Ben Duncan has been involved in the design of over 70 innovative, high-end audio products used by recording and broadcast studios, on stages, in clubs and by the most critical domestic listeners - as well as creating bespoke equipment for top musicians.

Newnes, 313 Washington Street, Newton, MA 02158-1626

PHOTOFACTS

| | | | | | | | |
|-----------------|-----------------|-------------------|------|----------------|------|----------------|------|
| CROSLEY | | MAGNAVOX | | F19203BKT X2 | 3819 | 27H-S100 | 3790 |
| CT2744C1 | 3801 | FS3262A2 | 3792 | F25209WTTX1 | 3823 | 27H-S120 | 3790 |
| 27V512 | 3801 | 32V506 | 3792 | X19150SGTX2 | 3819 | 20H-M60 | 3817 |
| CT2526C305 | 3826 | | | | | 20H-M60R | 3817 |
| 25V502-00AA | 3826 | | | | | 20H-M60S | 3817 |
| | | MITSUBISHI | | SAMSUNG | | | |
| GE | | CS-20103 | 3829 | KTC52A | 3800 | TOSHIBA | |
| CTC185AB | 3802 | CS-20103M | 3829 | TXE2045 | 3800 | CE20F10 | 3793 |
| 25GT516TX1 | 3802 | CS-20203 | 3824 | TXE2046 | 3800 | CF19F22 | 3799 |
| 25GT517TX1 | 3802 | CS-20203C | 3824 | | | CF20F40 | 3793 |
| 27GT616TX1 | 3802 | | | SANYO | | CL20F22 | 3799 |
| 27GT619TX1 | 3802 | PANASONIC | | AVM-2556 | 3794 | CL21F40 | 3793 |
| CTC177AM2 | 3828 | AEDP270 | 3803 | DS25650 | 3794 | TAC9610 | 3799 |
| 25GC731KF1 | 3828 | CT-27G21CU | 3803 | G5F-25560 | 3794 | TAC9617 | 3793 |
| 25GC732KF1 | 3828 | CT-27G21U | 3803 | 25650-00 | 3794 | TAC9624 | 3793 |
| | | CT-27G21UU | 3803 | 25650-01 | 3794 | CX27F60 | 3822 |
| | | ADP273 | 3821 | | | TAC9605 | 3822 |
| GOLDSTAR | | AMEDP252 | 3825 | SEARS | | | |
| GVR-C235 | VCR-285 | ASEDP252 | 3825 | CTC185AB | 3818 | | |
| GVR-C245 | VCR-285 | CT-13R14U | 3821 | 274.43458690 | 3818 | | |
| | | CT-13R15U | 3821 | | | ZENITH | |
| JCPENNEY | | CT-31G20CT | 3825 | | | SY1951Y | 3795 |
| 686-6227-00 | (sim to)VCR-285 | CT-31G20T | 3825 | SHARP | | SY1951YM | 3795 |
| 890-2264 | (sim to)VCR-285 | CT-31G20U | 3825 | CH27S12 | 3790 | SY1953Y | 3795 |
| 6227 | (sim to)VCR-285 | | | 20G-M100 | 3798 | SY1953YM | 3795 |
| | | RCA | | 20G-M100R | 3798 | SY2549S | 3791 |
| JVC | | CTC175C2 | 3819 | 20G-M120 | 3798 | SY2053S | 3820 |
| AV-27750 | 3797 | CTC185AA | 3823 | 20G-M120R | 3798 | SY2053SM | 3820 |
| AV-27710 | 3827 | F19201BKTX2 | 3819 | 20H-M100 | 3798 | SY2068DT | 3820 |
| AV-27720 | 3827 | F19202WNTX2 | 3819 | 20H-M100R | 3798 | SY2068DTM | 3820 |
| | | | | 25H-S100 | 3796 | | |

Your best source for the widest range of service data, technical books, and reference materials.

Technical Books

Service Data

Training Videos

A Bell Atlantic Company
Howard W. Sams

Call today for more information and the name of your local distributor.

800-428-7267

Circle (73) on Reply Card

Correcting a tape backup problem

By Sheldon Fingerman

Backing up the data on a computer is extremely important, so when a tape backup system fails the owner will probably call in somewhat of a panic. The other day I received a call about a Jumbo 250 drive breaking tapes. A quick look at the backup tape confirmed what the customer had told me. They had also purchased some new tapes, which promptly broke as well.

As it turns out, this is a fairly common problem with many popular tape backup systems that use mini data cartridges. Although the tapes appear to be broken—actually pulled off the spool—they are fine. This is a perfect example of a situation in which it's important to not merely treat the obvious symptoms, but to get to the root of the problem.

A look at the cartridge

First, let's take a close look at a mini data cartridge. Although it resembles a video or audio tape, the only things it has in common with them are the fact that it uses magnetic tape and has two spools. The similarity ends there.

Both reels on standard audio and video cassettes are exposed. This allows the transport to directly turn the reels. The tapes are attached to the reels, and the transport must be able to turn the reels at different speeds as the amount of tape changes from one side of the tape to the other. When a tape breaks you solve the problem that caused it to break, replace the tape, and usually do a good cleaning.

Remedies to problems with backup tape cartridges aren't quite that obvious. A quick glance at the cartridge will reveal two reels, but take a good look at the bottom of the cartridge.

There is no way for the transport to access either reel. Somehow, both reels are being controlled from the front of the cartridge.

Construction of the cartridge

Using a mini data cartridge that contains no useful data for experimentation, carefully take the cover off by removing the screws on the bottom of the cartridge. Even with the screws removed it will take a bit of effort to remove the cover, so be sure to keep the cartridge right-side-up, or you could find yourself searching for parts all over your bench and the floor.

Once the cartridge is opened (Figure 1), the first thing you will notice is a strange band—that at first looks like part of the tape. It's this band that allows both reels to rotate in sync, regardless of the amount of tape on either reel. Rotating either reel shows how ingenious this assembly really is, and you should probably take a few notes just in case the components of the assembly decide to part ways.

If you continue to explore the cartridge you will also notice something else that's very interesting: The only thing holding the tape to the reels is the tension of that strange band and overlapping layers of tape. When the end of the tape is pulled off the reel it may appear broken, but rarely is. Now, why would the tape come off the end of the reel? Or better yet, what the heck is supposed to stop the tape before it gets to the end?

If you look closely at the cover you just removed, you will notice a small mirror angled at 45 degrees. This mirror sits just behind the tape, and there is a small cutout in the cartridge just below it. Further examination will reveal very small holes in the tape at both ends (Figure 2). Be careful when looking for these holes not to pull the tape off the reel. Actually, as you'll soon discover, this is no big deal. Obviously, the holes in the tape, along with the mirror, have something to do with an end-of-tape sensor.

Fingerman is an electronics and computer consultant and servicing technician.

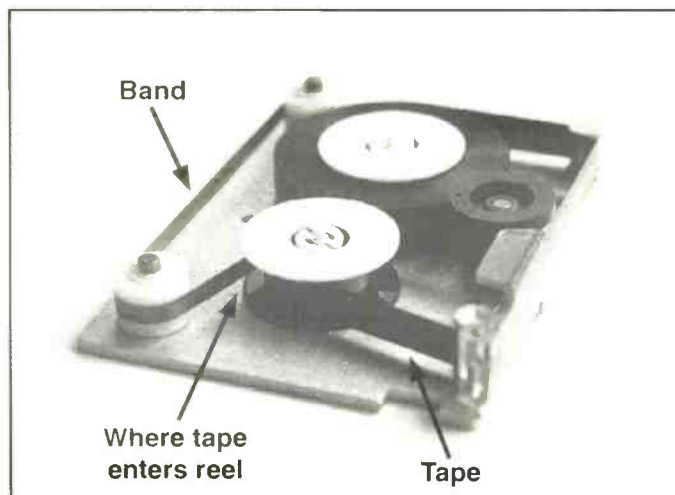


Figure 1. When you take apart a backup tape cartridge, you will note that it's constructed differently from an audio tape or video tape.

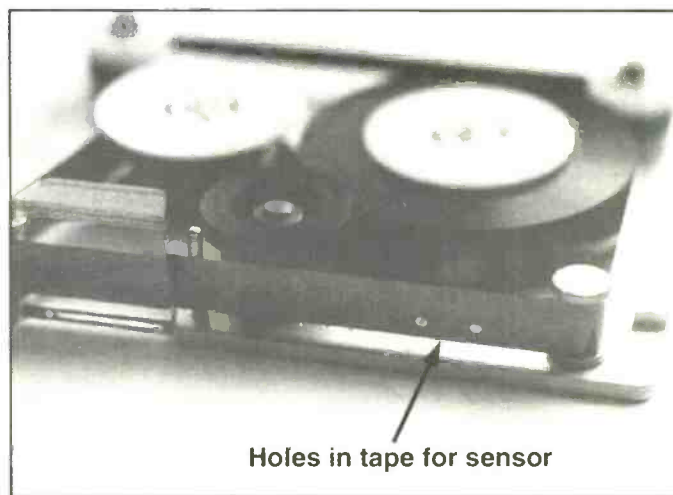


Figure 2. Light shining through small holes in the backup tape provide an end-of-tape signal for the tape drive.

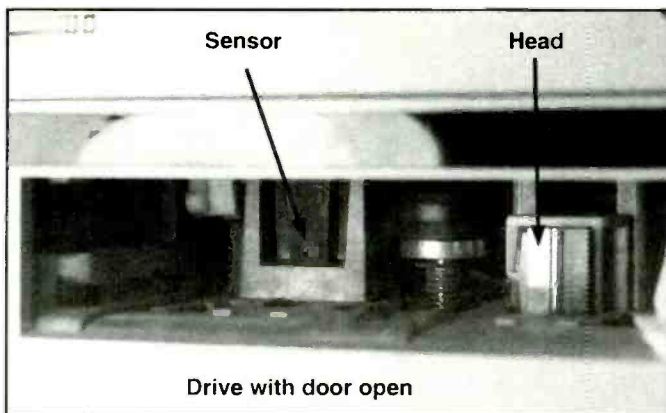


Figure 3. If the end of tape sensor is fouled by dust and dirt, the tape will continue to run and pull off of the reel.

Examining the drive

Now let's take a look at the drive itself. You need not remove the drive, simply hold the door out of the way and grab a flashlight (Figure 3). To the left of the rubber drive wheel there's a sensor. You can easily spot a very small hole straight in (part of the sensor), and the mate to this assembly is below it. If you haven't figured it out by now, a beam of light is reflected off the mirror completing the circuit thus telling the drive the tape has reached the end of its travel.

Only three things can possibly interrupt this process: there are no holes in the tape, the beam is not functioning, or the sensor is blocked by dust or dirt. Since the first is virtually impossible, and the second is highly unlikely, it's a pretty good bet that the problem is dust and dirt. Clean a backup tape drive the way you would any similar device. Use a cotton swab and alcohol, compressed air, and if it's really dirty in there use a small vacuum. It is rarely necessary to remove the drive; just work right through the door.

Now, how about that "broken" tape? You will need to get the end of the tape back on the reel. It must be placed under the band and wound up on the reel a bit. Getting the tape started on the reel is the tough part. You'll find a little "spit" goes a long way here. Wet the end of the tape with your finger, then "stick" it to the reel and begin winding. Be sure to wind it past the holes in the tape, and there may be two or three sets of holes (obviously, if you don't do this it will pull off the reel again). Any slack in the tape can easily be taken out by turning the reels in opposite directions—gently.

That should do it. You've repaired the drive, and also fixed the "broken" tape. If you've done this for a customer you've made a few bucks and become a hero by saving them the cost of new tapes. You've even saved the data on the, er, broken tape. If the problem is on your own computer the entire process can often be done in the time it would take to go out and buy a new tape—which, as we've discovered, isn't the problem.

Keep in mind not all tape backup systems are alike, but this repair covers an awful lot of them. Remember, there are still a lot of Colorado Memory Jumbo 125/250 tape drives out there. I'd love to have a buck for every "bad" tape and backup system that's been thrown away.

This is an easy repair with an almost 100% guaranteed success rate, and a definite service call charge. ■

DALBANI

The Ultimate Savings Source

HITACHI RCA

DALCO SANYO

SONY FLUKE

SOLIDEX 3M

JPRO SONY

EVEREADY PYRAMID

DURACELL

ENERGIZER

EMERSON MAGNAVOX

LEADERSHIP

JBC 666Z

RAWN

Xcelite Weller

ijp Products

CALL TOLL FREE
1-800-325-2264

\$3.95

FREE 248 PAGE CATALOG

A Picture is Worth **30,000** Items

4225 N. W. 72nd Ave.
Miami, Florida 33166
TEL : (305) 716-1016
FAX : (305) 594-6588

Circle (63) on Reply Card

**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.

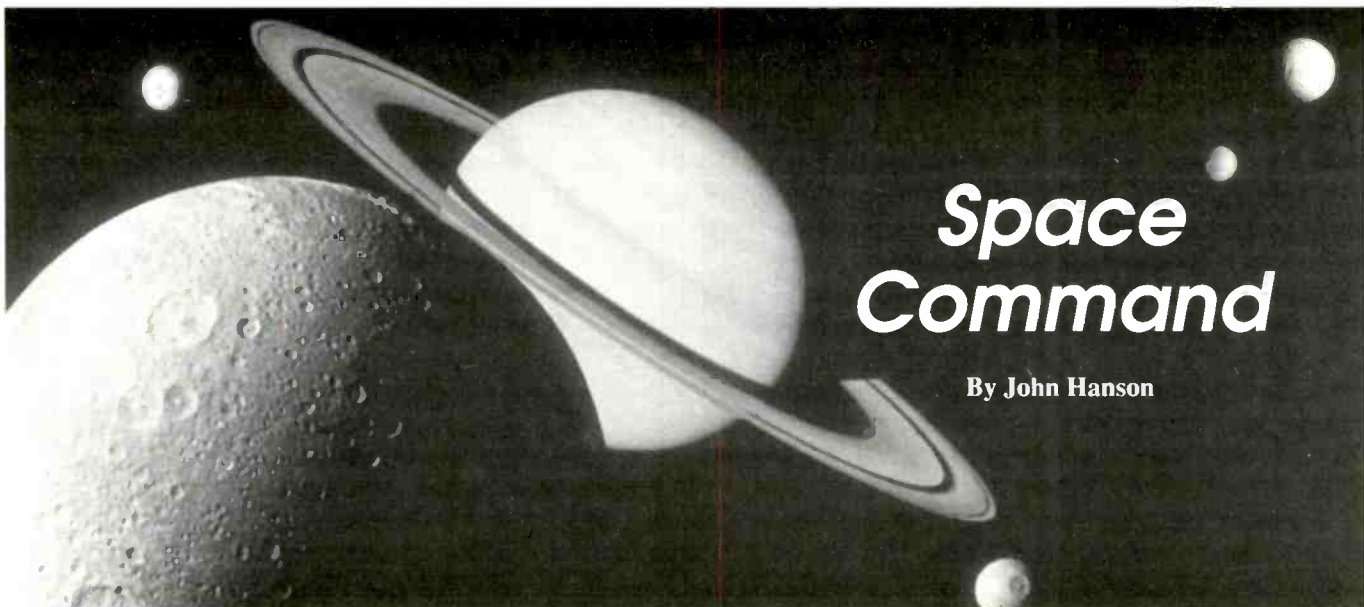
THE ASSOCIATE CET Exam Books

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>

Circle (81) on Reply Card



Space Command

By John Hanson

Something from Star Wars? No, Space Command is what Zenith called its first wireless TV remote back in 1957. Zenith ran to the patent office and received five patents for Bob Adler's (Zenith's Chief Engineer) invention.

The idea of remotely controlling radios and TVs was old hat, going back to the 1930s, but without wires: that was something new. The genius in the concept was the simplicity of the hand unit. It was entirely mechanical. Adler used ultrasound for the carrier, and generated four commands: on-off, channel up, channel down, and sound mute, by changing the sound frequency. Four aluminum rods, different in length, were struck by a spring-loaded hammer to emit a tone to "Space Command" the function pressed. This device, clever and unique, catapulted Zenith to the position of leader in TV remote controls.

Marketing strategy

As with every innovation in consumer electronics, the competition waited to see what marketing approach Zenith would use. The decision to limit the feature to the top-of-the-line models and to charge up to \$100 extra for the feature limited market penetration. Ignoring Zenith's patents, competition moved swiftly to circumvent the patents and a proliferation of me-too ideas hit the market. Most of the competing remote controls used an rf car-

rier and a complicated remote control that required a battery. Their immediate advantage was that they could offer more functions, such as volume up/down.

Both Zenith and its competitors began experiencing interference problems from a myriad of sources. Phantom commands plagued the industry for years. TVs would turn on mysteriously, and channels would change without a command. In the search for a better system, infrared light surfaced to become the carrier of choice. No patents were issued, so the entire industry moved in the same direction.

The codes

What is interesting, and a bit unusual, all manufacturers submitted their own unique serial codes to the EIA for registration. As a result, dealers could demonstrate any model and make of TV on their sales floor without a cross-talk problem from another product.

Thanks to the listing of registered codes, universal remotes became a possibility. A single remote could be programmed to operate a TV, VCR and cable box. Conversely, remotes provided by the cable company to operate their box could be programmed to operate the TV.

The remote control rf signal

Here's how a universal remote works. Each manufacturer has its own registered code for each product category. The customer looks up the two-digit or three-digit code in the remote's instruction guide,

and enters the code. The code is retrieved from the remote's memory and entered as the operating code. Figure 1, the rf signal code for a Sony remote control, is typical of manufacturers' codes.

In this code, the low levels represent the presence of light from the remote control's IR light, and the high levels, no light. With each customer command, a light code burst is a series of long and short light pulses that define the binary bits. In this example, a 0.5µsec high level followed by a 0.7µsec high level equals a zero. This followed by a 0.5µsec high level followed by a 1.3µsec pulse defines a 1, or a hexadecimal 4.

Remote control hand-held units can be repaired

IR remotes are well known as cost-effective, reliable, systems offering up to a year of average battery life. But they're not perfect. Channel surfers place a heavy burden on the button contacts. New, switch-mode fluorescent light fixtures compete with the light carrier frequency of the remotes, and can reduce sensitivity of the remote control.

In spite of the availability of low-cost replacements, remote controls can be repaired profitably. Repair of a remote is similar to cleaning tuner contacts, once you're beyond the mundane task of cleaning battery contacts and replacing the battery, it's possible to restore the contacts on the PC board using a type of liquid silver available at your parts distributor.

Hanson is an independent servicing technician and a retired service engineer from a major consumer electronics manufacturer.

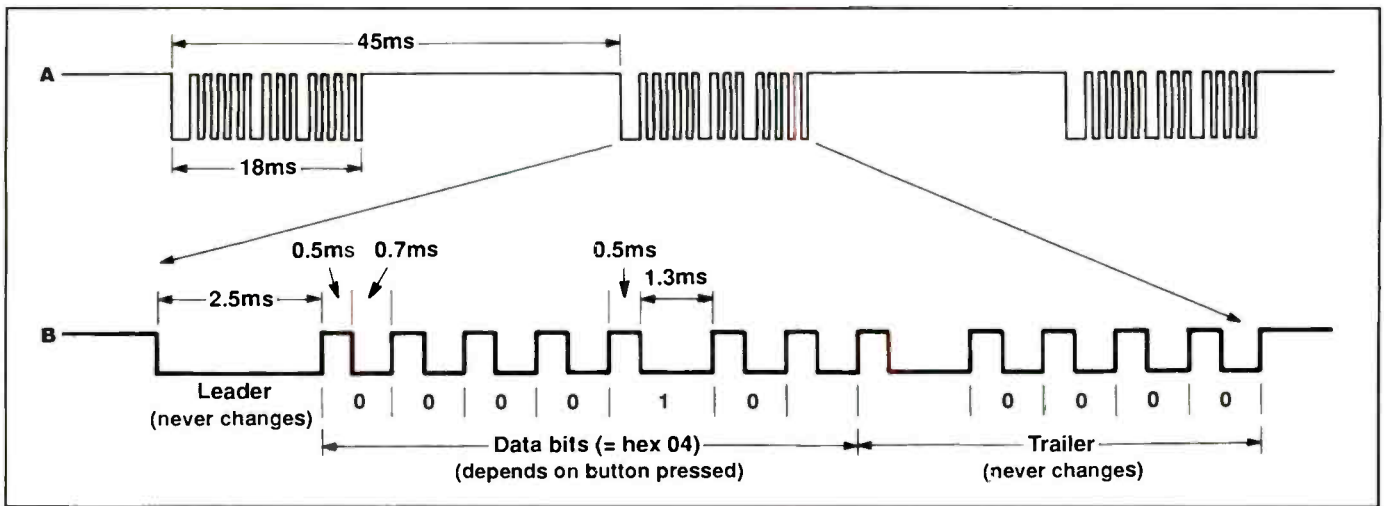


Figure 1. The rf signal code for a Sony remote control, shown here, is typical of manufacturers' codes. In this code, the low levels represent the presence of light from the remote control's IR light, and the high levels, no light. With each customer command, a light code burst is a series of long and short light pulses that define the binary bits.

The fluorescent light cross talk problem may be resolved by applying a one-inch square of black plastic tape with a pin hole in the center, directly over the IR sensor on the product the customer is controlling. This reduces the acceptance angle of the sensor to the IR light. All the customer needs to do is accurately point

the remote at the product. There's a good chance that this solution will work. Another approach, of course, is to simply replace the lamp in the room that's causing the problem with a three-way lamp.

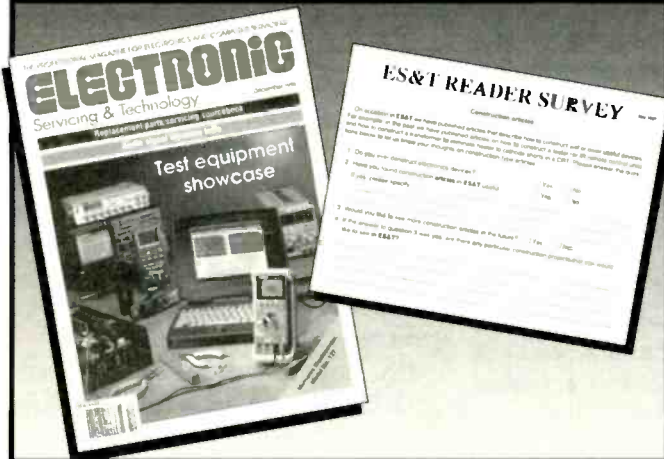
The future

What's in the future for remotes? Prob-

ably a voice recognition system. As for any consumer electronics product, the criterion is cost. This is the same argument we've heard for years on the CRT. No doubt the next century will bring us a flat display and a new remote control system, but for its time, Zenith's Space Command was a big breakthrough. ■

ES&T READER SURVEY

It's a mini survey about you.



Bound into this issue is the ES&T Reader Survey card.

We would like to hear about the problems you face, the opportunities you see and the equipment you use during the course of your work day.

The postage is paid. All you have to do is fill it out and mail it.

What could be easier?

Please fill yours out and mail it today.

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 (69) on Reply Card

What Do You Know About Electronics?

Conversions

By Sam Wilson

Based upon the premise that a little bit of review is always a good thing I will quickly go through the method of converting a binary number to a decimal number. I will also give a quick review of converting a decimal number to a binary number.

You might argue with the premise. For example, you might say: "If the bathtub is overflowing it is not a good thing to be reviewing digital basics."

OK—I'll grant you that. According to the rules of formal logic I can say: "I offer this premise 'a priori'." That is pronounced *ah pree or ee*. It means "This is my premise for the following and if you don't like it, spend the rest of the time counting the number of bricks in a wall."

Converting binary numbers

First review: Convert 1010110 to a decimal. It is like learning to ride a bicycle. First you watch someone do it so you get a good idea of what the pedals are for.

So, you write the binary number that represents all of the locations of the number you are going to convert. Then, multiply each number by the binary equivalent for the location of the number:

$$\begin{array}{ccccccc} 2^6 & 2^5 & 2^4 & 2^3 & 2^2 & 2^1 & 2^0 \\ 1 & 0 & 1 & 0 & 1 & 1 & 0 \end{array}$$

Starting from the right side and moving to the left you get:

$$(0 \times 2^0 = 0) (1 \times 2^1 = 2) (1 \times 2^2 = 4) (0 \times 2^3 = 0) (1 \times 2^4 = 16) (0 \times 2^5 = 0) \text{ and } (1 \times 2^6 = 64)$$

Then, you add all of the underlined numbers and you get:

$$2 + 4 + 16 + 64 = 86$$

Using the conventional method of writing it: $1010110_2 = 86_{10}$

Now, let's go the other way - convert 86 to a binary number. The trick is to divide by two and divide the remainder until you run out of numbers. For example, when you divide 86 by two the

remainder is 0. The remainder for each step is over the top of the division.

$$\begin{array}{cccc} & 0 & & 1 & & 1 \\ (86^2 = 43) & & (43^2 = 21) & & (21^2 = 10) & \\ & 0 & & 1 & & 0 & & 1 \\ (10^2 = 5) & & (5^2 = 2) & & (2^2 = 1) & & (1^2 = 0) & \end{array}$$

Now, you write the remainders as a binary number starting from the right and going to the left:

$$86_{10} = 1010110_2$$

I said this was a review. If you go through the above steps it should remind you of the procedure and you can go it alone from there.

Now that we have reviewed the procedures I would like someone (anyone) some place (any place) to write and tell me how they use this in their job. I correspond with a number of technicians who are good at what they do, but I never get answers to that question.

Now, think about that. Every book I reviewed shows you how to convert decimal to binary and binary to decimal. I am sure that every reader can do it (but some of us need a little review).

If it is in the books, magazine articles, lectures, etc. why is there no place that provides us with examples of where we can use it? I will not go so far as to say it is useless. What I am saying is that I haven't received any information on how to use it on the job.

What about ohm's law?

I am always amazed when a technician says, "I learned a lot of math when I was studying to be a technician, but I never have been able to use it".

The real truth is that the technician was never told how mathematics relates to the job, so I'll do it now.

In the mathematics of electronics courses you learned about Ohm's law, you did 207, or so, problems in Ohm's law and after you got out of school you never needed to do another problem.

Now, think about this. You measure the

voltage across a resistor (R) and you measure 10V when you should measure 2V. What are the possibilities?

- The resistor has changed value. That is very rare and you usually discard that possibility, but reserve it for later. You also discard the possibility that you have the wrong information. However, you might just want to double check your source of information.

- You know that there are two possibilities (disregarding the possibility of a bad meter or a bad measurement): either the current is wrong or the resistance is wrong. Statistically, your best choice is that the current is wrong.

You go through the possibilities much faster than you can read about them here. How do you arrive at the current so quickly? You know that the voltage across the resistor (V) is: $V = IR$

So, there are only two real choices if you discard (automatically) the other possible choices we have listed.

You know it is the wrong current or the wrong resistance. You pick the current. Statistically, current is the best choice. You don't waste time on measuring the resistance of the resistor unless the current proves to be OK.

Having worked those 207, or so, problems you got it locked in your mind. You know what determines the voltage.

You can add it up this way: the mathematics is like a quick way to learn the relationships between the parameters. If you had to memorize those relationships in words a basic electronics course would have been a ten year course.

OK, so we know at least one reason for studying math in our basic electronics course. But, how about decimal-to-binary and binary-to-decimal conversions?

I'm waiting to hear from you guys and gals. You too. Phrone Sledge!

Bad example

I was talking to a well-known and brilliant author about something he wrote in his book: A coulomb is the total electric

Wilson is the electronics theory consultant for ES&T.

charge of 6.28×10^{18} electrons (or something like that).

I said: "You know that 6.28 is actually 2π and it doesn't have anything to do with the value of a coulomb. However, you didn't correct it in the next edition of your book. Why, didn't you?"

His answer: "So many authors have copied that from me I was sure that if I put the real value in I would be accused of being wrong."

I put that story in here because I know I will get at least one letter saying "Why, then, did you put binary-decimal and decimal-binary conversions in your book?" (See above story.) In other words, if I didn't put it in my book people would say the book is not good. By the way, the real value of a coulomb is the sum of the charges of 6.24×10^{18} electrons. It can also be calculated to be 6.25×10^{18} which is a number you will sometimes see.

Baffle job

I'm going to start by telling you a true story. When very sophisticated scientists and engineers—those who carry briefcases—go to a convention, they expect to attend lectures that they don't really understand. They list the names of the lectures in order to justify their expenses (paid by the company).

Some of those lectures are the result of a "call for papers" issued by the people who organize the conventions.

As a joke, two smart aleck engineers sent a proposal for a lecture using very advanced terminology. It was accepted before someone told them the whole thing was about a resistor.

As I remember reading about it, the "joke" was considered to be in very bad taste. Not funny McGee!

How is it done?

There is a decoder going around that allows you to give a lofty title to your writing or lecture, or thesis, or dissertation. I provide you with the following decoder. The first word is usually an adverb. It modifies the adjective. The second word is an adjective that modifies the noun. The third word is the noun.

Here's the procedure: Think of a number with three digits. Select the word in the table that corresponds with the three digits you have chosen, and that is your title or subject or whatever. CONVENTION ORGANIZERS BEWARE! ■

FIRST WORD

- 0 Alternative
- 1 Increasingly
- 2 Theoretically
- 3 Developmentally
- 4 Tentatively
- 5 Mathematically
- 6 Largely
- 7 Patently
- 8 Differentially
- 9 Integrally

_____*
 _____*
 _____*
 _____*

* Your choices

SECOND WORD

- 0 Exponential
- 1 Distributive
- 2 Manipulative
- 3 Fourier
- 4 Mechanical
- 5 Technological
- 6 Industrial
- 7 Cooperative
- 8 Interactive
- 9 Thrusted

_____*
 _____*
 _____*
 _____*

THIRD WORD

- 0 Transformations
- 1 Pixels
- 2 Generations
- 3 Tautology
- 4 Torques
- 5 Thrusts
- 6 Cybernetics
- 7 Parcels
- 8 Declinations
- 9 Spoilers

_____*
 _____*
 _____*
 _____*

Example 473 - Tentatively Cooperative Transformations

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 |

- 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.

Add \$1.50 per case/binder for postage and handling. Outside USA \$3.50 per case/binder. (U.S. funds only)

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



Portable butane heat tool

Weller has introduced its improved Portasol PSI-100 professional-quality portable iron. The self-igniting portable butane heat tool can solder, heat, shrink, cut and seal nylon rope and perform other open-flame operations. A new wick insures that full power (or power set on the adjuster button) is maintained, regardless of the position of the tool.

The product allows anti static soldering and is ideal for service technicians in industries including electronics, avionics, cellular communications, alarm systems, marine and automotive.

The tool features a rugged stainless-steel body and provides up to 125W of power. Temperature is fully adjustable up to 1,076F and the tool will run for up to two hours on a single refill.

Circle (24) on Reply Card

Frequency counters

Two new frequency counters from Leader extend high resolution readings down 0.1Hz and offer operating versatility in the form of rpm and totalizer functions, deviation readings from a preset reference, and LO-GO-HI indicators that work from preset references to simplify judgment calls in production operations. The LF 826 covers the range 0.1Hz to 550MHz and the LF827 covers 0.1Hz to 1.3GHz. Time base accuracy is ± 3 ppm.



A large, bright 8-digit LED display has been selected for both units. Both feature reciprocal counting at frequencies below 10MHz to produce fast, high-resolution frequency readings at very low frequencies and direct counting from 10 to 100-MHz (Input A.). The prescaler method is used above 80MHz for Input B. Sensitivity is 15mV and 10mV rms for Inputs A and B respectively. An auto-trigger mode optimizes trigger level to minimize the effects of noise and hysteresis errors and a switchable low-pass filter removes RF to protect triggering on low frequency signal measurements.

Circle (25) on Reply Card



Phone line for product design and testing

Viking Electronics, Hudson, WI introduces the DLE-200B phone line simulator. The unit eliminates the need to install phone lines for telephone testing. The user can connect two phone devices, modems, faxes, etc. to the simulator, and as soon as one of the attached devices goes off-hook, it will ring the other attached device. The device will transmit voice or high-speed data between the two devices.

Circle (26) on Reply Card

Heat shrinkable tubing and sleeving selector guide

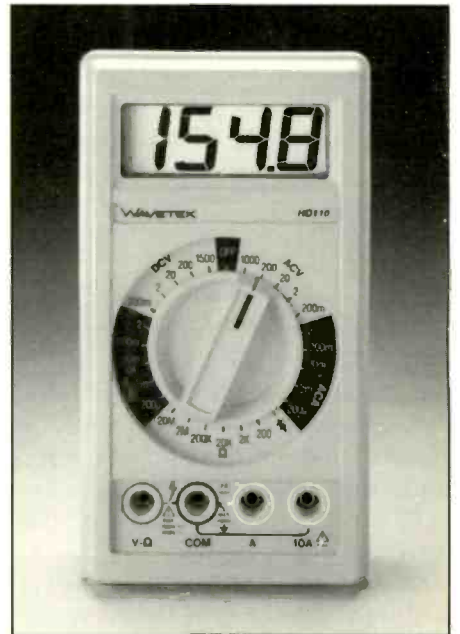
A new heat shrinkable tubing and sleeving selector guide supplied with a variety of evaluation samples is being offered by INSULTAB.

The Heat Shrinkable Tubing and Sleeving Selector Guide lists 36 standard products including PVC, thin wall polyolefin, multiple wall, special property, PTFE and FEP, and medical and non-

toxic heat shrinkable tubings. Also listed are PVC and PTFE sleeveings and spiral cut cable wrap.

The guide lists each material, its product name, specification, minimum shrink temperature, operating temperature, and flammability code ratings. Samples include various materials and colors.

Circle (27) on Reply Card



DMM for rugged use

Wavetek's newly-enhanced Model HD110 is drop-proof, withstanding drops of up to ten feet onto concrete surfaces without damage. It's water/splash proof; use it outdoors anytime, anywhere. Battery life is 1,500 hours.

Functions include measuring range of 1500Vdc 1000Vac and ac/dc current to 10A. It measures resistance to 20M Ω , in addition to diode and continuity testing. Transient overload protection is 6kv.

Accuracy is 0.1%. The oversized display features 0.8 inch high characters.

Circle (28) on Reply Card

Presaturated, lint-free wipes

These 8"x5", precut handwipes are manufactured in a choice of four solvents. ProClean flux remover, a mil-spec approved isopropyl based cleaner which will not affect soft plastic components; MultiClean, a general purpose cleaner

highly effective on water soluble contaminants, fluxes and pastes; Axarel 2200, a heavy duty cleaner which removes oils, grease, some inks and coatings, dries quickly with low aroma; and VeriClean, a new versatile and powerful cleaner which dries almost instantly, has no aroma and is 93% VOC exempt. None of the ingredients used are known or suspected to contain carcinogens.

Suited for use on SMT stencils and stencil printers, the wipes are also applicable for wiping connectors on PCBs, cleaning cables and harnesses and polishing assemblies such as optics, cabinets and equipment housings.

Circle (29) on Reply Card

Magnifier

WASSCO announces Luxo's WAVE+ Plus magnifier. The primary lens is increased to 3.5 diopter, new brighter bulbs to increase light output by 33% and up to 85% when using the easily installed



accessory lenses of 4,8, or 10 diopter. The large viewing area, focused light source (the light does not leak out the side, causing discomfort to the viewer), and optional anti-reflective lenses help to prevent user burnout, fatigue, and eyestrain.

Circle (30) on Reply Card

Programmable digital storage oscilloscope

Model 5150, a new four channel, 150-MHz Digital Storage Oscilloscope featuring a 50 GS/s sampling rate for repetitive waveforms and a 200 MS/s sampling

rate for non-repetitive waveforms, has been introduced by *B&K Precision*. Sampling repetitive signals at over 100 times the bandwidth of the oscilloscope greatly reduces the probability of aliasing.

These sampling rates complement standard features that include: automatic set-up of timebase, vertical sensitivity and trigger parameters; 40K of internal memory and a built-in PCMCIA slot that provides an additional 1 MB of memory per card; up to 16 automatic measurements; and full programming via built-in RS232 and IEEE488 interfaces. This oscilloscope also features Lab VIEW compatibility and a color VGA output.

Stored signals can be compared, manipulated, displayed and transmitted in a variety of formats. In addition, selected portions of measured waveforms can be compared directly with reference waveforms stored in memory. Trigger facilities include peak-to-peak, window and event counting.

Circle (31) on Reply Card

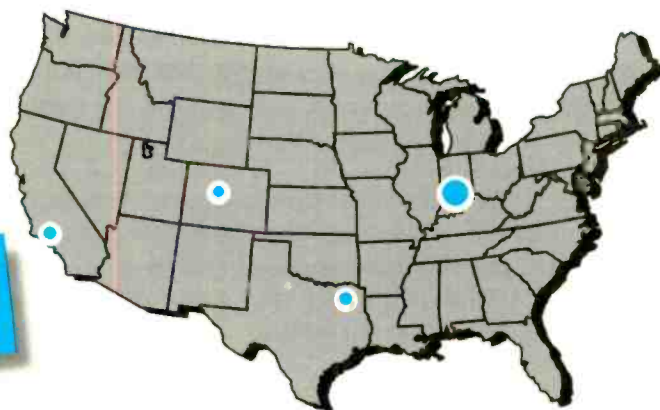
PTS Electronics

Supplying the World of Electronics

PTS Source

PTS is the nation's largest single source for all major brands of replacement Television Tuners, Chassis, Mainboards, and Modules. PTS stocks and services over 40 brands of manufacturer replacements. PTS is your source for major brands such as Zenith, RCA, Philips, and G.E. Call PTS today!

**THOUSANDS
IN STOCK**



CORPORATE HEADQUARTERS

| INDIANA BLOOMINGTON | COLORADO ARVADA | TEXAS LONGVIEW | CALIFORNIA TUSTIN |
|---------------------------|---------------------------|---------------------------|---------------------------|
| 800-844-7871 TOLL FREE | 800-331-3219 TOLL FREE | 800-264-5082 TOLL FREE | 800-380-2521 TOLL FREE |
| 800-844-3291 FAX | 303-422-5268 FAX | 903-234-0441 FAX | 714-258-0315 FAX |

**The Nation's Largest Inventory
of TV Tuners and Mainboards**

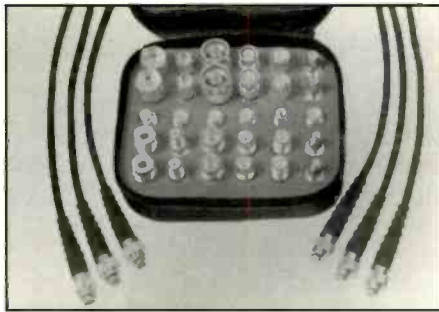


DMM with computer interface

B&K Precision announces the new Model 2880 DMM. The RS-232 interface allows the user to record measurements on a computer, and to print the results. The interval between measurements is selectable from one per second to one every .999 seconds. Measurements may also be graphed to show trends, or where to scrutinize the data more closely due to unusual or unexpected readings.

The meter has a "triple display" LCD with 4000 count resolution and a fast update analog bargraph. The triple display allows Min, Max, and Present readings to be displayed simultaneously. The user can change the mode to display Min, Max, and Average simultaneously. The triple display is also useful in the Compare mode where high and low limits may be set and displayed while the main display indicates PASS or FAIL when measurements are compared to the preset limits. Dual display can be used to measure ac voltage and frequency simultaneously. Other features include autoranging or manual ranging and Relative mode. The meter measures dc to 1000V at 0.3% accuracy, ac voltage to 750V and frequency to 20kHz. ac and dc current on 4 ranges to 10A. Ohms on six ranges to 40MΩ at 0.5% accuracy, continuity, diode test, frequency, and capacitance.

Circle (32) on Reply Card



Universal coax adapter kit

Time Motion Tools offers the Unidapt Kit, designed for the engineer technician. Users can mix or match any male or female UHF, N, BNC, TNC, Mini-UHF or SMA; optionally fitting F or RCA type with any other connector to create the adapter needed. Connectors are silver plated, machined brass, with gold plated contacts and Teflon dielectrics and come in an attractive padded and zippered case.

Circle (33) on Reply Card

Electronic CAD software

NTE Electronics, Inc., announces the availability of two new economical versions of WinDraft schematic design and WinBoard PCB layout CAD software programs developed by IVEX Design International of Beaverton, OR.

A lower cost set of WinDraft and WinBoard programs, with 200-pin capacity (upgradeable to higher pin capacities), was introduced earlier this year by NTE and has been extremely well received by professional engineers.

The new versions were developed to improve and simplify engineering and design of printed circuit boards. Both programs feature a 360-pin capacity (upgradeable to higher pin capacity), work with Windows-95, Windows 3.1, and Windows/NT, and come packaged in shrink-wrap boxes with a 75-page "getting started tutorial."

The user-friendly WinDraft can generate schematic designs within minutes of installation and provides everything needed for wiring, drawing, printing, and finishing the design. The WinBoard PCB layout software delivers sophisticated interactive routing capability. It has all the power necessary to accommodate complex board designs and the tools to

maneuver high-speed circuits, analog designs, and dense SMT boards. A library of over 700 module footprints (including over 350 SMT footprints); on-line editing of pad stacks; quick and easy placement of multiple copper pours; and reshaping of copper zones are all included.

Circle (34) on Reply Card

DMM with waveform display

Tektronix has added to its TekTools family a graphical DMM with waveform display, the THM 420 TekWaveMeter. This tool can be used in troubleshooting, maintenance, installation, calibration and repair of industrial, electronic, production and medical equipment.

The unit is a 3 3/4 digit, 4000 count DMM with true RMS for increased accuracy. It has auto power off, a backlight and continuity check beeper for ease-of-use. As a DMM, it can perform resistance, frequency, and diode tests. In waveform mode, the 5MHz, 16MS/s autoranging scope displays a graphic picture of the measurement to show characteristics like noise, glitches and intermittent failures. Additionally, the DMM can position, scale and trigger on a waveform.

Circle (35) on Reply Card



NEWS

(from page 8)

in particular, is enabling people to accomplish their business and personal goals while in the comfort of their homes."

A large majority (76 percent) of survey respondents said they use their home office for "organizing household finances," while 45 percent indicated "home entertainment" and 43 percent said they used their home office to complete work that is brought home.

Why do people decide to set aside space for a home office in the first place? Thirty-three percent of the respondents say they invested in a home office to establish a small business while avoiding business rent payments. The rationale for 16 percent of respondents was handling "household and personal finances."

The CEMA survey also shows that home offices have become mainstays in the home, as 57 percent of respondents said they designated a separate room specifically for the office. However, only 39 percent indicated that their home office has a dedicated phone line.

Which products do they choose to stock their home office? Seventy-two percent of home offices use an answering device, followed by desktop computer (67 percent), printer (66 percent), and cellular telephone (48 percent). Telephone features are also important in any home office, with 50 percent utilizing call waiting and 21 percent using caller ID.

"State of the art" equipment is on the wish lists of one-fourth of home office households, but almost half (46 percent) said they "want just enough home office equipment to get work done".

The nationwide telephone survey of 500 households with a home office was conducted during the month of November 1996. The results have a margin of error of \pm four percentage points.

The Consumer Electronics Manufacturers Association (CEMA) is a sector of the Electronic Industries Association (EIA), the Arlington, Virginia-based trade association representing all facets of electronics manufacturing since 1924. CEMA represents U.S. manufacturers of audio, video, consumer information, accessories, mobile electronics and multimedia products. ■

Test Your Electronics Knowledge

Answers to test (from page 23)

1.
$$\begin{matrix} 1 & & 0 & & 1 \\ (37^2 = 18) & (18^2 = 9) & (9^2 = 4) \end{matrix}$$

$$\begin{matrix} 0 & & 0 & & 1 \\ (4^2 = 2) & (2^2 = 1) & (1^2 = 0) \end{matrix}$$

Answer: $37_{10} = 100101_2$

2.
$$\begin{matrix} 2^5 & 2^4 & 2^3 & 2^2 & 2^1 & 2^0 \\ 1 & 0 & 0 & 1 & 0 & 1 \end{matrix}$$

 $32 + 0 + 0 + 4 + 0 + 1 = 32 + 4 + 1 = 37$

Answer: $100101_2 = 37_{10}$

3. noise

4. A. - A C. - A
B. - A D. - A

5. $R_{TH} = R_N$ The resistances are the same, and they can be computed the same way. Thevenin and Norton equivalent circuits are shown in Figure 1. Either can be Figure 1 substituted for a linear 2-terminal circuit.

6. A product detector. If you said BFO it is not the answer. That is an oscillator it is not a type of detector. The product detector reinserts the missing carrier.

7. One time constant:
 $= 0.01 \times 10^{-6} \times 500 \times 10^3$
 $= 0.005$ seconds
Two time constants = 2×0.005
 $= 0.01$ seconds (answer)

8. B - It changes once every input cycle.

9. $T = \frac{L}{R} = \frac{500 \times 10^{-6}}{500} = 1 \mu\text{sec}$

10. $5\text{dB} = 10 \log \frac{P_{OUT}}{P_{IN}}$

$0.5 = \log \frac{P_{OUT}}{P_{IN}}$

$\log^{-1}(0.5) = (\log^{-1}) \log \frac{P_{OUT}}{2.5}$

$\frac{P_{OUT}}{2.5} = 3.16$

$P_{OUT} = 7.9\text{W}$ (answer)

A Very Special Invitation

The Virginia Professional Electronics Association

wishes to extend to the readers of **Electronic Servicing & Technology**, a cordial invitation to attend and participate in **the 7th Annual Mid-Atlantic Conference**, held in conjunction with the 33rd Annual Mid-Atlantic Conference, June 6-8, 1997 at the Fort Magruder Inn and Conference Center, Williamsburg, Virginia.

There will be Manufacturers training seminars, management seminars, the Manufacturers Roundtable discussion as well as Manufacturers and Distributors exhibits, all tailored to keep you up-to-date with the changing technology in the industry.

For reservation and exhibit information, please call us at 1-757-874-8818 or fax us at 1-757-874-8488.

We hope to see you in Williamsburg!

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 additional. 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 Ph: 516-681-2922 FAX: 516-681-2926

FOR SALE

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.

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.

Steps to troubleshooting electronics problems in circuits, mail \$25.00. Steps to setting up your own TV store, send \$100.00. Certified checks or money orders ONLY. **Arnold Burns**, 425 East 51st Street, Brooklyn, NY 11203.

Radio - New in original packages: Rider Radio Manuals no. 6-7-8-10-11-15, no. 1 out of package, In box John Frider vol XIV Perpetual Troubleshoot Man, National Union by JF Rider, Sams Radio Photofacts 1-110, RCA Service Data 1-8, United Motor Service Inc., Home Radio Bulletin 1935-83. **TV - Rider TV Manuals** 1-3(2)-5-6(2)-7(2), RCA CTC 15-1156, Sams Photofacts folders 149-1992, \$500.00 each. **Seybert's Electronics**, 1331 Main Street, Anderson, IN 46016. 765-644-1252, Fax 765-642-1122.

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.

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.

21,034 SERVICE TIPS! *STAY AHEAD OF YOUR COMPETITION.** Put the knowledge of other servicers to work for you. **SERVICE TIPS** IS THE MOST VALUABLE PIECE OF EQUIPMENT YOU CAN OWN TODAY! **SERVICE TIPS** is the MOST PREFERRED consumer electronics computerized technical tips database in use today. With over 117 Manufacturer/Brands and 21,034 **ACTUAL TECHNICIANS FINDINGS** on most types of consumer electronic equipment ALL IN ONE EASY TO USE PROGRAM. **SERVICE TIPS** IS THE ONLY PROGRAM THAT IS **SUPPORTED BY ITS CREATORS, CUSTOMERS & APPROVED by NESDA** (the National Electronics Service Dealers Association) as well as being approved and endorsed by members of Electronic Associations Nationwide. Find out what the creators of this program and thousands of other technicians worldwide have discovered - **SERVICE TIPS cuts your troubleshooting time down and increases YOUR PROFITS. NO SERVICE CENTER SHOULD BE WITHOUT IT. DON'T WAIT!** CALL US TODAY at 1-800-621-8477 and order **SERVICE TIPS** with 21,034 technical **SERVICE TIPS** for just \$169.95 + s&h. We accept all major credit cards. **ELECTRONIC SOFTWARE DEVELOPERS INC** 826 So Main St., So. Farmingdale NY 11735 or e-mail us at esd@pb.net or visit our Web site at: www.pb.net/vcrtips

TEST EQUIPMENT BOUGHT & SOLD: OSCILLOSCOPES, ETC. 510-706-0177. FAX: 510-706-0156.

FOR SALE

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>.

((32,000 REPAIR TECH-TIPS)) TEST our **FULL DATABASE** of repairs in **CD-FORMAT, DOS** or **WINDOWS** for **ONE WEEK** in **YOUR SERVICE CENTER** for \$20.00. If satisfied, you may join our membership for an additional \$330.00. Over **2,300 members World-Wide** and growing. Our membership price has been the same for the past six years and will remain the same in the future. "**FREE**" 48 Page Member Magazine "**THE TIP INFORMER**", "**FREE**" Emergency Tech-Assist Telephone Line, "**FREE**" FCC-ID Cross-Reference Manual, "**FREE**" Service Center Forms, **Semi-annual** updates of **2,000 new repairs**. Paper Manuals or Computer, **CD, DOS** or **True Windows** in which you may enter your own repairs, edit or tag any report or press one key and printout selected or all repairs on a particular Model or Chassis. "**GET TO THE BOTTOM LINE PROFITABLY**" CALL and speak to a Service Center Owner and Technician ED Erickson, **NESDA MEMBER** and past president of the (**PROFESSIONAL ELECTRONICS ASSN. OF SOUTH FLORIDA**). You and your technicians will be glad you did! Remember, labor is your largest expense. **800-474-3588** or **954-349-2455**, **TV-Man Tech-Tips, Inc.** 2082 Augusta, Weston, Florida 33326.

Large collection of antique 1940's televisions & radios. Must sell, moving. \$600.00 or best offer takes all. Call **John**, 703-536-4442.

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. (or at <http://www.netgsi.com/~mikesrs>).

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.

18,000 *Valuable BOARD LEVEL TECHNICAL REPAIRS *FREE DEMO 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 *******

Sams Photofacts: Consecutive from 1100-2830, over 1,700 folders, all for \$1,900.00. Shipping extra. Call **Mark**, 908-685-4180

CLASSIFIED

FOR SALE

*****ALL FORMAT VCR ANALYZER***** Only 20 hours use. All documentation, test tapes, cables, extras, original packaging. (purchased for \$2,800), \$1,500. **Roland, 510-671-6514, 707-554-1021, fax 510-671-6626.**

Service tips. Over 10,000 Quality tips. KD T-V and 30 other Professional Servicers. All brands, TV-VCR-MWO-CC-CM-Audio-Misc. NEW Diskette database \$39.95. Paper version \$49.95. New version monthly. The finest database available! Disk upgrade \$29. **KDTV 514 3rd St. Aurora, IN 47001. 812-926-4321 c/cards ok.**

HELP WANTED

Electronic Technician needed to repair TV, VCR, Audio. Salary starts at 28K and up based on experience. **Call Tim at 919-469-9247 or check website at www.cesne.com.**

BUSINESS OPPORTUNITIES

For Sale in beautiful Montana: Successful, fully equipped, well established (48 years), consumer electronics service and sales business in the small but thriving town of Livingston where they filmed "A River Runs Through It." \$55,000.00, **406-222-0830.**

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 North Broadway, Hicksville, New York 11801

FOR SALE

Sencore model SC61. Oscilloscope and a Sencore AC "Powerite" model PR57. \$1500.00 for the pair. **Contact: 407-671-2780.**

Sencore SC3100-\$2488.00, CVA94-\$2108.48, VR940-\$489.28, TF46-\$225.00, Kenwood DSO CS8010-\$1000.00, Fluke 45-\$300.00, B&K 520B-\$175.00, Hewlett Packard 3311A-\$125.00, and much more. **Contact: Rick, 210-519-3655**

Sencore VG91 and TVA92 TV video analyzers, in as new condition, hardly used. Complete with spare HOT for the TVA92, manuals, leads and original boxes. Will only sell as a pair - \$3000.00 plus shipping. **Contact: Clyde 613-546-1880, e-mail halfouel@sympatico.ca.**

Sencore SG80 (new never used) and PA81 (like new). Both complete with manuals, accessories and original boxes. \$3600.00 OBO. **Contact: Mamtronix, 913-467-8431 or 913-467-3921**

VCR service manuals for AIWA model HV70 AMNU, Zenith model VR2000, Realistic model 16-505. **Contact: Ernie Sharron, 68 Grove Street #2, North Brookfield, MA 01535, 508-867-7929.**

Eyecomm double-sided lighted sign. It reads "Electronic Servicing" with atom graphic on it. Large 8ft x 2ft, black with yellow letters. A real eye catcher. Paid \$1500.00, asking \$500.00. Like new. Photos available. **Contact: Chris, The VCR Shop, 757-238-2299.**

RCA color TV model 10J106, test jig and adapters, \$90.00. RCA voltomyst WV98C, \$60.00 working order. R.E.M. picture tube rejuvenator, \$35.00. Sam Photofact folders \$1.00 each in quantity. Muntz console TV from early 1950's-70's, you pick up. Edison diamond disc records \$5.00 each. All plus shipping. **Contact: Maurer Television, 29 South Street, Lebanon, PA 17042.**

Sencore VA62A video analyzer system. \$1200.00 includes VC63, NT64, ST65, EX231, TP212, cables, adapters, manuals and original boxes. B&K model 1249 NTSC generator, like new \$150.00, includes manuals and original box. **Contact: 414-498-8630.**

Hitachi V069 (new), B&K 1400, 530. Sencore SG165, SR68. CCR lightbox with slides. Sony CCR jigs, torque, gauges, test tapes. First reasonable offer takes. **Contact: Ed, 209-686-0168.**

Complete TV chassis test jig, \$950.00 OBO. **Contact: Doug, 904-259-5219, Rt. 2 Box 1868, Glen St. Mary, FL 32040.**

Hitachi VCR model VT-76AY, need schematic. No longer available from Hitachi or any other supplier. Will pay for copy and postage or will copy and return. **Contact: John Rypski, Pacer Electronics, 1074 Roselawn Drive, Paxton, IL 60957-1833.**

Service tips on Delco AM/FM CD auto radios. Information wanted on the Panasonic CD transport used in these units. Will pay or exchange. **Contact: John, 25 Pringbriar Lane, Kings Park, NY 11754, 516-544-6004.**

Akai VCR model VS303U, D-LED part ED-358056. Akai model VS-555um motor block. **Contact: Daniel, 250-338-6575.**

Compaq Desk-Pro model 2551, need schematic for power supply. Also transistor Q1 BUW 13A-S, and Q3 650-119. And Opto. CNY65-G8639 or cross references. **Contact: White's TV Service, 622 N. 5th Street, Hollis, OK 73550, 405-688-2612.**

Manuals and schematics for RCA CR11 WT-333A and Hameg HM 203-S. **Contact: Jim, PO Box 474 Methon, WA 98834.**

Sencore test equipment. Hickok or Precise 111M tube tester, tube limiters and amplifiers. **Contact: 612-869-4963.**

Need schematics for Crown CTV-L13, CTV-TW13, and for IMA 13-CTV. Pay for Copies. **Contact: Vergin TV, PO Box 220, Rockford, MN 55373, 612-477-4211, Fax 612-477-6578.**

WANTED

NEC color TV model CT3000S, part no. 47105304 flyback transformer. Schematic for Zenith model R98 (Royal) Boombox AM/FM cassette radio. **Contact: Maynard Fischer, Route 1 Box 204A, Pulaski, WI 54162, 414-822-5458 (home), 414-497-8324 (work).**

Tech's Guide To Pricing **NEW**

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 (79) 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 (65) 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 (64) on Reply Card

HERMAN ELECTRONICS

Visit our new Home Page at
<http://gateintl.com/hermanelec>

LEADER
 FOR PROFESSIONALS WHO KNOW THE DIFFERENCE

See our ad on page 7
 Call 1-800-645-5104
 for full line catalog

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 53
 or Visit Our Website at www.nca-net.com

1-800-615-6224

ADVERTISERS' INDEX

| Company | Page Number | Reader Service Number | Advertiser Hotline |
|--|---------------|-----------------------|--------------------|
| Computer & Monitor Maintenance, Inc. | 25 | 62 | 800/466-4411 |
| Dalbani Corporation | 51 | 63 | 800/325-2264 |
| Den-On Instruments, Inc. | 46 | 83 | 800/397-5960 |
| Electronic Servicing & Technology Books | 19 | | 800/853-9797 |
| Electronics Technicians Association | 51 | 81 | 317/653-4301 |
| Electronix Corporation | 64 | 64 | 513/878-1828 |
| Herman Electronics | 64 | | 800/938-4376 |
| ITT Pomona | 41 | 66 | 909/623-3463 |
| ISCET | 23 | | 817/921-9101 |
| International Components Corp. | 64 | 65 | 800/645-9154 |
| Jensen Tools | 47 | 67 | 800/426-1194 |
| Jesse Jones Industries | 55 | | 800/825-6690 |
| Leader Instruments | 7,64 | 111,112 | 800/645-5104 |
| MCM Electronics | 40 | 68 | 800/543-4330 |
| MicroData | 9 | 116 | 800/539-0123 |
| NCA/National Computer Assn. | 53,64 | 69 | 800/615-6224 |
| PTS Electronics | 57 | 70 | 800/844-7871 |
| Panavise | 42 | 71 | 702/850-2900 |
| Parts Express | 44 | 72 | 800/338-0531 |
| Philips Software Development | IFC | 117 | 423/475-0393 |
| Philips Service Company | IBC | 120 | 800/851-8885 |
| SBS Direct | 23 | 74 | 800/603-9000 |
| Sams & Company, Howard | 49 | 73 | 800/428-7267 |
| Sencore | 11,13, 15,B,C | 75,76 77,1 | 800/SENCORE |
| Specialized Products | 43 | 78 | 800/866-5353 |
| Sperry Tech | 64 | 79 | 800/228-4338 |
| Tentel | 45 | 80 | 800/538-6894 |
| Thomson Consumer Electronics | 2,3 | 113 | 800/336-1900 |
| Virginia Professional Electronics Assoc. | 61 | | 757-874-8818 |

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.

ELECTRONIC **ELECTRONIC**

SALES OFFICE
PHONE (516) 681-2922
FAX (516) 681-2926

**Smart
Accessories**
The Intelligent Choice

Dumb Accessory

Smart Accessories



Do the Smart Thing. Sell Philips Accessories and Make More Money Now.

When you sell Philips Smart Accessories you're really using your head. That's because Smart Accessories give your customers all the extras they want—while adding a little extra to your bottom line.

So, get on top of the game and call the Philips Sales Center to order Philips Smart Accessories—your one-stop shop for parts, accessories and service aids. Anything else just isn't very smart.

To place your order call **1-800-851-8885** today.

401 E. Old Andrew Johnson Highway, P.O. Box 555, Jefferson City, TN 37760 • Fax 1-800-535-3715

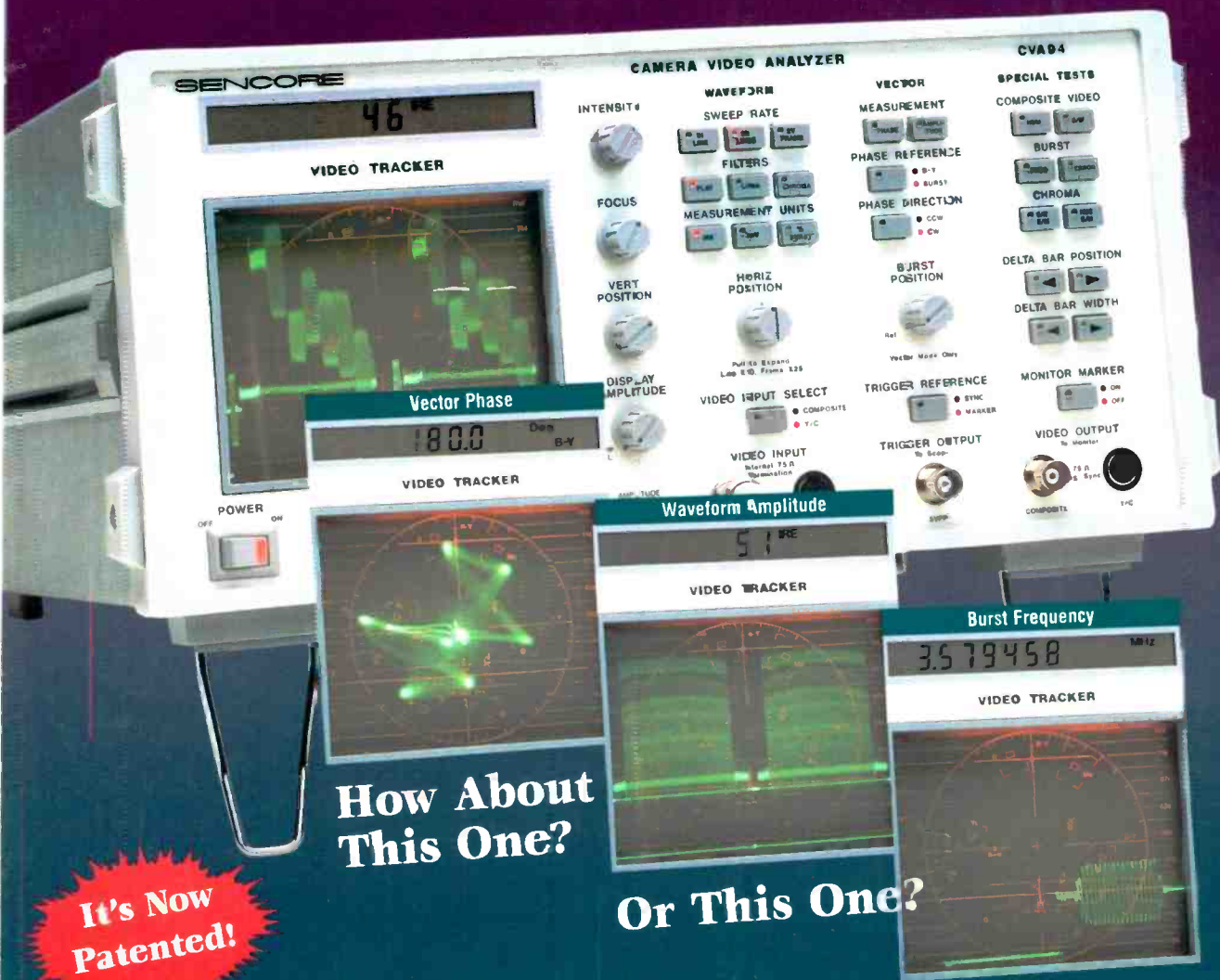
Let's make things better.

Circle (120) on Reply Card



PHILIPS

If You Don't Like This Camcorder Answer...



How About This One?

Or This One?

Or This One?

It's Now Patented!

CVA94 "Video Tracker" Camera Video Analyzer Patented



When you need another opinion on a camcorder signal, now all you have to do is push a button. The CVA94 "Video Tracker" provides a complete vectorscope and waveform monitor, plus digital waveform measurements for fast signal troubleshooting. It is the only instrument designed specifically for camera analyzing,

saving time, and building customer trust. The confidence you gain is what makes the "Video Tracker" such a powerful tool. From the first time you use it, you'll positively identify and localize camcorder problems for fast service and alignment. Need another opinion? Ask the CVA94 "Video Tracker."

But don't take our word for it. See it for yourself on your bench with our no-obligation trial.

Call 1-800-SENCORE (736-2672) ext #518 for details!

Circle (1) on Reply Card

SENCORE

3200 Sencore Drive, Sioux Falls, SD 57107
Direct: (605)339-0100 Fax: (605)339-0317