THE PROFESSIONAL MAGAZINE FOR ELECTRONICS AND COMPUTER SERVICING

ELECTRONIC Servicing & Technology

T.M.

June 1998

Test probes update

Cross-reference update

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THE PROFESSIONAL MAGAZINE FOR ELECTRONICS AND COMPUTER SERVICING

ELECTRONIC Servicing & Technology

Volume 18, No. 6 June, 1998

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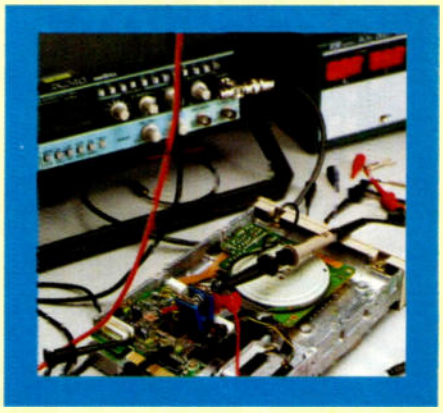

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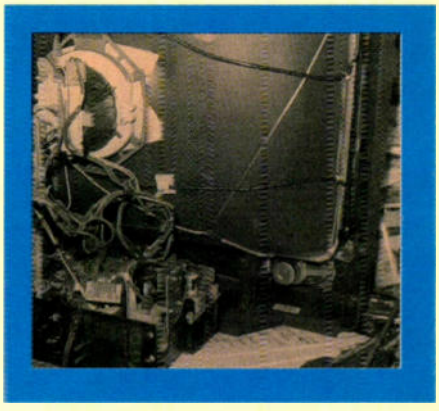

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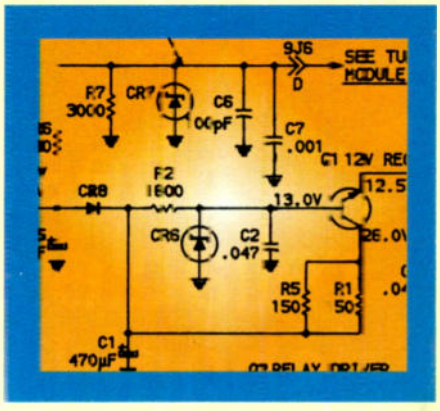

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ON THE COVER

Today's test equipment evolves to keep pace with the changes in consumer electronics equipment. (Photo courtesy Sencore)

EDITORIAL

More changes coming

Consumer electronics continues to change and grow. For example, we're now on the threshhold of the introduction of HDTV. Many existing TV sets are controlled by software (firmware?) that resides in electrically erasable programmable read-only memory (EEPROM). Consumers can now access the internet from their living rooms via their TV sets. DVD now allows interested people to view movies that exhibit both exceptional video and audio. Camcorders continue to shrink in size. Consumers can now buy digital cameras that take pictures as computer files that they can view on their home computer monitors and print out on their color ink jet printers. Of course, photo processing software will allow them to manipulate the images in a number of ways before they're even printed out.

All of this new consumer electronics capability has caused a number of changes in the type of test equipment and accessories required by the average consumer electronics service center. Hair thin, tightly spaced leads on integrated circuit packages, for example, challenge the technician just to find a way to connect a test probe to them. This frequently requires the use of special probes, grabbers and extenders. Products that are under the control of a computer that gets its information from an EEPROM have no traditional controls to tweak. Tweaking has to be done by changing bits in the EEPROM, which requires special test equipment. Computers and their peripherals, monitors, printers, etc. all require special test equipment.

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Naturally, test equipment manufacturers have responded to this challenge by offering the special types of test equipment that are required for these new consumer products. If a technician is faced with what seems to be an insurmountable test problem, he should talk to his favorite distributor or test equipment or probe manufacturer. No doubt the solution exists somewhere.

Changes in information delivery, too

The age in which we live has been dubbed "the information age." Most of us are bombarded with more information than we can possibly assimilate. Our bookcases and filing cabinets are groaning under the load of vital information that we may possibly never get a chance to read. More and more channels of

The presumption has been made by this company, and others for that matter, that consumer electronics service centers own and use personal computers.

television bombard us with bad programming, good programming and educational programming. The internet has opened up information resources so vast that most of us can't begin to comprehend it.

Closer to home, consumer electronics products have become so complex that the amount of literature required to convey service information has grown from pamphlets of a relatively few pages to service manuals that take up hundreds of pages. In an effort to address this problem, many manufacturers have turned to delivery of these sevicing documents via some kind of computer medium.

Just recently, one manufacturer, Thomson Consumer Electronics, has made the announcement that they will be making their service literature available on CD-ROM. That in itself is not big news. What is big news about this announcement is the statement that this is the only form in which that company's literature will be made available. No paper, no microfiche; CD-ROM only.

This is a sweeping change. The presumption has been made by this company, and others for that matter, that consumer electronics service centers own and use personal computers. Any service center that does not own a personal computer, and that currently services this company's products and plans to continue to do so, would do very well to begin looking into the purchase of a personal computer.

It's a new age

Changes and advances in consumer electronics product over the past decade or two have caused a lot of consequent changes in the service center. Remember 100W solder guns? Remember socketed components? Remember the days when it wasn't necessary to worry about electrostatic discharge damage. Remember a time when you could actually read the printing on a component? My, how times have changed. These changes in test equipment and information delivery are merely the latest in a long line of changes. Changes will continue. I wonder what changes HDTV will require. We're looking into that now to report on it as soon as we can. In the meantime, we all have to be ready for the changes that are coming in the future

Nils Conrad Persson

Fiber U and Wire U '98 Come To Boston

Fiber U, the fiber optic training conference, and the new "Wire U" training conference for communications wiring, will be held July 27 through 31 in the Boston area. New this year will be "Wire U" a training program for installers of copper wiring for communications systems and training programs for instructors in fiber optics. The combined week-long event has been dubbed "Cable U."

Since the first conference in Nashville in 1993, Fiber U has offered a combination of classroom and hands-on training by instructors and vendors in fiber optics. The Fiber U training program has even been published as "The Fiber Optic Technicians Manual."

Fiber U will feature its standard format, a combination of classroom instruction by professional instructors and hands-on training by top fiber optic vendors. Topics covered in the Fiber U training will be the basics of fiber optics, cables, connectors, splices, tools, installation and testing.

Wire U is a new program developed by the same instructors as the ones who developed Fiber U, using a similar outline. Fiber U provides purely practical education, directly applicable to the daily job of the installer. Wire U follows the same philosophy. Wire U will have a similar format to Fiber U, except the focus is on copper wiring for LANs, telephones, and video. Wire U will cover the basics of how networks use wire, specialized wire types like Category 5 UTP (unshielded twisted pair) and coax, termination hardware, installation techniques and testing.

Both Wire U and Fiber U will include sessions on structured cabling systems and standards, focused on the EIA/TIA 568 standard. Topics also include networks and applications, planning networks and estimating the cable plant.

Sessions will be held for instructors interested in teaching fiber optics, based on the Fiber U and Wire U programs.

Cable U will he held the week of July 27 through 31, 1998 at the Royal Plaza Trade Center in Marlboro, MA. Cable U will also be a feature of the NECA Show in Las Vegas, October 16 through 18, 1998.

For more information, call 1-8OO-537-8254, fax to 1-781-396-6395, or on the Internet email to info@fotec.com or http://www.fotec.com.

Blank media

While most of the blank media market was in decline during 1997, compact format videocassettes (8mm and VHS-C) continued to show rising sales. Overall, unit sales in this sector of blank media grew nine percent in 1997; and although both formats showed growth, shipments of the VHS-C format tapes gave the real boost with a 10 percent increase. Despite falling selling prices, dollar volume for compact format videocassettes did manage to move up one percent. Total dollar volume for all consumer blank media products reached $973 million in 1997.

CEMA is a sector of the Electronic Industries Association (EIA), the 74-year-old Arlington, Virginia-based trade association representing all facets of electronics manufacturing. CEMA represents U.S. manufacturers of audio, video, accessories, mobile electronics, communication, information and multimedia products which are sold through consumer channels.

Cordless phones outsell corded in 1997

The cordless telephone market exploded in 1997, with more than 28 million units sold to dealers - a 37 percent jump over 1996. According to the year-end data released today by the Consumer Electronics Manufacturers Association (CEMA), sales of cordless phones surpassed corded models for the first time.

In the cordless category, sales accounted for nearly $1.7 billion, up 42 percent. 900 MHz models helped spur - but by no means dominate - the cordless surge, with unit sales more than doubling in 1997 to 7.6 million. CEMA's research reveals that cordless phones can now be found in 70 percent of U.S. households, three years ago the product's household penetration stood at 52 percent.

Corded telephones and telephone answering devices (TADs) also helped propel the strong year for consumer telecommunication products. Unit sales of corded phones rose seven percent in 1997 to 27.8 million. Meanwhile, nearly 19 million TADs were sold to retail dealers - an eight percent increase. Over 60 percent of 1997 TAD sales came from cordless integrated models.

The fax machine showed surprising strength in 1997, as manufacturers shipped more than 3.6 million units; a 31 percent jump in sales.

E-mail and the Internet becoming more essential to home offices

Sixty percent of home office users have Internet access, 59 percent of whom gain access through an online service - according to a new survey released today by the Consumer Electronics Manufacturers Association (CEMA). The survey, conducted through the CEMA Consumer Research Service and administered via telephone in January 1998 to 752 households with home offices, reveals how home offices are being used and how the use of e-mail and the Internet is changing the home office landscape.

The survey shows that, among the 40 percent of home office users who do not have Internet access at home, over half (54 percent) do have access outside the home. When surfing the Web, they go most to reference sites (85 percent), news sites (70 percent), business sites (66 percent), and personal entertainment/sports sites (64 percent).

E-mail is catching up to the telephone as a communication tool in the home office, according to the CEMA survey. Among those currently with e-mail capabilities, it is estimated that 61 percent of communication from the home office is conducted over the phone, and 28 percent via e-mail. When asked to look ahead one year, the same respondents said they

(Continued on page 60)

THE PROFESSIONAL MAGAZINE FOR ELECTRONICS AND COMPUTER SERVICING

ELECTRONIC
Servicing & Technology

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

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Cross-reference update

by Victor Meeldijk

In the retail business the phrase "Location, Location, Location," denotes the reason why businesses thrive or fail. In the electronic servicing business the equivalent phrase might be "information, information, information". Often a repair effort is stalled because of a lack of information, be it a cross reference for a part, the pin out of an IC, the identity of a manufacturer's logo, the manufacturer's phone or address, etc. The following is a list of some books and reference materials that you may find helpful when looking for that piece of information you need.

The prices shown here were current as of the date the article was submitted. These prices may be subject to change without notice, so check before ordering.

To contact the publishers for the books listed you can use these contacts:

(formerly Tab) McGraw-Hill
1-800-2-McGraw
Fax:1-614-759-3644
http://www.books.mcgraw-hill.com

Howard W. Sams Prompt Publications
http://www.hwsams.com

Sams Publishing, Div. of Macmillian
Fax: 515-284-2607

Computer Telephony
212-691-8215, 1-800-LIBRARY
Fax: 212-691-1191
http://www.telecombooks.com

Newnes, Butterworth-Heinemann, Maplin
1-800-366-2665
Fax: 1-800-446-6520
http://www.bh.com
(in Europe (01865) 310366, Fax: (01865) 310898 (England).
Howard W. Sams also carries their books in their catalog (see above).

Books can also be ordered by the on line bookstores:

Amazon Books: http://www.amazon.com

Barnes and Nobles: http://www.barnesandnobles.com

Bernard Babani (Publishing), Ltd., The Grampians, Shepherds Bush Road,
London W6 7NF, England,
+44 171 603 2581/7296, Fax: +44 171 603 8203,
http://www.BookWeb.co.uk/babani/home.html.
Books are available in the U.S. from Electronics Technology Today, Inc.
P.O. Box 240, Massapequa Park, NY 11762-0240.

Meeldijk has been employed in the electronics industry for over 20 years.

Cross Reference Books:

IC Cross Reference Book, 2nd Ed.
Howard W. Sams Prompt Publications
Price: $19.95

Semiconductor Cross Reference Book 4th Ed.
By Howard W. Sams prompt Publications
Price: $24.95

Tube Substitution Handbook
by William Smith and Barry Buchanan
Publisher: Howard W. Sams Prompt Publications
Price: $16.95

Handbook of Radio, TV and Industrial and Transmitting Tube and Valve Equivalents,
G.C. Arnold Partners (based upon the 1974 Bernard Babani 3rd edition),
ISBN 1 89880506 7,
60 pages, 2.96 pounds (in the U.K.).
See:
http://www.valve.demon.co.uk/Books/handbook.htm and
Radio Bygones,
9 Wetherby Close,
Broadstone, Dorset BH18 8JB,
44 01202 658474,
http://www.valve.demon.co.uk/Mags/rb.htm.

Transistor Data Tables
by H.G. Steidle
ISBN 0 85934 401 0
Publisher: Bernard Babani (Publishing) Ltd. #BP401
Price: 5.95 pounds
(Note: Other books, now out of print, that were published by Bernard Babani include:
Linear IC Pin Equivalents and Pin Connections, BP141; ***International Transistor Equivalents Guide***, BP85)

Philips ECG Semiconductors
(a North American Philips Company)
Distributor and Special Markets
Division 1025 Westminster Drive
P.O. Box 3277
Williamsport PA 17701
800-526-9354
http://www.starcelectronic.com
http://www.ecgproducts.com
http://www.ecgproducts.com/ECGCrossReference/index.html#search

Philips ECG Canada Inc.
Electronic Components and Systems
8580 Darnley Road
Montreal, Quebec
Canada H4T 1M6
On line cross reference. Printed Guide (ET-2762) is $2.95; also available are a DOS Disk (ECG2604) or Windows Disk (ET2604W).

NTE-New Tone Electronics
44 Farrand Street
Bloomfield, N.J. 07003
973-748-5089
973-732-1326
1-800-631-1250
Telex 333226
http://www.nteinc.com
Cross reference s/w is available for free download from the web. A paper copy is available for $2.95 (or may be free from your local distributor) or a disk can be purchased for $8.98.

Thompson Consumer Electronics (RCA and GE)
Distributor and Special Products
2000 Clements Bridge Road
Deptford, N.J. 08096-2088
609-853-2417
SK series replacement semiconductors and Japanese JEDEC/ Generic replacement semiconductors.

World Wide Component Distributors
18 Stern Avenue
Springfield, N.J. 07081
201-467-6264
FAX:201-467-8519
1-800-222-6268
Specializes in Japanese Semiconductors and generic replacement parts.

ISCET (International Society of Certified Electronics Technicians)
2708 W. Berry Street
Ft Worth, TX 76109
VCR and VCR part cross reference guide, which identifies identical parts used in different model VCR's.

On-Line Data/Cross Reference

IC Pin Outs:
http://www.paranoia.com/filpg/HTML/cgibin/giicm_form.html

for PRB Belt Kits: http://www.sarasota-electronics.com/prbsrch.htm

General Reference Books:

Active Electronic Component Handbook, 2nd Ed.
by Charles Harper and Harold Jones
Publisher: McGraw-Hill
Price: $69.00

Capacitor, Inductor, Resistor Handbook Set
by C.J.Kaiser
Publisher: CJ Publishing
(also available thru Crestone Technical Books, Tucker GA, 770-908-2320, Fax: 770-939-0157)
Price: $60.00

Component Identifier and Source Book
by Victor Meeldijk
Publisher: Howard W. Sams Prompt Publications
Price: $24.95

Electronic Circuits Handbook, 2nd Ed.
by Michael Tooley
Publisher: Butterworth-Heinemann
Price: $54.95

Electronic Components: Selection and Application
Guidelines by; Victor Meeldijk
Publisher: John Wiley
Price: $99.00

Electronic Testing and Inspection Pocketbook
Book by Keith Brindley
Publisher; Newnes
Price: $32.95

Electronics Engineers Handbook, 4th Ed.
Editor: Donald Christiansen McGraw-Hill
Price: $110.50

Electronics Pocket Handbook, 3rd Ed.
by Daniel Metzger
Publisher: Prentice-Hall
Price: $19.95

Electronics Pocket Reference
by Edward Pasahow
Publisher; Prentice-Hall
Price: $24.95

Linear IC Pocket Book, Volume 1
by R.M. marston
Publisher: Newnes (available from Butterworth-Heinemann and Howard W. Sams)
Price: $34.95

Tab Electronics Technician's On Line Resource Reference
by Stephen J. Bigelow
Publisher: McGraw-Hill
Price: $24.95 (hardcover $44.95)

Tab Electronics Yellow Pages: Equipment, Components and Suppliers
by Andrew Yoder
Publisher: McGraw-Hill
Price: $29.95 (hardcover $49.95)

TTL Cookbook
Don Lancaster
Publisher: H.W. Sams Prompt Publications
Price: $24.95
Has electronic circuits and IC pinouts.

The Master IC Cookbook, 3rd Ed.
by Delton T. Horn
Publisher: McGraw-Hill
Price: $49.95

Encyclopedia of Electronic Circuits
by Rudolf Graf and William Sheets
Publisher: McGraw-Hill
CD-ROM Price: $99.00

Newnes Digital Logic IC Pocket Book, Volume 3
by R. M. Marston
Publisher: Newnes (available from Butterworth-Heinemann and Howard W. Sams)
Price: $27.95

Newnes Service Engineer's Pocket Book
by G. E. Lewis, Ian Sinclair
Publisher: Newnes (available from Butterworth-Heinemann and Howard W. Sams)
Price: $28.95

Newnes Electronic Engineer's Factfinder for Windows (Software)
by Keith Brindley
Publisher: Newnes (available from Butterworth-Heinemann and Howard W. Sams)
Price: $28.95

Newnes Electronic Components Pocket Book
by Mike Tooley
Publisher: Newnes (available from Butterworth-Heinemann and Howard W. Sams)
Price: $24.95

Newnes Electrical Engineer's Pocket Book, 23rd Edition
Edited by D.F. Warne
Publisher: Newnes (available from Butterworth-Heinemann and Howard W. Sams)
Price: $24.95

Passive Electronic Component Handbook
by Charles A. Harper
Publisher: McGraw-Hill
Price: $89.50

Pocket Reference
by Thomas J. Glover
Price: $14.95

Pocket PC Reference
by Thomas J. Glover and Millie M. Young
Price: $14.95

Radio and Electronics Engineer's Pocket Book, 18th Edition
by Keith Brindley
Publisher: Newnes (available from Butterworth-Heinemann and Howard W. Sams)
Price: $29.95

Reference Data for Engineers, 8th Ed.
Editor Dr. Mac Van Valkenburg
Publisher: Sams Publishing, Div. of Macmillian
Price: $99.95

Tab Encyclopedia of Electronics for Technicians and Hobbyists
by Stan Gibilisco
Publisher: McGraw-Hill
Price: $69.50

Books/Software that contain component specifications:

1.-D.A.T.A. Business Publishing
P.O. Box 6510,
Englewood, CO 80155-9832,
A division of Information Handling Services.
303-799-0381
1-800-447-4666
http://DATA.IHS.com
Reference books on digital, interface, linear, memory and microprocessor integrated circuits and transistors. The books summarize device parameters and provide listings of identical/equivalent parts from different manufacturers. There are 10 baseline books, cost $205 each. Full price details are on the web site.

2.-Berkeley Design Technology, Inc.
2107 Dwight Way
Second Floor
Berkeley, CA 94704
510-665-1600
Fax: 510-665-1680
http://www.bdti.com
e-mail: bdti@bdti.com
This company has a report, Buyer's Guide to DSP Processors that compares and analyzes 23 competitive digital signal processor chip families. The report, 950 pages, is in it's 3rd edition and costs $2600.

3.-EEM, Electronic Engineers Master Catalog
Hearst Business Comm. Inc.,
645 Stewart Avenue,
Garden City, N.Y. 11530,
516-227-1300
Fax: 516-227-1901
http://www.hearstcorp/bpub5.html
http://eemonline.com
http://www.eemlocalsources.com

A multi-volume set of books that contain product information from leading electronics manufacturers (including catalog pages), and distributor listings. There is also the EEM Local Sources which is available in nine regional editions listing local distributors in that region for components. Books are sent free to qualified readers of Electronic Products magazine.

4.-Edward's Publishing Co. Inc.
14129 Chadron Avenue
P.O. Box 1668
Hawthorne, CA 90251-1668
310-644-5643
Fax: 310-675-9850
http://www.edpub.com/epc/
http://www.deltanet.com/epc
E-mail: epc@edpub.com

This company publishes books on connectors, including:

Volume I: Military and Commercial Cylindrical Connectors (two books with over 60 military and commercial cross references and 1200 pages of data),

Volume III: Military and Commercial RF Coaxial Connectors (2 books with over 25,000 military and manufacturer part numbers, 2300 pages of data).

Volume IV: Military and Commercial 2 Piece Printed Wiring Board Connectors (2 books, 1,688 pages).

Volume V: DIN 41612 Printed Wiring Board Connectors,

Volume VI: Military (MIL- C21907) and Commercial Card Edge Connectors,

Volume V: Cylindrical Connector Accessories

Volume VI: Contacts and Tools

Volume VII: Military and Commercial Rectangular Rack and Panel Connectors (2 books, 2,032 pages)

Volume VIII: Military (MIL-C-24308 and 83513) and Commercial "D" Subminiature and Microminiature Connectors

Volume IX: Airbus, Boeing and McDonnell Douglas

Volume X: European VS U.S. Specifications

All major types of military and commercial connectors can be found in these books. The company also has available a CD-ROM connector identification and selection (CIDS) system that provides information on over 980,000 military part numbers, 1100 pages of military specifications and 3085 drawings. Information Handling Systems (IHS) sells a CD ROM version of the Edward's materials. Edwards is also preparing a new CD ROM. Prices range from $345 for Volume I to $425 for volume IX. A master index is available for $89. Full prices are on the web site, including export prices.

5.- Electronics Representatives Association (ERA);
http://www.era.org

This manufacturers' representative organization, has available a publication called the Locator, an international directory of manufacturers' representatives in the electronics industry. Member price is $5, non- members $50 and international non-member price is $75. In late 1995 Harris Infosource International (Twinsburg, OH) sold the Electronic Representatives Directory (ERD), launched in 1948, to this organization. This ERD directory lists over 5,300 electronics representatives.

6.- Harris Publishing Co.
2057 E. Aurora Road
Twinsburg, OH 44087-1999
216-425-9000
800-888-5900
Fax: 800-643-5997, 216-425-7150
1-800-643-5997
http://www.harrisInfo.com/emd.htm

This publisher issues the European Electronics Directories and other international directories such as Scott's for Canada as well as directories for Italy, Mexico, Puerto Rico and former Soviet Republics. They also issue Industrial Manufacturers Directories, separate issues for different states of the U.S.. Directories are also available on CD ROM and for LAN use. They also issue the Electronics Manufacturers Directory and the directory on disc (Selectory). The directory is priced at $255 (1997 edition). See teh web site for full price details.

7.-IC Master
Hearst Business Communications
645 Stewart Ave.
Garden City, N.Y. 11539
516-227-1300
Fax: 516-227-1901
Book Price prepaid is $195
CD ROM prepaid $235

This reference lists over 100,000 IC's by function. Alternate sources, IC manufacturers, distributors and local sales offices are listed. Specification sheets for some of the IC's are also included in this set of 3 books. The IC Master is available on CD ROM and the IC Master Directory of Manufacturers' Data Pages and the Alternate Source Directory (ASD) are available on computer disk.

8.- Master IC Cookbook
Delton T. Horn
Publisher: McGraw-Hill
Price: $21.95

This book lists various common ICs (generally not those found in consumer electronics).

9.-Modern IC Databook
WEKA Publishing Inc.,
97 Indian Field Road,
Greenwich, CT 06830.
203-622-4177

This databook contains data on various types of IC's including: linear, digital, consumer, microcontroller, microprocessor, coprocessor, digital signal processor, data communication, interface, A/D, D/A, synchro-resolver, VCR, optoelectronic, and transducer IC's. Periodic supplements expand the information contained in the book, which includes a functional index, detailed component data sheets and manufacturer address and alternate source list.

10.-Sav-Soft Products
Education Division
P.O. Box 360974
Milpitas, CA 95036
408-263-9150

This organization conducts seminars on a variety of subjects including one on Component Technology and Reliability. This seminar includes information on construction, qualification, application and reliability of various components, including resistors, capacitors, semiconductors, contacts/connectors, inductors/transformers and motors. The course includes a manual with derating guidelines and reliability design rules, which is also available separately.

In addition to these companies, there is a component information service called PartNet, that allows search by characteristics for mechanical and electronic components from numerous vendors simultaneously. the Web address is: http://part.net
423 Wakara Way, Suite 216
Salt lake City, UT 84108
800-727-8061
801-581-1118
Fax: 801-581-1785

11.- Television IC Data Files
by John Edwards
Published by: Newnes (Butterworth-Heinemann)
ISBN: 0 7506 2899 5
Price: $31.95
Common ICs used in Televisions are provided along with pin outs, and actual voltages and input/output signals that can be compared against devices in the product being repaired.

12.- Television Microprocessor IC Data Files
by John Edwards
Publisher: Newnes (Butterworth-Heinemann)
ISBN: 0 7506 3335 2
Price: $28.95
Common microprocessors used in Televisions are provided along with pin outs, and actual voltages and input/output signals that can be compared against devices in the product being repaired.

13.- VCR IC Data Files
by John Edwards
Publisher: Newnes (Butterworth-Heinemann)
ISBN: 0 7506 3993 8
Price: $28.95
Common ICs used in VCR are provided along with pin outs, and actual voltages and input/output signals that can be compared against devices in the product being repaired.

Books/software that list manufacturer representatives and distributors

1.-Ameritech Industrial Purchasing Guides
100 E. Big Beaver Rd., Suite 700E
Troy, MI 48083-1241
800-331-1385
Fax: 248-524-4849
Part of Amertech Industrial Yellow Pages, this group publishes 14 regional editions that cover various industries including: manufacturing, wholesale trade, construction, transportation, utilities, mining, government, professional services/institutions, business services and agriculture. The guides cover IL, WI, IN, MI and OH. They are free to qualified personnel or sell for $99 each.

2.- Daybreak Communications, Inc.
P.O. Box 3071
Point Pleasant, NJ 08742
800-440-7278
908-899-8295
Fax: 908-892-7341
This company has on computer disk the "Electronic Component Locator" (6 regional or one national edition is available). The program allows you to find distribution sources for electronic components from over 3300 manufacturers. Searches can be done using keywords or manufacturer names.

3.-EITD, Electronic Industries Telephone Directory
Cahners Publication
201 King of Prussia Rd.
Radnor, PA 19089
1-888-239-3272
610-964-4336
Fax: 610-964-4305, 6018
http://www.ecnmag.com/eitd
This directory (published by Harris Publications until 1995) contains manufacturer name or type of product manufactured. Distributors and representatives are also listed. They also publish Who's Who in Electronic Sources (separate issues for different regions of the U.S.). The website, established in September 1997, contains all the printed listings. Book price is $55.

4.- Electronics Purchasing Guide to Distribution
Springs Technical Pub., Inc.
P.O. Box 11-338
Albany, NY 12211-0388
518-452-4365
Fax: 518-435-9023

Osborn Marketing Group
P.O. Box 11-478
Albany, NY 12211-0478
These guide editions cover East US, West US, Canada and the Northern US. There are free copies for qualified personnel or they sell for $29.95 each.

5.- Electronics Source Book
An Intertec/Primedia Publication
P.O. Box 12943
Overland Park, KS 66282-2943
Fax: 913-967-1903
A regional directory (with New England, Mid-Atlantic, SouthAtlantic, Midwest, Northern CA, Southern CA, Southwest and Mountain States editions) that lists distributors, value added servicers, manufacturers and representatives. The book is free to qualified individuals or is $29.50 plus $4.50 tax and handling.

6.-ERD Electronics Representatives Directory,
see Electronic Representatives Assoc., above.

7.-Federal Buyers Guide Inc.
650 Ward Drive
Santa Barbara, CA 93111
805-683-8593
Fax: 805-683-8593

This company is a publisher of buying guides. These guides, include the Federal Buyers Guide (for federal purchasing agents), State and County Government Vendors Registry (for state and county officials), Municipal Government Purchasing Directory (for municipal government buyers), Overseas Contact Guides for U.S. Businesses (for overseas companies who want to deal with U.S. firms), Immediate Need Resource Directory for Government Procurement (for federal government purchasing agents), GSA Purchasing Guide (for the General Services Administration), Industrial Buyers Guide (for U.S. Industrial Firms) and the Government Contractors Source Book (lists prime sector government contractors who have existing government contracts or new projects). These guides are distributed free to qualified buyers. (Note: These guides include listings for all types of material including data processing equipment, software, plumbing materials, etc.).

8.-Information Gatekeepers, Inc.
214 Harvard Avenue
Boston, MA 02134
617-232-3111
Fax: 617-734-8562
5321 Holt Avenue
Los Angeles, CA 90056
310-215-0927
Fax: 310-338-9704

Linuvaaranitie 105
02660 ESPOO Finland
35 8 547 1062
Fax: 35 8 547 1362

New State Manor Bldg., #1257
Yoyogi 2-23-1, Shibuya-ku
Tokyo 151 Japan
81 33 299 3935
Fax: 81 33 299 3940

P.O. Box 13
Rozelle, NSW 2040
Australia
61 2 555 7377
Fax: 61 2 818 2294

IGI Europe, Inc.
c/o AKM AG
P.O. Box 6
CH-4005 Basel, Switzerland
41 61 691 8888
Fax: 41 61 691 8189

This publisher (and consultant) on telecommunications issues has a "Fiber Optics Yellow Pages" directory (updated yearly) that contains a company directory, geographical index, fiber optics standards organizations, fiber optic information, glossary and calendar of events in the industry. This publication expands their previous handbook and buyers guide. They also have Newsletters, studies, proceedings, publications and reports on LANs, ISDN, Wireless communications and telecommunications. Price is $89.95.

9.-Japan EBG
Dempa Publishing, Inc.
11-15, Higashi Gotanda 1-chrome,
Shinagawa-ku, Tokyo 141
+81 3 445-6111
Fax: +81 3 444-7515
Cable Address: DEMPASHIBUN TOKYO
Telex: 02424461 PRSDNP J.

New York Office:
275 Madison Avenue
New York, N.Y. 10016
212-682-4755
Fax: 212-682-2730

Dusseldorf Office:
Drususstr. 7,
4000 Dusseldorf 11, Germany
0211-554100
Telex: 8586481 DEMP D
Fax: 49-0211-589681

Listing of companies and distributors (trading companies) organized by product category. Similar to EEM in the U.S. but for companies in Japan.

10.-REED Reference Publishing
Reed Elsevier Group
121 Chanlon Road
New Providence, NJ 07974
908-771-8785
Fax: 908-771-8755

Reed Information Services
Windsor Court
East Grinstead House, Wood Street
East Grinstead
W. Sussex RH19 1XD
0342 326972
Fax: 0342 335992
TLX: 95127 INFSER G

Kompass USA
2000 Clearwater Drive
Oak Brook, IL 60521
Fax: 708-574-7080
http://www.kompass.com
http://kompass-intl.com
Comments on the Web Site: webmaster@kompassint.com

Kompass International S.A.
Saint Laurent
73800 Cruet France
+33 4 79 65 25 08
Fax: +33 4 79 84 13 95

This company publishes a variety of manufacturing directories including Kompass International, Kelly's and the U.S. Industrial Directory (described below). Kompass International directories include such business data as product information, names of directors and key personnel, financial details, and number of employees. Directories are available for industrial companies in 65 countries, including every member of the European Community. These editions include Australia, China, Japan, Israel, Korea, Russia, South Africa, Taiwan, United Arab Emirates, United Kingdom, and the U.S.. Kelly's directories provide product information but do not go into depth about the employees or financial details. Kompass USA is available in CD ROM format and is available on the web for searches.

11.-Regional Industrial Buying Guide
Thomas Regional Directory Co., Inc.
(a subsidiary of Thomas Pub. Co.)
Five Penn Plaza
New York, N.Y. 10117-0266
212-629-2100
http://www.thomasregister.com

Guides for regions of the United States, that list industrial suppliers, manufacturers representatives, distributors and service companies. The product section contains over 3,500 different product headings.

12.- Scott's Canadian Directories
Harris Publishing Co.
2057 Aurora Road
Twinsburg, OH 44087-1999
216-425-9000
800-888-5900
Fax: 800-643-5997, 216-425-7150

International directories including Scott's Canadian national, Canadian Trade Index, Atlantic, Ontario, Quebec, Greater Toronto, Western Region. Directories are also available on CD ROM and for LAN use.

13.-Thomas Register of American Manufacturers
One Penn Plaza
New York, N.Y. 10117-0138
1-800-222-7900 ext 200
212-290-7277
Fax: 212-290-7365
Telex: 12-6266
Thomas OnLine, 212-290-7291 (see text)
http://www.thomasregister.com
http://www2.thomaspublishing.com
http://www.productnews.com (web site on mechanical parts)

A multi-volume set of books that lists over 153,000 American and Canadian manufacturers and suppliers. The books contain over 52,000 product and service headings and over 111,000 trade and brand names, including manufacturer logos. In the catalog volumes there are over 1800 manufacturer catalogs that contain engineering drawings, specifications and performance tables. Note: the Thomas Register can be accessed online via Fax. The number is 900-FAX-THOM. An instruction sheet for this service is available by calling 800-4-FAXCAT (request document 630). Access charges are billed by the minute to your telephone number.

14.- U.S. Industrial Buyer's Guide
U.S. Industrial Directory
A Reed International, Cahners
Publication 8 Stamford Forum
P.O. Box 10277
Stamford, CT 06913-0168
203-328-2500
Fax: 203-357-7864

121 Chanlon Road
New Providence, NJ 07974
908-464-6800
Fax: 908-771-7704

Circulation Office
44 Cook Street
Denver, CO 80206
303-388-4511
1-800-637-6086

These books, of which the U.S. Industrial Buyer's Guide was introduced in 1991, contain manufacturer sources of various products including adhesives, crane parts, electronic components, electronic hardware, electronic enclosures, maintenance products, tubes, varistors, X-Ray equipment, etc. The books contain data on almost 60,000 companies which are sources of over 20,000 products from abrasive belts to zirconium oxide. ■

Test benches

by the ES&T Staff

On the surface of it, it would seem that putting together a test bench would require little thought. In actuality, nothing could be further from the truth. Most technicians spend eight hours, more or less, at the bench. Whether or not they are comfortable, or whether they are efficient, or whether they are distracted, depends on where and how the bench is situated, how it is constructed, how the tools, test equipment, replacement components and manufacturers' literature are arranged. A little thought given to the construction and arrangement of the workbench during the planning of the work area can reap large dividends down the road when the work station is being used every day.

One thing that managers can do when designing a work area is to ask the technicians for input. After all they are the ones who are going to occupy that area. If asked how a newly designed work station should be implemented, he may be able to suggest a number of factors that would improve it.

Distractions

Most of us don't think about it very often, but distractions can seriously impair an individual's productivity. If the service center is set up so that individual technicians are asked to talk to customers on the telephone, or at the customer service desk, the technician will lose a lot of productive time. Similarly, if the service area is located so that there is a lot of foot traffic through it, the technician may be distracted by people going by, and thereby lose a great deal of productive time.

Where possible, the service area should be isolated from the other parts of the service center, well lit, and kept at a comfortable temperature.

The workbench

Back in the old days, when consumer electronics products were relatively simple, and weren't sensitive to static electricity, and didn't have a hot chassis that required an isolation transformer, the workbench consisting of four legs and a top with a few amenities on it might have been adequate. It might even be possible for some service centers to get along with that kind of bench even now.

But things are changing. Most of today's consumer electronics products contain static sensitive components that require that the technician and the workbench be so equipped that they don't generate a static electric charge sufficient enough to destroy or seriously damage a sensitive component.

Every work bench should have a source of isolated power available to avoid the component damage that results when a consumer electronic product that has a hot chassis is touched with test probes from a piece of test equipment that is plugged into the same power system that the unit being tested is plugged into.

Other requirements at or near the bench

Something else that must be considered at the workbench is a place to hold the documentation. And these days, documentation doesn't simply mean paper, although, it certainly does mean paper. Sometimes very large pieces of paper. When management was planning the current generation of service benches in your service center, did the planners provide for holding thick service documents and huge fold-out schematic diagrams.

But in today's world, most service centers also have microfiche readers. Do the benches have provision for having a microfiche reader on or at least near the bench. And where does the computer go? These days more and more manufacturers are offering their service literature on a floppy disk. In past issues we have reported on the computerized service literature from Philips. An article in this issue describes the new CD-ROM-based serviced literature from Thomson. As that article states, it won't be long before a service center that wishes to service that manufacturer's products will absolutely need a personal computer, and a pretty powerful one at that, in order to gain access to any of the current service literature. In order to remain efficient, service centers will have to have computers at or near service benches.

"A little thought given to the construction and arrangement of the workbench during the planning of the work area can reap large dividends down the road when the work station is being used every day."

Designing a service bench

It frequently helps in planning a project to prepare a checklist. It's useful just to sit down, picture the project in your mind, look at the current situation, and brainstorm a list of the requirements. It might even be useful to sit down with a group of technicians and managers and generate as many ideas as possible as to what is, or might be, required at the service bench.

Here's a partial checklist of the things that make up a test bench. No doubt most technicians and service managers could add to this list.

- Surface area for the product, test equipment, tools, etc.
- Storage: drawers, shelves, bins, etc.
- Tools
- Soldering/desoldering equipment
- Test equipment
- Supplies
- Lighting: general, task and spot
- Power: ac, isolated ac, variable ac/dc power supply
- ESD (electrostatic discharge) protection
- Holder for service literature
- Communications
- Forms/writing implements
- Chemicals
- Computer or terminal
- Replacement parts/supplies reception
- Fume extractor
- Foot rest

Stocking the service bench

Everything necessary to get the job done should be at the service bench. Things that are not necessary to get the

job done should be elsewhere. For example, if the technician needs a DMM every day, or almost every day, it should be at the bench. But if he needs a signal level meter not more than once a week, it should be available nearby, but shouldn't be cluttering up the work area.

The items in the checklist are pretty much self explanatory, but here's a little detail about some of the critical elements.

ESD (electrostatic discharge) protection

Almost every consumer electronics product made today contains large-scale integrated circuits that are susceptible to electrostatic discharge damage. If these devices are handled without the necessary precautions there is a possibility that they may be destroyed or damaged.

Every service position should provide as much protection from this type of damage as possible: grounding wrist straps, static dissipative work surfaces, and static protective bags for storage.

Communications

In a small service center, it wouldn't be necessary to set up an elaborate communications system; the technician merely has to speak to someone nearby. In larger service centers, however, the technician at the bench may be a long way from the office or the replacement parts/supply area. If a technician needs to check on the availability of service literature, certain parts, or other requirements, it could mean several trips a day, causing productivity to suffer.

Such trips could be minimized by providing intercom communications at every bench. The cost of such a system might be quickly recouped through increases in productivity. Another method of providing this communication would be by placing a computer terminal at every position that would allow the technician to place requests via the keyboard.

Parts/materials

Hand in hand with good communications goes good parts handling. In the average medium to large service center, when a technician has isolated a problem to the component level, he walks to the parts/supplies area and submits a request for what he needs. The supply person may be busy at the time, thus causing delays. A system such as this can cause a great deal of wasted time.

In one service center operated by a major manufacturer, every service position has not only a means of communication, but a pneumatic tube station. Under this system, once the technician has isolated the problem, he can order the parts or supplies he requires and have them delivered to him without ever moving from the bench.

Of course, a system such as this requires a considerable up-front investment, but the increased efficiency realized by making the best use of a skilled technician's time can more than offset the cost.

The little things

Servicing a product, such as a TV, presents some peculiar problems. For example, while servicing a larger set it frequently becomes necessary to perform adjustments on controls at the rear of the set while observing the results on the screen at the front of the set. One of the more efficient and well thought out service centers we know of has a large mirror fastened to the wall at the back of the bench. With this setup, it is not necessary to find a mirror and try to place it where it can be seen. It's always right there.

Fume extraction

According to literature from one manufacturer of soldering fume extractors, the fumes produced when a technician solders may cause, or aggravate a number of problems: allergies, headaches, acne. In many service centers, for example those that are large and well ventilated, fumes might not be a serious problem. The existing air handling system might be able to sufficiently diffuse the fumes so that they're not a bother. In other service centers, those that are small, or have low ceilings, or in which some of the technicians do a lot of soldering, it might be wise to consider the benefits of fume extraction, especially if any of the technicians complain of discomfort caused by fumes.

There are a number of ways to eliminate soldering fumes, ranging from the simple and inexpensive to the elaborate and expensive. Which of these solutions should be chosen by a particular service center would depend on the size of the service center, the number of technicians, and the amount of soldering that the service center does.

"With every advance in technology, and with every addition of a product to the list of consumer electronics products, new problems arise in equipping the service bench."

For example one solution to soldering fume extraction is to eliminate it at its source. Some soldering/desoldering systems either come with, or can be fitted with tubes that are attached to the soldering iron in such a way that the fumes generated during soldering are sucked into the tube and either vented to the atmosphere, or, more likely, routed to a canister where the fumes are absorbed and the purified air is recirculated.

Another approach is to place a larger, higher volume air nozzle that sucks the air in the vicinity of the work area, including the soldering fumes, and conducts it to a canister where it is purified and recirculated into the service center. Systems that either ventilate a single work station or that several work stations at a time can be purchased .

The most elaborate fume extraction is the type that has a vent hood at each work station and ductwork that leads to a central fan that exhausts the fumes to the outside. The advantage of such a system is that it completely rids the service center of the unwanted fumes.

The exhaust method does have a couple of disadvantages. For one thing, there are environmental laws at every level; local, state and Federal that control the type and concentration of any fumes vented to the outside. You might have to prove that your installation is in compliance with those laws.

The other disadvantage is that air that is exhausted to the outside has to be made up by drawing air in from the outside. In the winter, that makeup air has to be heated. In the summer, the makeup air has to be cooled. Heating and cooling extra volumes of air can be a considerable expense.

Ergonomics

Another important but often overlooked aspect of workbench design is ergonomics, the study of how tools and workplaces should be designed to make a human worker more efficient and to minimize injury or distress to the worker. The popular and business press frequently carry articles on the problems that can arise when a worker performs certain tasks repetitively. It's more likely to occur on an assembly line where a worker might perform a certain task over and over hundreds of times throughout the day, but it can also occur to someone who performs the same types of task repeatedly over many years. Sometimes this results in inflammation of the muscles or tendons that are used to perform the task. This kind of problem can cost the service center in many ways: loss of a productive technician for a period of time, payment of that technician, as well as a replacement, while he is out.

Many factors play a part in these problems: design of the tool, method of using the tool, number of times the tool is used during a work period, the height of the workbench, the height of the chair, placement of the chair in relation to the workbench. There are many good books on the subject. And for those who own a computer, a visit to the internet and a search on the word "ergonomics" will result in a list of many sites where the visitor will find help and advice on buying or designing an ergonomic workplace.

Planning is an ongoing task

With every advance in technology, and with every addition of a product to the list of consumer electronics products, new problems arise in equipping the service bench. For example, it becomes necessary to answer questions such as whether an existing service position, say one that is currently used for the servicing of television sets will be used to service a new product as well, for example personal computers. Or will a new work station be set up for the purpose.

Either way, the same type of workbench planning must be done anew. Storage has to be set aside for diagnostic software, specialized tools and test equipment for computer service, etc.

If service center personnel don't think these things through as they arise, the service bench will become less efficient, and no service center can afford that. ■

Test probes update

by the ES&T Staff

The essence of troubleshooting electronics products is gathering as much information about the nature of the problem as possible and making a tentative judgement as to what circuit segment or component might be the cause of the problem. A competent technician uses all of his senses and every type of test equipment that he can bring to solve on the problem.

For example, a trained pair of eyes can see charring on a resistor, cracks in circuit traces, arcing around a high-voltage component. A good sense of smell can tell a trained technician when something has overheated. Fingers that have serviced electronics products for years can help a technician tell when a resistor, transistor or IC is too warm.

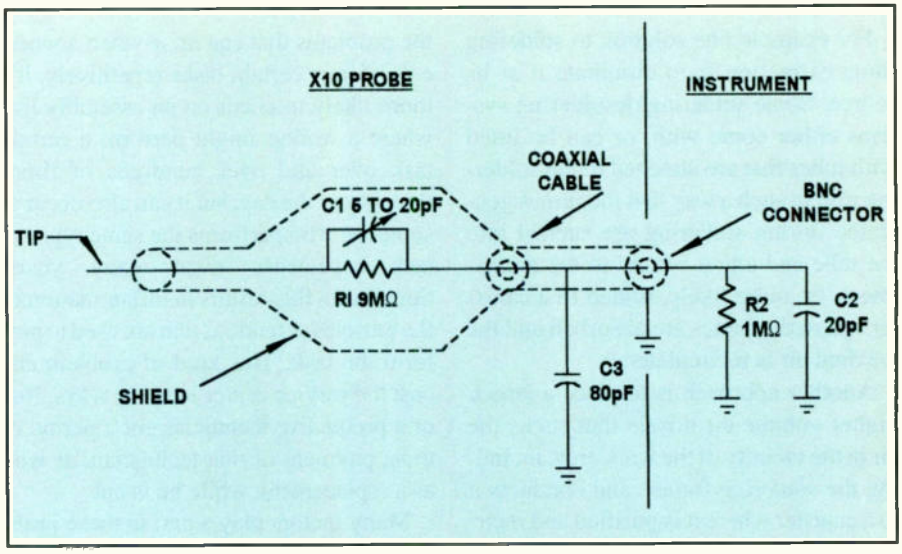


Figure 1. This schematic diagram shows the construction of a X10 oscilloscope probe.

Bringing in the test equipment and the probes

In many cases, the most highly trained senses reveal little or nothing about the nature of the problem, and even when the senses tell something about the problem, it remains for the highly sophisticated test equipment: multimeters, oscilloscopes, etc. to determine the actual cause of the problem. But every piece of test equipment that is to be used in the troubleshooting process requires some kind of probe to attach it to the points in the circuit that are to be tested.

As electronics equipment has evolved and become more sophisticated, and ever more crowded with tiny components with even tinier leads, it has become necessary for test equipment and test probe manufacturers to develop the sophisticated test probes necessary to connect to those test points. In some cases, the requirement was for a probe that would attach to the many tightly spaced leads of an IC and increase the spacing so that a technician can get a probe connected to the desired test point. In other cases, the requirement was to develop a probe that would provide an accurate reading when used with a particular piece of test equipment.

This article will discuss some of the recent advances in test probes that may make a technician's troubleshooting work a little easier, and/or more accurate.

Specifying an oscilloscope probe

Many people think that in order to get a precise reading, the bandwidth of the oscilloscope probe should be higher than the bandwidth of the oscilloscope. While this is true with some probes, other manufacturers specifically design, rate and specify probes to match the bandwidth of the particular instrument. The result is a probe frequency' response that can essentially be considered transparent.

In a pinch, even a piece of wire can be used as an oscilloscope test lead. It is inexpensive and readily available. But to use a piece of wire as a probe could seriously degrade the signal you are attempting to read. In addition, the instrument's input amplifier could be seriously overloaded by the unshielded wire's pick-up of induced extraneous noise. Only an oscilloscope probe specifically tailored to

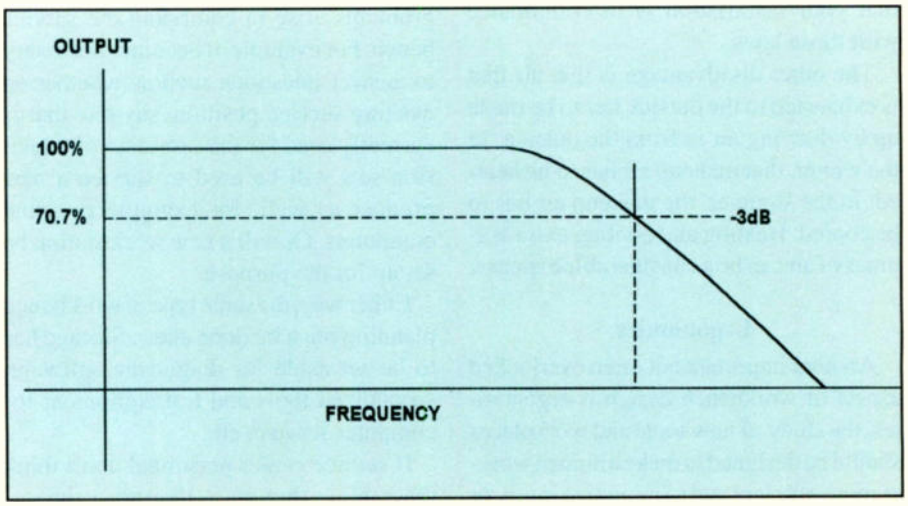


Figure 2. Bandwidth of an oscilloscope is the frequency range over which the probe has an output amplitude that is above a point that is 3dB below the maximum value of the signal.

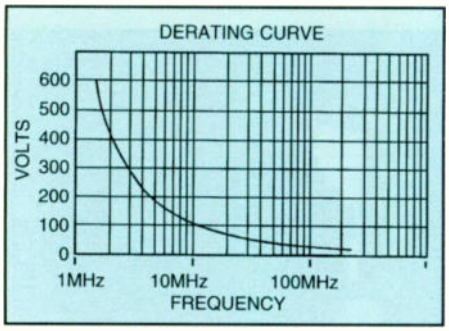


Figure 3. As frequency increases, the voltage capability of a probe decreases. A typical derating curve is shown here.

have a frequency response/bandwidth that matches the bandwidth of its companion oscilloscope and which includes adequate compensation circuitry and overall shielding can offer signal integrity and minimum loading of the signal source by the probe itself.

There are several important factors to consider when selecting an oscilloscope probe. By comparing these factors with your testing requirements and instruments, you should be able to select the probe best suited for your specific application. See Figure 1 for a basic schematic diagram of an oscilloscope probe and connected instrument. Before you read any further, review your instrument's rated bandwidth, input resistance (standard value is 1 MΩ and input capacitance (standard value is 20pF).

Probes are rated most often in terms of bandwidth and/or risetime. Bandwidth is usually defined as the sinewave frequency at which the output amplitude of the subject item has decreased by 3db, as compared to its mid-band or reference value. The general graphical representation of this would look like Figure 2. This -3db. point, represents an output amplitude that is nominally 70% of the mid-band or reference value.

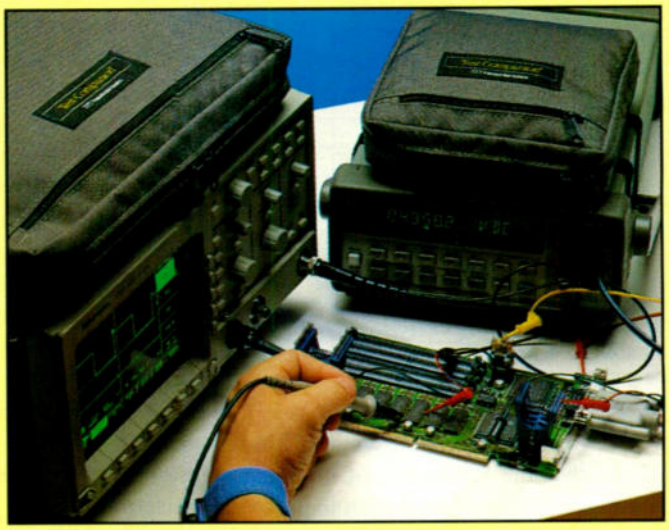
Risetime (Tr) is generally related to sinewave bandwidth by the equation Tr (ns, 10%-90% amplitude) =350/BW (MHz). This equation indicates that a 100MHz (sinewave rated) basic oscilloscope would have a risetime 10% to 90% of amplitude measured of 3.5 ns.

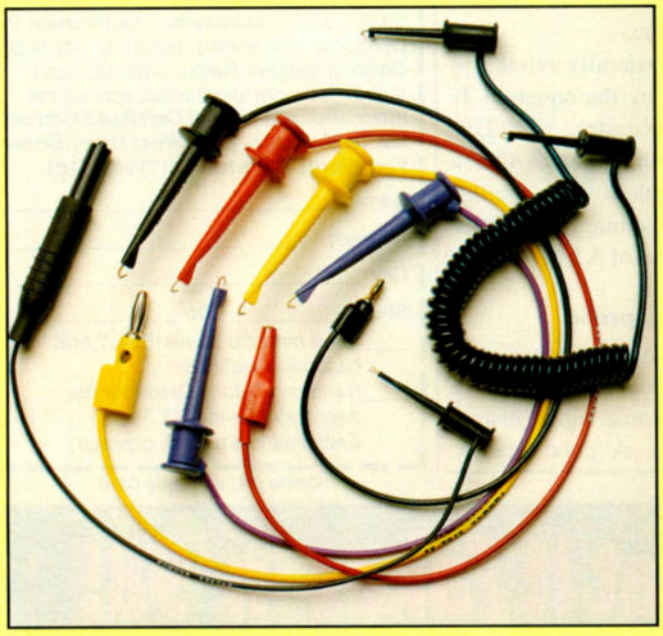
Choosing a probe

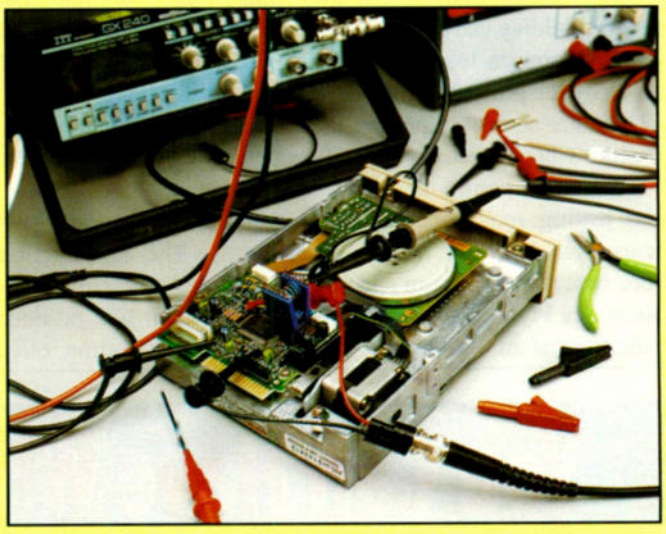
The introduction of any measuring device (scope/probe combination) to a circuit will produce some signal distortion (loading effect). A good quality

The pins of integrated circuits have become so thin and so closely spaced, and surface-mount components have become so tiny. In some cases, such as camcorders, the space in which a technician must work is so cramped, that just getting a probe on a test point has become a major challenge. Fortunately, many manufacturers are working diligently to produce probes, clips, extenders and more to address the problem.

Represented here is a selection of the probes that are available to assist technicians in connecting that oscilloscope or DMM to the point of interest in the circuit. Photos are courtesy of ITT Pomona.







probe matched to a scope will minimize this distortion, or reduce it to a known quantity. Each probe has an input resistance and capacitance. At low frequencies, usually less than 1MHz, input resistance is the principal factor in the loading effect. The high tip impedance of the probe, usually 1MΩ for a X1 probe and 10MΩ for a X10 probe, minimizes circuit loading. As frequency increases, the probe's capacitance becomes the dominant factor. The lower the capacitance the lower the loading and consequent distortion of the signal source.

For circuits that are sensitive to impedance loading there is the X100 probe. It has an input impedance of 10MΩ and approximately 6pF when connected to a standard oscilloscope. If a high enough signal voltage amplitude is available for the X100 attenuation, this probe would be most suitable.

For best results, to minimize signal source loading and to maximize bandwidth and risetime, select a probe with the highest input resistance and the lowest input capacitance.

Voltage input

For operator safety and to prevent equipment damage, before use, review the voltage and frequency to be measured to be sure that they are within the specified capability of the probe. Note: most probes have a decreasing voltage capability as the frequency increases (Figure 3).

Grounding

The quality and accuracy of the displayed measurement is greatly affected by the method by which the probe is grounded to the circuit under test. The ground lead has inductance. As the frequency increases, so does the inductive reactance. This reactance can cause signal distortions and leading-edge ringing on high-speed pulse waveforms. To reduce this effect, use the shortest ground lead possible (ground to the device under test) or adapters such as a BNC interface which is an included accessory.

Fully insulated probes

Because battery-powered portable scopes may be used without earth grounding, user safety becomes a primary factor. A signal voltage may set up on the shielding circuit and if a standard probe is used, this voltage would be present on the exposed BNC shell. Fully-insulated probes, specifically designed for use with portable scopes, cover these exposed points with plastic insulation. The international safety standard IEC1010-2-031 details the design criteria for safer operation of these probes. ■

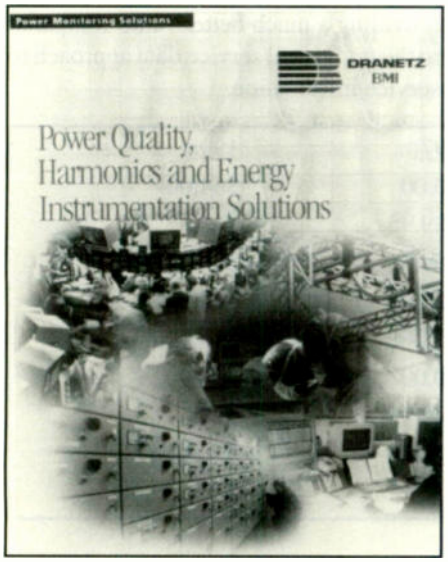
LITERATURE

Power quality catalog

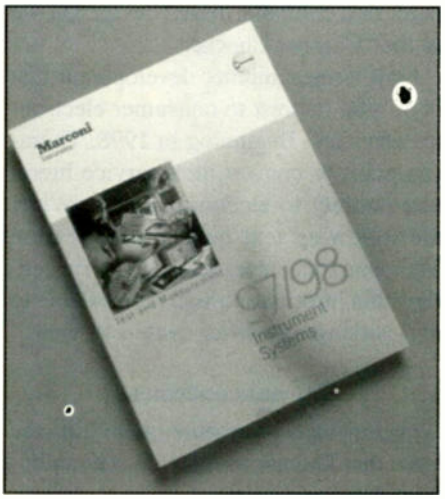
Dranetz-BMI announces the availability of a new eight- page product line catalog featuring the company's complete line of power quality, harmonics and energy instrumentation and software solutions The main product categories include hand-held, portable and permanently installed hardware products and PC based system software for data acquisition, analysis, evaluation and reporting

The portable and hand held products section includes a photo of each single and three-phase power quality instrument along with a brief description and bullets of key features. Products include the 4300 Power Platform series, 355 Harmonics Analyzer, 100G PowerVisa 130 PQ-Sentry Power Platform PP1, Dran-Logger DL-1, 658 PQ Analyzer, 8800 PowerScope and 3030A PowerProfiler. The permanently installed and portable instruments section is presented in a similar fashion and includes the following products: 7000, 8000 and 9000 PQNode series, 3100 PQNode/EPRI PQPager and PP-1R Power Platform.

The PC-based software section includes descriptions of the company's three primary software packages for data acquisition, analysis, evaluation and reporting. Bullet points of key features are augmented by multiple screen captures for each, illustrating the various capabilities of the DranView, Dran-Scan and Power Evaluation Software (PES) products. In addition, complete information is provided about how to contact the company's technical support, reference library and training lines. A comprehensive product selection matrix is also included which details the company's complete hardware and software product offering by model number, type and operational features.



Circle (90) on Reply Card



Test and measurement instruments catalog

Marconi Instruments announces its 1997/98 Test and Measurement catalog. The catalog features the company's line of test solutions for RF and microwave products. The catalog offers an updated selection of signal sources, radio test sets, and microwave and RF analyzers.

Circle (91) on Reply Card

Electronics catalog

TechAmerica is a new, nationwide catalog operation which has its strength in core electronic components. The catalog includes: Test equipment, tools; wire, cable and connectors; a library of technical and computer books, including service and repair subject titles; chemicals; security and automation components; computer networking products and accessories; audio/video distribution components, and business and amateur communication products.

TechAmerica maintains inventory levels and depth. Catalog merchandise is

presented in well defined sections of the book with informational specifications to assist in correct selection. Additional product information can be found by contacting the TechAmerica Technical Support group. Electronic components are sold in single or volume counts.

TechAmerica also offers benefits for service and repair professionals.

Circle (92) on Reply Card

Test equipment catalog

Global Specialties introduces its test equipment short form catalog featuring five new products. This new, easy to read tri-fold short form catalog features two new constant current/constant voltage digital dc power supplies; one single and one triple output.

Also featured are:

- a new 32 channel logic analyzer with a standard RS-232 interface and many other features and specifications that are necessary for evaluating microprocessor based circuits
- the third in the series of Global's unique triple isolated ac power sources with current and leakage measurement capabilities as well as a 220Vac-240Vac at 50Hz input capability, and
- the Protolab 4.0 circuit design and simulation software package that allows users to create circuits instantly on the personal computer.

Circle (93) on Reply Card

Test equipment update: Testing has changed

by the ES&T Staff

In the 1950's every service technician worthy of the name carried a tube tester and a caddy full of tubes to the home where he had been called to service a television set. Today that tube tester has been obsolete for years, and any tubes still left from that caddy are useful only to replace defective tubes in "antique" TV sets.

Just as television technology has changed, and the vacuum tubes on which they are based gave way, first to transistors and then ICs, the test equipment used to test those products has changed as well. Moreover, even the information delivery system used to provide servicers with service literature has evolved. The complexity of consumer electronics products required that manufacturers produce service manuals that rivaled "War and Peace" for thickness. That led manufacturers to attempt to deliver service manuals on microfiche.

The digital age of consumer electronics has arrived

In recent years consumer electronics products have undergone a revolution, not simply further evolution. Digital techniques which once were applied only to devices known as "computers" are now found in many circuits in consumer electronics: audio systems have digital tuners, television sets have digital circuitry, web TV products can connect the family's TV set to the internet.

Some television sets have digital circuitry that controls the operation of the product based on information stored in read only memory (ROM) ICs. On those sets, there are no knobs to tweak to optimize operation; all inputs must be done with either a computer, or some kind of computer-based device.

A case in point

Thomson Consumer Electronics has been one of the consumer electronics manufacturers that have been at the forefront when applying new technology to consumer electronics products. As most servicers are aware, they have applied digital technology to their television products, and many of their products are designed so that all operations are controlled by microprocessors and all adjustments are made using a personal computer or a computer-based device known as the "Chipper Checker."

Now comes another development that is of vital interest to consumer electronics servicers. Beginning in 1998, Thomson plans to convert their service literature entirely to electronic media. While the following text quotes a letter from Thomson to their authorized service centers, this information will be available to non-authorized service centers as well.

The announcement

Following is a verbatim quote from the letter that Thomson sent to all of its authorized service centers:

In 1999, we plan to change all service data from paper to electronic. The new Electronic Service Information will be distributed via CD-ROM. The purpose of this communication is to acquaint you with this new medium. The Electronic Service Information we plan to provide should be viewed as a comprehensive service aid that will reduce your costs while improving service quality.

To help you understand this exciting new medium, the following are some of the features of the new Electronic Service Information:

"The complexity of consumer electronics products required that manufacturers produce service manuals that rivaled "War and Peace" for thickness."

It will provide a single source for all information required to service the product including:

- -Schematics and Parts Lists
- - Circuit Board Views
- - Alignment Procedures
- - Training Materials
- - Technical Bulletins
- - Chipper Check
- - Alignment Software
- - Customer Instruction Books

• It's interactive with built-in links between service information components.

• It has the ability for the technician to record notes regarding repair.

• It requires much less storage space than traditional service literature.

• All information on the CD is printable using standard PC printers.

• It's priced at or below current pricing, providing a much better value compared to the traditional service data approach to service information.

	1997	1998
TV - Service Data	$80.00	$64.00
- Chipper Check	$129.95	Free
- Total	$209.95	$64.00
VCR - Service Data	$120.00	$120.00
C/C - Service Data	$135.00	$135.00
Audio - Service Data	$60.00	$50.00
Parts Finder	$149.95	Free
Total - All Products	$674.90	$369.00
Saving - All Products		$305.90

Table 1.

• Schematics are easy to read, even on smaller monitors.

• All data is on the CD-ROM, freeing up your computer's hard drive.

• Multiple copies of the CDs are available at a greatly reduced price."

Previously it was mentioned that electronic data is a better value. Please review the following for a comparison.

• 1997 Subscription = service data + service bulletins only

• 1998 Subscription = Interactive service data + service bulletins + training materials + chipper check (TV) + Partsfinder + Customer Instruction Books.

• Cost

Refer to Table 1.

Computer requirements for this software

TCE's Electronic Service Information (ESI) uses several software programs to view service information. Many of these programs would have been installed on most computers with Windows 95 or NT. There are also several programs, such as Internet Explorer 4.0 and Adobe Acrobat 3.0, which were not installed with Windows and might have to be installed by the service center in order to use the information on the ESI CD-ROM.

Note that these programs come at no additional charge on the CD-ROM. Moreover, the requirement to install the Internet doesn't imply the requirement to connect to the internet. No requirement to connect to the internet is required. The reason that Internet Explorer is required to run the ESI disk is that that Internet Explorer contains certain software that is used to operate the ESI CD-ROM system.

In order to operate the ESI CD-ROM, the service center will have to have this equipment as a *minimum.*

Operating System: Windows 95 or NT 4.0

Processor: 486DX2

RAM: 16Mbytes

Hard Drive: During installation, Thomson's Electronic Service Information system only loads required system files on the computer. Service information remains on the CD ROM minimizing hard drive space requirements.

CD-ROM: At least 4X

Mouse: Two-button, minimum

Printer: The ESI software will work with a large assortment of printers, including dot matrix, laser and bubble jet printers, and plotters.

To reiterate, the requirements listed above are minimum requirements. For best performance, it is recommended that you use at least a Pentium processor with 16Mbytes of RAM. When purchasing a computer to use with ESI, or for that matter, any software, it is recommended that the purchaser buy as much computer as he can afford. It saves time and money in the long term.

A huge change

This decision to deliver all service literature via CD-ROM, especially for a company as influential in consumer electronics as Thomson, represents a huge change in the way information is delivered; a fundamental change. Thomson will no longer make any kind of paper service information available. If a service center wishes to gain access to service literature, they will only be able to do so if they have a computer, and a fairly advanced computer at that. Other manufacturers are also making service literature available for use with the computer, although it's not currently known if they will also cease publication of paper.

"Beginning in 1998, Thomson plans to convert their service literature entirely to electronic media."

Perhaps more than any other development in a long time, this one states that computers have become a fact of life in the consumer electronics service business. It will be difficult to do business without one. There seems to be little doubt that this trend will continue. Any service center that does not currently use a computer should seriously consider doing so. The benefits of doing so will be many. The consequences of not doing so could be serious. ■

ES&T Calendar

SUPERCOMM '98
June 7-11
Atlanta, GA
703-907-7981

CES Habitech '98 - Home Systems
June 7-9, 1998
Atlanta, GA
703-907-7600

Fuse '98
June 19-21, 1998
Atlantic City, NJ
703-907-7643

CES Mobile Electronics
June 19-21, 1998
Atlantic City, NJ
703-907-7600

VICA National Leadership and Skills Conference
June 22-26, 1998
Kansas City, MO
703-777-8810

Systems Support Expo
June 23-25, 1998
Boston, MA
800-272-1812

CE Executive Summit (CEMA)
June 24-28, 1998
Colorado Springs, Colorado
703-907-7616

NESDA 48th/ISCET 28th/NIAS 6th Annual
August 10-15, 1998
Kissimmee, FL
817-921-9061

CeBit Home Electronics '98
August 26-30, 1998
Hanover Germany
609-987-1202

PCS 98
September 23-25, 1998
Orlando, FL
703-739-0300

Personal Computer & Electronics Expo
October 15-18, 1998
Uniondale L.I., NY
800-886-8000

PCS 99
September 22-24, 1999
New Orleans, LA
703-739-0300

Service mode adjustments for the newer televisions

by Bob Rose

The customer said the picture had shrunk. "Can it be fixed so the picture fills the whole screen the way it did when I bought it?" she asked. Sure enough, the raster did not fill the screen vertically. "Quick fix," you think. Pop the back off, adjust the vertical height pot, and write the bill. Well, the fix wasn't quite that simple. I put the set into what the manufacturer calls "the service mode," pulled the literature (which was on "fiche"), located the register that controlled vertical height, and made the necessary adjustments.

This is the new way of doing things. There are no pots, capacitors, or inductors to tweak. The days of mechanical adjustments have given way to electronic adjustments which are written into memory chips and stored until system control calls for them. In many respects it is easier and more accurate than the old way; in some respects it is more difficult. The tech has to know how to enter the service mode, what register to check, and how to make the adjustment. Then the technician has to write the adjustment(s) to memory and exit the service mode without losing the data. Sometimes the necessary data can be located in a Sams Photofact folder, and sometimes it has to be obtained from the set's maker.

Moreover, if you work with projection televisions, you will find yourself doing convergence adjustments using a remote control instead of an alignment tool. Every adjustment value will be written into an EEPROM which sends its data to a microprocessor and then to the convergence amplifiers.

Things have definitely changed!

This article will explore how service modes are entered, how adjustments are made, and how to exit the service mode without losing data. I will use five brands to illustrate the process. These brands are popular in my area and illustrate how almost every manufacturer does things.

Rose is an independent consumer electronics bsuiness owner and technician.

Thomson (RCA\GE) televisions

To enter the service mode in these televisions (from CTC 175 to the present), while the receiver is on press and hold the menu button and then press and release the power button and the volume + button. The instrument will display a one line menu on the screen. The lower left display will read P 00; the lower right display will read V 00. The "P" stands for "parameter," and the "V" stands for "value."

There are three levels in RCA's service menu. To get to the first level, use either the remote control or volume + on the front panel and adjust the "V" to read 76. You now have access to the "service adjustment parameters." To select a specific parameter, use channel up/down buttons on the remote control or the front panel. Once you select a particular parameter, use volume up/down buttons on the remote control or the front panel to make the necessary adjustment.

To enter level two of the service menu, change the parameter to twelve and the value to seventy-seven. You can now adjust the "chassis alignment parameters." To enter level three, change the parameter to twenty-eight and the value to seventy-eight. You can now write changes to "tuner alignment parameters." I have a complete list of the adjustments you can make in the July, 1977 issue of Electronic Servicing and Technology. I suggest you consult this issue for additional information.

To exit the service mode, simply press the power button on the handheld remote control unit or the front panel. The TV will exit the service mode and write all changes to memory in the EEPROM. By the way, be very sure to make a *written* record of the existing value in a register ("parameter") before you make any changes. Don't trust your memory. I speak from experience. And don't worry about making a mistake. If you don't follow the procedure exactly as Thompson has outlined it, the TV will automatically exit the service mode.

The bulk of this information can be found in a Thompson publication, CTC 175/176/177 Technical Training Manual. You can get it from your RCA distributor or directly from Thompson (POB 1976, Indianapolis, IN 46206).

Philips' products

Philips (Magnavox, Philco, Sylvania, Philips) does things a bit differently. To enter, let us say, a Magnavox service menu, use the remote control handheld unit and enter the following seven-button sequence: 0, 6, 2, 5, 9, 6, Menu. Depressing the power button will exit the service mode and save the current changes. It will also turn the unit off.

I will use the PTV 700 as an example. Keep in mind that this information generally applies to their other models, but there will be exceptions. Philips stores such information on microfiche instead of paper. Which is to say, if you order a specific manual be sure to get the "fiche" as well. The information I am about to give you can be found in Manual 7541 which covers PTV 700, 705/6, 710/11, 715, 720, and 725. I believe it cost about $30.00. If you do a lot of work on these units, you will not spend a better $30.00!

Let's say you have entered the service mode. All normal on-screen displays will be suppressed and replaced by a special display. It will look something like Figure 1. The first line will show the factory part number of the microcomputer: 613085-3. The next set of characters (GR5X3.0) identifies the version of software in current use. The second line, reading left to right, displays the currently tuned channel (channel 3). By the way, channel 3 is the default channel when entering the service mode. Why? Because most signal generators output to channel 3! If you are not using a generator or if channel 3 is not

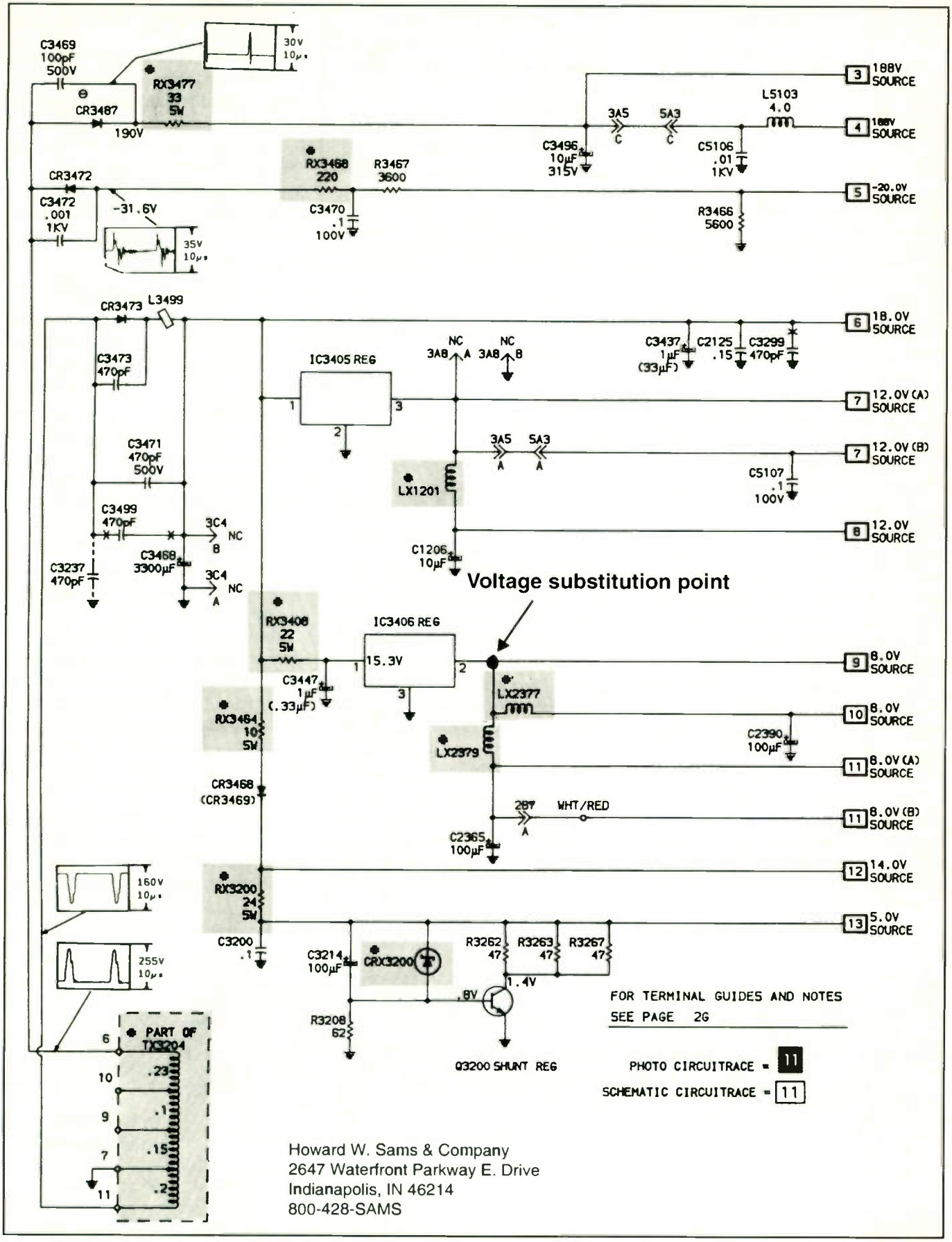


Figure 3. In this chassis, both the horizontal drive section and the main processor IC are powered by the secondary or scan-derived supply. Voltage substitution can be helpful in isolating a start-up problem. (Schematics courtesy Howard W. Sams)

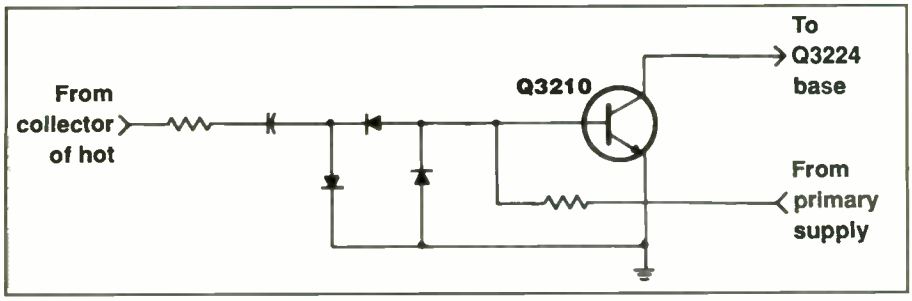


Figure 4. Some start-up circuits, such as this one, run continuously if the horizontal drive section fails to take over for any reason. In this case the chassis may power up with a very distorted raster. This is because the start-up circuit does not generate the proper waveform required for a uniform raster.

driver transistor. This transistor drives the HOT via the driver transformer. Each of the transistors receives collector voltage from the primary or low-voltage supply when the set is turned on. All that is needed to start the chassis is a supply voltage for the main processor IC. Typically, this voltage is bled from the primary supply by a resistor. Once the chassis is running, the secondary or scan-derived supply will take over by forward biasing the commutating diode. Note that the start-up voltage is only applied to the HOR VCC pin and does not power the entire IC. In some designs the primary supply powers HOR VCC continuously.

The x-ray protect circuit is also very straightforward. A sample voltage is taken from one of the IHVT secondary windings. Though this is not high-voltage (HV), its level does track the HV. This voltage is rectified and then applied to a zener diode. The rating of the diode is such that it will not conduct unless the HV rises above its normal value. If this happens, the x-ray protect circuit in the main processor will be activated shutting down the horizontal drive.

Zenith manufactured a series of chassis in the 80s that are somewhat complicated. They employ a three-stage horizontal driver circuit, a three-transistor start-up circuit, and a two-transistor shutdown circuit. We will look at these circuits one at a time using a Zenith model D2500W as an example (Figure 2).

The horizontal driver circuit

The most unusual thing about the driver circuit, aside from the fact that it uses three transistors, is that it is powered by the secondary supply. This means that the horizontal output section and its associated secondary supply must be running before the driver section can run. In other words, even if voltage was applied to the main processor IC and drive pulses were being produced, the chassis would still not run if the horizontal output section isn't running. Furthermore, substitution of a horizontal drive signal into the driver circuit will not work unless it is done at the output of the final driver stage or into the HOT itself.

The horizontal driver collector is supplied by secondary source number 6, while the predriver and phase inverter are supplied by number 7. The purpose of the horizontal inverter is to compensate for the phase inversion caused by the common-emitter pre-driver. Note that these transistors are direct coupled and should all be replaced if one fails.

The start-up circuit

The start-up circuit is essentially an oscillator that directly drives the HOT. The drive signal is coupled to a tap on the secondary of the driver transformer TX3205 via R3216. The oscillator is an astable (i.e., freerunning) multivibrator comprising Q3224 and Q3213. This circuit is powered by the primary supply so that it will run as soon as the set is turned on. The start-up circuit actually takes the place of the main processor IC and the horizontal driver section until the chassis starts and the secondary supply takes over operation of the set.

The third transistor, Q3210, is part of the "quenching" circuit that disables the multivibrator at the appropriate time. The quench circuit used in this example is self-activating. The components have been selected so that quenching will occur about one second after the set is turned on. In a normal chassis this is sufficient time to get the secondary supply running.

Each transistor in the multivibrator has its collector output RC coupled to the base of the other transistor. If both are proper-

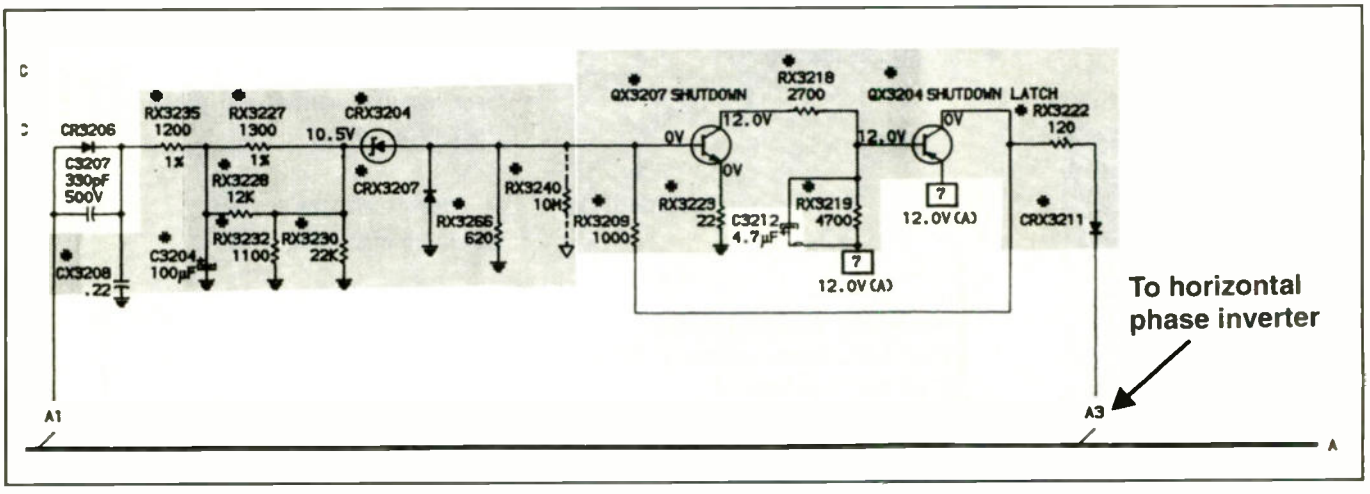


Figure 5. The shutdown circuit in this chassis uses a two-transistor latch circuit.

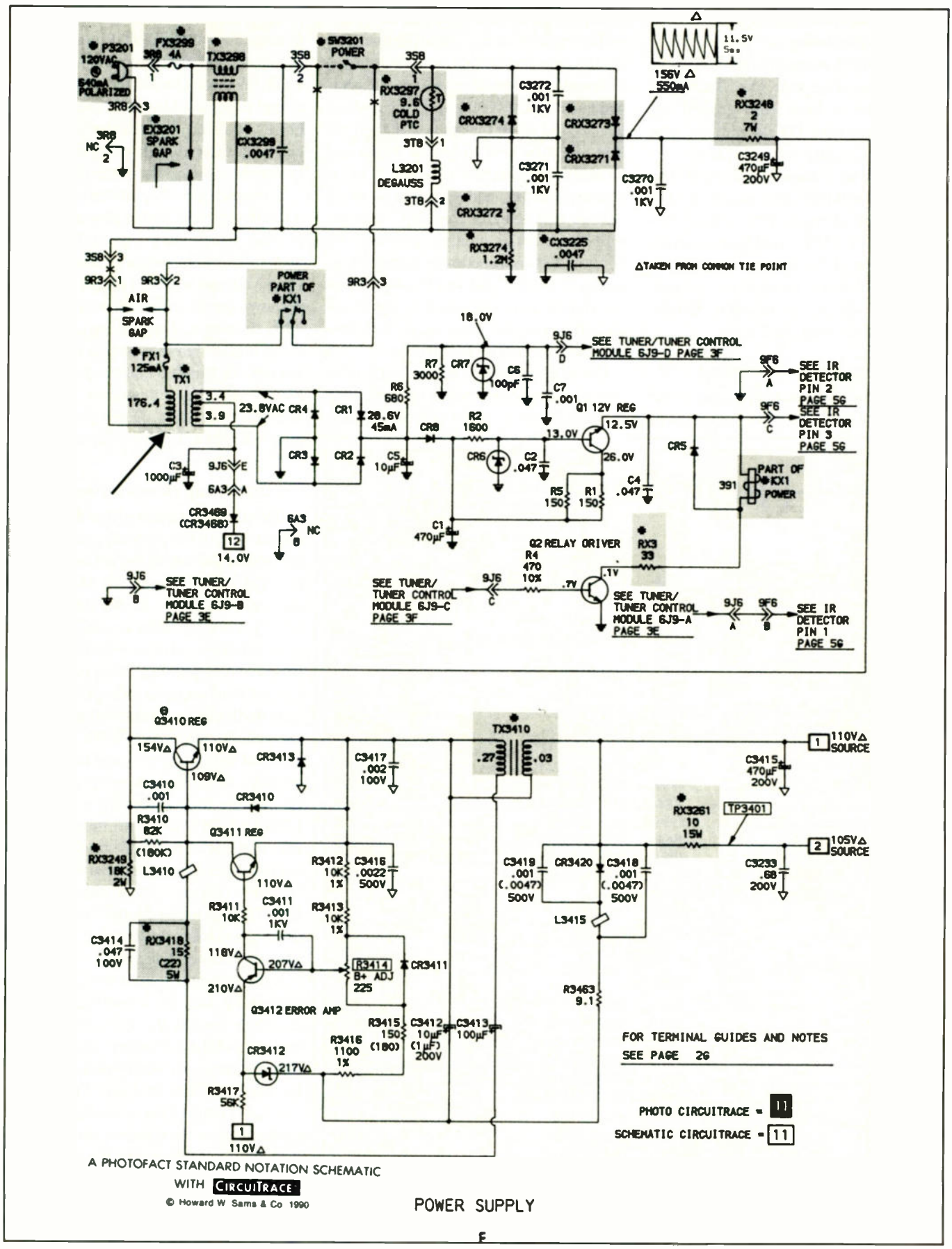


Figure 6. This diagram shows the entire primary power supply. Note that the tuner and tuner control modules are powered independently and are isolated from ground by transformer TX1, whereas the main supply uses a hot ground.

ly biased, the multivibrator will run continuously producing a characteristic waveform. Both transistors are PNP units and need negative base bias. Transistor Q3213 gets its bias from ground via R3215. Transistor Q3224 gets its bias from ground via R3215 and Q3210.

When the set is turned on there will be a positive voltage drop across R3229 while C3210 charges. This voltage forward biases Q3210, providing a current path to ground for the base of Q3224 which enables the multivibrator. Once C3210 is sufficiently charged, Q3210 turns off, quenching oscillation.

If the set will not start up

If the set will not start up, observe the output of the multivibrator using an oscilloscope. In a no-start situation the multivibrator can be scoped. With the timebase set for 1ms you should be able to see a differentiated squarewave (having positive and negative-going spikes) for about one second when the set is switched on. You might be able to hear a whine and possibly a short burst of audio. This is because the HV and secondary supply voltage will actually come up while the start-up circuit is running, provided the horizontal output section is working normally. This may lead you to suspect that the chassis is going into HV shutdown since the symptom is the same. The shutdown circuit will be covered later.

If you encounter a chassis that has no sign of life when switched on (assuming that the primary supply is working) it is possible that the start-up circuit is at fault. In some chassis the LED display will still come on and the remote control may work. In these chassis the tuner control circuit is powered by the primary supply. Once you determine that the start-up circuit is faulty, troubleshooting will be fairly simple and straightforward.

In most chassis the start-up circuit uses a floating ground and is powered directly from the primary supply. Be sure to bear this in mind when measuring voltages. Voltages will read higher than what is shown on the schematic until the chassis is running and regulating properly. If B+ is present but the start-up circuit will not run, the simplest course of action is to simply test the components beginning with the transistors. Don't overlook the possibility of a defective quench circuit.

If the startup circuit is functioning

If you have determined that the start-up circuit is okay, the problem must be in the horizontal section or the secondary supply. The 8V source on pins 28 and 31 of the main processor IC should come up briefly while the start-up circuit is running. A horizontal drive waveform should be present at pin 37. If this event is too fast for your scope to lock on, the IC can be tested by voltage substitution. Connect the positive terminal of a 9V battery to either of the supply pins and the negative terminal to ground. A more convenient tie-in point is on either leg of inductors L2377 or L2379 which are mounted adjacent to the IC. These inductors are in the supply lines from secondary regulator IC3406 (Figure 3). Incidentally, if IC2376 does not generate a horizontal drive signal during this test then it is almost certainly defective.

If the start-up circuit is working but the 8V supply does not come up, turn your attention toward the horizontal output section and the secondary supply. These sections are conventional and so will not be discussed here in detail. Suffice it to say that if none of the secondary supplies comes up then the problem must be in the horizontal output section. Be sure that the drive pulses from the start-up circuit are actually making it to the horizontal driver transformer. Resistor R3216, a 1W device, has been known to open.

Some start-up circuits run continuously if the horizontal drive section fails to

PHOTOFACTS

CROSLEY
CT131 3989

MAGNAVOX
MX2789B101 3987
27W508-00AA 3987

ORION
TV1326BW (Versions A, C, D) 3988
TV1925A (Versions C, D) 3997

PANASONIC
AMEDP266 3994
ANEDP264 3994
AREDP264 3994
CT-27SF14V 3994
CT-27XF14CV 3994
CT-31SF14V 3994
PV-7400 ..... VCR-298
PV-7401 ..... VCR-298
PV-7401-K VCR-298

PHILIPS/MAGNAVOX
PR1388C121 3991
PR1388C122 3991
PR1389X121 3991
PR1389X122 3991
TR2502C121 3995
TS2544C121 3995
TS2744C103 3995
TS2744C121 3995
XR1388C121 3991
XR1388C122 3991

QUASAR
VHQ720sim to VCR-298
VHQ740sim to VCR-298

RCA
E13332BCC25 3999
E13332BCF253 999
TX826WD 3999

SANSUI
TVM1302 (Version A) 3993

SONY
KV-27S26 3998
KV-27V26 3996
KV-29RS26 3998
KV-29RS26C 3998
KV-29V22M 3996
SCC-K96L-A 3996
SCC-K96P-A 3998
SCC-K97L-A 3998
SCC-K98F-A 3996
SCC-K98M-A 3998
SCC-K98N-A 3998

TOSHIBA
CF32G50 3990
CL34G50 3990
TAC9715 3990

ZENITH
SM2722MK 3992
SM2722MK6 3992
SM2722RK 3992
SM2722RK6 3992
SM2724N 3992
SM2724N6 3992
SM2726EW 3992
SM2726EW6 3992
SM2726EWM 3992
SM2727RK 3992
SM2727RK6 3992
SM2728RK 3992
SM2751Y 3992
SM2768S 3992
SM2768S9 3992

take over for any reason (Figure 4). In this case the chassis may power up with a very distorted raster. This is because the start-up circuit does not generate the proper waveform required for a uniform raster. For example, the raster might have a bright vertical stripe down the center. Such a symptom might lead you to suspect a problem in the horizontal output section. In most of these chassis, however, the start-up circuit will not produce sufficient voltage on its own to produce a raster as the TV screen.

High-voltage shutdown

Operation of the shutdown circuit is fairly simple (Figure 5). A sample of the secondary supply voltage from pin 10 of the integrated high voltage transformer (IHVT), TX3204, is rectified by diode CR3602 and applied to the cathode of zener diode CRX3204 after being filtered and divided by an RC network. If the zener conducts due to excessive voltage, NPN transistor QX3207 will conduct forward biasing PNP transistor QX3204. This will apply excessive forward bias to the horizontal phase inverter transistor Q3209 via diode CRX3211. The inverter will then saturate. You will recall that this transistor passes the drive signal by switching on and off. The negative excursions of the base drive signal will not be great enough to overcome the positive bias from the shutdown circuit.

The collector of the shutdown latch, transistor QX3204, is coupled to the base of transistor QX3207 forcing it to stay on even after the high-voltage has dropped. The circuit will remain latched until the set is turned off and the power supply capacitors discharge. If you suspect that a start-up problem is actually a shutdown problem, you can temporarily defeat the shutdown circuit by disconnecting one leg of diode CRX3211.

There is nothing unusual about the primary supply used in this chassis (Figure 6). The schematic is being included to complete this troubleshooting package. Problems that appear to be related to the start-up or shutdown circuits will sometimes actually be in the power supply. For example, C3413 is in a feedback loop from TX3410 to the base of regulator Q3410. This capacitor has been known to dry up prematurely because it is mounted in a hot spot. When this happens the chassis may cycle on and off continuously because the regulator has lost its ability to compensate for the initial in-rush current during power up. In some cases the set may begin to run properly once it warms up. Such a problem is easy to misdiagnose as start-up or shutdown related.

Summary

Many service technicians routinely replace the entire board on these Zenith chassis and the manufacturer makes it easy to do so by offering replacements at a relatively low cost. While this "super-shotgun" method may be the expedient course of action in some cases, these chassis can often be repaired faster and cheaper by replacing a single component. What's more, there is very little challenge involved in board replacement and certainly nothing to be gained in terms of experience. With a basic understanding of the unconventional circuits, these chassis are no more difficult to service than chassis using a more standard design. ■

Guide to national, state and regional associations

by The ES&T Staff

Consumer electronics can be a solitary business. Especially for smaller service centers. This isolation can have a number of detrimental effects on the business. For example, most service technicians who become business owners are well trained in the technical aspects of servicing but have little or no formal training in the business aspects. In some cases this leads to failure. A manager may not be able to provide for enough profits and proper cash flow, and the business suffers, possibly going under.

Another aspect of this isolation is the difficulty in keeping up with the technology, and lack of knowledge as to how to best deal with manufacturers.

Those are only two of the many problems attendant upon service centers because of their relative isolation.

Associations help

Fortunately, there is a way for service centers to compensate for their isolation. They can belong to an association. Joining associations allows individual organizations to work together to develop both business and technical training, to share tips on how to run the business, and to exchange information on their dealings with manufacturers.

The following list of associations is published here to help service centers that may be interested in joining an association to find one that may be right for them.

National Associations

American Electronics Association (AEA)
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Fax: 202-638-4922

Computer & Communications Industry Association
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Fax: 202-783-0534

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Electronics Industries Association/Mobile Electronics Division (EIA/MED)
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Greencastle, IN 46135
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Information Technolgy Assoication of America
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New York, NY 10017
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Jacksonville, FL 32216
Phone: 904-725-9789
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Decatur, GA 30030
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Chesapeake Electronics Association (CEA)
1306 Continental Drive
Abingdon, MD 21009
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Council Bluffs, IA 51503
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3987 Lockport Olcott Road
Lockport, NY 14094
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Portland, OR 97215
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Texas Electronics Association (T-E-A)
2708 West Berry Street, Suite 7
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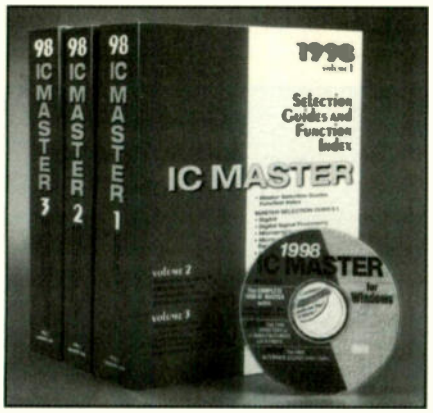
Virginia Electronics Association (VEA)
329 Virginia Beach Boulevard
Virginia Beach, VA 23451
Phone: 804-428-7317
Fax: 804-425-6373

NESDA of Washington
6319 112th Street E.
Puyallup, WA 98373
Phone: 206-851-6428
Fax: 206-840-5099

Wisconsin Electronic Sales and Service Association (WESA)
PO Box 09091
Milwaukee, WI 53209



IC database is on the Web

Hearst Business Communications, Inc./UTP Division announces IC MASTER Online. For the first time, this entire database is on the Internet.

Subscribers only to the just published 1998 IC MASTER catalog and 1998 IC MASTER CD-ROM for Windows have access for one full year to IC MASTER Online. The website offers the complete database, continuously updated, and including devices discontinued during the past 5 years, full parametric search with Krakatoa engine, pinout diagrams and package styles, direct links to IC manufacturer's home pages, and direct links to datasheets on IC manufacturer's websites for selected advertised devices.

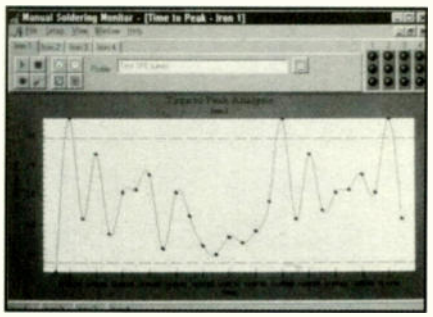
The database contains the latest information engineers need on commercially available ICs. Now engineers and technicians have a combination of search tools, the catalog or the CD-ROM for Windows with exclusive access to the online database to quickly and efficiently work with this information.

Circle (80) on Reply Card

Soldering stations

Weller, a CooperTools brand, has introduced its Silver Series of electronically-controlled soldering stations. The stations feature silver heaters and provide as much as 80W of power for fast heat-up and recovery time. Three stations, including a high performance dual output unit, are available. The stations connect to a variety of new and existing Weller soldering irons and accessories and are suited for production lines and other areas where continuous soldering takes place.

Circle (81) on Reply Card



Manual soldering monitor

The new MSM Manual Soldering Monitor, offered by the *American Competitiveness Institute (ACI)*, is a true hand soldering process control instrument designed to monitor and reduce variability in the hand soldering process. The MSM works with Metcal hand-held soldering irons. It continuously monitors them during use and displays process information such as cycle time and changes in operator technique, recording power usage and thermal behavior.

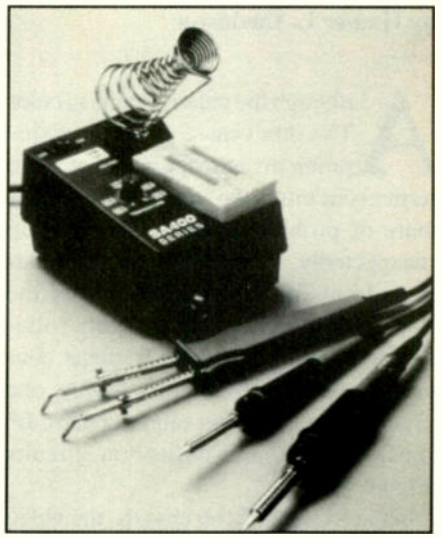
The MSM collects two different types of information from the soldering iron; a.) the time it takes to obtain the maximum amount of power during a soldering step, and b.) the maximum power delivery during the same soldering step. The real-time information generated is automatically plotted on SPC charts and can be used for process monitoring and operator training.

The MSM can help identify hand soldering process problems, operator technique problems and equipment problems.

Circle (82) on Reply Card

Soldering rework station

The new SA-400 Series Soldering Rework Station from *OK Industries* is a versatile benchtop rework system that can operate any of three hand pieces, including 40W soldering iron for surface mount touch up, a 90W iron for through-hole soldering, or surface mount tweezers for removal of SMT chip components.



Special features of the unit include closed loop temperature control, variable temperature control, long life ceramic heating elements, external fuse and calibration ports, and ESD-safe construction. The SA-400 soldering iron tip to ground resistance is below 2Ω, and leakage is less than 2mVrms, with a safe 28V delivered to the hand piece.

The handles are also available with built-in fume extraction compatibility.

Circle (83) on Reply Card

Multimeter

Omega's HHM90 Series of multimeter is supplied with test leads, rubber boot and 9V battery. All models measure ac/dc voltage, ac/dc current and resistance. Selected models feature capacitance, Hfe test, continuity check, diode test, auto power off, auto ranging, bargraph display and backlight.

Circle (84) on Reply Card

From tuner to picture tube

by Homer L. Davidson

Although the video circuits in color TVs don't cause as many service problems as do the horizontal and vertical circuits, they do account for their share of problems, which may pop up unexpectedly. Video problems are related to front-end circuits found after the tuner and IF sections. In the early solid-state television chassis, the IF stages consisted entirely of transistors. Today, one large integrated circuit might contain IF, luma, chroma, and deflection circuits (Figure 1).

In the RCA CTC166 chassis, the video circuits consist of the IF preamp (Q2301), SAW filter (SW2301), and a processor, U1001, that precedes the two video buffer stages (Q2305 and Q2302). Q2301 amplifies the IF signal from the tuner to the SAW filter (SW2301). The input of the video processor (U1001) is tied directly to pin 1 of the SAW filter. U1001 amplifies the IF signal and the output at pin 47 feeds to a PNP video buffer transistor Q2305. A ceramic filter network couples the video buffer signal to another video buffer Q2302. The video buffer output is fed to a video switch U1401, and then to a video amp Q1403. Likewise, the amplified video signal is fed back to pin 49 of the luma/chroma U1001 circuits, and on it goes (Figure 2).

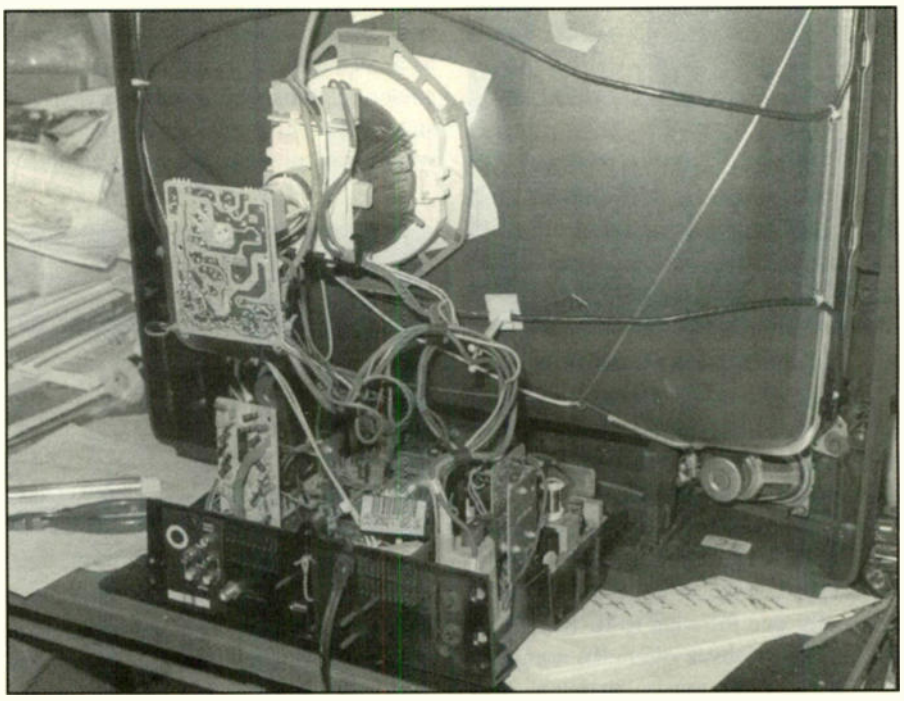


Figure 1. If you encounter video problems, pull the chassis back and look for a large integrated circuit or processor.

The various video symptoms

Many different video problems affect the color TV circuits. Some of the symptoms you might observe if the video circuits have developed a defect are: no video/no sound; no video/normal sound; no video/no raster; no video/raster only; no video/bright picture; no picture/no brightness; no video/no picture; no picture/dark screen; intermittent picture; smeary picture; no video/looks like AGC; snowy picture; washed-out picture.

You might also find related video problems that affect the luminance circuits, such as low brightness or high brightness, intermittent brightness, picture flashes off and on, no brightness control, retrace lines at the top, bright screen and retrace lines, poor picture, and defective CRT. Whatever the symptom, the defective video circuits can be located with signal tracing methods, voltage and resistance measurements (Figure 3).

Davidson is TV servicing consultant for ES&T.

Signal tracing

Because the latest TV chassis contain fewer components than their older counterparts, the IC video circuits are easier to service. Simply use the oscilloscope to

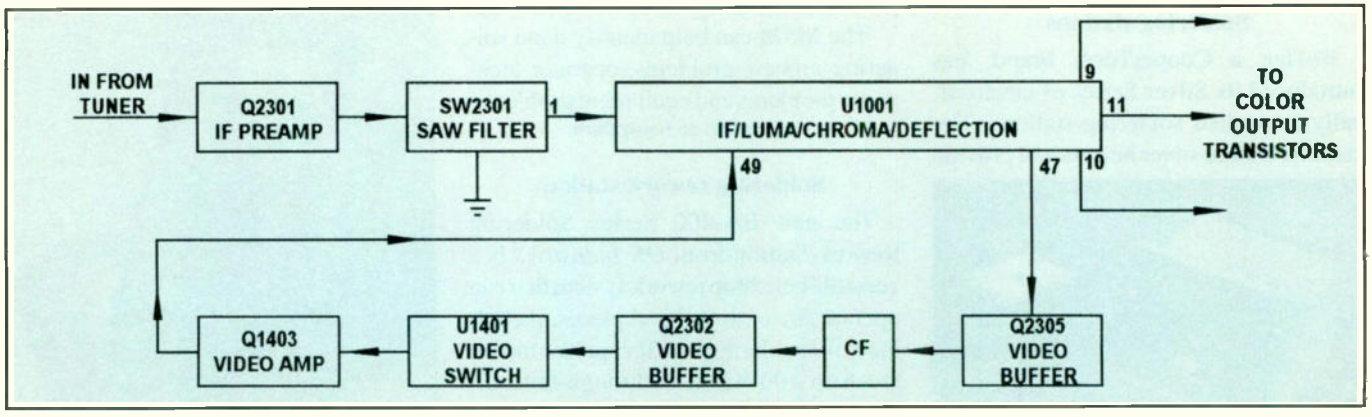


Figure 2. A block diagram of the video circuits in the RCA CTC166 chassis.

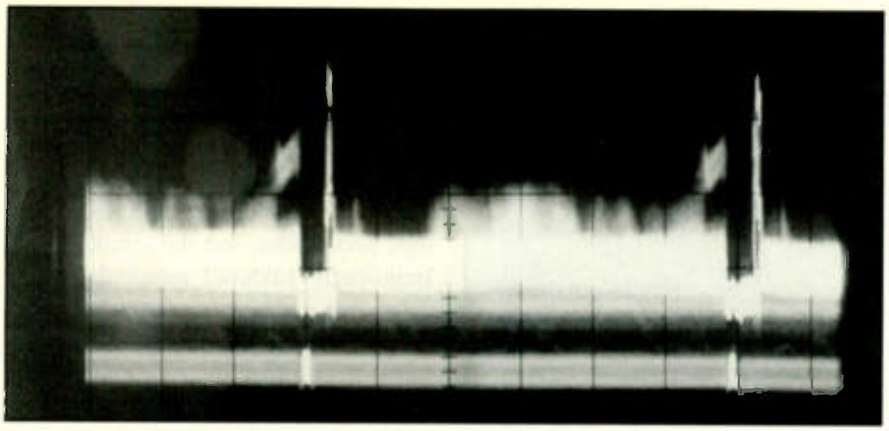


Figure 3. This is the video waveform of the output signal at the SAW filter with the set tuned to a TV broadcast station.

observe the signal into and out of the video IC component. Remember, the front-end IF circuits must be signal-traced with a demodulator probe attached to the scope. Then trace the signal from stage to stage of buffer and video amp transistors. The TV broadcast channel can be used for signal tracing, although it is better to use the color-dot-bar generator as the signal source (Figure 4). You will note the dot-bar-generator is used in conjunction with test patterns found in Howard Sams Photofact folders.

When the video signal disappears, or appears at the input of a video IC or transistor but not at the output, measure the voltages at the IC or transistor terminals. First measure the supply voltage terminal (V_{CC}) of the suspected IC. Check each component tied to the video IC pin terminals. Measure and record the voltage at each pin of the IC and compare them to the values printed on the schematic.

Often, the schematic diagram shows only the pin terminals in and out of an IC package. They do not show the internal circuits or pin terminals that tie to the video circuits. In many cases, you can determine the nature of the circuitry, or at least the voltages that should appear at the terminals of the IC by checking in one of the cross references. In the case of U1001 in this set, the RCA chassis, part number (193082) crosses to a NTE-1790, ECG-1790 or RCA SK-9850 universal IC. Once you have determined the generic equivalent of the IC, you can look up the universal part number in the universal semiconductor manual and check the terminals that are related to the video circuits.

In the case of U1001, pin 16 is the supply voltage (V_{CC}) terminal of +9V for the video, color and deflection circuits; while pin 19 provides +9V to the picture IC circuits. The video input of U1001 is pin terminal 20 and the output pin is 47 to the video buffer transistors. The video amp input is at pin 49, with the contrast and luma input at pin 53. By taking scope waveforms at the video input and output terminals with critical voltage measurements, the most difficult video problems can be repaired.

Figure 4. If the problem appears to originate in the video section, locate the large video processor or IC and observe critical waveforms.

No video

The no video symptom might consist of no video input, no-video-no raster, no video-raster only, no video-bright picture, and no video-no brightness. If the symptom is no video, connect the color-dot-bar generator to the antenna terminals and observe the signals at the IF and SAW filter input circuits using the oscilloscope. Check for defective IF transistors, IC and input coupling capacitors. Resolder all pin terminals of transistors, coupling capacitors, resistors and diodes if the symptom is no-video and no picture. As an example, in an RCA CTC169 chassis that had no video and no picture, capacitor (C1406), on the video input and output board was found to be leaky.

A defective video buffer or video amp can cause a no video-no raster symptom. The no picture-no video symptom might result from an open coil in the video circuits. Suspect a leaky or open video IC processor if there is a video signal into the IC, but no video out. Check all bypass capacitors that are connected to the IF/luma IC terminals.

The symptom of no-video with a bright screen may be caused by a leaky or open video output, buffer or pulse shaper transistor. Excessive brightness with no video can be caused by color output transistors or improper boost voltage.

A Quasar SL2734 console was hauled into the shop with the symptom of extreme brightness and no video or picture. The audio was normal and there was high voltage at the picture tube. Since the brightness could not be controlled, I assumed that the defective component was in the CRT circuits. A quick voltage test on the CRT socket and color output

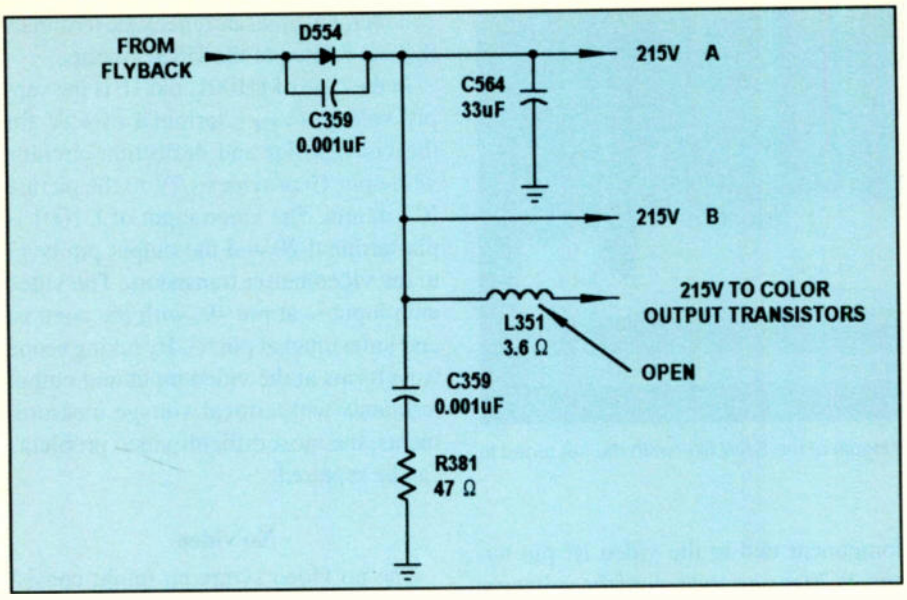


Figure 5. Open coil L351 produced extreme screen brightness and no picture in a Quasar SL2734 television set.

transistors indicated that this voltage was very low. I noted that the boost voltage (+215V) was taken from the flyback winding and a D554 rectifier. A higher than normal voltage was found at the cathode of D554 and near zero at the supply source. When I checked L351 I found it to be open. Replacing this inductor solved the problem (Figure 5).

No video-no audio

Usually the cause of a symptom of no video with no sound lies within the front-end video circuits. Suspect the IF/luma/chroma IC when there is no video. Check for a change of resistance of an AGC resistor to ground, connected to the AGC pin of the IC. If the video waveform is normal at the input terminal of the IC, but there is no sound or video out, check the IC and the components tied to the video input circuits. Measure the voltage at each pin. Check all bypass capacitors in the IF transistor and IC circuits. Suspect a defective system control IC if there is no picture and sound when all other parts seem normal.

I encountered an RCA CTC167 set with no picture and no sound. The video waveform was present at pin 20 of U1001, but there was no waveform at output pin 47 or at the base of video buffer transistor (Q2305). I measured the voltages at each of the pins of U1001. The voltage at pin 23 was very low. When I measured the resistance from pin 23 to ground, I found that it was only a few ohms. Further checking showed that C2309 (0.022µF) had leakage (Figure 6). Replacing bypass capacitor C2309 solved the problem.

Do not overlook a shorted or leaky luma or video amp transistor if the symptom is no picture and a dark raster. Suspect leaky diodes within the video circuits if the symptom is no video and no sound.

Intermittent video

Intermittent video problems might be caused by improperly soldered connections between coupling capacitors, resistors, and diodes and the circuit board. Improperly soldered terminals of the delay line can cause intermittent problems. Check for intermittent video symptoms of IF preamp transistors, bypass capacitors, and ICs. Test for proper voltage sources. If the video is intermittent, suspect that the diodes in the voltage source may be operating intermittently.

In one RCA CTC159 chassis the symptom was intermittent video. Voltage measurements in the video circuits revealed that the defective component was located in the IF preamp transistor (Q2301) circuits (Figure 7). Leaky bypass capacitors in the emitter and collector circuits are common causes of problems in transistor circuits. In this case, C2301 (0.01µF) was found to be intermittent and caused the intermittent video problem. Do not overlook C2304, U1001, or DL2701 as possible causes of intermittent problems in the CTC159 chassis.

Snowy picture

Suspect a defective tuner, IF preamp transistor or SAW filter when the symptom is a snowy picture. Inspect the IF cable at the tuner and where it enters the IF board for poor or shorted connections. A defective IF cable can also cause the intermittent snowy picture. If the IF is socketed, check the socket for bad connections. Another possible cause of a snowy picture is a leaky preamp transis-

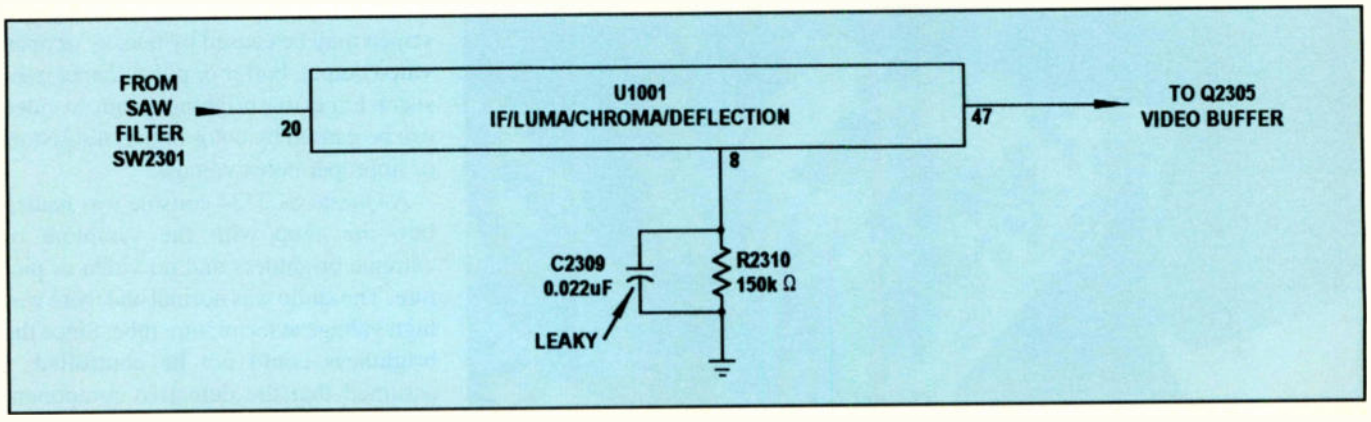


Figure 6. Leaky capacitor C2309 produced a no video/no sound symptom in a set based on the RCA CTC167 chassis.

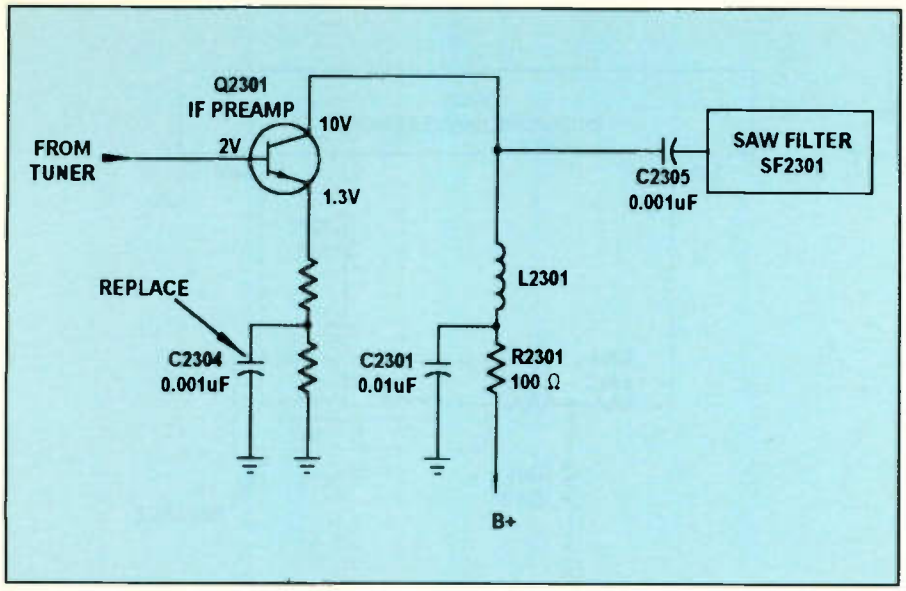


Figure 7. Intermittent bypass capacitor C2304 in the emitter IF preamp transistor caused intermittent video in an RCA CTC159 chassis.

tor ahead of the SAW filter or video circuits. Check all coupling capacitors from the IF tuner to the input of the video IF IC for open conditions. Test all bypass capacitors within the preamp transistor circuits to ground if the picture is snowy.

The picture was snowy and the sound was noisy in a Goldstar CMT-2612 portable TV. After locating the preamp and IF circuits of IC201, I scoped the signal after the preamp transistor (Q101). Everything here seemed normal. The voltage at the collector terminal of this transistor measured extremely low. In-circuit tests showed Q101 to be normal. Resistor R105 (150Ω) resistor felt very warm (Figure 8). Although I suspected that Q101 might have current leakage, I first checked bypass capacitor C101 (0.01μF). This capacitor was found to have leakage to chassis ground. I replaced both C102 and R105 and a normal picture returned.

Do not overlook the possibility of a defective SAW filter if the picture is snowy. If you do suspect the filter, remove it from the chassis and measure the resistances of the input and output terminals; the resistance at these terminals should be infinite. You can also check the SAW filter using a crystal checker.

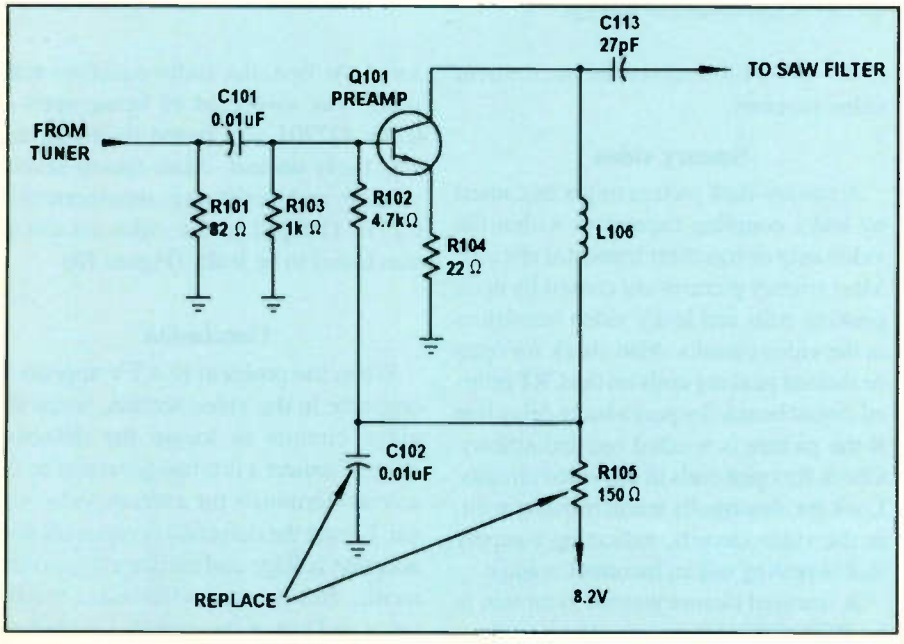


Figure 8. Replacing capacitor C102 in the preamp IF circuits corrected a snowy picture in a Goldstar portable.

A ghostly appearing picture may be caused by a voltage source that is not at the correct voltage. In one RCA CTC140 chassis, a defect in zener diode CR2100 reduced the 12V source to 9V. Replacing CR2100 corrected the problem.

Defective delay line

One of the most troublesome components within the video circuits are video transistors and the delay line. Usually the delay line is located between the 1st video and 2nd video amp or just before the video/chroma IC. If the delay line is defective, the symptom may be a smeary picture, a washed-out picture, or intermittent brightness and video. If the delay line is shorted to chassis ground the picture will be very poor.

If you think that the delay line may be the cause of the problem, scope the signal in and out of the delay line. Suspect a defective delay line if the input is normal but there is no output waveform. Monitor the delay line output or input pin of the video amp IC if the brightness and video are intermittent. Resolder all delay line

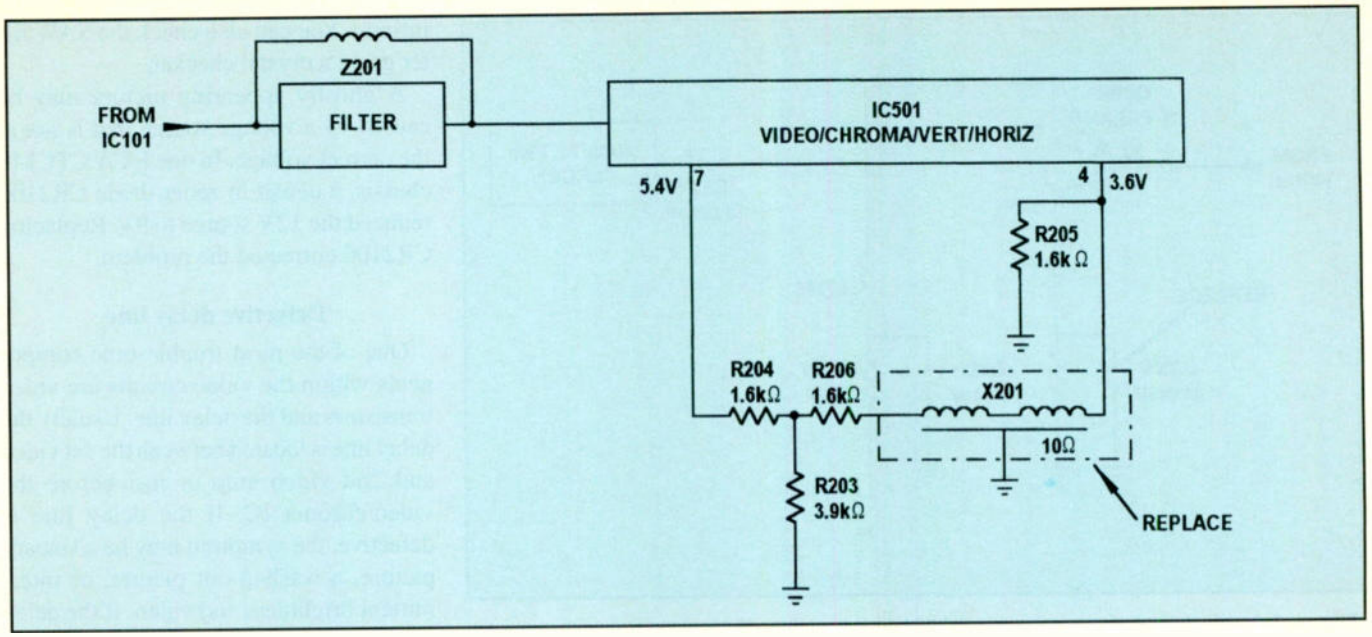


Figure 9. A defective delay line in a Samsung CT-339 portable television set produced an intermittent picture.

terminals to see if this will correct intermittent reception.

If you're pretty sure that the delay line is the cause of erratic operation, replace it. If you wish to check the resistances between the terminals of the delay line, remove it from the circuit to make those measurements, because the delay line might be shunted with low resistors across the terminals. If you do replace a defective delay line, replace it with the exact manufacturer's replacement.

Intermittent delay line

The owners of a Samsung CT-339 portable complained that it operated intermittently. Sometimes the video was missing for several minutes and then returned. To locate the intermittent component in a situation such as this, monitor the video section where the input signal enters the PIF/Video/Chroma IC and video amp transistor. Monitor both sides of the delay line with the scope to locate a defective delay line. In this case, the video input signal from IC101 appeared at the input terminal of IC501 and was quite steady (Figure 9). When the video signal was checked at the delay line, the picture was intermittent.

All three terminals of the delay line (X201) were resoldered. There was no improvement in the operation of the set. A quick continuity measurement of the delay line indicated it would open and then have a measurement around 10Ω. Replacement of the delay line, X201 (2469-010-9100), solved the intermittent video problem.

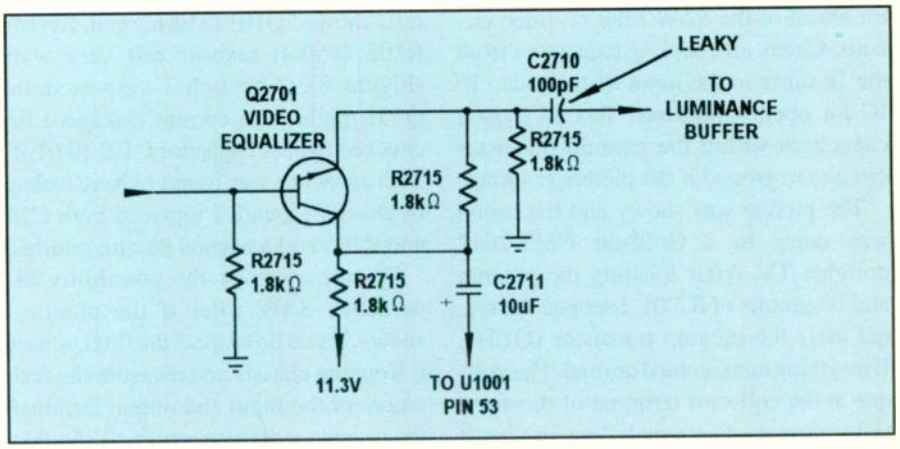


Figure 10. Smeary video was the symptom in an RCA CTC159 TV in which coupling capacitor C2710 had developed leakage.

Smeary video

A smeary-dark picture might be caused by leaky coupling capacitors within the video amp or equalizer transistor circuits. Most smeary pictures are caused by open peaking coils and leaky video transistors in the video circuits. Also check for open or shorted peaking coils on the CRT printed circuit board. Suspect a leaky delay line if the picture is washed out and smeary. Check for open coils in the video circuits. Look for abnormally warm resistors within the video circuits, indicating a supply that is putting out an incorrect voltage.

A smeared picture was the symptom in an RCA CTC159 chassis. The signals in the video stages were observed using the oscilloscope, critical voltages were measured. At first, the audio equalizer transistor was suspected of being open or leaky. Q2701 was tested in-circuit and was fairly normal. After taking several voltage and resistance measurements, C2710 (100pF) in the collector circuit was found to be leaky (Figure 10).

Conclusion

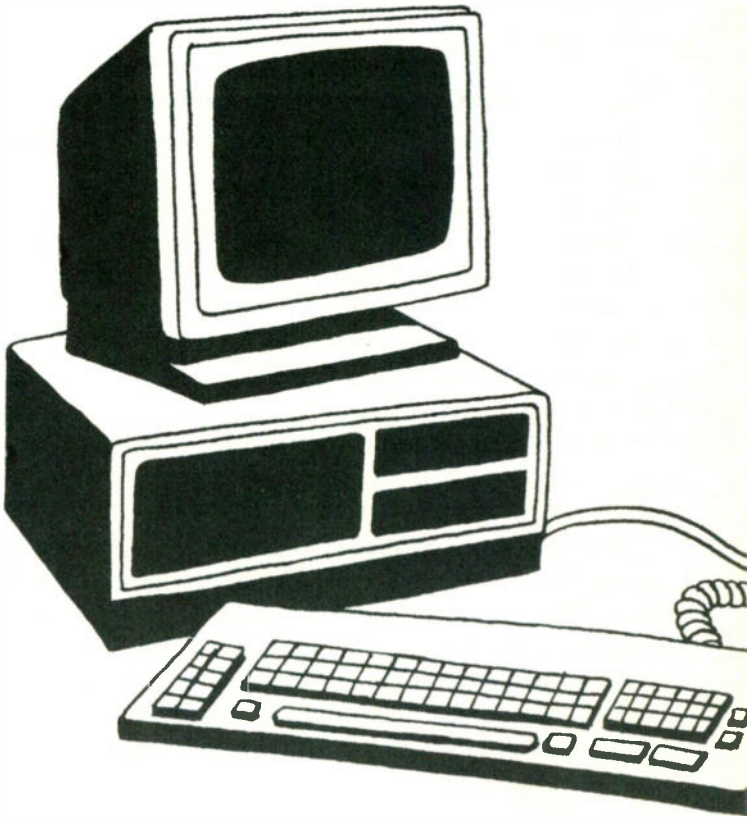
When the problem in a TV appears to originate in the video section, scope the video circuits to locate the defective stage. Connect a dot-bar-generator to the antenna terminals for a steady video signal. Locate the defective component with accurate voltage and resistance measurements. Test the suspected video transistor in and out of the circuit. Last but not least, check for improper voltage source feeding the video circuits. ■

Servicing resources on the internet

by the ES&T Staff

As every consumer electronics servicing technician knows, there are times when it is just about impossible to find the information needed to complete a service procedure. For example, an IC in that Brand X TV set is fried. If the local distributor, or your favorite mail order distributor doesn't have it, where do you go to to look for it?

Or take another familiar scenario that frequently plays itself out in a service center: you're pretty sure that if you had just a little bit of information about the theory of operation, you could probably come up with a diagnosis and a fix for that VCR that's not working right. But where do you go to get that kind of information?



Try the internet

When you're faced with a dilemma such as the ones described above, one possibility is to turn to the internet to try to find the information you need. In many cases, of course, you won't find what you need on the internet. On the other hand, there are times when you just might.

For example, let's say that you have a no-name brand set, but it does happen to have an FCC ID number on it. You've checked the number against the list that's printed every year in the December issue of **ES&T**, but it wasn't there. What now? Well, why not go right to the source. The FCC maintains a website on which they provide a complete list of FCC ID vs. manufacturer name information.

Accessing the FCC

You can access the FCC's web site through the URL (uniform resource locator) http://www.fcc.gov/.

Actually, when we first reported on this FCC site, you couldn't look up an individual product manufacturer. You had to download their entire database and look up the information at your leisure, off-line. Now, the database is searchable on line. Here's what that page says:

"The Equipment Authorization Database is now searchable on-line! You can search the database from the World Wide Web by accessing the FCC's Internet server. The search routine uses a simple to use string search routine and returns your specified search while you wait. You can search the database by FCC ID#, Manufacturer Name and any other string that may be found in the database. Remember because the search program is based on a string search the shorter the string the more responses returned. But in addition, you can look up what kinds of decisions the FCC is involved with, and pretty much everything the FCC is concerning itself with at the moment."

You can get to that page from the FCC home page, or if you wish to save time, you can go directly to this page http://www.fcc.gov/oet/info/database/ead/.

HDTV info on the net

For someone who's interested in HDTV, and who isn't these days, they can find useful information at a number of sites on the internet. A really good place to start is the ATSC (Advanced Television System Committee) website at http://www.atsc.org/. At this site, you can download hundreds of pages of documentation about HDTV. Here's a paraphrase of what we found at the site.

The following ATSC technical documents are available for download:

- ATSC Document A/49 is the ATSC Standard "Ghost Canceling Reference Signal For NTSC."
- ATSC Document A/52 is the "Digital Audio Compression (AC-3) Standard."
- ATSC Document A/53 is the "ATSC Digital Television Standard."
- ATSC Document A/54 is the "Guide to the Use of the ATSC Digital Television Standard."
- ATSC Document A/55 is the Standard "Program Guide for Digital Television."
- ATSC Document A/56 is the Standard "System Information for Digital Television."

• ATSC Document A/57 is the Standard "Program/Episode/Version Identification."

• ATSC Document A/63 is the "Standard for Coding 25/50 Hz Video."

• ATSC Document A/64 is the "Transmission Measurement and Compliance Standard for Digital Television."

• Document A/65 is the Standard for "Program and System Information Protocol for Terrestrial Broadcast and Cable." (This is not yet available.)

ATSC administrative documents

The following ATSC administrative documents are available for download:

• ATSC Document A/1 is the ATSC Charter.

• ATSC Document A/2 is the ATSC Administrative Procedures.

• ATSC Document E/11 is the ATSC Guidelines for Technology Group Operation

• ATSC Membership Application

Document formats

ATSC documents are drafted using Word for Windows version 6. These "DOC" files are made available here as they are the ATSC master documents. Zip versions of the Word (DOC) files are provided for faster download. Because the "DOC" format is not usable by all, the documents are made available also in Rich Text Format (RTF) and Portable Document Format (PDF). Note that the RTF and PDF files may suffer some loss due to the conversion.

A DTV site

Many interested people maintain their own independent web sites on a number of subjects. One such page on a subject of interest to consumer electronics service is Doug Lung's DTV reference page. This internet page can be accessed at http://-www.transmitter.com/dtvref.html. This page has an assortment of digital television information, with links to other sites of interest on the same subject.

Manufacturers' websites

Many manufacturers of consumer electronics equipment, as well as manufacturers of the types of equipment service centers use to service the consumer products have websites where a visitor can glean useful information. For no particular reason, we accessed the Sony website at http://www.sel.com/SEL/consumer/dvd/index/html, and from there linked to that company's "About DVD" page at http://www.sel.sony.com/SEL/consumer/dvd/aboutdvd.html.

There was some useful information about digital video disc on that page. For example, there was a timeline description of the technological developments that led up to the digital video disk. A "Features" page provided a detailed description of the construction and operation of digital video disk including some very nice graphics. The "Format Specs" page gave a table of the specifications of the product, including such things as disc diameter and thickness, laser parameters, etc. A FAQ (frequently asked questions) page provided answers to typical questions asked by consumers.

Many other manufacturers of consumer electronics products offer similar information on their websites.

Technical information

Many internet sites offer good, although frequently limited, technical information on such subjects as repair of products, or operation of consumer electronics servicing test equipment. Following is a list of a handful of such sites.

These two offer some actual servicing information:

• http://www.paranoia.com/~filipg/html/repair/

• http://isdl.ee.washington.edu/CE/repair/cd1.txt

These two sites offer basic information on the use of the oscilloscope:

• http://www.ee.su.oz.au/teaching/topics/labintro/cro.html

• http://www.richardson.k12.tx.us/schools/phs/Academics/Physics/APPhysics/OscopeWeb/OscopeLab.html

Associations

Many of the consumer electronics service and related associations offer a variety of helpful information on their web pages. Following is a list of some of the association websites you might want to visit.

• http://www2.fwi.com/~n9pdt/eta.html (ETA)

• http://www.nca-net.com (NCA)

• http://www.nesda.com (NESDA)

• http://www.vica.org (VICA)

Search engines

Another way to access websites that might be of interest to servicers is through existing search engines. To do this, you access your internet server, then tell it to go to the appropriate search engine website. A number of the better-known search engines is listed below. Once you have reached the site, you will find instructions on how to search for information on the topic in which you're interested.

• http://www.altavista.com

• http://www.lycos.com/

• http://www.hotbot.com

• http://www.yahoo.com

Check out our list

This issue provides readers with a huge list of websites, some of which may be immensely useful, and some of which may not be so useful. The company listings in this years annual Buyers' Guide includes websites of every company that provided that information on the questionnaire forms. If you're interested in obtaining more information on any of those companies, you can simply access that website and see what information that company provides there. ■

BOOKS

***TThe Biomedical Engineering Handbook*, Edited by Josehp D. Bronzino, CRC Press, 2896 pages, hardcover, $139.00 plus $10.95 S&H**

The Biomedical Engineering Handbook, the first handbook ever written for the field, contains information on innovations in every aspect of biomedical engineering. It reflects the current perception of the field as one that encompasses emerging and expanding disciplines of investigation and application.

The book includes a complete review of the major physiological systems and presents knowledge of the current and accepted practices involving bioelectric phenomena, biomechanics, biomaterials, physiological systems, biosensors, biomedical signal analysis, imaging, medical instruments and devices, biological effects of nonionizing electromagnetic fields, biotechnology, tissue engineering, prosthesis and artificial organs, rehabilitation engineering, human performance engineering, physiological modeling, clinical engineering, medical informatics, and artificial intelligence.

CRC Press, A Division of CRC Press LLC, 2000 Corporate Blvd, N.W. Boca Raton Fl, 33431-9868

***Beginner's Guide To Tube Audio Design*, by Bruce Rozenblit, Audio Amateur Corporation**

This beginner's guide on what vacuum tubes do and how to use them shows readers how to design with tubes. Rozenblit, a frequent contributor to *Glass Audio* magazine, starts with a clear explanation of what a vacuum tube is and how it works. The author steps through the basics of tubes, what their characteristics mean and how to read charts and specifications.

For more advanced readers, the author presents the complete picture of tube audio design including single one-stage amplifiers, a simple gain circuit, negative feedback and how to use it, multistage basics and variations such as triode and ultralinear operation.

Chapters include stabilization and testing, how to work effectively as a designer and a description of 13 world-famous and classic amps and preamps. A final chapter is a hands-on guide to construction techniques, tools, and choosing components and tubes. As an added feature, the book presents instructions to build three working designs by the author previously published in *Glass Audio*.

Bruce Rozenblit is a graduate electrical engineer who owns and operates Transcendent Sound, a high-end amplifier manufacturing company. He has recently been awarded U.S. Patent No. 5,604,461 on a new power amplifier.

Audio Amateur Corporation, 305 Union Street, Peterborough, NH 03458-0576

***Oscilloscope Guide*, by Dr. Arnold J. Banks, PROMPT Publications, 336 pages, paperback $24.95**

An oscilloscope is an essential troubleshooting tool for any hobbyist, technician, or electronics engineer, but often this valuable piece of equipment isn't used to its fullest potential. Though you can use it to check circuit operation, diagnose circuit faults, and develop a mental picture of electrical flow, how many other ways could you use the oscilloscope to find out a wealth of information? Dozens of manufacturers produce a wide variety of models from the simple to the complex, but how do you choose the right one for your bench? Which features are necessary and which are just bells and whistles? The Howard W. Sams *Oscilloscope Guide* will answer all of these questions, plus many more.

Dr. Banks not only offers advice on choosing the right oscilloscope, he also explains the basics of use and take you into the higher, more advanced testing.

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

***The Industrial Electronics Handbook*, Edited by J. David Irwin, by CRC Press, 1728 pages, hardcover, $134.95 plus $10.95 S&H**

Explore the world of industrial electronics - all in a single volume. From traditional topics that form the core of industrial electronics to new and emerging concepts and technologies, this handbook has the field covered, according to the publisher. For facts you need every day, the handbook is a useful reference.

The handbook combines all important topics in electronics, system and process control, factory communications, measurement and instrumentation, circuits and devices, hardware, software, factory automation, and more.

In addition to the coverage of these core subjects, the handbook also contains in-depth coverage of intelligent electronics and emerging technologies, including applications in expert systems, neural networks, fuzzy systems, soft computing, evolutionary systems, computational intelligence, hybrid systems, virtual reality, asynchronous transfer mode technology, micro systems technology, multisensor fusion and integration.

A careful balance between basic principles and their applications makes this reference useful to anyone and everyone involved with the design, use, manufacture, and maintenance of industrial electronic equipment.

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***The Communications Handbook*, Edited by Jerry D. Gibson, CRC Press, 1632 pages, hardcover, $135.00 plus $10.95 S&H**

This massive, comprehensive, single-volume reference contains coverage of major topics in communications. The handbook provides a balance of essential information, background material, technical details, and the latest on international telecommunications standards. This allows readers to accomplish three important objectives: to quickly access necessary facts and figures; to review basic concepts; and to obtain the details and compliance issues underlying modem communications systems.

Covering the most exciting areas in the field, the handbook includes telephony, satellite communications, communications networks, optical communications, wireless communications, source compression and data recording.

In addition, basic principles of telecommunications are fully covered in an introductory section. This section includes more than 20 articles on fundamental topics that provide a thorough understanding of modern communication applications and theory.

This handbook features over 2,500 pages in more than 100 chapters from 140 expert contributors, more than 20 back-

ground chapters on analog and digital communications, 36 chapters on the latest in wireless communications and communication networks, the most recent telecommunications standards from the United States and around the world, concise, expertly written chapters, coverage of practical design issues, hundreds of definitions, dozens of listings, providing information on journals, societies, meetings, publications, software, websites, supplementary texts, and more

CRC Press, A Division of CRC Press LLC, 2000 Corporate Blvd. N.W. Boca Raton Fl. 33431-9868

***The Electrical Engineering Handbook*, Edited by Richard C. Dorf, CRC Press, 2752 pages, hardcover, $115.00 plus $10.95 S&H**

The Electrical Engineering Handbook has been substantially revised and updated to include the latest information on all the important topics in electrical engineering today. This handbook provides a complete reference to answer the questions encountered by engineers in industry, government, or academia. This well-organized book is divided into 12 major sections that encompass the entire field of electrical engineering, including circuits, signal processing, electronics, electromagnetics, electrical effects and devices, and energy as well as the emerging trends in the fields of communications, digital devices, computer engineering, systems, and biomedical engineering. A compendium of physical, chemical, material, and mathematical data completes this comprehensive resource. Every major topic is thoroughly covered and every important concept is defined, described, and illustrated. Conceptually challenging but carefully explained articles will be equally valuable to practicing engineers, researchers and students.

CRC Press, A Division of CRC Press LLC, 2000 Corporate Blvd. N.W. Boca Raton Fl. 33431-9868

***The Antenna Book, 1 and 2*, Satellite Dealers Association, 100 pages per book, $49.90 for set**

The Greencastle, IN office of the Satellite Dealers Association has available both texts of the two book set of antenna installation study guides for consumer electronics technicians. The books are titled: *The Antenna Book, #1 and #2.*

Book #1 contains chapters illustrating how all types of antennas really function; working with RF signal levels and decibels; site surveys and techniques for installing satellite dishes of all common sizes; understanding of bandwidth, frequency spectra and polar patterns, and the use of active and passive devices in signal distribution system work.

Book #2 continues the basics training, concentrating on safety, transmission lines, modulation and wiring practices, plus it takes the reader into basic distribution techniques, small and large master antenna distribution (SMATV) and small cable systems. It contains a lengthy chapter pictorially dealing with virtually all types of interference an antenna installer may encounter in the field.

SDA has published *The Antenna Book #1 and #2* in part as support to the effort of the satellite industry to bring about the best local TV reception for those people who have switched from cable to the small dish systems, and to improve off-air reception for suburban and rural residents.

SDA also has established the Antenna Experts Group (A.E.G.). This is a listing of firms and individuals who are seriously in the rooftop antenna business. AEG members can be contacted by other retailers or consumers to install the correct local antennas, towers, distribution systems, and other signal reception products, or can be called on to solve difficult interference or weak signal problems. Those who would like to join the A.E.G. and be listed on the SDA web page should fax a request to SDA at 765-653-8262.

The Antenna Books contain over 250 quiz questions to help the student master and reinforce the subject.

Authored by five Certified Satellite Installers or C.E.T.s., SDA recommends the guides for those wanting to become industry certified as Satellite Installers; Registered Small Dish Installers; or C.E.T.s utilizing the RF Video Distribution Option.

Special pricing is available for members or schools purchasing in quantity.

Satellite Dealers Association, 602 N Jackson, Greencastle, IN 46135

NEWS *(from page 4)*

expect their e-mail communication to increase to 36 percent.

Despite the fact that 91 percent of home office workers say their primary PC meets their needs, the CEMA survey shows significant interest in other Internet devices. Thirty-four percent of home office Internet users showed interest in a network computer (N/C), assuming a price of $400. Fifty-one percent were interested in a telephone/internet access combination device.

How interested would you be in a combination telephone and Internet access device?

Very Interested	11%
Somewhat Interested	40%
Somewhat Uninterested	21%
Very Uninterested	28%

The survey shows that organizing household finances (85 percent) tops the list of functions that home offices are used for most, followed by home entertainment (65 percent), and work brought home (59 percent). These activities may become even easier to accomplish as new speech recognition technology hits the market. When asked their thoughts about speech recognition software, 48 percent indicated an interest.

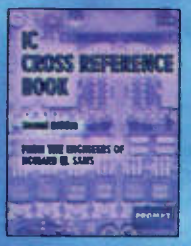
How interested would you be in speech recognition software?

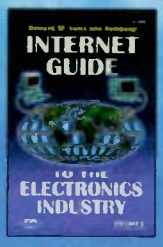
Very Interested	14%
Somewhat Interested	34%
Somewhat Uninterested	21%
Very Uninterested	30%

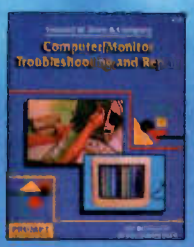
Mobile computing products are becoming essential tools for home office workers, according to the CEMA survey. Eighteen percent say they use an electronic organizer in conjunction with other home office equipment; 15 percent use a notebook computer.

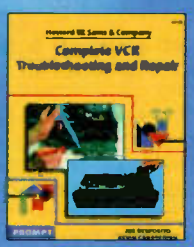
The full survey study consists of an executive summary and analysis, topline results and detailed demographic profiles of responses by questions. The study is priced at $495 for non-members and is provided free to CEMA members. Those interested in purchasing the survey may call 703-907-7764. ■

ES&T Book Shop









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Riders radio service manuals Vol. 1 to 17, $300.00 plus shipping. will include index. Sams photofacts in 22 binders covers, folders 1 to 500, $350.00 plus shipping. *Contact: Maurer Television, 2950 4th Street, Lebanon, PA 17042, 717-272-2481.*

Sencore VC93 VCR analyzer. New, used once, $2100.00. *Contact: Rudy Helfenstine, PO Box 15, Feesburg, OH 45119, 937-3790-1040.*

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IBM computer PS1 model 2133-W11 color monitor part number 33G6267, manuals and schematics. Addison keyboard model KB5311. *Contact: Al Potter, 2 buttonwood Drive, Parlin, NJ 08859-1110.*

Carver CD player model DTL-200MK2 service manual. No longer available from Carver Corporation. *Contact: Earl Friedman, 27 N.E. 5th Avenue, Hialeah, FL 33010-5014, 305-884-2175.*

Fisher VCR service manuals. *Contact: Ed Herbert, 410 N. Third Street, Minersville, PA 17954.*

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ES&T Manufacturers' schematics PROFAX

June 1998

Sharp
Color Television, Model 19H-M60/100/150, CH19M6 ..... Profax Number 3162

Chassis Layout/Block Diagram

Product safety should be considered when component replacement is made in any area of an electronics product. A star next to a component symbol number designates components in which safety is of special significance. It is recommended that only exact cataloged parts be used for replacement of these components.

Use of substitute replacement parts that do not have the same safety characteristics as recommended in factory service information may create shock, fire, excessive x-radiation of other hazards.

This schematic is for the use of qualified technicians only. This instrument contains no user-serviceable parts.

The other portions of this schematic may be found on other Profax pages.

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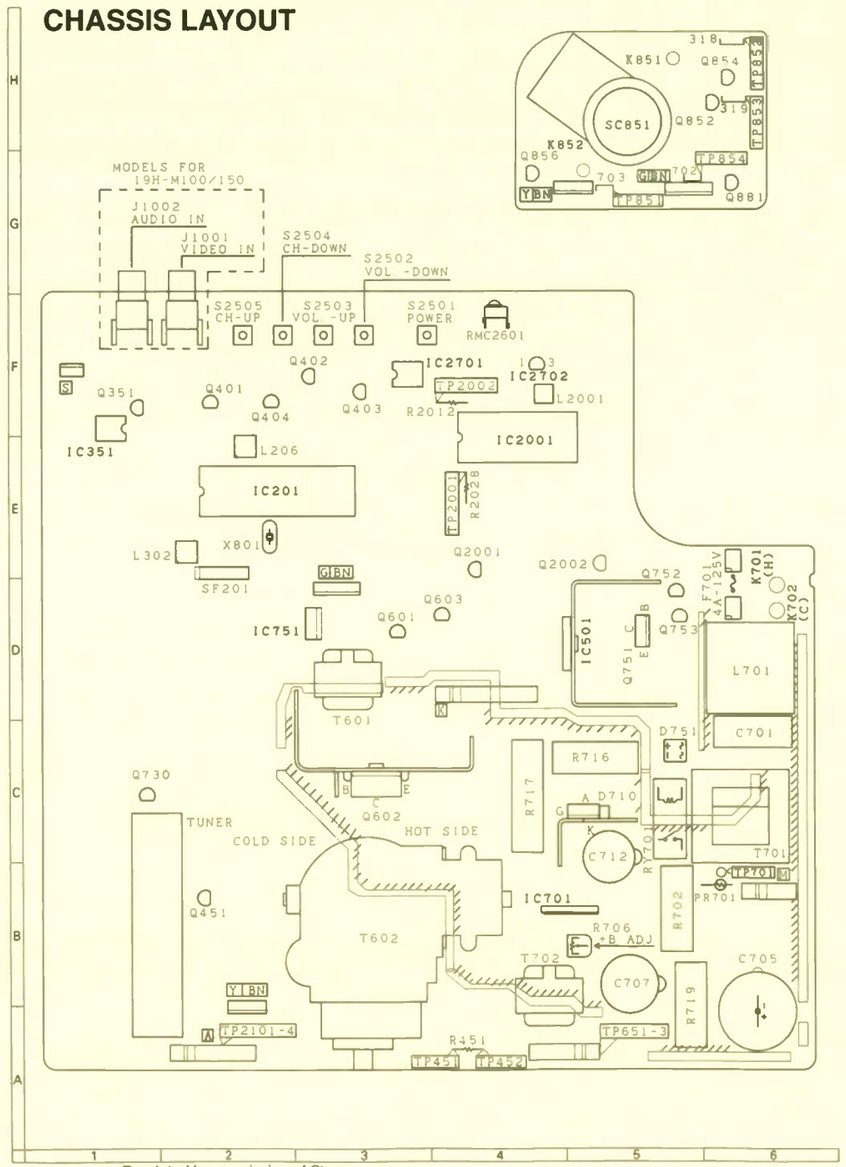
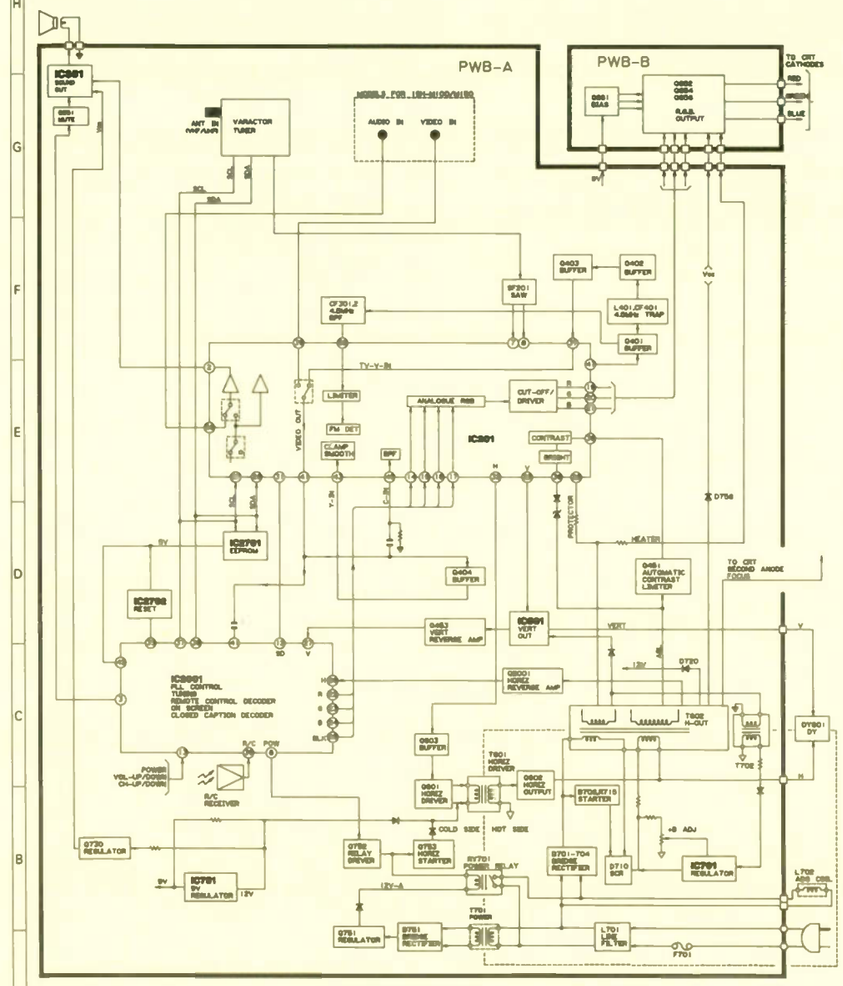
All integrated circuits and many other semiconductors are electrostatically sensitive and require special handling techniques.

19H-M60/100/150, CH9M6	19H-M60/100/150, CH9M6

CHASSIS LAYOUT



BLOCK DIAGRAM



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Schematic Diagram: CRT Unit

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Manufacturers' schematics PROFAX 3162

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19H-M60/100/150, CH9M6 | **19H-M60/100/150, CH9M6**

DESCRIPTION OF SCHEMATIC DIAGRAM

NOTE:

1. *The unit of resistance "ohm" is omitted (K:1000 ohms, M:1 Meg ohm).*
2. *All resistors are 1/8 watt, unless otherwise noted.*
3. *All capacitors are μ F, unless otherwise noted P: μμ F.*
4. *(G) indicates ±2% tolerance may be used.*
5. *⏚ indecates line isolated ground.*
6. *⏚ indecates hot ground.*

VOLTAGE MEASUREMENT CONDITIONS:

1. *All DC voltages are measured with VTVM connected between points indicated and chassis ground, line voltage set at 120V AC and all controls set for normal picture unless otherwise indicated.*
2. *All voltages measured with 1000μ V B & W or Color signal.*

WAVEFORM MEASUREMENT CONDITIONS:

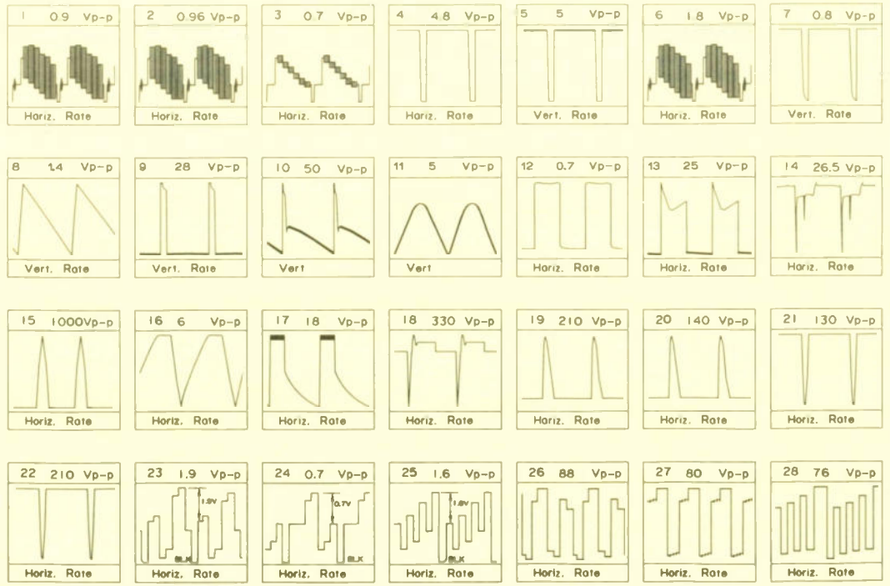
1. *Photographs taken on a standard gated color bar signal, the tint setting adjusted for proper color. The wave shapes at the red, green and blue cathodes of the picture tube depend on the tint, color level and picture control.*
2. *◯▶ indicates waveform check points (See chart, waveforms are measured from point indicated to chassis ground.)*

DRGANNES MARQUES ⚠ ET HACHRES (▬): PIECES RELATIVES A LA SECURITE.
MARQUE ▲ : PIECS RELATIVE AUX RAYONS X.

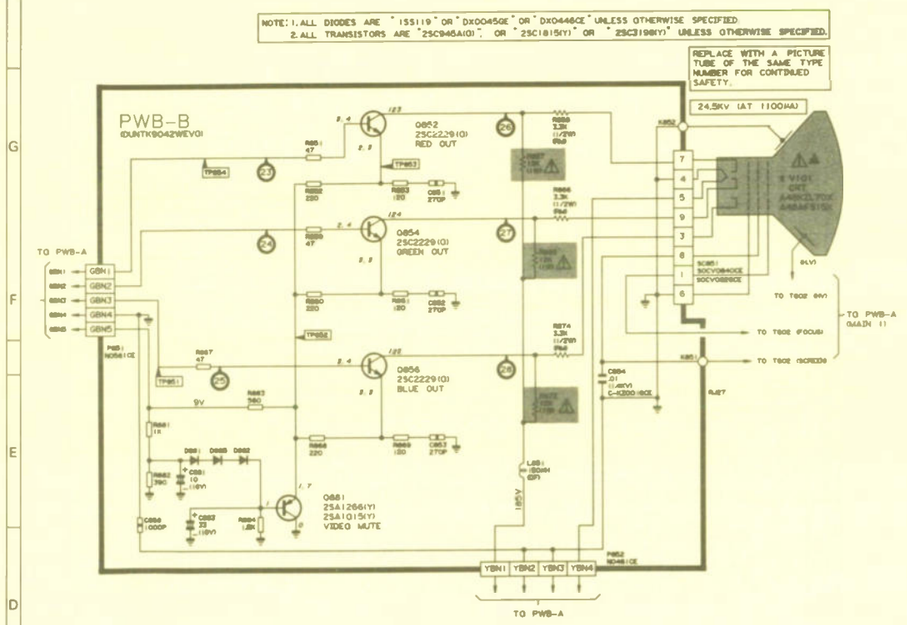
⚠ AND SHADED (▬) COMPONENTS = SAFETY RELATED PARTS.
▲ MARK= X-RAY RELATED PARTS.

This circuit diagram is a standard one, printed circuits may be subject to change for product improvement without prior notice.

WAVE FORMS



SCHEMATIC DIAGRAM :CRT Unit



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Main Schematic Diagram, Models 19H-M60, CH19M6

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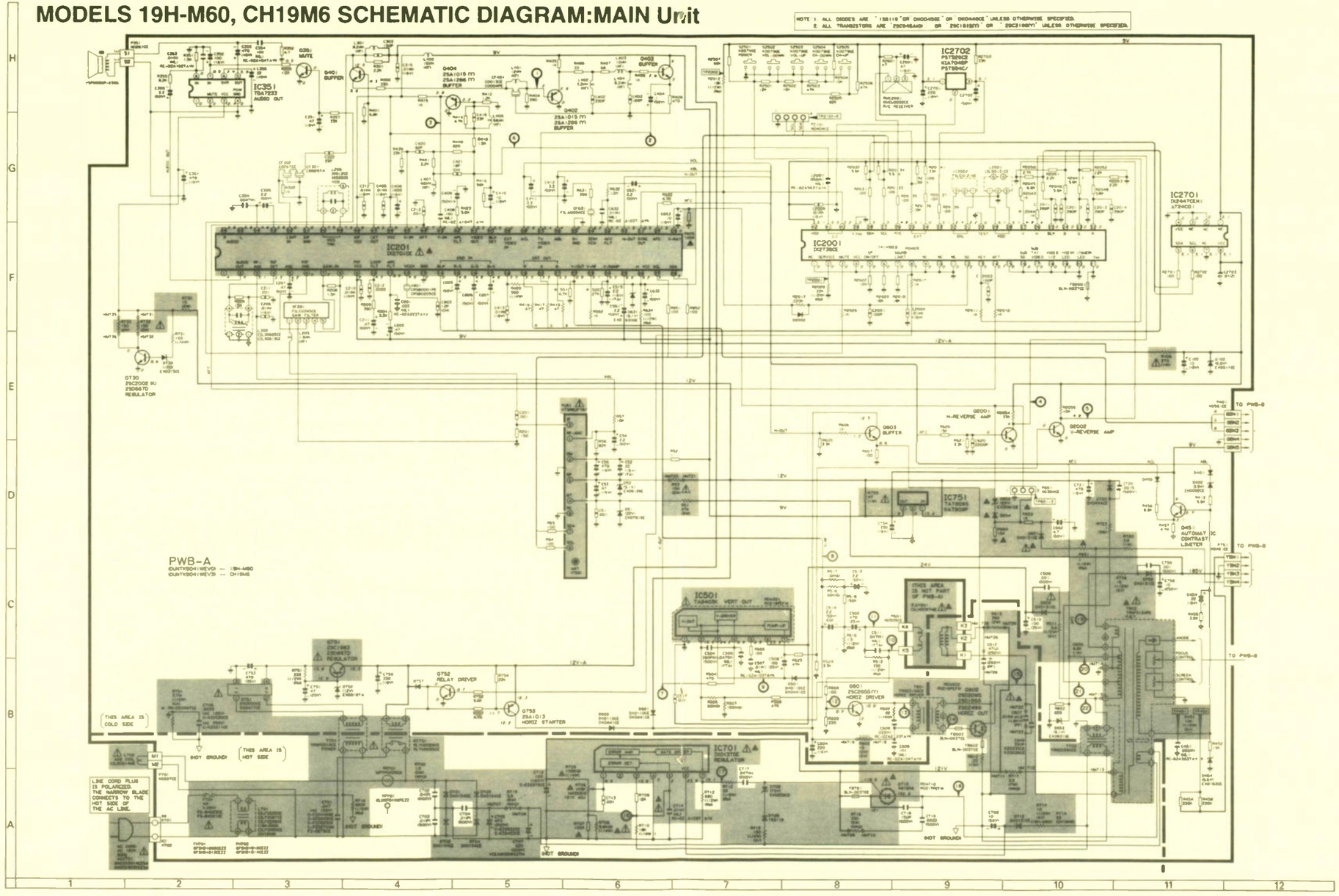
All integrated circuits and many other semiconductors are electrostatically sensitive and require special handling techniques.

19H-M60/100/150, CH9M6	19H-M60/100/150, CH9M6

MODELS 19H-M60, CH19M6 SCHEMATIC DIAGRAM:MAIN Unit



Main Schematic Diagram, Models 19H-M60, CH19M6

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PROFAX Manufacturers' schematics

June 1998

Sharp Color Television Model No. 19H-M60/100/150, CH19M6

Main Schematic Diagram, Models 19H-M100/150

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Main Schematic Diagram, Models 19H-M100/150

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All integrated circuits and many other semiconductors are electrostatically sensitive and require special handling techniques.

19H-M60/100/150, CH9M6	19H-M60/100/150, CH9M6

MODELS 19H-M100/150 SCHEMATIC DIAGRAM:MAIN Unit

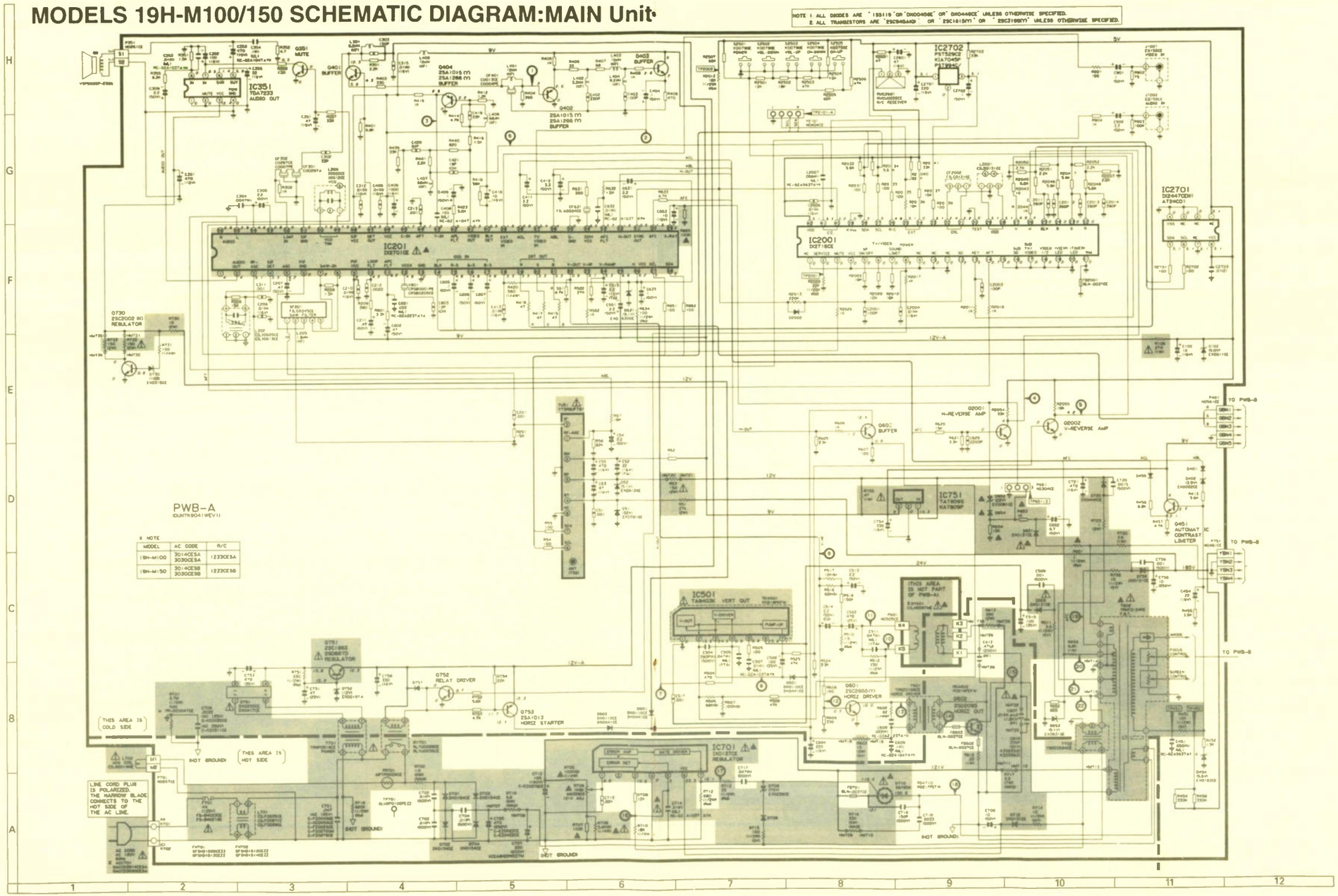

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Figure 1. For this T, in the service mode all normal on-screen displays will be suppressed and replaced by a special display. It will look something like this. In this case, the first line shows the factory part number of the microcomputer: 613085-3. The next set of characters (GR5X3.0) identifies the version of software in current use. The second line, reading left to right, displays the currently tuned channel (channel 3).

active, you can tune to an active channel by pressing the channel +/- button. The current register number is next (00). The "EXIT" is a short description of the register. Farthest to the right is 1A which is the current value held in register 00. The value is always given in hexadecimal.

How do you select and change a particular register? The cursor-left and cursor-right keys on the remote control allow you to select among the channel, register, and data held in the register. The cursor-up and cursor-down keys allow you to adjust the desired item up or down.

When you are in the service mode, depress the status/exit button on the remote unit. Two additional lines of information will appear at the top of the screen. The first line (00B7) will give you the running time of the unit in hexadecimal (183 hours). The next line displays a string of letters, EFKLMNO. Each letter represents a sub-system which *could* be present but *did not* respond to the micro's commands via the IIC bus. For example, "M," the audio controller (IC301 on the pro-logic panel), did not respond. In this instance "M" is not present. But if you were having an audio problem and didn't know where to look and if "M" were present, then you would have a starting place wouldn't you?

The last PTV I worked on had to have a sweep-power supply module. Since it was under warranty, I ordered and installed a new unit. The picture was stretched vertically and horizontally. Registers 34 (picture height), 35 (linearity), and 39 (width) had to be adjusted. I didn't have to access the unit from the rear and depend on a mirror. I simply stood in front of the TV, used the remote control, and made the adjustments in a matter of a minute or two. Piece of cake!

If you need to do a convergence procedure, you use a different menu. Using the hand unit, you enter the following: 0, 6, 2, 5, 9, 7, menu. You then have access to the convergence menu. What you do next

```
00B7
EFKLMNO

613085-3 GR5X3.0
3          00 EXIT  1A
```

05	TINT	1F	mid-range
06	SHARPNESS	1F	mid-range
07	BASS	1F	mid-range
08	TREBLE	1F	mid-range
09	BALANCE	1F	mid-range
10	SF LAG 00	24	System Flags
11	SF LAG 01	00	System Flags
12	SF LAG 02	23	System Flags
13	SF LAG 03	00	System Flags
14	RL ADDRESS	05	Remote Locator Code
15	FEATURE ID	03	Feature Word (01=PTV700, 02=PTV705/706, 03=PTV710/711, 04=PTV715, 06=PTV705/706)
16	DEMO ID	00	01=Magnavox Demo On
17	CLOCK CAL	00	see Clock Calibration Adjustment
18	OSD VERT	22	OSD Vertical Position
19	OSD HERZ	20	OSD Horixontal Position
20	PIP COLOR	1F	PIP Color Control, mid-range
21	PIP TINT	1E	PIP Tnt Control, midrange
22	PIP X1 POS	00	PIP upper left, horiz. start position
23	PIP Y1 POS	05	PIP upper left, vert. start position
24	PIP X2 POS	3F	PIP lower right, horiz. start position
25	PIP Y2 POS	21	PIP lower right, vert. start position
26	P READ POS	CF	
27	P WRITE POS	4C	
28	COLOR DLY	14	
29	BACK BURST	11	PIP background burst level
30	RED HORZ.	1F	Customer Center Convergence
31	RED VERT	1F	Customer Center Convergence
32	BLUE HORIZ	1F	Customer Center Convergence
33	BLUE VERT	1F	Customer Center Convergence
34	PICTURE HT	OA	
35	LINEARITY	04	
36	VS CORR	0A	Do Not Modify
37	V SHIFT	00	Do Not Modify (must be 00)
38	V COMP	00	Do Not Modify (must be 00)
39	PICT WIDTH	29	
40	E W PARAB	17	Do Not Modify
41	E W CORNERS	05	Do Not Modify
42	TRAPEZIUM	15	Do Not Modify
43	H COMP	00	Do Not Modify (must be 00)
44	VSS CORR	00	Do Not Modify (must be 00)
45	HORZ PH	10	
46	RGB BRT	40	
47	RGB CONT	40	
48	SUB COLOR	EA	
49	SUB CONT	E7	
50	RED CUT-OFF	80	
51	GREEN CUT-OFF	80	
52	BLUE CUT-OFF	80	
53	GREEN DRIVE	40	
54	BLUE DRIVE	40	
55	CHROMA	FA	
56	VID CTRL 1	07	
57	VID CTRL 2	C3	
58	DEF CTRL	20	
59	G2 SETUP	1A	Data=00 kills video and OSD
60	SUB BRIGHT	5F	
61	SUB TINT	3F	
62	SURROUND LEVEL	FF	Do Not Modify
63	AUD CNTRL 2	70	Do Not Modify
64	AUD CNTRL 3	03	see Stereo Decoder Alignments, Composite Input Level Adj.
65	AUD ALIGN 1	17	Wide Band Adj. (Stereo Alignment)
66	AUD ALIGN 2	13	Spectrum Adj. (Stereo Alignment)
67	AUD ALIGN 3	08	Do Not Modify
68	DOLBY MODE	82	
69	GRAPH EQ 4K	05	
70	GRAPH EQ 12K	05	
71	GRAPH EQ 1K	05	
72	GRAPH EQ 225	05	
73	GRAPH EQ 59	05	
74	ADDRESS	6A	Add. of EEPROM where data is stored.
75	DATA	00	

depends on the nature of the procedure. You might have to use a template, or you might just need to touch up what is already there. In either case, you will find the instructions as a part of the on screen information. Convergence has always been difficult for me. If I can "palm the job off," I will do it. But this one is so easy, I can do it. My partner, who doesn't know the difference between an electron and screw driver, has even taken over the job from me.

Sharp televisions

The Sharp model I will use is 19J-M100 or 20J-M100. To enter the service mode, press the volume-up and channel-up buttons at once and then plug the set into the ac outlet. The TV comes on and enters the service mode. To exit this mode, depress the power button.

Once in the service mode, press the channel up/down button(s) on the remote or the set to select the register you wish to adjust. Use the volume up/down buttons to adjust the data. The register number will have an "S" in front of it, and the data number will be expressed in hexadecimal. For example, S11 is the red cutoff, and the data might be 00. Figure 2 lists the registers and typical values.

SERVICE NUMBER DATA: RANGE	ADJUSTMENT ITEM ADJUSTMENT CONTENTS	DATA: INITIAL VALUE	
S01	PICTURE	55	00-7F
S02	TINT	46	00-7F
S03	COLOR	32	00-7F
S04	BRIGHTNESS	40	00-7F
S05 Must be set to "24"	SHARPNESS	28	00-3F
S06 Must be set to "00"-"03"	VERTICAL PHASE	00	00-07
S07	HORIZONTAL PHASE	12	00-1F
S08	RF-AGC	2A	00-3F
S09	VERTICAL AMP	20	00-3F
S10	VCO	2C	00-7F
S11	R CUT-OFF	00	00-FF
S12	G CUT-OFF	00	00-FF
S13	B CUT-OFF	00	00-FF
S14	G GAIN	7F	00-FF
S15	B GAIN	7F	00-FF
S16 Must be set to "00"	TRAP (3.58MHz)	00	00 or 01
S17 Must be set to "20"	BALANCE	20	00-3F
S18	C.C. POSITION	18	00-7F
S19 00=NORMAL, 01=no "Y, 03=NO VERTICAL"	Y-MUTE	00	00, 01, 03

Figure 2. This is a service menu in one of Sharp's TV sets.

Zenith televisions

In spite of the fact that Zenith has changed a great deal since Goldstar (now L. G. Electronics) "took over," some things have remained basically unchanged. For example, you may enter the service mode by pressing and holding the menu key on the remote control until the menu disappears and then pressing the following keys: 9, 8, 7, 6 , ENTER. Or use the keyboard by pressing and holding MENU until the OSD menu disappears and then simultaneously pressing ADJUST RIGHT and CHANNEL UP. Exit the service mode by pressing ENTER.

The chassis I will use as an example is their new GH chassis. My information is taken from Z-Line Color Television GH Chassis. You can order it directly from Zenith (1000 Milwaukee Avenue, Glenview, IL 60025). Since things have changed, I am not sure you can get it via a local jobber. Figure 3 contains information that you might find useful in this and other connections.

When the service menu first comes up, there will be a black bar at the top that contains the part number of the software. A black bar at the bottom has a date (when the module went through the factory) and a number (which indicates the module

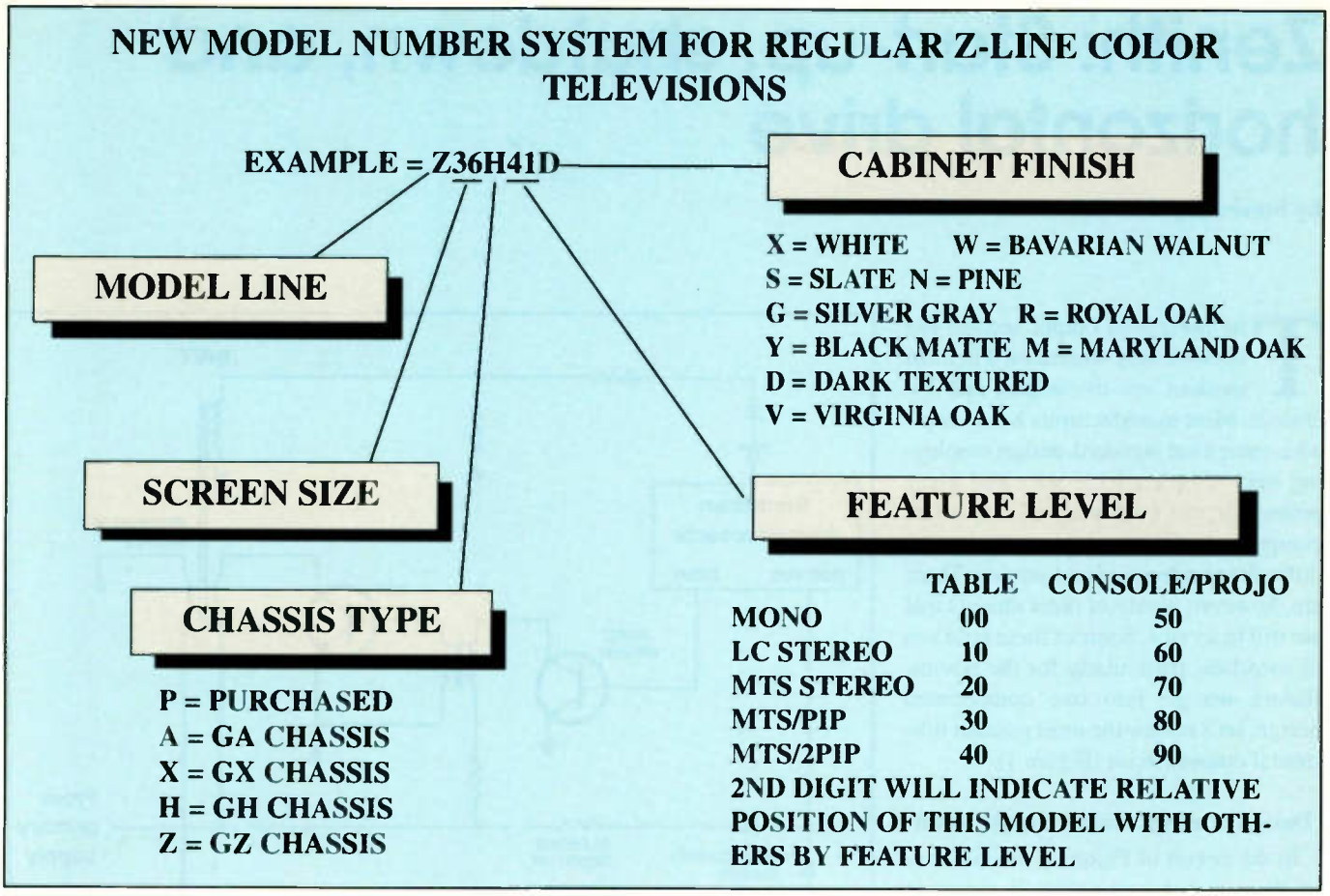

Figure 3. This list shows you how to read Zenith's new model numbers.

has been tested) in it. When the menu comes up, it will always select the third item (H Pos) in the service menu. The SELECT key lets you toggle through all of the adjustments.

Use SELECT to select item 00 (Factory Mode). This parameter is used by the factory when the module is tested. Always make sure it is turned OFF ("0") before you exit the service menu. When the factory mode is set at 0, you have access to the first seven items only. When you set it to 1, you have access to all thirty-nine items. The items will come onto the screen one at a time at the top left of the screen. Use ADJUST keys to make the necessary adjustments. One interesting feature. If you forget to reset factory mode to 0 before exiting the service mode, just set the clock or run auto program in the customer menu, and the factory mode will be reset to 0.

The booklet I mentioned is relatively inexpensive. If you service Zenith TV's I suggest you buy it because it has a lot of very useful information in addition to giving you the factory service parameters. For example, *do not* remove the video output CBA from the CRT while the TV is up and running. If you do, you will expose yourself to a dangerous electric shock and could also damage the CRT because additional elements in the CRT are tied to the HV through a divider network.

Quasar-Panasonic

Panasonic Services Company calls their service menu mode "The Serviceman Mode." I will use their GL 9C chassis to illustrate their procedure.

While the receiver is on and operating, momentarily short TP-8 to ground (FA-1 to FA-2 on the A-Board). A yellow on-screen "CHK" will appear in the upper right of the screen. (This is the "aging mode.") Press the ACTION button and VOLUME UP button on the front panel at the same time. The yellow "CHK" will turn red. You are now in the service mode.

Use the POWER button on the remote control to select one of five service adjustments: B, sub-adjustments; C, CRT adjustments; D, pincushion adjustments; S, factory adjustments only; NORMAL TV, normal operation of channel and volume buttons. The adjustments will appear in the lower right corner of the screen. Channel buttons on the remote control let you select the feature, and volume buttons let you change the register value.

To exit serviceman mode, press ACTION and POWER buttons at the same time for about two seconds. The TV will momentarily turn off and come back on tuned to channel 3.

Different ways to do the same thing

As you can see, different manufacturers do things differently. I suggest that you have available good literature for the TV's that you regularly service. There is no substitute and no excuse for not keeping up. Your business and your livelihood depend on it. I also suggest that you write down the value in any register before you tinker with it. It will take a little time, but it will very possibly save you time over the long haul on the repair. ■

Zenith: Start-up, shutdown, and horizontal drive

by Steven Jay Babbert

The horizontal output section has become very streamlined in most modern low-to-medium end TV chassis. Most manufacturers have adopted a somewhat standard design employing very simple trickle-start and x-ray protect circuits consisting of only a few components. These are generally not too difficult to understand and service. There are, however, plenty of older chassis that are still in service. Some of these hold lots of surprises, particularly for the novice. Before we go into one complicated design, let's review the most popular horizontal output circuit (Figure 1).

Design of a horizontal output circuit

In the circuit of Figure 1, the horizontal drive signal, originating in the main processor IC, is applied to a single-stage

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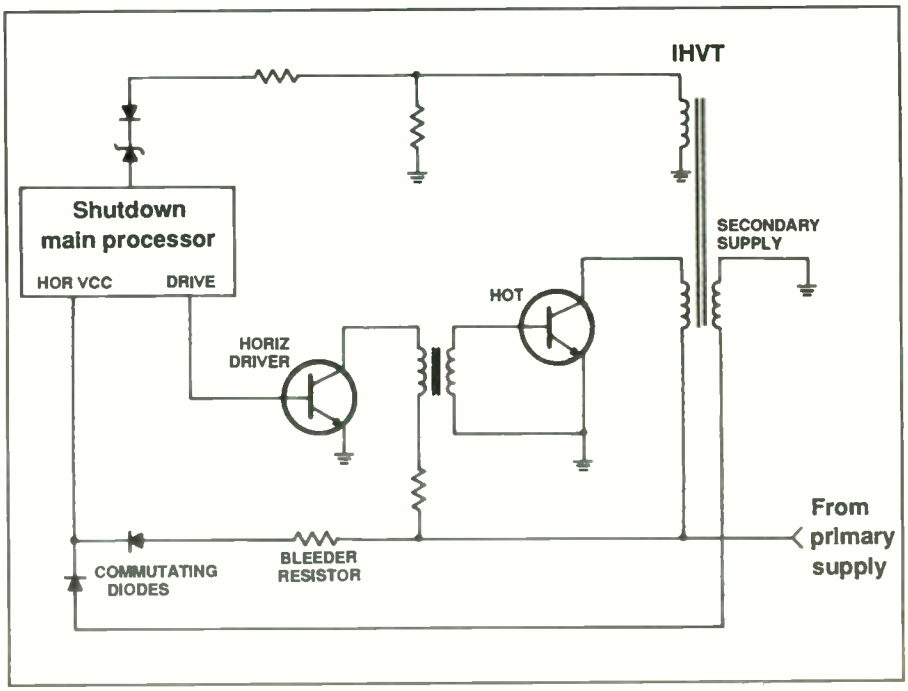

Figure 1. This circuit is that of a very popular horizontal output circuit.

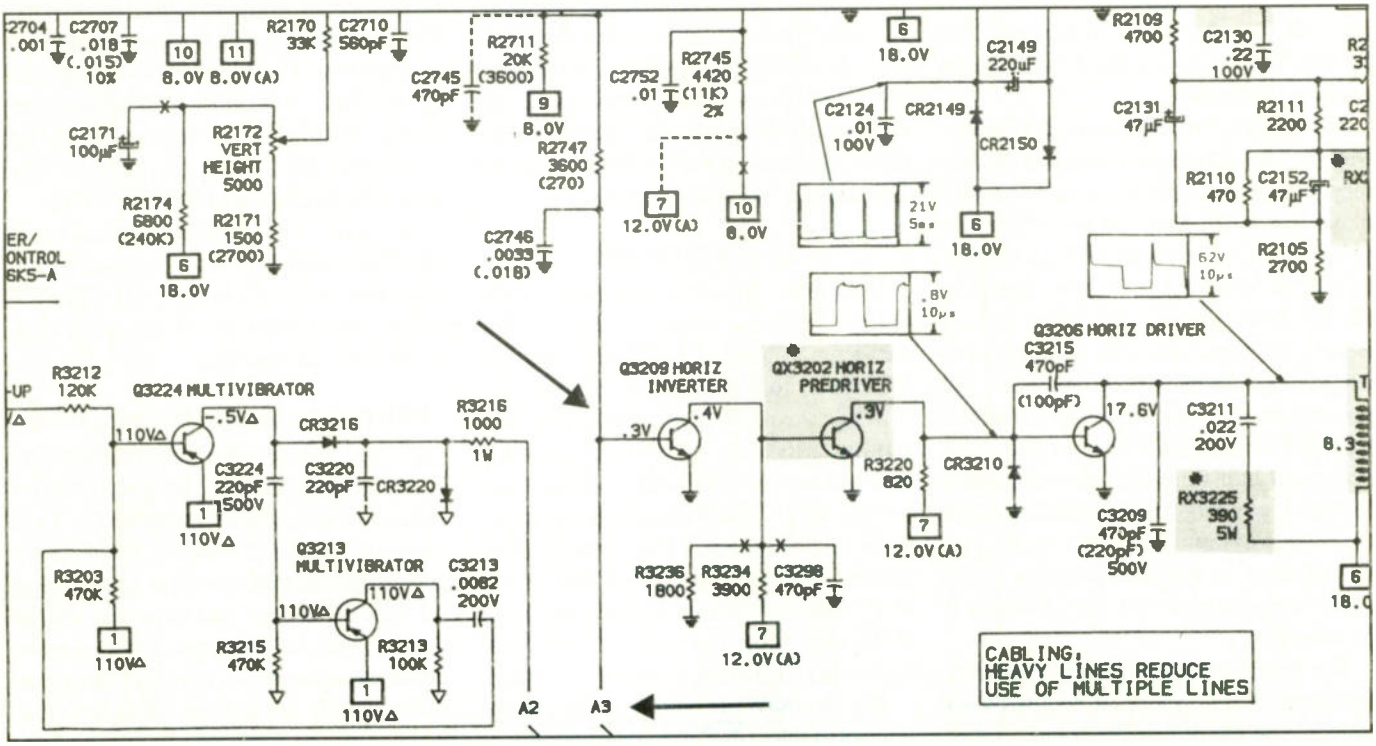

Figure 2. This unusual start-up and horizontal drive circuit used in a number of Zenith chassis can be difficult to understand at first.

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