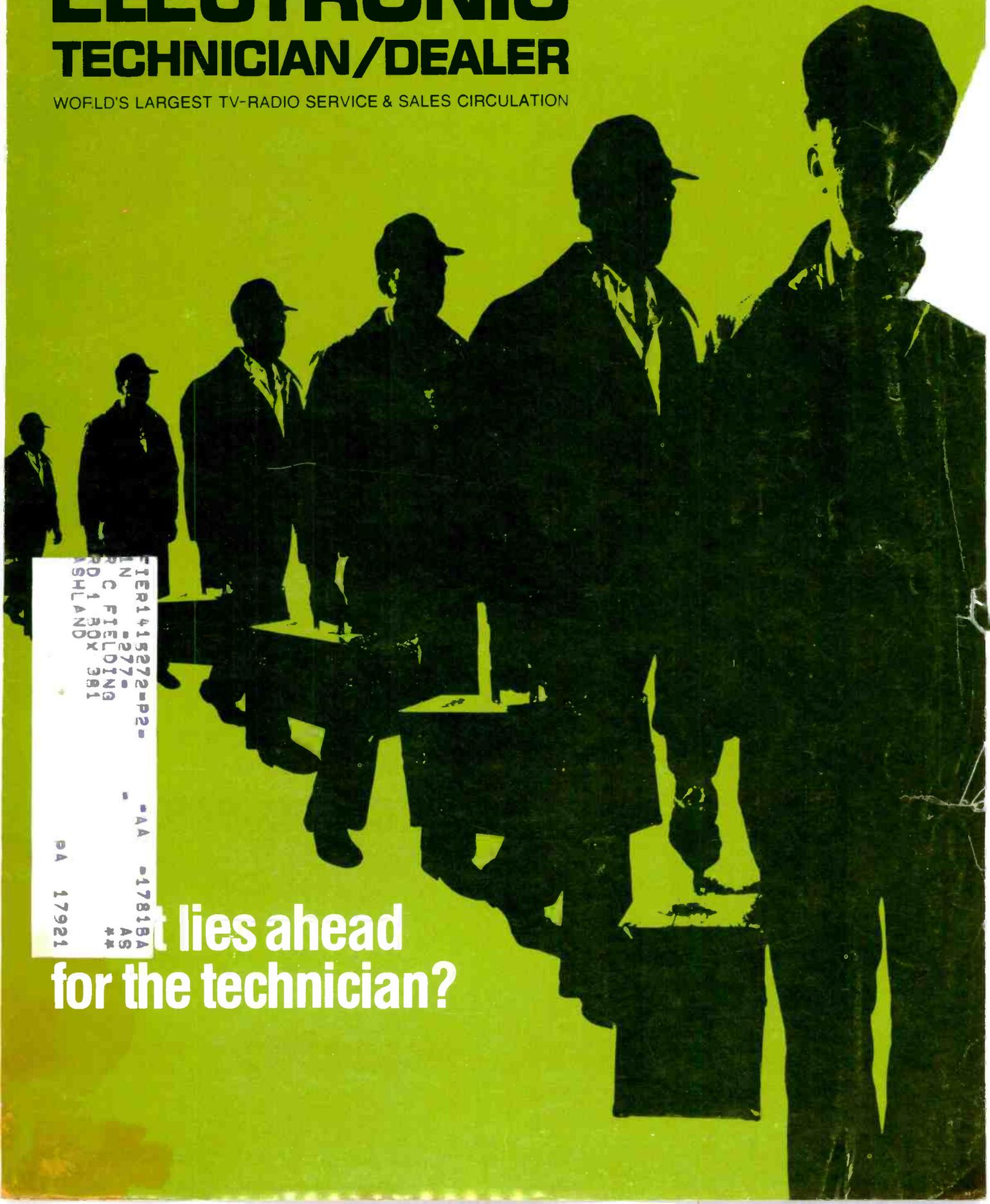


OCTOBER 1977 • 75 CENTS  A HARCOURT BRACE JOVANOVICH PUBLICATION

# ELECTRONIC TECHNICIAN/DEALER

WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION



ENTER 1415272-P2-  
IN C FIELDING  
PO BOX 381  
ASHLAND  
AA -17818A  
AS  
PA 17921

What lies ahead  
for the technician?

# GET MORE FOR YOUR DUDS!

PTS OFFERS GREATER VALUES FOR DUD TV MODULES

PTS is into module rebuilding in a big way, and we'll buy all the dud modules you can lay your hands on. Check your shop. Whether you have one or 101, PTS will give you more for your dud TV modules.

## COMPARE!

A FEW EXAMPLES OF DUD MODULES PTS PAYS TOP DOLLAR FOR:

MODULE	OEM DUD VALUE	PTS DUD VALUE
Quasar 65534A82-B-If	\$13.05	\$14.20
RCA MCK001A/141224	\$10.00	\$11.40
Zenith 150-162	\$10.48	\$12.20

If you have a large quantity of dud TV modules send us a list of brand\* and module numbers and we'll advise you of the value. Contact the PTS Servicenter nearest you for more information.

\* Acceptable brands are Admiral, GE, Magnavox, Montgomery Ward, Philco, Quasar, RCA, Sears/Warwick, Sylvania and Zenith. Do not include ceramic encapsulated, broken or cannibalized modules. PTS reserves the right to reject any or all modules.

# PTS ELECTRONICS, INC.

A Complete List of All PTS Servicenters Appears On The Opposite Page



# PTS THE WORLD'S LARGEST TUNER REPAIR COMPANY

## SERVICENTER LOCATIONS

### MIDWEST

**Home Office**  
BLOOMINGTON, IN 47401  
5233 S. Hwy. 37, P.O. 272  
812-824-9331

**CLEVELAND, OH 44134**  
5682 State Road  
216-845-4480

**KANSAS CITY, KS 66106**  
3119A Merriam Lane, P.O. 6149  
913-831-1222

**MINNEAPOLIS, MN 55408**  
815-W. Lake St., P.O. 8458  
612-824-2333

**ST. LOUIS, MO 63130**  
8456 Page Blvd., P.O. 24256  
314-428-1299

**DETROIT, MI 48235**  
13707 W. 8-Mile Rd.  
313-862-1783

**GRAND RAPIDS, MI 49501**  
1134 Walker Northwest  
P.O. 1435  
616-454-2754

**CINCINNATI, OH 45216**  
8172 Vine St., P.O. 15491  
513-821-2298

**MILWAUKEE, WI 53218**  
7211 Fond du Lac  
414-464-0789

**COLUMBUS, OH 43227**  
4005A E. Livingston  
614-237-3820

**INDIANAPOLIS, IN 46202**  
28 E. 14th St.  
317-631-1551

**DAVENPORT, IA 52805**  
2024 E. River Dr., P.O. 187  
319-323-3975

**OMAHA, NE 68132**  
5008 Dodge Street  
402-558-1800

**CHICAGO**  
Berkeley, IL 60163  
1756 S. Tall Street  
312-449-2082

### SOUTH

**ATLANTA, GA 30311**  
2180 Campbellton Road  
P.O. 42558  
404-753-0007

**JACKSONVILLE, FL 32210**  
1918 Blending Blvd., P.O. 7923  
904-389-9952

**WASHINGTON, DC**  
Silver Spring, MD 20910  
8880 Brookville Rd.  
301-565-0025

**CHARLOTTE, NC 28225**  
726 Seigle Ave., P.O. 5512  
704-332-8007

**BIRMINGHAM, AL 35201**  
210 N. 9th St., P.O. 1801  
205-323-2657

**MEMPHIS, TN 38118**  
3614 Lamar Ave., P.O. 18053  
901-365-1918

**NORFOLK, VA 23504**  
3118 E. Princess Anne Rd.  
804-625-2030

**NEW ORLEANS**  
Metairie, LA 70004  
3920A Airline Hwy., P.O. 303  
504-837-7569

**TAMPA, FL 33690**  
2703 S. Macdill, P.O. 14301  
813-839-5521

**NASHVILLE, TN 37214**  
2426 A Lebanon Rd.  
615-885-0688

### NORTHEAST

**SPRINGFIELD, MA 01103**  
191 Chesnut, P.O. 3189  
413-734-2737

**PHILADELPHIA**  
Upper Darby, PA 19082  
1742 44 State Rd., P.O. 207  
215-352-6609

**PITTSBURGH, PA 15202**  
257 Riverview Ave. W, P.O. 4130  
412-761-764R

**E. PATERSON, NJ 07407**  
158 Market St., P.O. 421  
201-791-6380

**BUFFALO, NY 14212**  
993 Sycamore St., P.O. 1241  
716-891-4935

**BOSTON**  
Arlington, MA 02174  
1167 Massachusetts Ave., P.O. 371  
617-648-7110

**SYRACUSE, NY 13204**  
418 Solar St., P.O. 207, Salina Sta.  
315-475-2330

**BALTIMORE, MD 21215**  
5505 Reisterstown Rd.  
301-358-1186

### PACIFIC

**SACRAMENTO, CA 95841**  
4611 Auburn Blvd., P.O. 41354  
916-482-6220

**SAN DIEGO, CA 92105**  
5111 University Ave., P.O. 5794  
714-280-7070

**LOS ANGELES, CA 90023**  
4184 Pacific Way  
213-266-3728

**PORTLAND, OR 97213**  
5220 N.E. Soudy Blvd.  
P.O. 13096  
503-282-9636

**SEATTLE, WA 98109**  
432 Yale Ave. N, P.O. 9225  
206-623-2320

### MOUNTAIN

**DENVER**  
Arvado, CO 80001  
4958 Allison St., P.O. 672  
303-423-7080

**SALT LAKE CITY, UT 84106**  
1233 Wilmington Ave.  
P.O. 6218  
801-484-1451

**PHOENIX, AZ 85009**  
2916 West McDowell Rd.  
602-278-1218

### SOUTHWEST

**LONGVIEW, TX 75601**  
110 Mopac Rd., P.O. 7332  
214-753-4334

**OKLAHOMA CITY, OK 73106**  
3007 N. Moy, P.O. 60566  
405-947-2013

**HOUSTON, TX 77207**  
4326 Telephone Rd., P.O. 26616  
713-644-6793

## NEWS OF THE INDUSTRY

### NATESA Meeting Ends In Accord, Name Change Approved

Frank Moch, NATESA's Executive Director, calls recent convention gathering in Itasca, Ill., "one of the most successful in recent years. We've been through some pretty rough periods with internal problems but we're now coming out stronger than ever and I feel we're back on track and all thinking in the same general direction.

Moch labeled the name change, from the National Alliance of Television and Electronic Service Associations to National Association of TV and Electronic Servicers of America, and the association's firm backing of Rhode Island's tough warranty law as two of the most important actions taken this year. The name change, according to Moch, will pave the way for increased membership.

In the past, only service shops which were members of a state or local association were eligible for membership. With the name change, individual shops, whether or not they belong to local groups, will be eligible for membership in the national association.

Rounding out NATESA's meeting, all current officers, George Weiss, Chicago, President; Paul Kelly, Warwick, R.I., Vice President, Leo Cloutier, Los Angeles, Secretary; and Richard Ebare, Essex Junction, Vt., Treasurer, were re-elected by acclamation.

### Zenith—RCA Introduce Competing Video Cassette Recorders

Two more manufacturers have announced marketing plans for their non-compatible video cassette recorders which are just now going on the market. Zenith, with its Sony manufactured two-hour maximum recording units, and RCA with its JVC patterned two-and-four hour recording format, will launch major advertising campaigns for the Fall season.

Zenith, which is also marketing one and two hour blank video tape cassettes at suggested retail prices of \$12.45 and \$16.95, is offering its tape unit in two versions, either as a separate deck retailing at \$1,300 or as a full color TV/Video Cassette Recorder console combination with a furniture-style cabinet with a suggested retail price of \$2,600. An optional black-and-white video camera kit has a suggested retail price of \$395.

RCA, which is unveiling a \$4 million advertising program to push its

"Selecta Vision" video cassette recorder, offers users the choice of recording in either two-hour or four-hour modes. Optionally priced at \$1000, RCA is offering two versions of a black and white TV camera, a \$300 unit and a \$400 unit with zoom lens. RCA also will market two-and-four-hour length tapes at suggested retail prices of \$17.95 and \$24.95.

RCA's marketing people are now projecting a total video tape recorder market of 1.2 million by the end of 1978. That compares, says RCA, with the sale of the 1-millionth color television set in 1964, some ten years after color TV was commercially introduced.

### Dynascan Reports Operating Loss

Dynascan Corp., the Chicago-based manufacturer of Cobra CB, says "adverse, industrywide" conditions in the CB market resulted in second quarters operating losses of \$900,000 or 21 cents per share.

A company statement said the loss was directly attributable to inventory price reductions. During the comparable period a year earlier Dynascan reported earnings of \$4.3 million, or \$1.63 per share, on sales of \$33,853,000. Sales in the second quarter this year amounted to \$18,254,000, Dynascan said.

For the first six months, the company reports earnings of \$1 million, or 39 cents a share on sales of \$55,663,000.

### Glass Resigns NESDA Post

In a surprise move as NESDA's Florida meeting wound to a close, Executive Vice President Dick Glass resigned following the hotly contested election of LeRoy Ragsdale, Fort Smith, Ark., as President. Glass, one of NESDA's founding fathers, cited a "time for a change" philosophy in publicly announcing his resignation. "Some people haven't been listening," he said. Although Ragsdale, a previous NESDA as well as NATESA president, and Glass both glossed over reasons for the change in staff leadership, it's no secret one of Ragsdale's complaints was a need for "more cooperation and communication between officers and staff."

Taking over as interim Executive Vice President on a 90-day basis is Ralph Tirrell, Executive Director of the Arizona State Electronics Association for the past four years. "At the end of the 90-day interim period we'll be taking a look to see if he's happy and we're happy and then we can talk about a longer contract," Ragsdale told ET/D. He said he also anticipates applications from other sources.

Ironically, Glass' resignation wound



PTS ELECTRONICS, INC.

PRECISION TUNER SERVICE

**RICHARD W. LAY**  
Editor  
43 East Ohio Street  
Chicago, Ill. 60611  
(312) 467-0670

**DON W. MASON**  
Managing Editor  
1 East First Street  
Duluth, Minn. 55802  
(218) 727-8511

**ALFRED A. MENEGUS**  
Publisher  
757 Third Avenue  
New York, N.Y. 10017  
(212) 838-4382

**DAVID J. HAGELIN**  
Associate Publisher  
and General Manager

**TOM GRENEY**  
Publishing Director

**JOHN PASZAK**  
Graphic Design

**DEBI HARMER**  
Production Manager

**BERNICE GEISERT**  
Production Supervisor

**LILLIE PEARSON**  
Circulation Fulfillment

**GENE BAILEY**  
Manager, Reader Services

**SUSAN HELLERMAN**  
Classified Ad Manager

#### ADVERTISING OFFICES

**DAVID J. HAGELIN**  
43 East Ohio Street  
Chicago, Ill. 60611  
(312) 467-0670

**CHUCK CUMMINGS**  
Ad Space South/West  
613 North O'Connor  
Irving, Texas 75061  
(214) 253-8678

**ROBERT UPTON**  
Tokyo, Japan  
C.P.O., Box 1717

# ELECTRONIC TECHNICIAN/DEALER

OCTOBER 1977 • VOLUME 99 NUMBER 10

**THE COVER:** This artist's rendition symbolically represents the home electronics service industry as it faces toward its future. What lies ahead is the subject of a special report starting on page 18.

## 18 Electronic servicing in the 1980s—A look ahead

New technologies, new products, and new skills face the home entertainment electronics serviceman in the near future. In this article, ET/D looks at some trends. By Richard W. Lay

## 22 Raster problems in solid state color chassis

Knowing if that loss of raster is caused by a stage breakdown or incorrect CRT potentials can save you valuable troubleshooting time. Here are some useful tips that could speed your search. By Paul Shih

## 30 Zenith color TV for 1978

Our review of color television for 1978 continues with a description of the improvements being made in Zenith's new "J" line of chassis. By Don W. Mason

## 34 GE color TV for 1978—Part two

In this concluding portion of our review of GE Color TV for 1978, we discuss troubleshooting methods for their new electronic tuning system and we take a look at their new portable color TV chassis. By Don W. Mason

### DEPARTMENTS

1 NEWS OF THE INDUSTRY	37 NEW PRODUCTS
8 NEWSLINE	46 CLASSIFIED ADS
10 TECHNICAL LITERATURE	48 ADVERTISING INDEX
12 FROM THE EDITOR'S DESK	49 READERS SERVICE
15 SERVICE SEMINAR	51 TEKFAK
36 TEST INSTRUMENT REPORT	



A HARCOURT BRACE JOVANOVICH PUBLICATION



HARCOURT BRACE JOVANOVICH PUBLICATIONS. Robert L. Edgell, Chairman, Richard Moeller, President/Treasurer, Lars Fladmark, Senior Vice President, Thomas Greney, Vice President, Ezra Pincus, Vice President, James Gherna, Vice President, Lois Sanders, Vice President, Harry Ramaley, Vice President, Joe Bilderbach, Vice President, George Glenn, Editorial Director.

ELECTRONIC TECHNICIAN/DEALER is published monthly by Harcourt Brace Jovanovich Publications. Corporate offices: 757 Third Avenue, New York, New York 10017. Advertising and editorial offices: 43 East Ohio Street, Chicago, Illinois 60611 and 757 Third Avenue, New York, New York 10017. Editorial, Accounting, Advertising Production and Circulation offices: 1 East First Street, Duluth, Minnesota 55802. Subscription rate: one year, \$8; two years, \$14; three years, \$18 in the United States and Canada. Other countries, one year, \$15; two years, \$24; three years, \$30. Single copies: 75¢ in the U.S. and Canada, all other countries: \$2. Second Class postage paid at Duluth, Minnesota 55806 and at additional mailing offices. Copyright © 1977 by Harcourt Brace Jovanovich, Inc. All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without permission in writing from the publisher.

POSTMASTER: Send Form 3579 to ELECTRONIC TECHNICIAN/DEALER, P.O. Box 6016, Duluth, Minnesota 55806.

# THERE'S A Simpson® 260 VOM FOR EVERYONE

- Designers
- Engineers
- Technicians
- Electricians
- Inspectors
- Assemblers
- Scientists
- Environmentalists
- Experimenters
- Students
- Teachers
- Hobbyists



260-6... \$79.50



260-6XL... \$93.00



**260-6M**  
with Mirror  
Scale  
**\$82.50**



**260-6P**  
Overload  
Protected  
**\$119.00**



**260-6PRT**  
Overload  
Protected  
in Roll Top  
Case  
**\$129.00**



**260-6XLM**  
with Mirror  
Scale  
**\$96.00**



**260-6XLP**  
Overload  
Protected  
**\$128.00**



**260-6XLP M**  
Overload  
Protected  
with Mirror  
Scale  
**\$131.00**



**260-6RT**  
in Roll Top  
Case  
**\$89.50**



**260-6PM**  
Overload  
Protected  
with Mirror  
Scale  
**\$122.00**



**260-6MRT**  
with Mirror  
Scale  
in Roll Top  
Case  
**\$92.50**

COMPLETE LINE OF PROBES,  
LEADS, CARRYING CASES AND  
OTHER ACCESSORIES AVAILABLE.

SEE THEM ALL AT YOUR LOCAL ELECTRONICS/ELECTRICAL DISTRIBUTOR or Write for Catalog 4500



## SIMPSON ELECTRIC COMPANY

853 Dundee Avenue, Elgin, Illinois 60120 • (312) 697-2260  
CABLE: SIMELCO • Telex: 72-2416  
IN CANADA: Bach-Simpson, Ltd., London, Ontario  
IN ENGLAND: Bach-Simpson (U.K.) Ltd., Wadebridge, Cornwall  
IN INDIA: Ruttonsha-Simpson Private, Ltd., Vikhroli, Bombay



...for more details circle 130 on Reader Service Card

Services the latest solid state chassis!  
chassis! And is even designed to service

# All-new Zenith Universal Color TV 800-880 Test Rig

Comes completely assembled and ready for use. Not a kit. No troublesome switches to fail.

Features a 19TT 30KV 19" Chromacolor<sup>®</sup> picture tube with a limited one-year warranty

A quick and easy-to-use plug positively locks-in to allow you to match the 800-880 Test Rig to the TV chassis being tested.

Magnetic shield helps eliminate the effects of stray magnetic fields.

Built-in 35KV constant voltage monitor with 2% accuracy aids servicing. Ideal for performance verification after work is completed. Helps prevent needless call-backs.

No need for an external Univerter or Transverter. Vertical and horizontal matching networks are built-in.

Built-in, too, are static convergence and blue lateral assemblies in addition to a highly efficient deflection yoke for quick and accurate bench work

Adjustable focus control is provided to focus the 800-880 if the receiver under test does not provide focus voltage.

Even incorporates a built-in speaker to check the audio of chassis being tested.

And the proper adapters are included with the 800-880 to allow servicing of virtually all Zenith TV chassis, while optional Zenith adapters are available to permit servicing 110° Zenith sets as well as other brands.

Additional adapters available from Zenith increases its versatility to over 10,000 sets from 52 manufacturers. Zenith adapters currently on your shelf can also be used.

Also included is a complete up-to-date Instruction and Cross-Reference Guide with each and every unit.

Ask your Zenith distributor about this latest and most versatile of all Zenith Universal Color TV Test Rigs, the Model 800-880!

You need one...if not two or more!

# Virtually all the earliest tube and hybrid the new 100° "ABLE" tube sets!



25¾" wide; 20" deep; 18¾" high.



### Plug-in Yoke Matching

Quick and accurate matching of the yoke circuitry to the chassis. Ranges 16 to 12mh horizontal - no ringing - 2 to 34 OHM vertical.



### Built-in 35KV Constant Voltage Monitor

Monitors the voltage of the chassis under test. It's ideal for performance verification after work is completed, plus the monitor is a great aid in servicing.



### Adapters and Extensions

All the current Zenith adapters necessary to service most Zenith chassis are supplied with the rig. A complete up-to-date Cross-Reference Guide is included to cover most all other TV brands. A special optional adapter is available to cover the 13-inch sets.



The quality goes in before the name goes on®

Zenith Radio Corporation/Service, Parts & Accessories Division/11000 Seymour Avenue/Franklin Park, Illinois 60131

...for more details circle 135 on Reader Service Card

OCTOBER 1977, ELECTRONIC TECHNICIAN/DEALER / 5

Limited time  
offer on

# B&K-PRECISION guide to CB servicing

The highly detailed sixty-page manual for B&K-PRECISION's popular Model 1040 CB Servicemaster is now available as a reference guide. The CB Servicemaster manual is far more than just an instruction book—it contains detailed information on virtually all aspects of CB transceiver servicing. Individual chapters include: CB Performance Testing, CB Receiver Adjustments and Troubleshooting CB Transceivers.

In "CB Performance Testing," twenty-two different test procedures are detailed and the importance of each specification is explained. Troubleshooting information describes how to locate a CB transceiver fault in the shortest time possible for most efficient servicing.

The price of the B&K-PRECISION CB Servicemaster manual is \$5 (postpaid) and includes a \$10 discount certificate toward the purchase of B&K-PRECISION Model 1040 CB Servicemaster. The \$10 discount certificate is being offered for a limited time only. Send your check or money order directly to B&K-PRECISION, Sales Department, Dynascan Corporation 6460 W. Cortland, Chicago, IL 60635.

**B&K PRECISION**  
**DYNASCAN**  
**CORPORATION**

Enclosed is \$5.00, please send me the B&K-PRECISION Guide to CB Servicing and \$10.00 CB Servicemaster discount certificate.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_

Zip \_\_\_\_\_

...for more details circle 106 on Reader Service Card

up one of NESDA's more successful conventions, with an estimated attendance of some 900. Glass, who says he plans consulting work and writing, is a former two-time NESDA President, having first been elected in 1964. In 1969 he took over NESDA's top post on a part-time basis, writing and selling memberships on a commission basis to bring in necessary funds. Under his stewardship the organization grew from 700 to 2,500 service shop members, in addition to some 1,500 individual memberships in ISCET, NESDA's subsidiary. Says Glass of his resignation: "The Executive Committee of the Association has assured members that this move doesn't mean the association is going to fold." Says Ragsdale: "No one expected him to resign. We tried to get him to reconsider but his mind was made up."

Others elected with Ragsdale were: Bob Villont, Tacoma, Wa., national vice president; Ken Parse, Wappinger Falls, N.Y., secretary; and Herschel Lawhorn, Perry, Ga., treasurer.

### Zenith Chassis Redesign?

Zenith refuses to comment on recent news story on *Electronic News* of a "Major chassis re-design of a 1978 color TV receiver." According to EN an X-chassis scheduled for "volume production" this Fall has now been scrapped as being too costly. The result, says EN, is "cancellation of purchase orders for thousands of parts."

As for Zenith's comment on the story, it was "no comment."

### Admiral Introduces New Portables

Five new color portables and three black and white models have been unveiled by Admiral during a news conference at the company's suburban Chicago headquarters.

The biggest feature is the extension of carry-in labor warranty to a full year on all color portables except the "13 inch leader." The new color line includes the 13-inch leader with a suggested retail a full \$30 down from last year's comparable model which sold at \$340. Other introductions include four 19-inch models. Of special note to servicers is the new high end 19-inch model, with a suggested retail of \$590, which features an optional \$100 consumer installable remote control.

In addition to the color models, Admiral also announced three new black and white portables, two 9-inch models and a 12-inch version.

### Rash of Warranty Laws Forecast

The warranty battle between manufacturers and servicers continued to

hold the spotlight during the recently completed national conventions of both NESDA and NATESA.

Rhode Island's landmark warranty law, which makes it mandatory for manufacturer's to reimburse servicers on a "full cost" basis, represents a "swing of the pendulum in the opposite direction," servicers attending both meetings were told.

Had manufacturers been listening to servicers in the past, the consumer coalition which pressured for passage of the Rhode Island law would never have gotten off the ground, but the net effect of the law may be to bring warranty service in that state to an end, or at best it will result in a reduction of the number of warranty stations. "Manufacturers may just run products into neighboring states," one spokesman said.

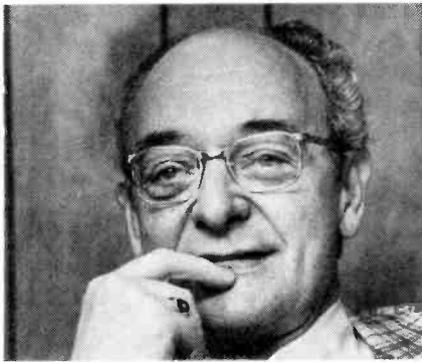
However, the most pressing danger, according to RCA's Arnold Valencia, is the "groundswell" of similar warranty laws now pending in state legislatures around the country. There are some 187 at last count, he said. "It is a shame the situation has come to this point and that we have not policed ourselves better. Once you create a bureaucracy of this nature you begin to lose control," Valencia said.

L.D. Menaugh, Admiral's Director of National Service, called warranty "the largest single cost a manufacturer faces beyond the fact of manufacturing the set itself." Citing reasons for the current state of affairs, Menaugh said in the past manufacturing executives too far removed from the service field and interested only in "bottom line" philosophies may have been too involved in warranty decision-making. However, citing manufacturers' reasoning for a single areawide warranty rate he said: "We deal every day with 20 different service shops that have 20 different prices. Why the variation in rates?"

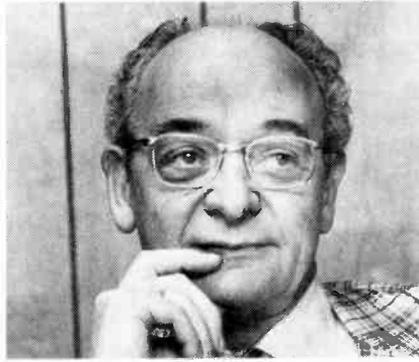
Meanwhile, a Sony representative sounded the outlook some manufacturers are taking regarding the Rhode Island situation when he said: "We now have 2,500 authorized service stations, but the sheer cost of auditing these people might cause us to limit the number of people we do business with in the future." ■

### CORRECTION

It was incorrectly reported in the May, 1977 issue of ET/D that a company called Tuner Service Company of Baltimore was purchased by PTS Electronics. The tuner repair company purchased by PTS at that time was no longer the Tuner Service Company of Baltimore.



"People refer friends to our shop because of their own good experience."



"When I got into this business there was a need for reliable service. At Electromatic we provide that service."



"A diverse market has diverse needs. We have the trained personnel, the organization and the experience to meet these needs."

## "Good service goes beyond qualified repair."

James A. (Jim) Rolison, Electromatic, Inc., Portland, Oregon 97211.

"We give each customer what he needs, when he needs it. If the customer can't come to us, we go to him. Electromatic technicians have even made 'house calls' to repair radios on Columbia River barges. That's good service."

Jim Rolison is the president of Electromatic, Inc., one of the largest servicing organizations in the Pacific Northwest. Electromatic serves the entire metropolitan Portland area of approximately one million people. Customers include the general public (carry-in or call-in), trucking, timber and maritime companies, and government agencies. Electromatic also has a two-way radio installation and service business that serves the U.S. Army and Navy, fire and police departments plus local radio-equipped firms. Their appliance department services commercial ice makers and Electromatic's own coin-operated laundry business.

**Electromatic Rooted In Customer Needs**  
Electromatic began as Rolison's answer to a department store's serious servicing problem. At that time Rolison was selling consumer electronics in that store.

Then in 1960, Rolison and four colleagues bought the store's service shop. One of those four, Bob Kunze, is still with Electromatic. As "Mr. Inside" Kunze manages the Appliance and Industrial Electronics departments, Rolison—"Mr. Outside"—makes contacts with dealers, manufacturers and service organizations. He also heads the Consumer Electronics department.

Tom Maddocks, controller/office manager and a licensed CPA, is another team member. Maddocks developed the firm's efficient record keeping and reporting system.

**Organization Pays Off in Better Service**  
Between 15 and 25% of all service calls are answered the same day. Incoming service calls are noted on special job cards. The information can be dispatched immediately by radio to a field technician, or the card is placed in a technician's bin for later pickup. The procedure depends on the technician's work load and customer requests for specific service dates.

The job card filing system uses the first letter of a customer's last name and the street number from his address. For

example, for a customer named Bradshaw who lives at 3132 Main Street, the job card would be filed under B 3132.

Three men specialize in ordering, over-the-counter sales, processing of warranty parts and receiving customer carry-in products for servicing.

To keep the parts department well-stocked an Electromatic truck makes daily pickups from their parts distributors.

### Dealer/Customer Conveniences

Electromatic serves dealers and their customers as well as carry-in and call-in customers.

Each dealer served by Electromatic is visited weekly. A telephone call is made ahead of the visit to determine what parts may be needed. When the technician arrives at the dealer's shop, he's ready to make on-the-spot repairs.

For the convenience of the carry-in customer, sets can be attached to handy antenna and power receptacles and checked while he waits.

Electromatic offers customers a choice of four service plans: balance-of-first-year, balance-of-first-year and all of second, parts and labor during second year, and similar coverage for following years. Emphasis is on monthly payments instead of an annual payment.

### Rotation Provides Saturday Service

One-third of the technicians are off on Monday, one-third on Wednesday, and one-third on Saturday. This gives each technician a three-day weekend every three weeks. And it provides Saturday service for the Electromatic customer.

### People Make It Work

Rolison believes in promotions from within and in enriching employees through continued training. Periodically seminars are offered to journeymen and apprentices. And manufacturers' training sessions are held as they become available. A safety seminar including driving tips is given every other month.

The usual ratio of journeymen to apprentices is 5 to 1. This permits careful training and supervision of beginning technicians.

High personal standards are emphasized from the beginning. Good personal appearance and a safe driving record are important.



Technician Mark Gilmore services a two-way radio unit in an 18-wheeler in Electromatic's shop.

### Growth Through Service

Electromatic has grown from \$170,000 in gross business the year before the purchase of the firm (1960), up to the \$1.5 million level in 1976.

Electromatic now operates from a 22,000 square-foot building. There are 29 field technicians, delivery personnel and antenna installers. They man 27 dispatch service trucks. Backing them are 13 shop technicians and an office staff of 20.

These are the people who provide the good service that brings customers back to Electromatic. And word gets around.

# RCA

Consumer Electronics Division  
600 N. Sherman Drive  
Indianapolis, IN 46201

## Better Service Through Better Communications.

## NEWSLINE

ZENITH CANCELS OUT ON MARK IV PICTURE TUBE. The cooperative effort between Zenith and Corning Glass to develop the new low-cost "Able" picture tube with Mark IV design has been stopped because production cost savings developed during pilot production runs didn't hold up in mass output of the tubes. The cancellation is not expected to upset Zenith's production plans for this year, however, as sets designed for the "Able" tube will also accept 100° tri potential tubes using conventional glass, Zenith spokesmen say.

SONY STICKS TO THE ORIGINAL BETAMAX PRICE. When RCA introduced a new four-hour video recorder with a price tag of \$1000 recently, it was expected that Sony would react with a lower price on their new two-hour Betamax unit. But Akio Morita, Sony Board Chairman, said "We believe that to win a race, we must keep to our own pace. We don't care what price other manufactures have. We firmly believe we have the best machine." So, the price on the new Sony unit stays at \$1300.

PRICES REDUCED ON QUASAR VIDEO CASSETTES. Across the board price reductions have been announced by Quasar on video cassettes for their "Great Time Machine." The two-hour cassette has been reduced from \$33.95 to \$24.95, and the 100-minute and 60-minute tapes now have new list prices of \$19.95 and \$16.95, respectively. New prices are effective immediately, including those in dealers' inventories.

EIA CHOOSES A NEW PRESIDENT. Peter F. McCloskey is the new president of the Electronic Industries Association, replacing V.J. Adduci, who left this past June. McCloskey, who was selected by a special EIA committee directed by vice chairman William J. Weisz, had been president, since 1973, of the Computer and Business Equipment Manufacturers Association.

FCC CB CUTOFF RULE REVISED. The Federal Communications Commission has extended to August 1, 1978, the deadline for selling handheld 23-channel CB radios. Previously the FCC had set January 1, 1978, as the deadline for all 23-channel units. At that time, only 40-channel sets -- with their stricter harmonic suppression standards -- would remain on retailers' shelves. Handheld CB's, defined, are those with built-in mike, antenna and power supply.

RCA DECLARES 30 CENT COMMON STOCK DIVIDEND. RCA Directors have declared a quarterly dividend of 30 cents per share on RCA Common Stock payable November 1, 1977 to holders of record September 19, 1977. Dividends of 87½ cents per share on \$3.50 Cumulative First Preferred Stock and \$1 per share on \$4 Cumulative Convertible First Preferred Stock were also declared.

QUASAR TV PLANT IN CANADA TO CLOSE. Production of Quasar color TV will end in Canada in November with the closing of their Markham, Ontario plant. The operation will be moved to the firm's Franklin Park, Illinois facilities. As quoted by Electronic News, Canadian general manager Don Gordon said, "TV manufacturing is not a viable proposition in Canada anymore."

A simple truth about color TV:  
Ordinary mechanical tuners have moving parts inside. They can wear out or corrode and cause picture problems. But Zenith has the Electronic Video Guard Tuner. With no moving parts inside. It's designed to keep your great Zenith color picture looking great. For a long time.



**ZENITH**  
**CHROMACOLOR II**

The quality goes in before the name goes on.®

The Electronic Video Guard Tuner is available in 13" through 25" (diagonal) screen sizes.  
Shown: The Ellipse IV, SJ1951W in simulated Walnut highlighted with brushed aluminum color. Simulated TV picture.

# OPTIMA VALUE SALE

G. E., SYLVANIA, ZENITH, RCA, ETC.  
75% OFF LIST NEW JOBBER-BOXED TUBES

<input type="checkbox"/> 3A3 5 for \$7.08	<input type="checkbox"/> 6HA5 5 for \$6.69
<input type="checkbox"/> 5GH8 5 for \$8.25	<input type="checkbox"/> 6JE6 5 for 14.03
<input type="checkbox"/> 6BK4 5 for 13.06	<input type="checkbox"/> 6JS6 5 for 13.00
<input type="checkbox"/> 6FQ7 5 for \$5.31	<input type="checkbox"/> 6LB6 5 for 14.06
<input type="checkbox"/> 6GH8 5 for \$5.20	<input type="checkbox"/> 17JZ8 5 for \$7.25
<input type="checkbox"/> 6DW4 5 for \$6.58	<input type="checkbox"/> 38HE7 5 for 12.81

\*All Tubes Not Advertised, Write In at 75% off list. Sleeves Only, Singles at 72% off list.  
Special: 100—6GH8's, I.C.C. \$79.00.

## TRANSISTORS EQUIVALENT UP TO 90% OFF LIST

.35 each—Minimum 20 per number			
<input type="checkbox"/> SK	<input type="checkbox"/> ECG	<input type="checkbox"/> SK	<input type="checkbox"/> ECG
<input type="checkbox"/> 3018 108	<input type="checkbox"/> 3122 123A	<input type="checkbox"/> 3024 128	<input type="checkbox"/> 3124 123A
<input type="checkbox"/> 3025 129	<input type="checkbox"/> 3125 161	<input type="checkbox"/> 3114 159	<input type="checkbox"/> 3248 186A
<input type="checkbox"/> 3124 192			

Minimum 5 of a Number

<input type="checkbox"/> SK	<input type="checkbox"/> ECG	
<input type="checkbox"/> 3021 124		ea. 60¢
<input type="checkbox"/> 3027 130		ea. 90¢
<input type="checkbox"/> 3054 184		ea. 70¢
<input type="checkbox"/> 3103 157		ea. 60¢
<input type="checkbox"/> 3041 152		ea. 70¢
<input type="checkbox"/> 3079 162		ea. \$1.50
<input type="checkbox"/> 3115 165		ea. \$2.75
	1155	ea. \$2.50
	1058	ea. \$2.50
<input type="checkbox"/> 3197 235		ea. \$2.00
<input type="checkbox"/> 25C1307		ea. \$3.00
<input type="checkbox"/> 25C1306		ea. \$2.00
<input type="checkbox"/> 25D235		ea. 70¢

## IC'S EQUIVALENT TO ECG

\$1.00 each Minimum 5

<input type="checkbox"/> 708 709 710 712
<input type="checkbox"/> 713 714 715 716
<input type="checkbox"/> 722 723 725 731
<input type="checkbox"/> 740 743 748 780
<input type="checkbox"/> 783 788 790 791
<input type="checkbox"/> 793 912 923D

## YOKES

<input type="checkbox"/> Y-88	<input type="checkbox"/> Y130	<input type="checkbox"/> Y94	<input type="checkbox"/> Y105
<input type="checkbox"/> 95-2779			ea. \$5.75
<input type="checkbox"/> Y153	<input type="checkbox"/> Y162/Y132		
<input type="checkbox"/> DY 92C	<input type="checkbox"/> DY 99AC		ea. \$8.95

## DIODES, RECTIFIERS, EQUIVALENT

<input type="checkbox"/> 6500 PIV Color Focus Rect.	10 for \$4.95
<input type="checkbox"/> 2.5a 1000 PIV IR 170	100 for \$3.00
<input type="checkbox"/> B—Boost Rectifiers	20 for \$6.00
<input type="checkbox"/> Syl-Zen. Tripler	ea. \$6.50
<input type="checkbox"/> Admiral Tripler	ea. \$4.95

## AUDIO-CARTRIDGES-NEEDLES EQUIV.

<input type="checkbox"/> Astatic 133	ea. \$1.95
<input type="checkbox"/> Astatic 142	ea. \$1.45
<input type="checkbox"/> BSR SC7	ea. \$1.70
<input type="checkbox"/> BSR SC7M	ea. \$1.90
<input type="checkbox"/> Panasonic EPC 42	ea. \$2.00
<input type="checkbox"/> EV 26 \$1.50	<input type="checkbox"/> EV 5015
<input type="checkbox"/> Tetrad All Numbers	ea. \$1.95
<input type="checkbox"/> N44	<input type="checkbox"/> N75
<input type="checkbox"/> N3	<input type="checkbox"/> N91
	<input type="checkbox"/> V15
	ea. \$1.25

## CB HARDWARE and WIRE

<input type="checkbox"/> PL 258	10 for \$3.90
<input type="checkbox"/> 3 ft. RG 58U 2PL259	\$1.25
<input type="checkbox"/> 20 ft. RG 58U 2PL259	\$2.00
<input type="checkbox"/> 20 ft. RG 58U 1PL259 1 spade lug	\$1.70
<input type="checkbox"/> CB Lightning Arrestors	ea. \$9.95
<input type="checkbox"/> 50 ft. 59U Cable, Incl. F conn	\$1.79
<input type="checkbox"/> 100 ft. RG 59U Incl. F conn	\$3.49
<input type="checkbox"/> 500 ft. 59U Coax Mill Ends	\$15.00
<input type="checkbox"/> 50 ft. RG 8U	\$5.95
<input type="checkbox"/> 100 ft. RG 8U	\$10.95

## GENERAL

<input type="checkbox"/> 60 Min. Irish Cassette Tapes	24 for \$8.00
<input type="checkbox"/> \$300 Surprise Package	\$10.00
<input type="checkbox"/> 100 Asst. Caps	\$4.00
<input type="checkbox"/> 20 Asst. Belts	\$7.00
<input type="checkbox"/> 500 ft. Speaker Wire	\$5.00
<input type="checkbox"/> 300 ohm Signal Splitters	10 for \$5.90
<input type="checkbox"/> TV Lightning Arrestors	10 for \$5.00
<input type="checkbox"/> 25 ft. Telephone Headphone Ext.	5 for \$6.00
<input type="checkbox"/> 75-300 ohm Matching	
<input type="checkbox"/> Transformers	10 for \$4.40
<input type="checkbox"/> Deluxe Lock Mounts w/PL 259	\$2.95
<input type="checkbox"/> 5000 ft. Insulated 20 gauge copper wire	\$25.00
<input type="checkbox"/> Color C.R.T. Harness	10 for \$1.50
<input type="checkbox"/> 6 x 9 Grills	10 for \$4.90

WANTED: Electronic Merchandise.

WILL PAY CASH . . .

Letters of credit & all checks placed on deposit with Manufacturers Hanover Trust Bank, N.Y.C. Master Charge—Min. \$100—C.O.D.'s 50% Dep. Minimum Order \$75 FOB Brooklyn, N.Y.

Catalogs \$3 Refundable Upon Your Order.

SEND CHECK OR MONEY ORDER TO:

## Optima Electronics

P.O. BOX 372, RYDER ST. STA.

BROOKLYN, N.Y. 11234

Phone: (212) 439-7434

...for more details circle 131 on Reader Service Card

# TECHNICAL LITERATURE

**Servicing Tools for Repair & Installation** are covered in the latest tool kit catalog from Electronic Tool. Tools included cover the fields of the electronic, electro-mechanical and mechanical industries plus special sections for medical electronics, instrumentation and computer industries. Tools range from complex kits for sophisticated electronic equipment to simple kits for production lines. A test equipment section is also included. Free from *Electronic Tool Company*, Claremont Avenue, Thornwood, N.Y. 10594.

**Series U and Series F P.C. Board Power Transformers** are described in a new 4 page catalog from Inductive Components, Inc. Over 2500 Series U transformers are listed covering 115/230 volts and 50/60/500Hz inputs with 25 voltage outputs in four winding styles. Simplified charts enable the user to select and identify specific PC mount power transformers. More than 100 models are identified as off-the-shelf. The catalog also shows winding and interconnection configurations, mechanical dimensions, weights and recommended PC board layouts. Available free from Marketing Dept., *Inductive Components, Inc.*, 181 Bridge Road, Hauppauge, N.Y. 11787.

**Replacement Parts For TV Games** are listed in a new brochure from Workman. The literature describes crystals, chips, switches, controls, antenna junction boxes and AC adaptors needed for servicing of the new TV, or video games. The brochure, No. MS2422, is available free from *Workman Electronic Products, Inc.*, P.O. Box 3828, Sarasota, Florida 33578.

**Communication Filters For Noise** from ignition coils and points are covered in new literature from Cornell-Dubilier. The product sheet covers specifically the firm's new CBFT315D filter and details the problem of transceiver noise interference, the functioning of the filter, the filter ratings, and installation features for domestic and imported vehicles. Available free from Douglas Graham, *Cornell-Dubilier Electronics*, 150 Avenue 1, Newark, N.J. 07101.

**Customer Service** is the subject of a newsletter called Davis Database that is available for the asking. The pitfalls in traditional measures of customer service are analyzed in the latest issue. For example, the newsletter points out that a cross section of your

customer complaints is not a reliable measure of your degree of customer service performance. It is only a cross section of your more articulate and noisier customers. The newsletter is free from *Herbert W. Davis & Co.*, 120 Charlotte Place, Englewood Cliffs, N.J. 07632.

**Audible Signal Devices** used in various warning systems are covered by the latest brochure from the Mallory Capacitor Co. The literature describes the company's line of audible signalers, their capabilities and applications, as well as technical information on Audio, environmental and electrical specifications and case configurations for the solid-state signals. The 8-page Sonalert brochure is free from Charles Klasing, *Mallory Capacitor Co.*, P.O. Box 1284, Indianapolis, Ind. 46206.

**Transformers and Mountings** are described in the latest transformer catalog from Dormeyer Industries. A wide variety of channel frame and bracket mount open coil 120/30 VAC transformers; universal mount control transformers with 5,10,12,20,40 and 55 VA ratings, are covered in the new literature. Complete electrical data, load curves and mounting data is provided on these U/L and CSA listed or recognized transformers. In this catalog numbered TC-75-A, thorough information is furnished on the wide variety of mountings available, such as junction box knockouts, junction box plates, special drop-through or surface mounted plates and special plug-in or conduit mounts. The catalog is free from Dept. PR, *Dormeyer Industries, Inc.*, 3418 N. Milwaukee Ave., Chicago, Illinois 60641.

**Basic Facts About CB Power Mikes** are discussed in a new booklet from Telex Communications. For example, the booklet explains how a CB noise-cancelling mike keeps unwanted sound out. Other basic points covered in the 10-page booklet include "Why the Microphone is a Most Important Part of Your Transmitter," "Will a Power Mike Work With My 40 Channel Radio," and "The Special Advantages of a CB Power Mike Headset." The booklet is free from: *Telex Communications, Inc.*, 9600 Aldrich Ave. So., Minneapolis, MN. 55420.

**Communications Batteries** are covered in a new six-page catalog from JaBro Batteries. The new literature describes an expanded line of rechargeable and throw-away batteries the firm produces. Included are cross reference information, illustrations, voltages, capacities, dimensions and charging rates for batteries that fit all popular two-way communications

products. The catalog is free from *JaBro Batteries, Inc.*, Dept. 139, 140 No. LaGrange Rd., LaGrange, Ill., 60525.

A New Work-Holding Vise is described in a new brochure produced by Dremel Manufacturing. The product is called the "D-Vise"<sup>TM</sup>, and utilizes a full-tilt, full swivel-locking arrangement. Application photos in the brochure show how the D-Vise can be used in electronic circuit assembly and repair, camera repairing, sculpting, and scientific and musical instrument repair. Diagrams describe the ball swivel mount that permits a 180° tilt and 360° rotation. The brochure is free from *Dremel Manufacturing*, 4915 21st Street, Racine, Wisconsin 53406.

The Latest Heathkit Catalog is now available, listing nearly 400 electronic products in kit form, or fully assembled. Among the kit products are: personal computer systems, an audio signal processor for hi-fi systems, a digital electronic scale for the home, and new test equipment, including an FET multimeter and oscilloscope. Assembled products include: microcomputer-based electronic chess game, a videoscope recorder, and an electronic greenhouse. The catalog is free from *Heath Company*, Dept. 350-420, Benton Harbor, Michigan 49022.

High Fidelity Loudspeakers are covered in the latest catalog from Acoustic Research. The 14-page brochure defines the characteristics of accurate sound reproduction, and describes in detail the expanded AR speaker line. Charts, photos, and artists drawing enhance the text. Complete specifications, including DIN measurements, are provided for all seven of the firm's speakers. Also discussed in the catalog are: "What Is Truth?", Practical Considerations, AR Innovations, AR Drivers, Selecting Speakers, and AR Precision for Smaller Rooms. The catalog is free from *Acoustic Research*, 10 American Drive, Norwood, MA 02062.

An Engineering Manual and Purchasing Guide for 1978 is now available from Allied Electronics. The new guide covers a wide selection of industrial-type electronic parts, components, supplies and equipment. Included in the new catalog are wire and cable products, solid-state devices, test equipment, resistors, trimmers and potentiometers, transformers, solar energy products, CB test equipment, and a micro-computer system. The new catalog is available for \$1.00 from *Allied Electronics*, Dept. C-78, 401 East 8th Street, Fort Worth, Texas 76102. ■

# You can be sure

more times in more circuits in more places than with any other multimeters on the market today

Each Sencore DVM is backed with 15 Megohm input impedance for one third less circuit loading on every measurement. That means 50% higher accuracy than other DVMs.

**DVM38 \$348**  
3½ DIGIT .1% DCV ACCURACY  
AUTO-RANGING DVM

A "prime" standard at your fingertips for measurements you can trust. Auto-ranging for extended low-level range and ease of operation. 15 Megohm input impedance assures .1% reading accuracy is maintained in solid state circuits. Highly sensitive, yet fully protected to 2000 VDC overloads. Hi-Lo Power Ohms circuit simplifies in-circuit resistance measurements.

**DVM37 New \$248**  
3½ DIGIT .1% DCV ACCURACY  
PORTABLE DVM

Prime standard .1% accuracy on the bench or in the field for less than \$250. The DVM37 is the most accurate portable DVM you can buy, with 15 Megohm input impedance for 50% more accuracy. Includes automatic features—Auto Zero, Polarity, Decimal, Overrange. Fully protected inside to over 2000V on all functions, including Ohms, and protected outside with super-rugged case. Full ranges for every test. Fingertip "Push-On" switch in probe saves batteries as power is applied only when needed.

**DVM32 \$198**  
3½ DIGIT .5% DCV ACCURACY  
PORTABLE DIGITAL MULTIMETER

Bench and field master for digital accuracy measurements anywhere. 0.5% DCV accuracy, backed with 15 Megohm input impedance. Exclusive battery-saving Auto-Display turns the display on automatically when you make a measurement. 2000V input protection on all functions and ranges—including Ohms.

**DVM36 \$158**  
3½ DIGIT .5% DCV ACCURACY  
POCKET PORTABLE DVM

Pocket portable lab accurate performance that fits every budget with highest performance-to-price benefits of any meter. .5% DCV accuracy, backed with 15 Megohm input impedance for lowest circuit loading. Full protection to 1000 V on all functions and ranges—including ohms. Drop-proof case. Battery-saving "Push On" button in probe.

**DVM35 \$134**  
3 DIGIT 1% DCV ACCURACY  
POCKET PORTABLE DVM

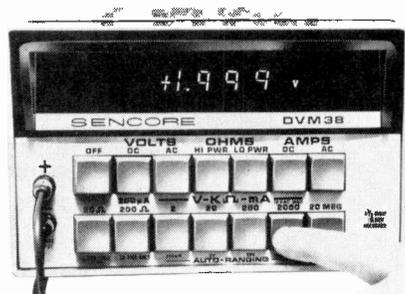
Fast, direct reading digital accuracy for the man on the go. Same features as DVM36, except 3-digit, 1% DCV accuracy, backed by 15 Megohm input impedance that is ten times more accurate than analog meters.



New **DVM37**



**DVM32**



**DVM38**

BACKED BY SENCORE'S  
100% MADE  
RIGHT  
LIFETIME GUARANTEE



**DVM36**

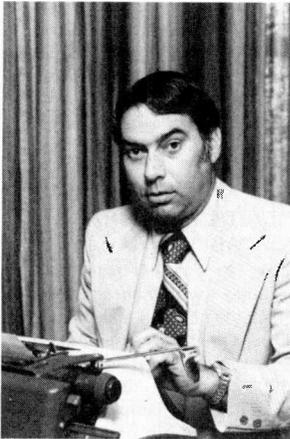
In stock at your favorite local  
Sencore Full Line Distributor.

...for more details circle 129 on Reader Service Card

**SENCORE**  
DIGITAL MULTIMETER SPECIALISTS  
3200 Sencore Dr., Sioux Falls, SD 57107 (605) 339-0100

## FROM THE EDITOR'S DESK

### Looking ahead



Last month I was privileged to spend a few days visiting the meetings of the two national organizations whose members represent many of the owners and technicians who work in the home entertainment electronics service industry. These organizations, as you know, are the National Association of TV and Electronic Servicers of America and the National Electronic Service Dealers Association.

While these organizations represent only a percentage of the total number of home electronic servicemen and shops in America, the forums they provide always serve as a focal point where all parties which carry an interest in the electronic service industry can meet to exchange views, information and ideas.

Such was the case this year with NESDA at Orlando, Fla., and NATESA in Itasca, Ill. Throughout these meetings there was an underlying theme which ran through virtually all of the sessions I was able to attend.

That theme was *CHANGE*. All agreed the nature of the home electronics service industry today is one of fast and continuing technological change.

I think it is accurate to say that the most important "feeling" to emerge from this year's meetings was the assessment of what the home entertainment electronics service industry will be in the 1980s. It is the subject of our special report this month and begins on page 18.

Personally I feel there will be a strong service industry throughout the 1980s. I believe it will continue to play a significant role, but I believe that now is the time for each and every technician, shop manager or owner to begin to assess his or her individual needs as a preliminary step in preparing for the new technologies and products that will be a significant part of home entertainment electronics in the 1980s.

I would like also to point out that with this issue of ET/D we are adding two new departments which will help keep you—our readers—better informed from both the technical side as well through the quicker reporting of general news.

The first department—called Service Seminar—actually is the reinstatement of a department we have carried off and on in the past under a different name, *Technical Digest*. It was brought back at your request and—as you know—is a collection of troubleshooting tips provided by manufacturers and based on their own experience with various models.

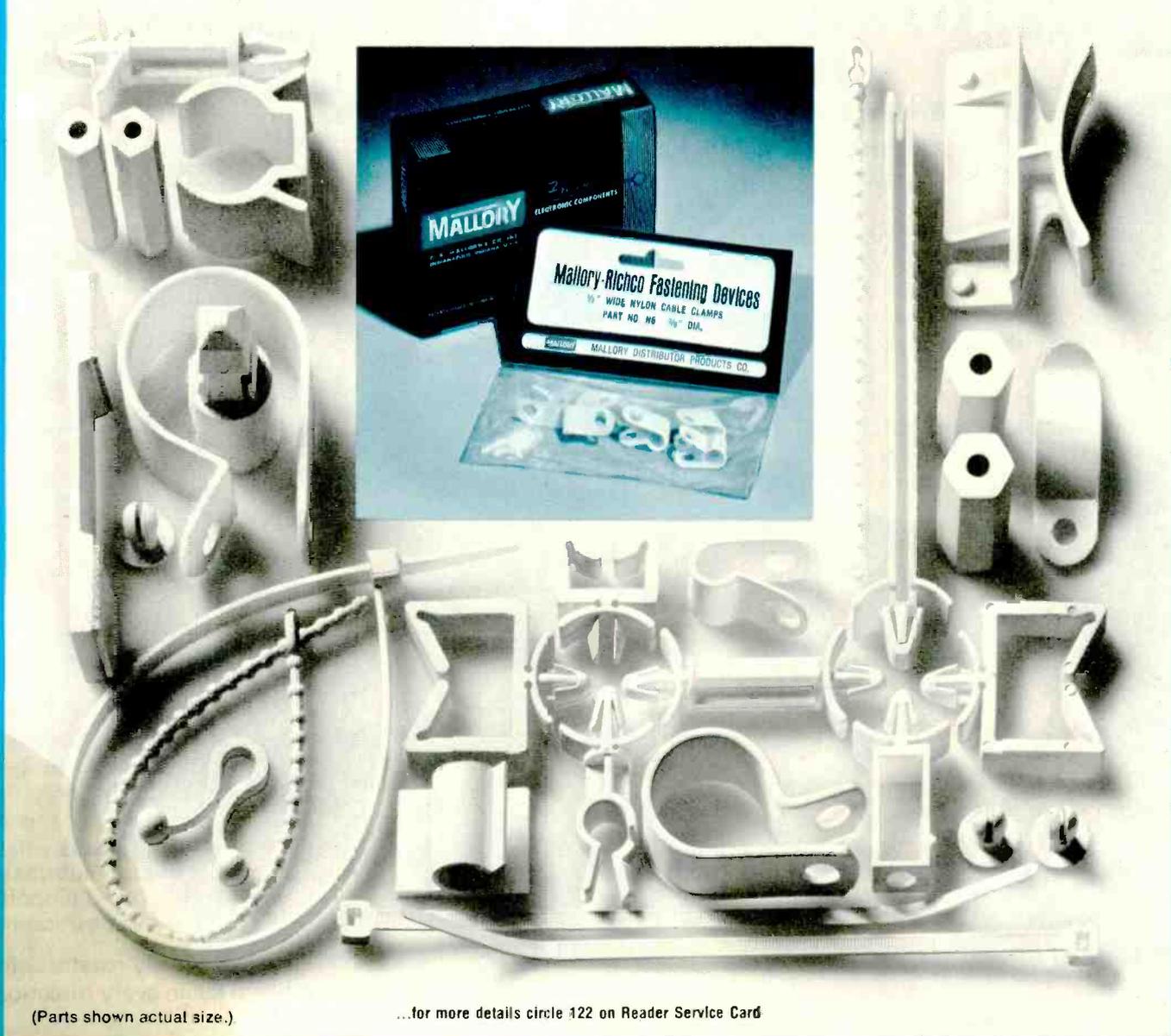
The second department, NewsLine, is a page devoted to late breaking news stories at deadline and is a complimentary page to our usual News of the Industry feature which we will continue to carry.

Sincerely

Richard M. Lay

# Get your fastening act together with Mallory-Richco.

Clamps, clips, wire saddles, spacers, cable hangers, circuit board supports, guides and dozens of other accessories. Your Mallory distributor has them. Packaged the way you want them. See him soon. Or contact Mallory Distributor Products Company, a division of P. R. Mallory & Co. Inc., Box 1284, Indianapolis, Indiana 46206. (317) 856-3731.



# MALLORY

Capacitors • Controls • Fastening Devices • Resistors • Security Products • Semiconductors • Solderless Terminals • Sonalert® Signals • Switches

# BEAM MASTER™

## ...geared for performance

Channel Master's Heavy-Duty Rotator. Specifically designed for CB Beams and large TV Antenna Arrays.

Only Beam Master has 100% machined, tool-steel gears....gears that provide plenty of torque to rotate some of the largest CB beam antennas and TV antenna arrays. With Beam Master you get one of the strongest rotator drive-trains ever designed and a built-in thrust bearing that can handle up to 250 lbs. That means dependable, all-season rotator performance....even under the heaviest of ice-load conditions.



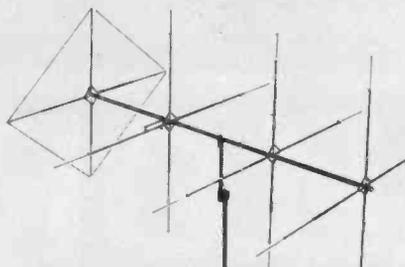
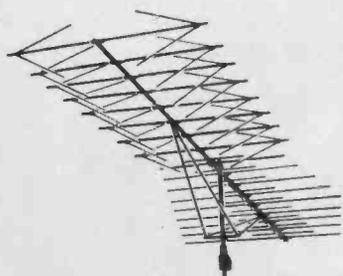
Beam Master's solid, reinforced construction and weatherproof housing design will provide years of maintenance-free performance. Its handsomely designed control console offers smooth automatic operation and pinpoint antenna positioning!

Best value around in a heavy duty rotator

# \$89<sup>95</sup>

Suggested Retail

Beam Master heavy duty rotator....for the best in reception in every direction.



## Channel Master

Division of Avnet, Inc.  
ET/D1077, Ellenville, N.Y. 12428

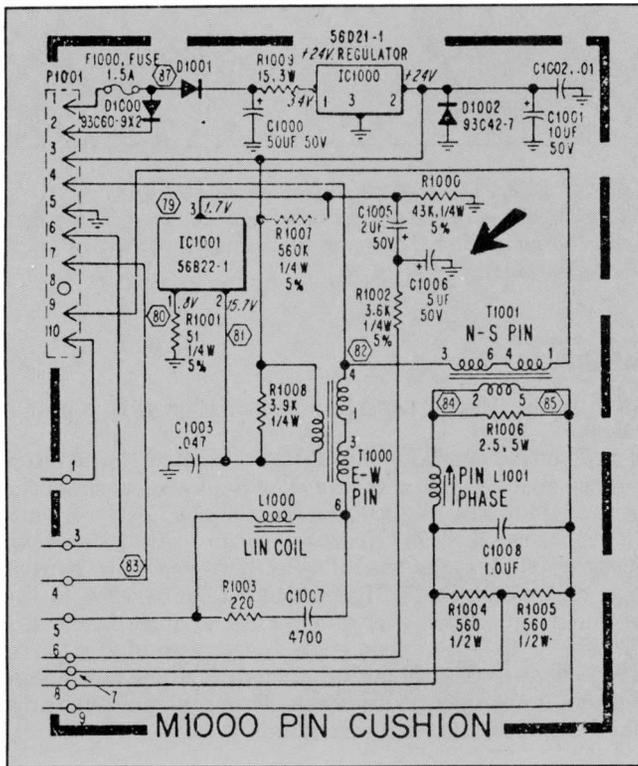
# SERVICE SEMINAR

The material used in this section is selected from information supplied through the cooperation of the respective manufacturers or their agencies.

## ADMIRAL

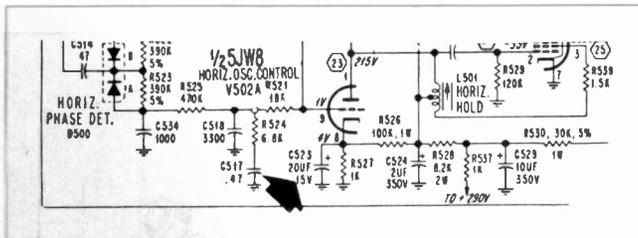
### Color TV Chassis M10—No side pincushion correction & raster pulled in at sides

The possible cause of this symptom is a defective electrolytic capacitor (C1006, 5mfd, 50V), that is mounted on the pincushion board. Replace with Admiral part number 67A200-479-7 (4.7mfd, 50V).



### Color TV Chassis 3K19—Horizontal frequency drift

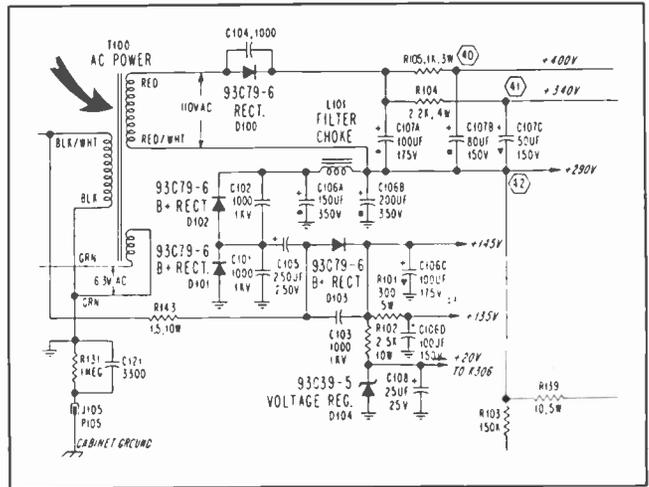
The possible cause of this drift is a defective electrolytic capacitor, C523 (20mfd, 15V). Replace with Admiral part no. 67A4-71.



### Color TV Chassis 3K19—Weak video, vertical retrace lines & very little or no control of brightness.

The possible cause of this condition is an open secondary winding on the T100 power transformer (110VAC winding for 400V B+ supply.)

(Editors Note: In response to numerous requests from our readers, we are pleased to bring back with this issue the department known previously as Technical Digest, but now renamed "Service Seminar." Your comments on the type and range of service tips to be covered in future issues will be appreciated.)



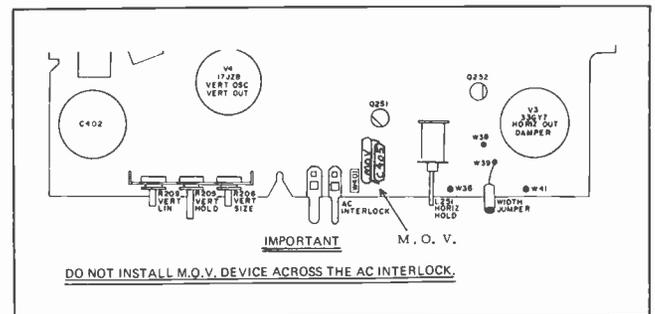
In this condition, the 400V B+ supply will be low, and you'll find the following supply voltages: 400V will measure 310V (low); 340V will measure 300V (low); and 290V will measure correct at 290V. The reduced B+ voltage to the plate (pin 2) of the 11CH11 video amplifier tube upsets the picture tube cathode bias. And the open winding may also cause failure of the C107 electrolytic capacitor. To correct, replace the power transformer with Admiral part number 80A116-3.

## GENERAL ELECTRIC

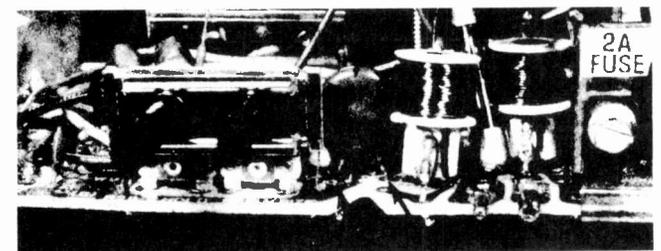
### B&W Chassis SF and XB—Failures due to lightning

Due to high line transients in certain areas of the country, usually caused by frequent lightning storms, it may be desirable to protect the power supply from a repetitive failure by installing a BE 750 M.O.V. device.

In the SF chassis, the M.O.V. may be installed across C405 (diagram below) by carefully wrapping and soldering the leads around the legs of 405. Dress the M.O.V. close to the capacitor on top of the circuit board. But do not install M.O.V. across the AC interlock.



In the XB Chassis, the M.O.V. may be installed from the switch side of L403 to ground. Physically, this is an unused hole marked C404 (toward the front of the set) and in the ground side griplet hole of C210. (see diagram below).



INSTALL HERE



occurs, remove the microphone from its mounting cup and make the following checks:

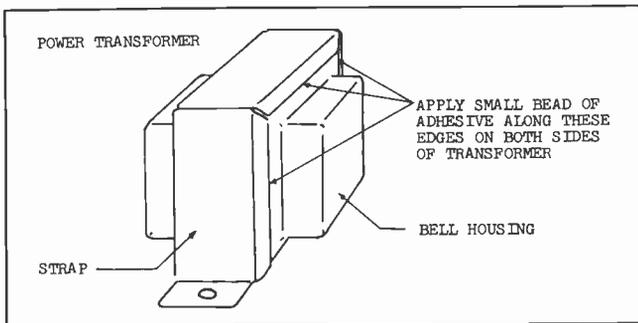
- Check that the microphone seal ring is installed in the cup ahead of the microphone.
- Check that the metal microphone housing not covered by the rubber boot is insulated with electrical tape to prevent possible contact with the cup.
- Place the microphone squarely into the cup.
- Install the Z bracket so the ears capture the sides of the boot and the cable connector is centered in the bracket opening.

If these checks do not correct the low sensitivity problem, replace the Remote Receiver assembly.

## ZENITH

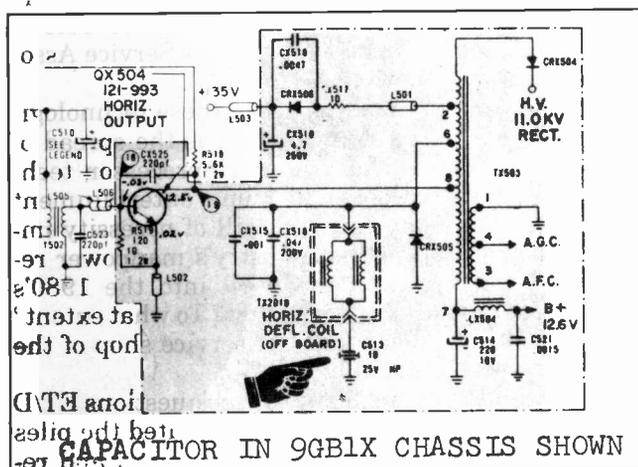
### Digital Clock Radio, Model H472W—Audible hum and vibration

The power transformer bell housings on certain early production H472W digital clock radios may vibrate and produce an audible hum. At very low volume levels, this may be noticeable to some people. If a repair is desired, apply a small bead of a good adhesive such as epoxy between adjoining edges of the bell housings and transformer strap as indicated by arrows in diagram below. Allow the adhesive time to cure thoroughly before plugging in the receiver for operation.



### B & W TV—Replacement capacitor in horizontal yoke circuit

Special nonpolarized capacitors are used in series with the horizontal yoke coil of all Zenith 9 and 12-inch all-solid-state B & W TV. These capacitors are specially designed for high current application in this circuit. If they fail, be sure to replace them with the identical part available only from Zenith. Other replacement parts which seem to have similar characteristics (and even higher voltage ratings) will fail. ■



## The GE Bottoms Up Program will end November 30, 1977.

**Time is running out.**

Get busy before your chance for some pretty fabulous awards is gone.

Mail orders and flaps to:  
**General Electric Award HQ**  
 3003 E. Kemper Road  
 Cincinnati, Ohio 45266

TUBE PRODUCTS DEPARTMENT  
 GENERAL ELECTRIC COMPANY  
 OWENSBORO, KENTUCKY 42301

GENERAL  ELECTRIC



Third generation video games make their way to the marketplace. Here RCA's Studio II with the COSMAC microprocessor circuitry is explained to one interested convention goer.

## The Service Industry in the 1980s.

A capsule report of industry trends and developments that will ultimately effect what you will be seeing in your service shops in the 1980s and beyond. Plus some thoughts on how you can prepare yourself to meet the challenge.

By Richard W. Lay

■ The home entertainment electronics service industry is poised at the edge of the most significant technological changes since transistors, and before that, the advent of television itself some 30 years ago.

While this may not have been expressed in so many words, it is the clear consensus ET/D was able to draw from four days of discussions, meetings, and personal talks with representatives of manufacturers, distributors and service dealers during the recently completed national conventions of the National Electronic Service

Dealers Association (NESDA) and the National Alliance of Television and Electronics Service Associations (NATESA).

The impact of these technological changes, that is the spread of digital and microprocessor technologies to home entertainment applications, will of necessity impact the industry's manpower requirements well into the 1980's and beyond. How? To what extent? What will the service shop of the future be like?

To answer these questions ET/D examined and evaluated the piles of notes, taped seminars, and re-



Unveiled publicly for the first time during NESDA's convention in Orlando, Fla., was RCA's new Matsushita produced home video tape recorder—one of three non-compatible makes consumers will find on the market this Fall. The unit, retailing around \$1,000, is capable of two or four hour recordings.

called numerous conversations.

In a nutshell: Here are some basic conclusions.

Many important factors are at work shaping the future of the home entertainment service industry. The immediate impact of these factors, that is through 1980, will probably result in total manpower requirements that are commensurate with today's. But, product servicing mixes will most likely change during the interim, with less reliance on television and more on new home entertainment products, many, perhaps just at the planning stage now.

Right now there is a shortage of really qualified "top drawer" service technicians in home entertainment, and industry is the most fierce competitor for this type of individual. ET/D heard time and again during these two national conventions that virtually every service shop owner could use "more," high caliber technicians but couldn't find them.

The only way to combat this "flight" to industry is to upgrade salaries, benefits and general "status".

The age of specialization, in both products serviced and brands handled is here and will grow.

Because new technologies are altering and changing old and

trusted patterns of troubleshooting, more and more reliance is being placed on manufacturer's specific instructions when aligning or troubleshooting new products.

And, test and repair equipment of the future will be more exacting, more sophisticated, require more highly skilled personnel, and definitely will cost more. You'll also need more of it and will be required to upgrade regularly to keep abreast of new innovations.

---

**"To get the technician back into our industry we've got to siphon them back from where they went. We've got to give them a good future."**

---

Regarding the future of television service requirements specifically, most people we talked to feel the manpower needs are about the same today as they were back in the days when all sets were electron tube powered. The reason? While tube sets gave out more often, there are a significantly

greater number of sets around today.

As to the future beyond 1980, we can only surmise, but it seems a strong possibility that as manufacturers build more and more reliability into television sets, especially with MSI and LSI entering the picture, there will be less demand for service. We even heard one source suggest television—like the transistor radio—may become a throw-away item. We won't go that far, but the trend certainly is towards less and less service.

Here are some factors to consider about the future television servicing. The greater reliability and life going into televisions was made possible with the advent of solid state. Now you're seeing a trend towards all of the active components going onto chips. These steps in effect "lower" the price of a set in the sense a customer is getting longer service for the same—or about the same—price he paid for a previous set that broke down more often.

Another factor—rotary tuners. In the past these accounted for a large chunk of business, but these units are gradually going the route of extinction with electronic tuning rushing in the front door. How much service will electronic tuners require?

Picture tubes! With the five year warranty now a part of our environment, it's not uncommon for a tube to last the entire useful life of a set.

There can be little doubt that manufacturers are preparing for the future—and their emphasis is no longer devoted solely to the production of more and better television sets. Witness the thoughts of several key manufacturers.

W. E. (Dutch) Meyer, General Electric's National Service Manager: "The television service business is now phasing into a most critical, transitional period, a period in which the overall decline in available television repair work in the field is evident. This has resulted from the most dramatic improvement in receiver reliability."

J. W. Ritter, an official of GTE

Sylvania: "It looks like the video tape recorder is going to be the next big boom. And, what is in store for the television set in the home, the use of the receiver as a computer terminal where the housewife can plan her shopping list, where you can do the household banking, it all adds up to a very exciting industry in the future."

Jim Newbrough, RCA's Video Cassette Recorder Sales Manager: "With a Gallop Poll predicting a market of 5 million potential sales, 1.2 million of them by the end of 1978, this is the point in time for you to seriously consider whether there is a place for you in the video cassette field."

Ray Yeranko, National Service Manager, Magnavox: "Independent Service will continue to thrive for those who prepare for the future."

Amplifying his remarks, Meyer told a breakfast gathering during the meeting of NATESA in Itasca,

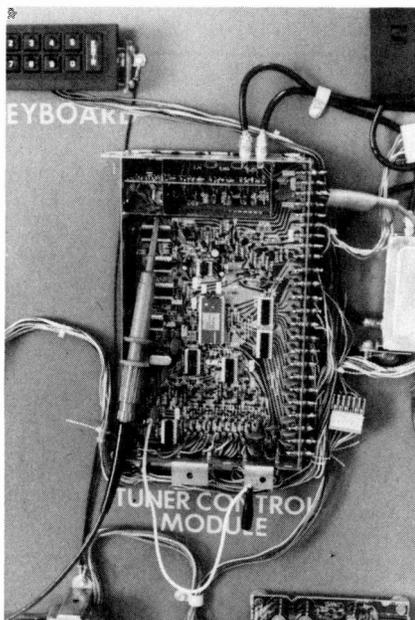
---

## **"The television service business is now phasing into a most critical, transitional period, a period in which the overall decline in available repair work in the field is evident."**

---

Ill., that GE is seeing their warranty calls "falling out at a tremendous rate. This symptom," he said, "presents a major challenge to all in the service business because it will be necessary to seek ways and means of maintaining the number of requests for service in order to maintain a viable business."

"We have to get out and see if we can develop other products in order to maintain our businesses and remember, there are a lot of products out there that are within the capability of the people here to service. You have the capability to tackle these additional products.



Typical of the race toward digital applications in home entertainment products is the tuner control module of GE's electronic tuning system. The heart of this module is a large scale N-channel MOS, IC—the technology of which approaches that of a microprocessor.

We at GE have found the most capable technicians are the television technicians."

According to Meyer, GE has verified this through their experience with their own service shops, "our television technicians make the best appliance technicians if they choose to expand into this area."

"Remember this," Meyer said, "the day of the hermit, the day of the lone wolf as a self sustaining business, is gone forever."

So what's ahead? How will the service shop of the future be organized? For answers, ET/D turned to the 250 industry representatives, manufacturers, service dealers, and distributors—who participated in NESDA's "National Service Conference". Here's what we heard.

For openers, the age of specialization is here. The "jack of all trades", the guy who fixed toasters as well as TV's, as well as stereo and tape decks, is gone, or almost gone, as a viable business entity.

If you now service TV and audio, you'll have your specialists in each area, as you probably already have. But this specialization will reach down not only to service categories (i.e. TV, CB, audio, etc.) but also into brand specialization among the technicians in a par-

ticular department.

If you're a smaller shop, you probably won't do TV *and* audio, but TV *or* audio. And most likely you'll be turning down less widely sold brands and sending them down the street to your "friends".

The reason? Cost, of course. High degrees of sophistication are being built into new home entertainment products, more is coming. The same is true of the test equipment you will need to service the chips, digital and analog.

We heard one estimate of an additional equipment investment of \$2,000 just to be able to service television by 1980 (based on the three man shop). If you're into audio you may need to put up another \$5,000 for your wow and flutter meters, dual trace scopes, audio analyzers, etc. And if you have designs on video tape units, you'll need the special test jigs, wide band triggered scope, and free counters just to get you started. This discussion did not even take into account the budding hobby market in mini-computer systems, and the necessary logic state analyzers that will be coming onto the market if this current "fad" develops into a significant home product.

And don't forget, one spokesman at the seminar pointed out, "Test equipment is not designed to last 20 or 25 years. We can't say that a piece of equipment on our shelves that is 10 to 15 years old—and working—is fine. Technologically speaking we know that equipment is outdated."

This specialization in the long run will enable the customer to get quicker service and allow the small shop owner who specializes to cut back on a mounting problem for all service shops—spare parts inventories. But, with the highly sophisticated test equipment we'll be seeing the service industry is going to "need guidance as to what pieces of test equipment are needed and which are luxuries," one conference participant pointed out.

Insofar as the individual technician of the future is concerned, there is no doubt he will have to be more highly skilled in the use of newer, more complicated test

equipment and he'll require a sound foundation in digital theory and practice. He'll need to produce fast and efficiently, and for this the really top tech will command an attractive salary.

Right now, ET/D was told, there is a shortage of the highly skilled

**“Independent service will continue to thrive for those who prepare for the future.”**

technician who is sharp enough, and fast enough to keep a service operation operating in the profit area. One conference participant, a service shop owner, told ET/D there is no oversupply of the high caliber tech who can complete a job every 30 to 45 minutes. “I’ve got two technicians in my shop who will go over \$22,000 (in earnings) each this year and I’m looking for more but I can’t find ’em,” he said.

The portrait of this highly skilled home entertainment tech, which emerged is that he has a minimum of eight years experience—two years either military or trade school training—and six years of on-the-job training in the field and on the bench.

Yet, in many cases, before the tech reaches this point, he’s lost in most cases to industry “the terrible competitor we have to fight”, conference participants were told.

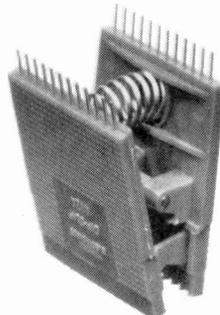
The answer to the technician shortage, in a word, is *money*. The prescription, as written by the conference participants, is to raise the technicians status. “We get a guy who has one or two years of training and what does he have to look forward to? He works in a television shop and sees his boss working 60 hours a week—he doesn’t want to have that for a future.

“We’ve got to increase our rates, give them fringe benefits, improve working conditions, give them schooling, even organized retirement programs... We’ve got to get the technician up to where he’s a pillar of the community instead of the guy who just sweeps the floors”, according to the conclusions of one conference group. ■

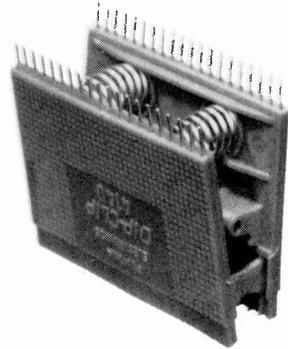
# MEET OUR family of dip clips



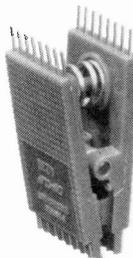
**Model 3916**  
14/16 Pin



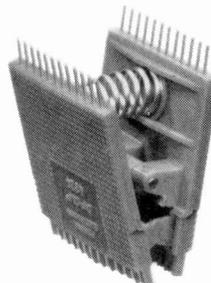
**Model 4124**  
24 Pin



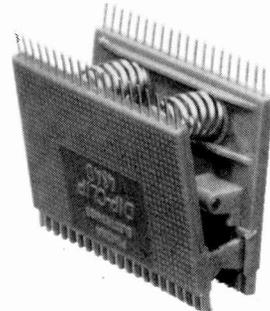
**Model 4140**  
40 Pin



**Model 4236**  
14/16 Pin  
For Ultra Dense  
Packaging



**Model 4324**  
24 Pin  
For Ultra Dense  
Packaging



**Model 4340**  
40 Pin  
For Ultra Dense  
Packaging

**Count on Pomona Electronics** to keep pace with the industry's trend toward higher density Dual In-Line packaging. We introduced the first Model 3916 in 1972. Now there are six improved models, including three designed for ultra dense packaging.

**DIP CLIPS** are designed for hands-free testing of integrated circuit packages. Lower contacts are .050 wide for improved surface contact with I.C. packages. Test contacts are .025 square, and are serrated for improved connection of test clips. Molded barrier between contacts minimizes accidental shorting. Can also be used as insertion and removal tool for DIPs.

**Available Through Your Favorite Electronic Parts Distributor**

## ITT POMONA ELECTRONICS

1500 East Ninth St., Pomona, Calif. 91766  
Telephone (714) 623-3463. TWX: 910-581-3822



...for more details circle 125 on Reader Service Card

OCTOBER 1977, ELECTRONIC TECHNICIAN/DEALER / 21

# Raster Problems In Solid State Color Chassis

The author pinpoints troublesome raster-damping problems, including special hints for servicing chassis with scan-derived low voltage supplies

By Paul Shih

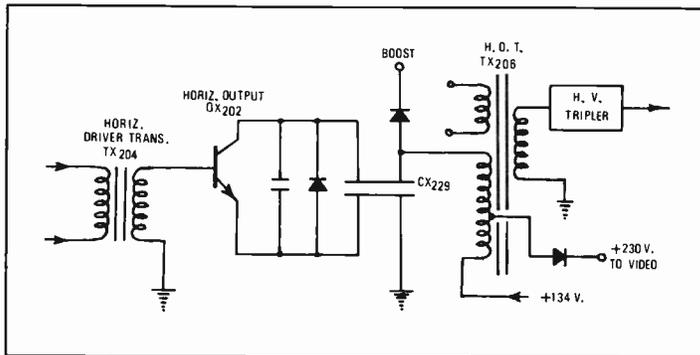


Fig. 1—A simplified diagram of the horizontal output section used in Zenith's chassis 17GC45 thru 25GC50.

zontal output section, such as a leaky or shorted transistor, open or shorted switching diodes or SCRs, or defective associated components can render the section inoperative.

## An Open or Shorted Circuit

An open circuit such as a cold solder joint, a cracked printed circuit board, or a wire being accidentally pulled loose from its connection, may lead to a complete loss of the horizontal output. In Zenith's "G" line chassis (Fig. 1.), for example, if there is an open mode failure in the horizontal output section, the four-lead capacitor (CX229) installed on the output transistor heat sink will disconnect the DC power source, thus stopping the circuit operation. An open circuit at a number of critical points in an SCR deflection system may render the whole horizontal output section inoperative (Fig. 2.) Some of the common locations where an open circuit may occur are terminals at the flyback transformer T403, a burned out resistor R405, the commutating coil L108 and transformer T401.

A short in the commutating coil L108 in the SCR horizontal deflection circuit will also prevent proper switching operation. The SCR under this condition may not unlatch. Instead, it will conduct continuously and heavily, resulting in not only a loss of raster due to lack of horizontal pulse output voltage, but also possible damages to the SCR or its associated components.

## Lack of Horizontal Sweep

An inoperative horizontal oscillator stage delivers no horizontal sweep voltage to the output section, and when this is the case, it is obvious that there will be no high voltage developed. There are many possible causes for a defective horizontal oscillator or multivibrator. Among the common ones are a defective transistor, an open connection and a low or missing DC supply voltage.

The interaction between the horizontal oscillator and its AFC stage should not be overlooked. A defective AFC stage may develop an improper correction voltage,

■ In a solid state color TV receiver, the rectangular area of light produced by the striking electron beams on the picture tube screen is called the scanning raster. When the video signal voltage is applied between the cathodes and the grids of the picture tube to modulate the electron beams, the picture is then produced on the raster. It is therefore understandable that a raster may or may not have a picture, and that without a raster, there will be no pictures.

Brightness of a raster depends on the intensity of the beam current, which in turn depends on the DC potentials on various electrodes of the CRT. By varying these potentials, particularly the grid-cathode potential, the beam current or the brightness of the raster will be changed.

With no video or noise input, a properly adjusted tri-color TV receiver should be able to produce a light bluish-white raster. If one or two of the three electron beams are extinguished, the raster would be either in one of the three primary colors (red, green, blue) or in one of their complementary colors (cyan,

magenta, yellow.) A complete loss of raster implies either cut off of all three beams or none of the beams striking the screen. The center theme of this article is to deal with the cause and cure for the loss of raster.

## Loss of Raster with Sound Present

The causes for a complete loss of raster with sound present are:

- (1) low or missing high voltage or focusing voltage,
- (2) incorrect CRT bias and screen grid potentials,
- (3) defective CRT filament circuit, and
- (4) defective CRT.

A large percentage of troubles associated with the loss of raster is due to the loss of high voltage or incorrect CRT bias. With missing or very low high voltage, none of the electron beams can be accelerated to the CRT screen. Quite a few defects in the horizontal sweep and output section may result in a loss of high voltage. A defective high voltage multiplier or its associated components can decrease the high voltage or eliminate it completely. A failure in the hori-

which sometimes can make the oscillator fail to function. If after the antenna is disconnected from the receiver or the channel selector is switched to a blank channel, the raster is restored, it is an indication of a possible AFC defect. However, care should be exercised to distinguish the AFC defect from an AGC defect, which can also produce a similar symptom due to an overloading on channel.

### Incorrect Focusing Voltage

Another common cause for a dark screen, which is sometimes overlooked, is a loss of focusing voltage. Without the focusing potential, the electron beams coming out of grid G<sub>2</sub> would begin to diverge before they hit the screen properly. With the presence of correct high voltage, a low or missing focusing voltage may be caused by an open inside the high voltage multiplier, a defective focus control and its associated resistor assembly, or an open circuit along the wiring from the multiplier to the focus plug connector. Loss of focusing voltage on the CRT base pin is sometimes caused by a poor contact between the CRT socket and the base pin. A light greenish powdery substance may have formed around the base pin. The substance has a high resistance, and it may insulate the pin from the socket.

### Incorrect CRT Bias

Incorrect CRT bias may occur in two forms. One is caused by too much negative bias from the G<sub>1</sub> grid to the cathode (same as too much positive from the cathode to the grid), and the other is that of too little or missing bias. Too much bias results in cutting off the electron beams, whereas little or no bias allows the CRT to conduct heavily, loading down the high voltage section.

The incorrect CRT bias is usually caused by a defect in the video or CRT circuit. This is because the video output stages are coupled to the cathodes of the CRT, and a failure anywhere in the whole video system may be very well reflected to the CRT bias circuit through the inter-stage direct coupling. The location of the fail-

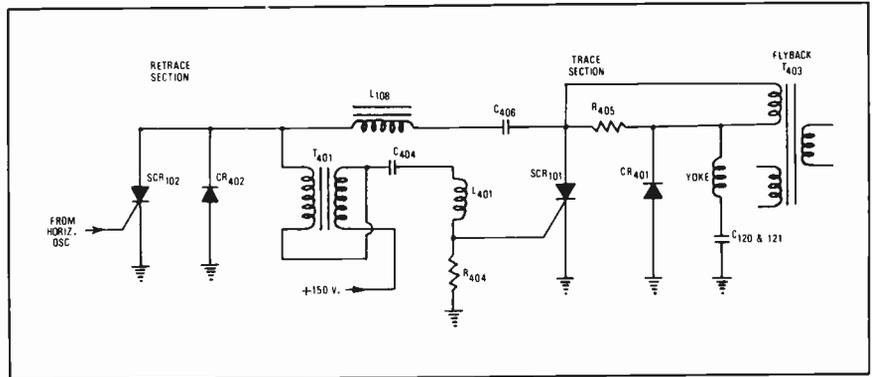


Fig. 2—A simplified diagram of the SCR deflection circuit used in RCA's CTC58 chassis.

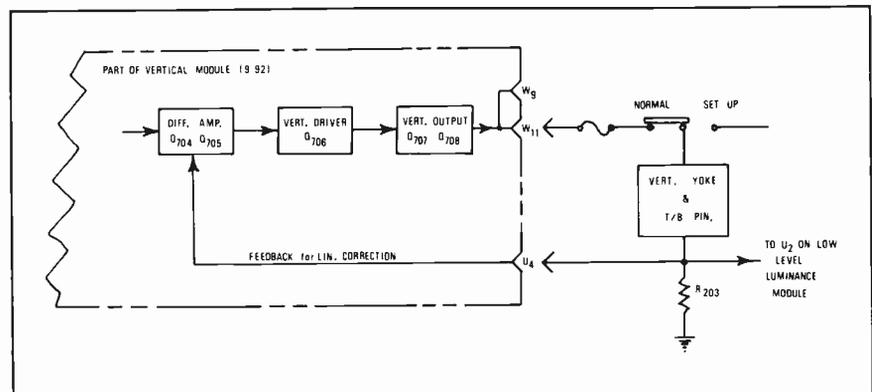


Fig. 3—A simplified block diagram of the vertical output section used in Zenith's chassis 25GC50.

ure may be right in the CRT cathode circuit, such as an open B+ line or an open peaking coil, or may be as far back as in the front of the video section, such as in the video detector stage. If the defect results in heavy conduction in the disordered stage, the trouble may be amplified stage after stage right up to the video output and the CRT circuits. The collector voltages of the video output transistors under this saturation condition would be very low, and so would the CRT cathode voltages, causing a loss of raster or raster blooming. On the other hand, if the defect induces low conduction or cutoff of the video output transistors, the collector voltages would be high, biasing the CRT cathodes beyond cutoff.

Two unique circuits, one for blanking and the other for beam current limiting, are generally located somewhere in the low level luminance and the video driver sections. Both circuits have a direct bearing upon the DC bias condition in the video system. Failure in these circuits, such as a defective transistor, a shorted blanking

diode or a defective brightness limiter control, may change the bias condition in the video system drastically to the point that the raster is blanked out.

### Incorrect G<sub>1</sub> or G<sub>2</sub> Potentials

The grids G<sub>1</sub> of the CRT are normally at the ac ground. If the grid resistor used for the DC bias reference is open from the ground, the normal bias between the grid and the cathode is lost. The condition may lead to the loss of raster because of beam current saturation.

The screen grid voltages on the CRT also affect the conduction level of the electron beams. With very low or missing positive potentials, the CRT beams may be cut off. The common cause for this trouble is either a defective master screen control or an open DC potential to the screens. In a circuit that uses boost source for the G<sub>2</sub> potentials, a defect in the boost system would certainly affect the CRT operation.

In contrast to cutoff, if the screen voltages rise too high because of a defect existing in the DC

voltage feeding circuit, the brightness of the raster may be too high. In fact you may be unable to dim it. In other cases, the bright raster, after the set is turned on, may immediately begin to load down the high voltage circuit, resulting in blooming and fading of the raster.

### Loss of CRT Filament Voltage

Disappearance of the CRT filament voltage is an obvious cause for the loss of raster. Poor CRT socket contacts, filament voltage dressing wires accidentally pulled loose, or an open CRT heater voltage winding on the transformer are some of the common causes. In a scan-derived CRT heater supply system, a loss of horizontal sweep causes the loss of CRT filament voltage. Of course the high voltage and possibly the sound under this condition would also go out.

### Defective CRT

A defective CRT may account for the loss of raster. A short or open in the CRT gun structure is likely to curtail the raster producing capacity of the CRT. An open between the anode connector on the side of the picture tube cone and the inside conductive coating may prevent the high voltage from reaching the ultor to accelerate the electron beams.

A dim raster is sometimes mistakenly interpreted as a loss of raster. The CRT cathodes with very low emission may not emit enough electrons to produce a recognizable raster. However, this type of defect is mostly associated with an old or worn out CRT.

### Vertical Section Affecting the Raster

There is one fail-safe feature found in the vertical section of Zenith's E line and subsequent chassis which affects the raster producing capacity. In these chassis (Fig. 3), if the vertical sweep is lost, the sample of the sweep voltage normally developed across R<sub>203</sub> will also be lost. The loss of this sweep voltage across R<sub>203</sub> and to terminal U<sub>2</sub> on the low level luminance module results in shutting down the luminance stage and the subsequent video section. The CRT cathode voltages under

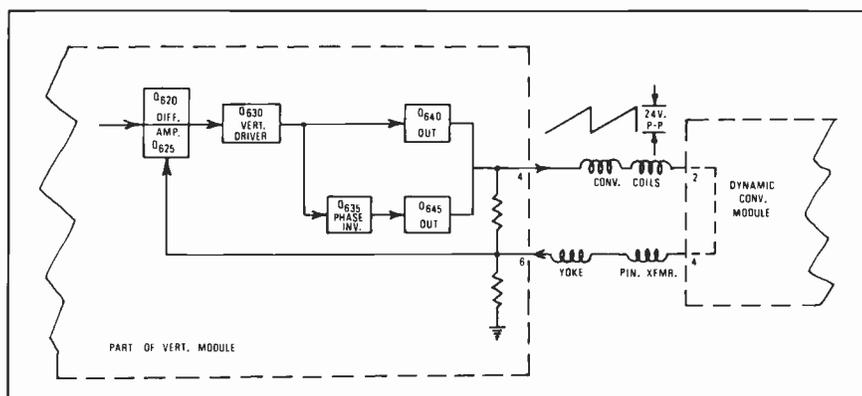


Fig. 4—A partial block diagram of the vertical module used in General Electric's Y-series chassis.

this condition rise about 50 volts, enough to blank out the raster.

Certain failures in the vertical differential amplifier and output stages in the General Electric Y-series chassis can result in the raster being deflected entirely off the CRT screen. There will be a reflected "glow" on the face of the picture tube. If the glow is very faint or not visible at all, then the condition can be easily interpreted as a loss of raster.

### Troubleshooting Loss of Raster with Sound Present

Troubleshooting a loss of raster is generally a straight-forward process, provided that the preliminary diagnosis steps are correctly performed. The first step is to make sure the brightness control or any related controls are in proper setting. Take a look at the base of CRT and be certain that the CRT filament is lit. If it is not, monitor the filament voltage. If the filament voltage is present but the filament fails to light, check the continuity of the filament and the CRT socket pin contacts.

### Checking the High Voltage

No raster with the filament lit would call for measuring the high voltage at the second anode of the picture tube. If it reads low or at zero, remove the high voltage lead from the anode connector and re-measure the voltage at the lead. A return of a proper high voltage is an indication of having either a CRT bias problem or a defective CRT. One way that can be used quickly in some sets to verify the presence of the high voltage and a good CRT is to flip the service

switch to the Service or Set-Up position. If it is possible to get three bright horizontal lines by either turning up or turning down the screen controls or the kine bias control, the high voltage supply and the CRT are probably okay. While still at the high voltage circuit, check the focusing voltage at the CRT base. If it is missing or reads low, check the focus control, resistor network and also inspect the contact condition of the CRT socket pin or the focus plug connector.

When a very low or zero reading at the high voltage end is noticed with the CRT base socket pulled out or the second anode high voltage lead disconnected, the problem is probably in the horizontal sweep system or in the high voltage multiplier circuit. To isolate one from the other, bring a small neon lamp close to the horizontal flyback transformer or near the input lead to the multiplier. If the lamp glows, the horizontal flyback system is functioning. Attention should now be directed to the high voltage multiplier, and chances are that the multiplier is defective. A short inside the high voltage multiplier sometimes can be detected by allowing the receiver to operate for a few minutes and then feeling for hot spots on the multiplier case right after turning off the receiver.

### Checking the Horizontal Section

If there is an indication that the horizontal sweep system is not working properly, measure the DC supply to the various stages and also observe the sweep waveform around the horizontal oscillator and the input circuit to the hori-

zontal output stage. After the trouble is narrowed down to a particular stage, a measurement of resistance around the stage should reveal the defective component.

One popular troubleshooting method, particularly during home service, is to replace the suspected modules, one at a time, until the trouble is cleared up. The defective module is then sent to the factory for service or is repaired in the shop.

### Troubleshooting an SCR Deflection System

The troubleshooting methods for a loss of raster due to a defect in an SCR deflection system are similar to some of those used for the conventional circuit. Waveform observation is very useful during a preliminary test because it allows for a quick isolation of the trouble to a particular stage or even to a particular component. For example, if the correct DC supply is detected at the anode of SCR102 (see Fig. 2), but no sweep waveform is

observed at the anode of SCR102, it is most likely that the horizontal sweep from the oscillator is not reaching the gate of SCR102, or that SCR102 is defective. To test for defects in the retrace SCR102, scope the waveform at the gate. If a strong waveform is present at the gate, but no proper negative DC voltage is noticed there, the gate of the SCR is probably open. With the waveform at the gate but none at the anode, it is an indication of an open anode. If there is no waveform observed at the gate, it is likely that the horizontal oscillator is not functioning or that there is a short from gate to cathode. In contrast to a high resistance measured from anode to cathode, the normal resistance from the gate to the cathode is low. However, a near zero resistance measured from the gate to the chassis ground is a proof of a shorted gate.

### Checking the Vertical Section

As was pointed out previously, a

defective vertical section in a number of chassis may result in a loss of raster. It is therefore a good practice to check for proper operation of the vertical section during the preliminary testing for the loss of raster in this type of chassis.

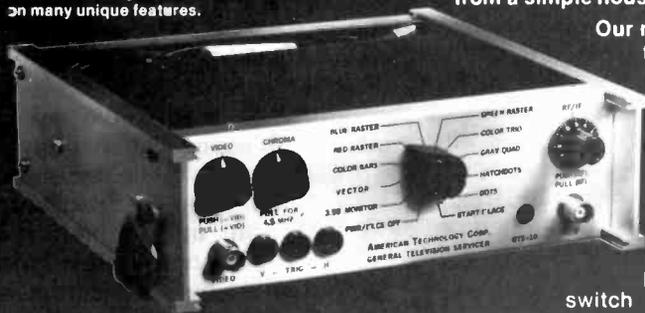
As was also described earlier, failure in the vertical section in the General Electric Y-series chassis may cause a dark screen. A key measurement as suggested by the manufacturer when troubleshooting this type of failure is to measure the DC voltage on pin 4 of the vertical module (Fig. 4), or at pin 2 of the convergence assembly. Under normal conditions, the DC voltage should read within  $0 \pm 2$  volts. Any voltage reading that is outside these limits indicates that the raster has been deflected off the screen.

### Troubleshooting Incorrect CRT Element Voltages

There are times that when the high voltage and the focusing voltage stay up, the CRT filament

# Introducing... GTS-10 our new model of General Television Servicer

Patents Pending  
on many unique features.



American Technology's model ATC-10, the original General Television Servicer, has earned its reputation for a wide range of useful functions, dependable performance and profit making potential in every imaginable job situation from a simple house call to the toughest dog.

Our new model, the GTS-10, carries on this tradition with added features like 4.5 MHz Sound Carrier . . . Blue Raster . . . Green Raster . . . Color Trio. Advanced yet sensibly priced at \$349.00 the GTS-10 is the ultimate instrument on the TV service equipment market.

Other of GTS-10 features and facts: 3.58 Monitor pattern for oscillator frequency checks with no need to short the AFPC test point — Unique Vector pattern — Color Bars (6th bar marker) — Gray Quad pattern for simplified gray scale tracking checks and adjustments — Red Raster pattern for checking and adjusting purity at the flip of a switch — Hatchdots — versatile composite pattern for static & dynamic convergence — Crystal-controlled RF — Wide range RF/IF attenuator — Video and IF outputs for signal injection — Interlace — and more.

Write for comprehensive 6 page full color brochure that describes these and many more features.

Telephone orders on VISA and MASTER CHARGE accepted for same day shipment.

2 year factory warranty against all failures in normal use.

30 day money back guarantee.

**ATC**  
AMERICAN TECHNOLOGY CORPORATION

225 Main Street, Dept. 10B, Canon City, Colorado 81212, (303) 275-8991

...for more details circle 105 on Reader Service Card

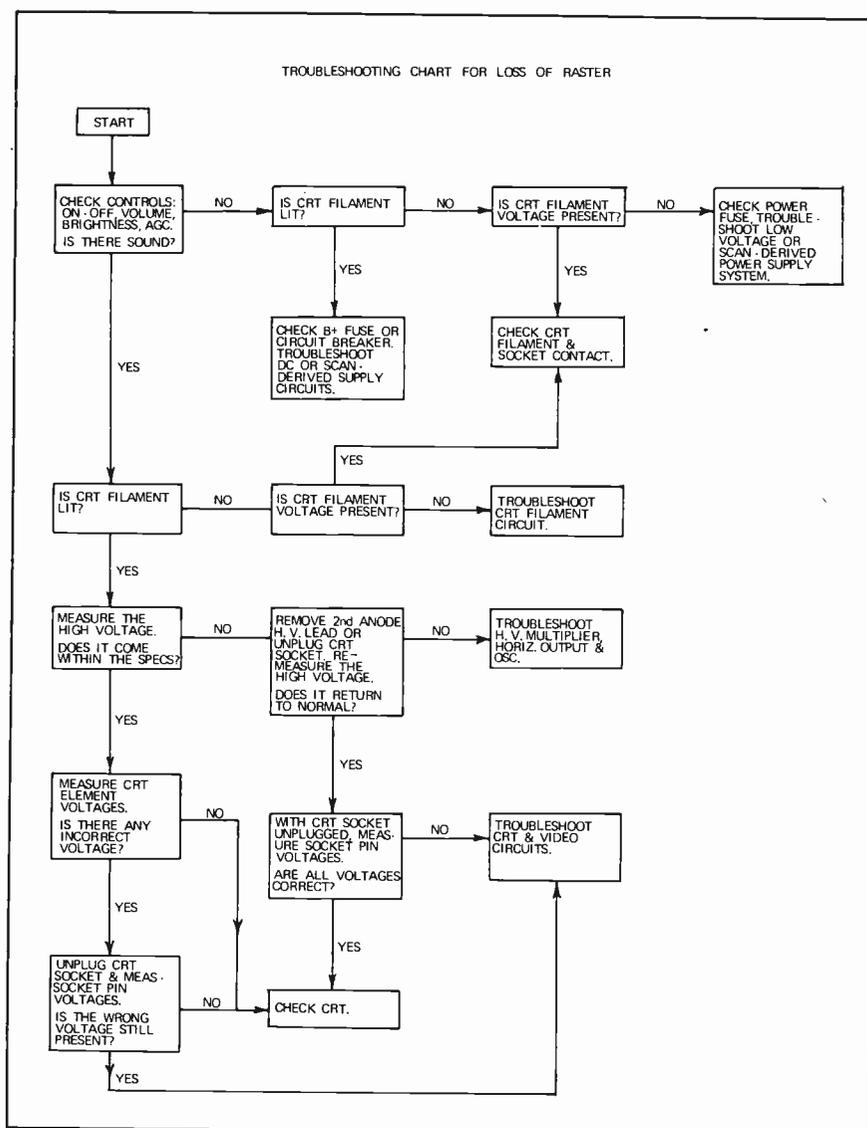


Fig. 5—A troubleshooting chart for loss of raster.

is lit, but the raster is still out. Checking the CRT base element voltages should be the next logical step. These voltages should be checked with the socket on and off of the CRT base. If the measured voltages are incorrect with the socket on the CRT base but return to normal with the socket removed, the defect is in the CRT. However, if the wrong element voltages are noticed with the CRT socket out of the base, the trouble is probably in the circuit associated with these CRT elements. Measure the DC supply to the CRT circuit and also perform resistance measurements in the suspected part of the circuit. Do not overlook spark gaps and the resistors inside the CRT socket. Shorted spark gaps or open resistors are known

to have caused a loss of raster.

To troubleshoot the problem with incorrect CRT cathode voltages, it is best to start at the video output stage and work back toward the input, such as the video driver, blanking circuit, and low level luminance stages until a normal DC voltage reading is found. Stop there and do more checking. At this time, the associated module may be replaced for testing, or part of the suspected circuit may be opened up to break shunt resistance paths for measuring resistances or testing a transistor. While the DC voltage and resistance measurements are adequate to deal with many situations, do not overlook the merit of signal tracing, particularly in troubleshooting an IC stage.

### Loss of Raster with no Sound

The common causes for the loss of raster and sound together are:

- (1) a defective low voltage power supply system,
- (2) a defective scan-derived power supply system, and
- (3) a short elsewhere in the receiver causing the power supply to break down.

The low voltage power supply is the heart of a TV receiver. With very low or missing B+ supply voltages, various sections in the receiver will not work. Under such conditions, no sound and no raster would be a common symptom. The most likely causes for a defective power supply system include an open fuse, a defective circuit breaker, a shorted or open transformer winding, defective diodes or bad filter components, and an inoperative voltage regulator. The most frequent offender found in a suspected solid state voltage regulator is a defective transistor or a bad IC.

A defect in the power supply system also may be caused by another defect in a loading circuit. Any other non-defective loading circuits that are connected to the same power source will no doubt be affected.

In a scan-derived power supply system, any failure that results in the removal of the horizontal sweep would also eliminate all the scan-derived DC voltage sources. Consequently all the sections that receive their DC sources from the scan system would be immediately disabled. With all scan-derived DC sources removed, the receiver would most likely have neither raster nor sound. There may be situations, however, when the horizontal sweep is functioning normally, but one or more scan rectifier diodes, or associated filter components, become defective. Thus, there may be no sound or no vertical deflection, but the CRT may be still able to produce a raster or a white horizontal line.

### Troubleshooting Loss of Raster with no Sound

Loss of raster and sound calls for attention in the low voltage power supply or scan-derived power sup-

ply system. Check for an open fuse, a tripped circuit breaker, a defective rectifier diode, shorted or open filter components and a defective voltage regulator.

If the defect in the power supply system is due to an overloading by another circuit, isolate the trouble by disconnecting one load at a time. Once a general location of a short is located, resistance measurements should reveal the culprit.

In a scan-derived power supply system, an important thing to look for beside those just listed above is the presence of the horizontal sweep voltage. If no sweep is present, troubleshoot the horizontal section as described previously.

#### Troubleshooting Intermittent Raster

Intermittent rasters are always frustrating. There are two forms. One is mechanical in nature and the other is thermal related. The symptom may be identified by tapping, heating or cooling the suspected components and areas,

one at a time.

#### Picture Tube Replacement

If every thing in the chassis has been checked up and found to be functioning properly, then it is certain that the trouble of loss of raster is caused by a defective picture tube. The best approach now is to use a test jig, such as a test CRT, or a CRT tester. A good CRT tester not only detects gun element shorts, open, improper emission ratio, presence of gas and the tube life, but also performs some repair functions, such as rejuvenating, removing shorts, or welding open elements.

If it is deemed necessary to replace the expensive picture tube, be sure to make an exact replacement since improper matching between the new picture tube and the old yoke or convergence assembly may produce insoluble color and raster problems. Before removing anything on the defective picture tube neck, it is recommended that notes be taken on

the exact location of each component. They should be mounted on the new picture tube at exactly the same locations as they were on the old one.

#### Conclusion

Loss of raster is generally the result of either cutoff of all three CRT electron beams or divergence of the beams so they never hit the screen. Common causes for this failure are an incorrect CRT bias, a loss of the high voltage and a defective CRT. Diagnosis procedures for raster loss are similar for most receivers. However, a few have special features and a failure in the vertical section could cause loss of raster. In these cases, the manufacturer's recommended troubleshooting procedures should be followed.

A troubleshooting chart—as shown in Figure 5—is included here to summarize the general procedures that may be used for raster problems in most TV receivers. ■

# FORDHAM BEST BUYS

## Sencore direct reading DVM multimeters



**DVM35**  
POCKET PORTABLE  
ANALOG REPLACEMENT  
3-digit, 1% DCV,  
Battery or AC



**DVM36**  
LAB ACCURATE  
POCKET PORTABLE  
3½ digit, .5% DCV,  
Battery or AC



**DVM32**  
BENCH & FIELD MASTER  
3½ digit, .5% DCV,  
Battery or AC



**DVM38**  
"PRIME" STANDARD  
AT YOUR FINGERTIPS  
3½ digit, .1% DCV,  
Auto-Ranging

## FOR PRICING AND TO PLACE YOUR ORDER

Call TOLL FREE 800 645-9518 For N.Y. State call (516) 752-0050

**FREE** 64 page catalog of over 3000 items... test equipment, CB, tools, tubes, components and electronic supplies

# FORDHAM

**YOUR ONE STOP DISCOUNT CENTER**

RADIO SUPPLY CO., INC.  
855R Conklin St.  
Farmingdale, N.Y. 11735

Mastercharge,  
BankAmericard,  
VISA and  
C.O.D.'s accepted

# Zenith Color TV for 1978

We continue with our review of changes, improvements and innovations in color television for 1978. This month—the 'updating' of the Zenith "J" line. By Don W. Mason

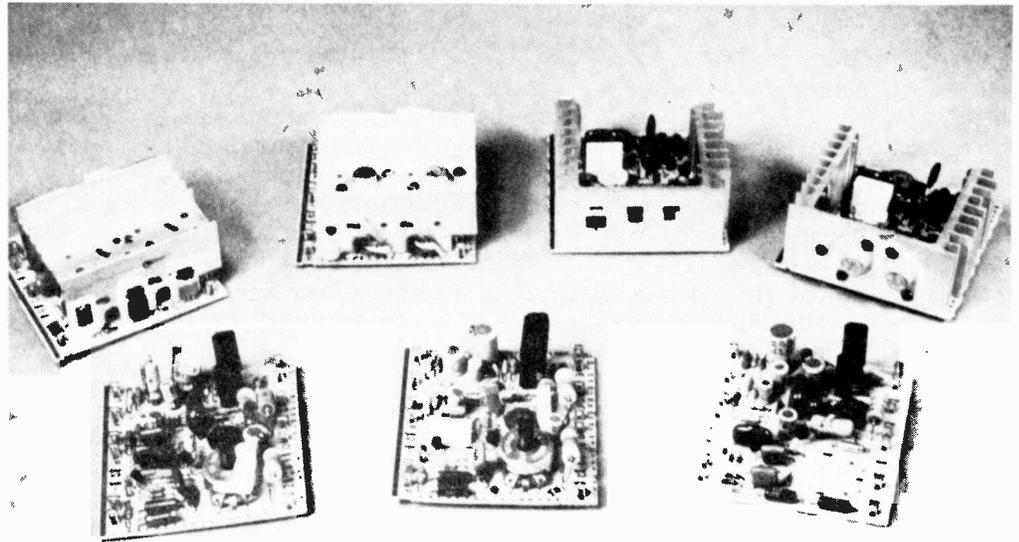


Fig. 1—Modules used in vertical circuitry in the Zenith J line of color TV. Top four modules are DC-coupled, and bottom three are AC-coupled modules.

■ As with most other TV set manufacturers this year, Zenith is "updating its color television line for 1978—refining the circuitry and adding new customer features—rather than introducing new chassis and new models. (Zenith has introduced a new videocassette recorder and a new black-and-white TV chassis, however, as additions to their 1978 product line.)

The improvements in circuitry are concentrated on the "J" line of Zenith color chassis. Circuits involved are: vertical, horizontal, high voltage multiplier, low level luminance, video output, IF and the tuner.

## The Vertical Modules

The seven different modules (Fig. 1) used in the vertical circuit of the Zenith "J" line of receivers are of two basic types—AC-coupled and DC-coupled. AC-coupled modules are used in the 100 and 110 degree deflection receivers, and DC-coupled modules are used in the 90-degree deflection receivers. The DC-coupled

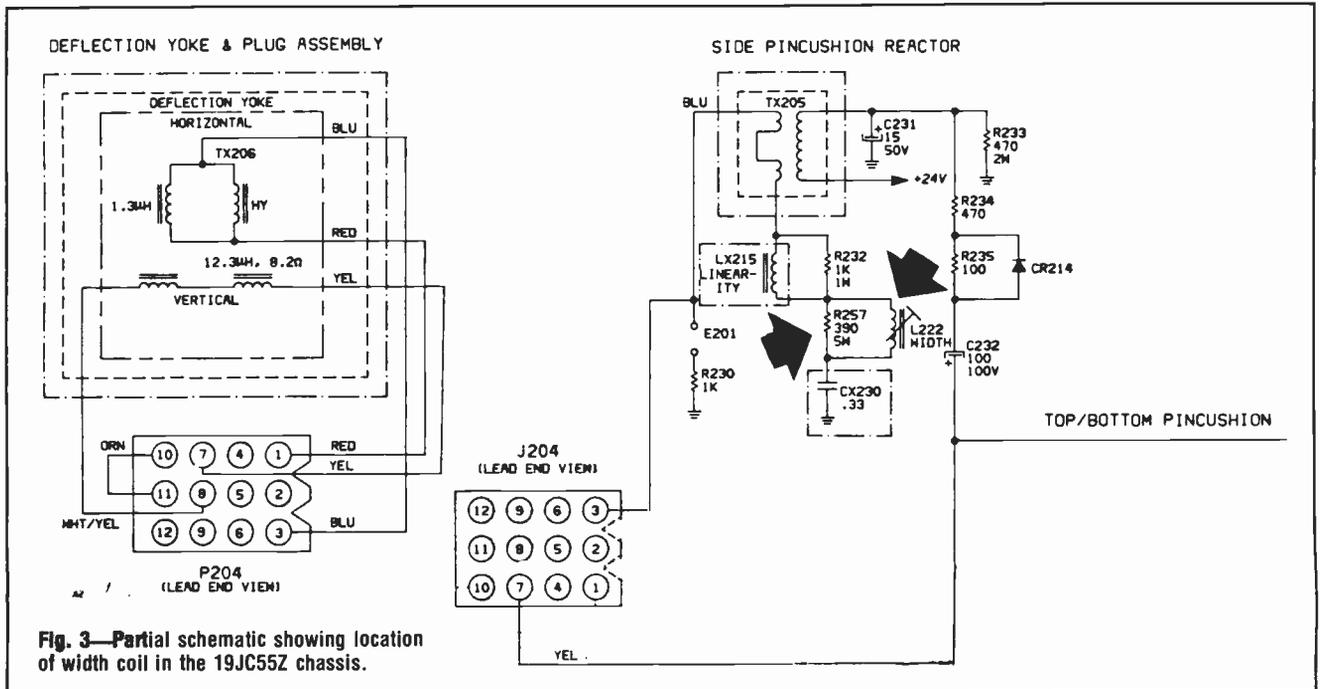
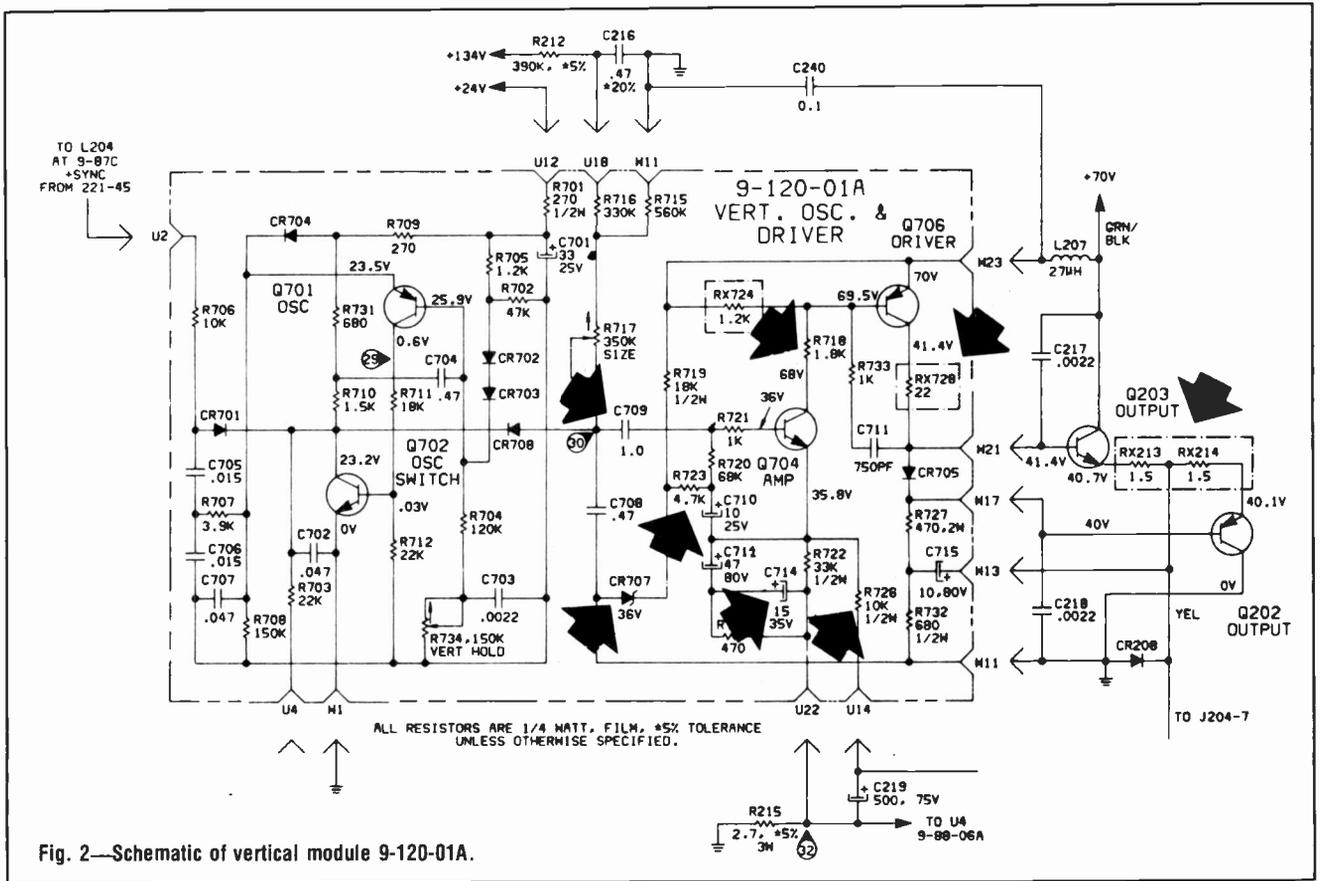
modules are completely interchangeable, but the AC-coupled modules are not, and must be used as intended with specific chassis and deflection angle receivers.

Actually, the AC-coupled modules can be interchanged for servicing purposes, but should not be left in the receiver for normal operation as a poor linearity condition will exist.

A schematic of AC-coupled vertical module 9-120-01A is provided in Fig. 2. Whenever servicing for vertical problems involving this module, the emitter resistors, RX213 and RX214, of the output amplifiers should be checked for an open condition. And, if resistor RX728 has opened, do not replace the module before checking for a short or other fault in the output transistor, deflection yoke, or the wiring. If resistor RX728 failed because of a short, and the short is not removed or repaired, the replacement module will also fail.

## The Horizontal Sweep System

Several improvements have



been made in the horizontal sweep system of Zenith's "J" line of color chassis. The main improvement is the addition of an adjustable width coil. The partial schematic of the 19JC55Z chassis in Fig. 3 shows the location of the new width coil.

The new coil was added to the J line chassis because of an 'overscan', or variation in horizontal width which occurred in the ear-

lier H line chassis, preventing the viewer from seeing the entire picture.

The new coil is composed of two layers of No. 26 gauge wire wound on a paper form with an adjustable ferrite core, and a ferrite cup core fitted over the outside of the windings. This construction offers a high range of inductance from 10 to 150 microhenries.

As Fig. 3 shows, the coil is in series with the deflection yoke, between linearity coil LX215 and "S" capacitor, CX230. The yoke circuit stores energy which is proportional to the added inductance provided by the new width coil. This storing of energy reduces the energy available to the horizontal yoke winding for the deflection of the electron beam, and therefore,

reduces the horizontal width.

Because the yoke circuit is part of the fundamental resonant circuit, the resonant frequency decreases as the total inductance increases, and in turn, the width of the horizontal pulse is increased. As a result, the retrace time increases.

The change of inductance in the fundamental resonant circuit, caused by variation of the width coil inductance, can be expected to reduce high voltage by approximately 700 volts, or depending on the tuning of the sweep transformer, can increase it by as much as 500 volts.

Correct adjustment of the width coil is important not only for con-

trolling raster overscan but because it also has an influence on brightness and high voltage. To adjust, the core of the coil is turned clockwise until both vertical edges of the raster are tangent to the escutcheon. Then the core is turned three complete turns counter-clockwise. At this point, the raster should have an overscan of about 6.5% to 8.5%.

Centering of the raster is accomplished by adjusting the width coil until the short scan side is tangent to the escutcheon, and then turning the core counter-clockwise three more complete turns.

Troubleshooting the width coil is somewhat a matter of observing

the screen. A *shorted* coil would cause excessive width, but it might or might not be objectionable unless lettering in the image is off the screen at the sides of the raster. An *open* width coil would cause symptoms in the receiver similar to an open deflection yoke winding, reduced high voltage, and wide retrace time. The symptoms would occur because an open width coil would, in turn, cause the 390 ohm parallel resistor, R257, to open because of excessive current. Also, if R257 becomes open, ringing will be exhibited on the left side of the screen.

### Horizontal Driver Circuitry

The circuitry for the horizontal driver has been improved in the J line of chassis with several new components added (Fig. 4). A new driver transistor (121-1014) which has a higher voltage and power rating is used along with a new 800 ohm B+ dropping resistor which will not change value under stress. The driver transformer (95-3275) is new in the J line, also. It is said to have better current handling capabilities. In fact, the Zenith service literature suggests that should the transistor or transformer in the horizontal driver circuit of previous models fail, the new 121-1014 transistor and the 95-3275 transformer should be used as replacements.

The ferrite bead used in the horizontal driver circuit to remove

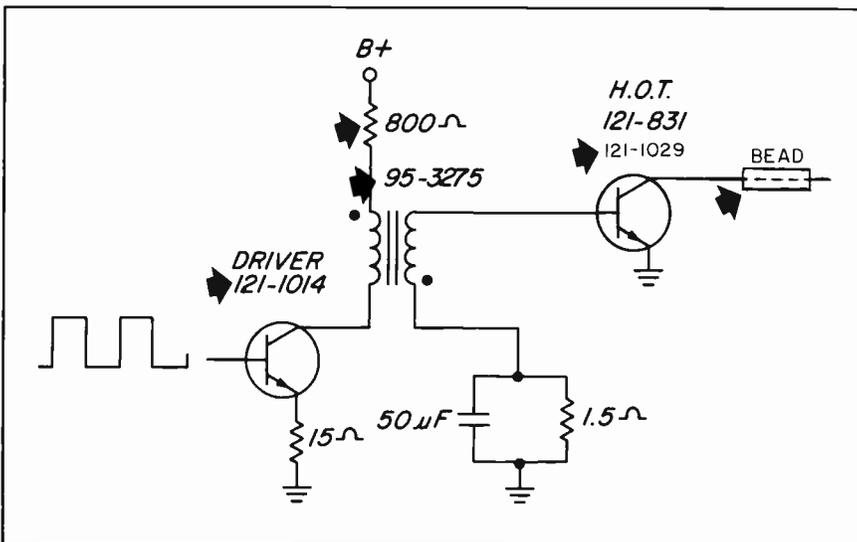
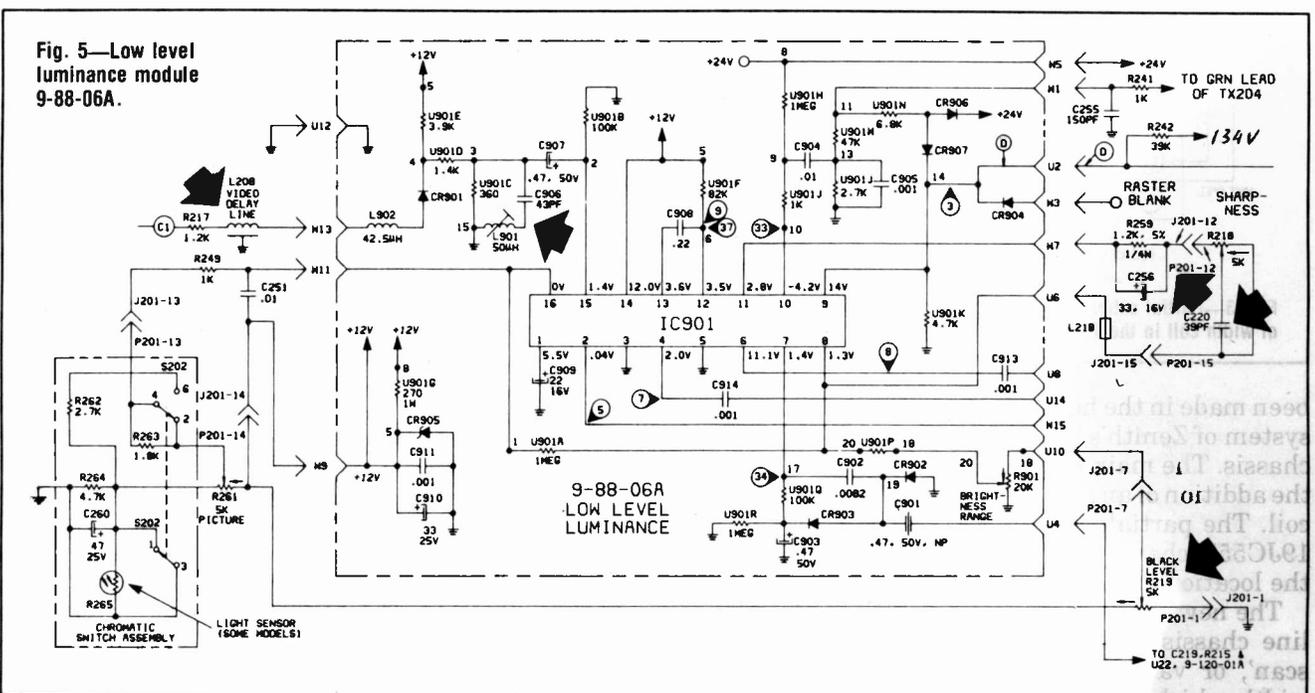


Fig. 4—Simplified schematic of "J" line horizontal driver circuitry with new type components (marked with arrows).



or reduce the high energy RF spikes, or 'snivets' has been improved in the J line. It is said to assure more consistent snivet rejection.

Also new in the J line is the horizontal output transistor, 121-1029, and the transistor socket. In the J line, the socket consists of a single piece, thermoset plastic transistor carrier, held in place by mounting screws instead of rivets. Two tinnerman clips are provided for collector connections. The emitter and base connections, however, are soldered.

### Low Level Luminance Module

The 100 degree, EFL CRT Chassis, 19JC55Z, features a newly designed module for the low level luminance circuit. The new module, designated 9-88-06A replaces the 9-88-03. The new module incorporates circuit modifications which are said to improve picture quality in the J line.

In Fig. 5, the schematic of module 9-88-06A, you'll see a 3.58 MHz trap, L901, used in association with a 43 pfd capacitor, C906. This combination can decrease noise immunity, but according to Zenith, also enhances picture quality.

The new module also features a

new delay line which will tend to equalize any video preshoot to overshoot, and thus, will improve the video response. Also, as part of the improved peaking changes, the capacitor (C220) in series with the arm of the sharpness control has been changed to 39 pfd for improved reduction of background noise. And the Brightness control has been renamed "Black level" control in the J line to more accurately describe its function. This 'black level control' has also been detented for optimum setting in most instances.

### The IF Module

An alignment modification has been made in the IF module, 150-

190-01, to change the conventional 'haystack' bandpass response to a 'flat-top' IF bandpass response. This change is said to improve the IF synchronous detector transient response and reduce the apparent strong signal background noise in the picture.

As shown in Fig. 6, the conventional IF bandpass response on a linear voltage scale appears as a 'haystack'. This shape provides a certain amount of video peaking in the region of 1.5MHz to 2.0MHz from the picture carrier. In a diode 'envelope' detector system, this peaking is necessary because of the apparent de-peaking in that frequency region caused by distortion

*continued on page 44*

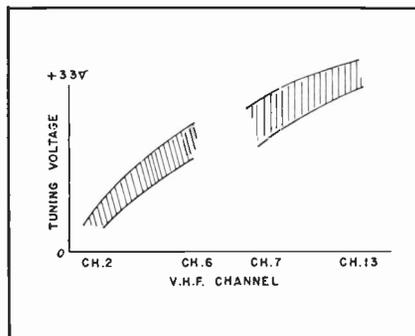
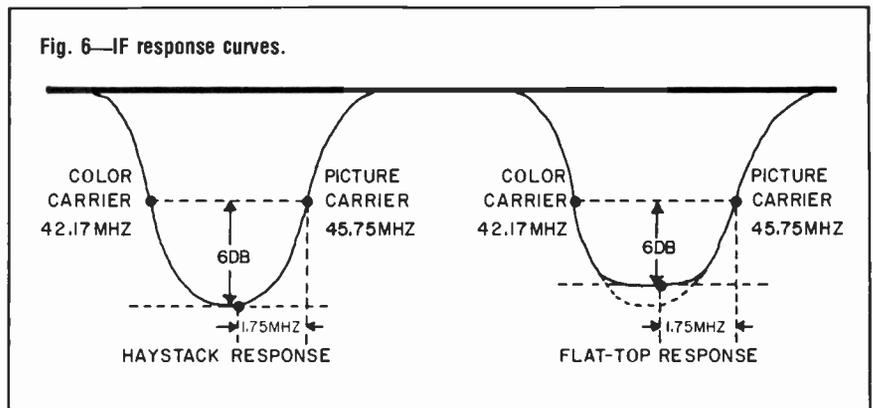


Fig. 8—Hyperabrupt tuning curve.

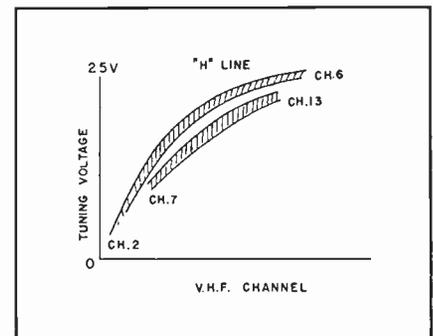


Fig. 9—Abrupt tuning curve.

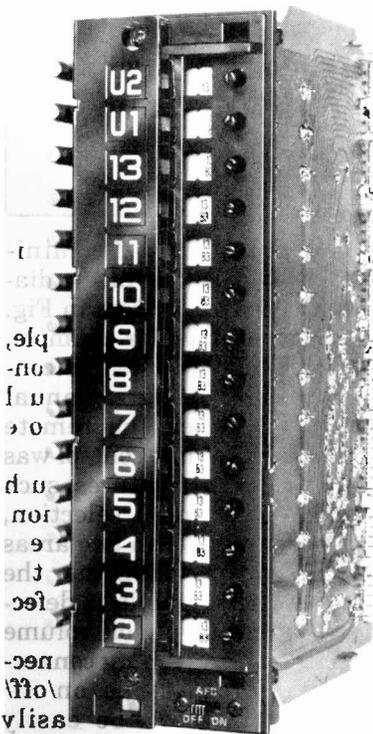


Fig. 7—Photo of Zenith 14 pushbutton varactor tuning assembly.

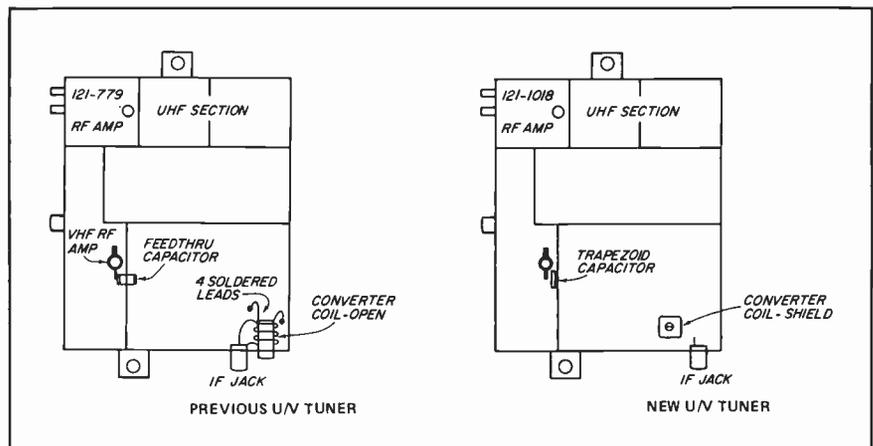


Fig. 10—Drawings of previous U/V Tuner (left), and the new 1978 U/V Tuner (right).

# GE Color TV for 1978 -Part Two

By Don W. Mason

We conclude our review of new features in General Electric's color TV line for 1978.

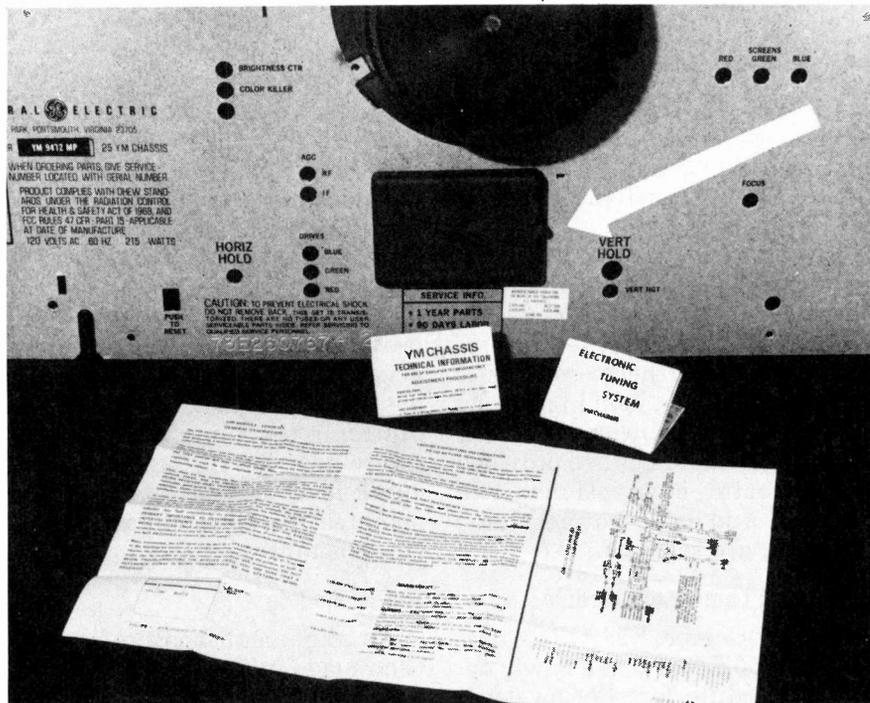


Fig. 1—"Mini-service" manuals will be enclosed in all GE color TV receivers for 1978. The manuals are enclosed in a special enclosure on the back of each set, accessible only to the technician.

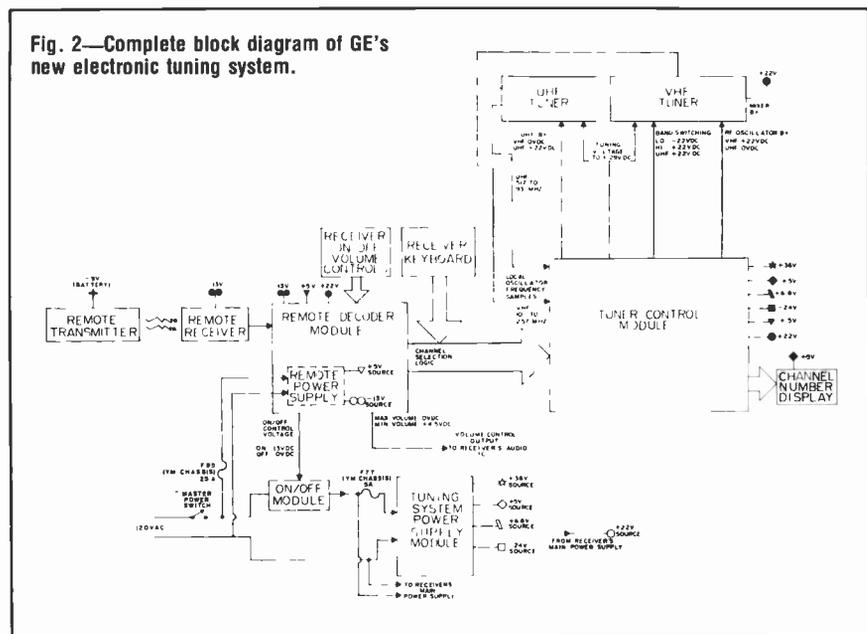
■ Last month we examined the circuitry involved in GE's new electronic tuning system and their remote control unit that utilizes infrared light to transmit commands from the unit to the receiver. The infrared light replaces the sonic signals, or sound waves, used in other remote units, and is said to eliminate false-triggering.

We conclude our coverage of GE color TV for 1978 with a look at what will be required for troubleshooting the new electronic tuning system—and the new GE portable color TV chassis AA.

## Troubleshooting The Electronic Tuning System

GE design engineers seem to have kept the service technician in mind as they developed both the new tuning system and the latest GE receivers. The various modules involved are accessible, and fairly easily removed for inspection and replacement. And a minimum amount of test equipment is needed to diagnose defective modules. A standard VOM, jumper leads, flashlight, and hand tools are all that is said to be necessary for service in the field. And, of course, it is pointed out that beginning with the GE TV models for 1978, a "mini-service" manual is packed with each set.

The mini-manual, shown in Fig. 1, contains the information necessary to locate the individual mod-



ules and components of the system. It includes a functional block diagram of the electronic tuning system, and provides procedures for identifying a defective module.

The mini-manual is contained in an enclosure attached by two screws from *inside* the cabinet back, meaning that only the service technician should have access to the service information.

The troubleshooting procedures offered in the mini-manual are to a great extent a "Go—No Go" proposition, typical of digital logic circuitry. Either it works perfectly—or doesn't work at all.

This 'all-or-nothing-at-all' technique can be illustrated by

some examples from the mini-manual. Refer to the block diagram of the tuning system in Fig. 2, and then suppose, for example, the TV receiver exhibited no control of volume with its manual controls, but, when the remote unit was used, volume control was normal. If all other features, such as on/off and channel selection, perform normally, then two areas of failure are possible. Either the Remote Decoder Module is defective, or the receiver on/off/volume control assembly and plug connections are at fault. The on/off/volume controls can be easily eliminated by checking their continuity with an ohmmeter.

An Extraordinary Offer to introduce you to the benefits of Membership in

# ELECTRONICS BOOK CLUB

take any **3** of these unique electronics books (value to \$47.75) for only **99¢** each

with a Trial Membership in the Book Club that guarantees to save you 25% to 75% on a wide selection of electronics books

All two-book sets count as only one of your three Selections.



709-294 p.—Modern Guide to Digital Logic: Processors, Memories & Interfaces (\$9.95)

SMALL APPLIANCE REPAIR GUIDE—Vol. 2  
by Lou E. Sands

715/745-405 p.—TWO BOOKS—Small Appliance Repair Guide—Vol. 2 & The Home Appliance Clinic: Controls, Cycle Timers, Wiring & Repair (\$15.90)

THE HOME APPLIANCE CLINIC: Controls, Cycle Timers, Wiring & Repair

BUILD YOUR OWN WORKING ROBOT  
BY DAVID L. ROSS

841-238 p.—Build Your Own Working Robot (\$8.95)

T97-160 p.—Electric Motor Test & Repair (\$6.95)

ELECTRIC MOTOR TEST & REPAIR

876-352 p.—Color TV Case Histories Illustrated: Photo Guide to Troubles & Cures—Vol. 2 (\$10.95)

Color TV Case Histories Illustrated: Photo Guide to Troubles & Cures—Vol. 2

BASIC DIGITAL ELECTRONICS: Understanding Number Systems, Boolean Algebra & Logic Circuits (\$7.95)

228-210 p.—Basic Digital Electronics: Understanding Number Systems, Boolean Algebra & Logic Circuits (\$7.95)

652-602 p.—2nd Class FCC Encyclopedia—Complete Study Guide to the Commercial Radiotelephone Exam (\$10.95)

795-196 p.—MOSFET Circuits Guidebook—with 100 Tested Projects (\$7.95)

MOSFET CIRCUITS GUIDEBOOK—with 100 Tested Projects  
By Rufus P. Tomes

300-420 p.—Dictionary of Electronics (\$9.95)

DICTIONARY OF ELECTRONICS  
Helen Carter

666-180 p.—Experimenting With Electronic Music (\$7.95)

Experimenting With Electronic Music  
By Robert Bro...

729-252 p.—RF & Digital Test Equipment You Can Build (\$8.95)

RF & Digital Test Equipment You Can Build  
Edited by Wayne Green

834-288 p.—Photo Guide to AM/FM Stereo Repair (\$9.95)

Photo Guide to AM/FM Stereo Repair

771-196 p.—Integrated Circuits Guidebook (\$8.95)

Integrated Circuits Guidebook

708-276 p.—Modern Applications of Linear IC's (\$12.95)

modern applications of linear IC's

975-322 p.—The "Computer" Book—Building Super Calculators & Minicomputer Hardware With Calculator Chips (\$10.95)

THE "COMPUTER" BOOK—Building Super Calculators & Minicomputer Hardware With Calculator Chips  
How to make the COMPUTER with the CALCULATOR

985-280 p.—Programming Microprocessors (\$9.95)

Programming Microprocessors  
By M. W. Mumford

101-416 p.—Electronic Circuit Design Handbook—4th Edition (\$17.95)

ELECTRONIC CIRCUIT DESIGN HANDBOOK  
By the Editors of ESD: magazine

790/668-308 p.—TWO BOOKS-21 Simple Transistor Radios You Can Build—From Crystal Sets to Superhets & CBER's Handybook of Simple Hobby Projects (\$13.90)

CBER's Handybook of Simple Hobby Projects

May we send you your choice of these 3 practical, time-and-money-saving books as part of an unusual offer of a Trial Membership in Electronics Book Club?

Here are quality hardbound volumes, each especially designed to help you increase your know-how, earning power, and enjoyment of electronics. Whatever your interest in electronics, you'll find Electronics Book Club offers practical, quality books that you can put to immediate use and benefit.

This extraordinary offer is intended to prove to you, through your own experience, that these very real advantages can be yours—that it is possible to keep up with the literature published in your areas of interest, and to save substantially while so doing. As part of your Trial Membership, you need purchase as few as four books during the coming 12 months. You would probably buy at least this many anyway, without the substantial savings offered through Club Membership.

To start your Membership on these attractive terms, simply fill out and mail the coupon today. You will receive the 3 books of your choice for 10-day inspection. YOU NEED SEND NO MONEY! If you are not delighted, return the books within 10 days and your Trial Membership will be cancelled without cost or obligation.

### Facts About Club Membership

- The 3 introductory books of your choice carry publishers' retail prices of up to \$47.75. They are yours for only 99¢ each (plus postage and handling) with your Trial Membership.
- You will receive the Club News, describing the current Selection, Alternates and other offerings, every 4 weeks (13 times a year).
- If you want the Selection, do nothing. It will be sent to you automatically. If you do not wish to receive the Selection, or if you want to order one of the many Alternates offered, you simply give instructions on the reply form (and in the envelope) provided, and return it to us by the date specified. This date allows you at least 10 days in which to return the form. If, because of late mail delivery, you do not have 10 days to make a decision and so receive an unwanted Selection, you may return it at Club expense.
- Personal service for your account—no computers used!
- To complete your Trial Membership, you need buy only four additional monthly selections or alternates during the next 12 months. You may cancel your Membership any time after you purchase these four books.
- All books—including the Introductory Offer—are fully returnable after 10 days if you're not completely satisfied.
- All books are offered at low Member prices, plus a small postage and handling charge. Prepaid orders shipped postpaid.
- Continuing Bonus: If you continue after this Trial Membership, you will earn a Dividend Certificate for every book you purchase. Three Certificates plus payment of the nominal sum of \$1.99 will entitle you to a valuable Book Dividend of your choice which you may choose from a list provided Members.

## ELECTRONICS BOOK CLUB

Blue Ridge Summit, Pa. 17214

Please open my Trial Membership in ELECTRONICS BOOK CLUB and send me the 3 books circled below. I understand the cost of the books I have selected is only 99¢ each, plus a small shipping charge. If not delighted, I may return the books within 10 days and owe nothing, and have my Trial Membership cancelled. I agree to purchase at least four additional books during the next 12 months, after which I may cancel my membership at any time.

T-97	101	300	652	666	708
709	715/745	728	729	771	
790/868	796	841	876	934	975 985

Name \_\_\_\_\_ Phone \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_ Zip \_\_\_\_\_

(Valid for new Members only. Foreign and Canada add 10%) T-107

ELECTRONICS BOOK CLUB, Blue Ridge Summit, Pa. 17214

...for more details circle 114 on Reader Service Card

In another example, suppose that TV stations cannot be selected with the Remote Transmitter unit. All other remote and front control functions are correct. An analysis of the block diagram would reveal that the Remote Decoder Module is almost certain to be the problem area.

However, as the GE Service Training Manual points out, some types of failure don't lend themselves to this troubleshooting logic. For example, the receiver may display a "no raster/no sound" condition. You would have to choose, then, between the Remote Decoder Module, the On/Off Module, or the conventional power supply in the receiver's main chassis. In other words, a combination of observation and DC voltage checks would be necessary for troubleshooting in this instance.

### THE NEW PORTABLE COLOR TV CHASSIS—AA

A new chassis, designated AA, is introduced in GE's 1978 line of portable color TV. The fourth gen-

eration of GE solid state color TV receivers, the AA chassis is used in the 10 inch and 13 inch models (Fig. 3). All models feature automatic frequency control (AFC), automatic color control (ACC), DC restoration of the video signal, VHF 'preset' fine tuning, and 70 position detent UHF tuning. Some models have a black matrix picture tube, earphone jack, and a totally new 'Color Monitor' system which is said to maintain consistent color levels from program to program and channel to channel.

The IF, AGC, color killer and video peaking adjustment are fixed and the tint centering, tint range, and brightness centering adjustments have been eliminated. The new chassis includes an automatic phase correction (APC) circuit.

Four basic assemblies mounted to the front portion of the two-piece cabinet make up the AA chassis. The assemblies, shown in Fig. 4, include: (1) The control package; (2) The power supply assembly; (3) The high voltage as-

sembly; and (4) The main printed circuit board. The chassis layout in Fig. 4 is as seen from the rear.

The *Control Package* includes the UHF and VHF tuners and the on/off/volume control.

The *Power Supply Assembly* contains the AC input components, the B+ input filter capacitor, the B+ filter and dropping resistors, the CRT filament transformer, and an audio output transformer on those models equipped with an earphone jack.

The *High Voltage Assembly* contains the high voltage transformer, the horizontal output circuitry, the CRT screen controls, focus control, focus divider, vertical transistors, and a pin-cushion transformer, on the 13AA chassis.

The high voltage transformer can be removed without a soldering iron by just removing 3 connector plugs, a U-bolt and one screw.

The *Main Printed Circuit Board* is mounted so that it can be pulled almost out of the chassis for easier servicing. The board features cop-

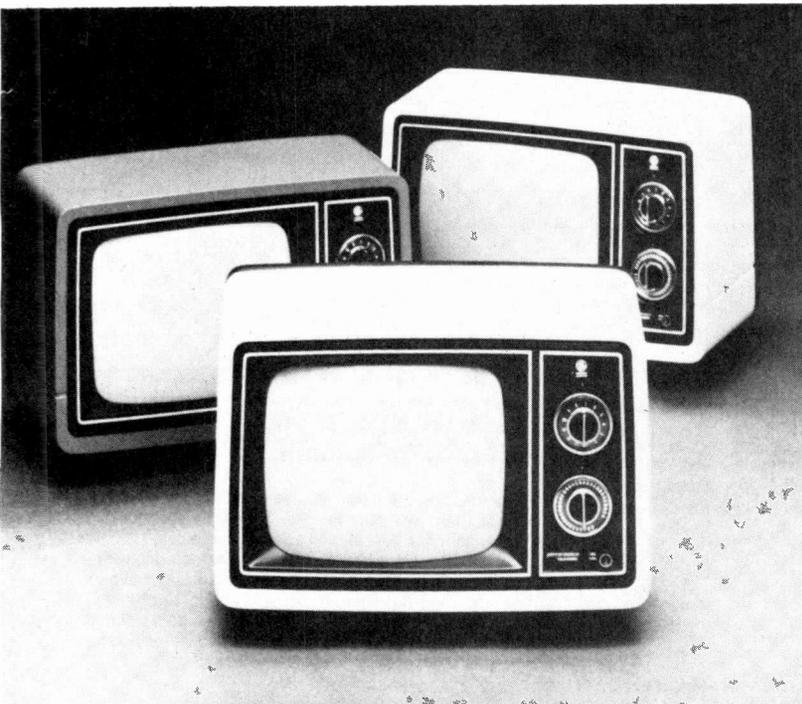


Fig. 3—General Electric's new line-up of small-screen Porta Color TV, featuring their new AA chassis.

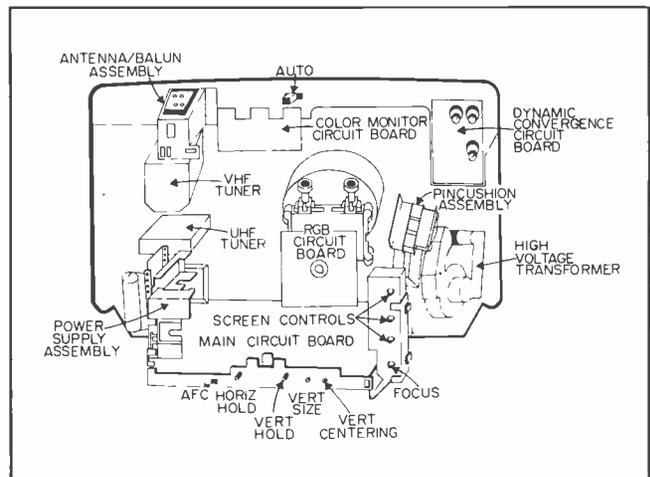


Fig. 4—The chassis layout of GE's new portable color TV chassis AA, shown from the rear.

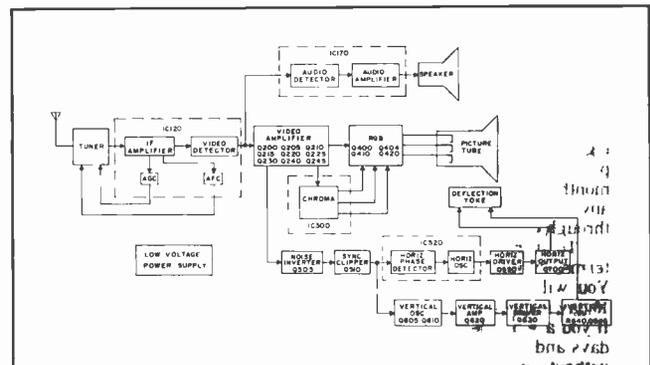


Fig. 5—The functional block diagram of the new GE AA color TV chassis.

per patterns on both the component and solder sides of the board.

Secondary controls for color, tint, contrast and brightness, are mounted on the front edge of the board with shafts extending to thumbwheel knobs under the front of the set. The B+ rectifier diodes, B+ fuse and B+ output filter capacitors are also on the main board.

The four IC's, 120, 170, 300 and 520, are socket-mounted on the main circuit board, as are three vertical amplifier transistors. A functional block diagram of the AA chassis is shown in Fig. 5.

### IC 120

Integrated circuit 120 (Fig. 6) contains not only the IF amplifier, but the AGC, AFC and Video Detector functions as well. New to GE TV designs, the AGC circuit is not keyed, and the video detector is a synchronous demodulator.

### IC 170

Containing a 4.5MHz amplifier, quadrature detector, electronic at-

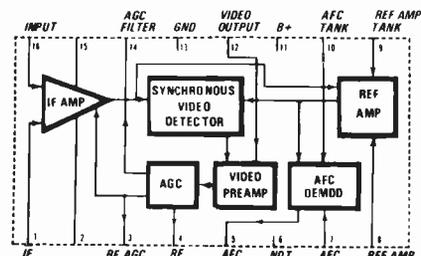


Fig. 6—Block diagram of IC 120 that contains the IF amplifier, AGC, AFC, and Video Detector for the new GE AA TV chassis.

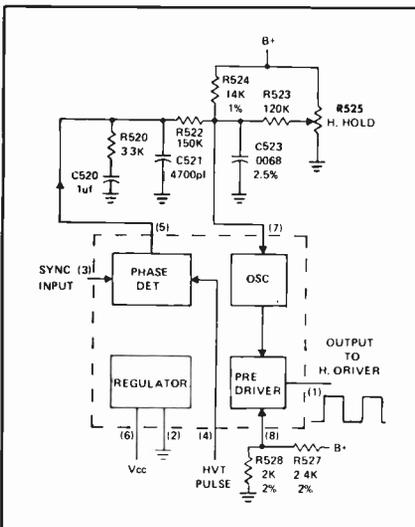


Fig. 9—Horizontal functions for the GE AA chassis are performed by IC520.

tenuator, and an audio amplifier, IC 170 (Fig. 7) is a complete audio system. It also contains voltage regulating, current limiting, and thermal overload circuitry.

One note of interest with IC 170: its power dissipation is largely governed by the impedance of the speaker, so, always use a 32 ohm speaker for replacement. A lower impedance speaker will increase power dissipation.

### IC 300

Integrated circuit 300 (Fig. 8) is the chroma integrated circuit, and contains the bandpass amplifier,

burst gate, 3.58 MHz oscillator, color control, color killer, APC detector and chroma demodulator functions.

### IC 520

Horizontal functions are performed by IC520 (Fig. 9). The circuit contains the horizontal phase detector, horizontal oscillator and horizontal predriver. The sync pulse input to the phase detector is pin 3. The HVT pulse input is pin 4, and the phase detector output is pin 5. The oscillator is an RC type with the frequency controlling components connected to pin 7. ■

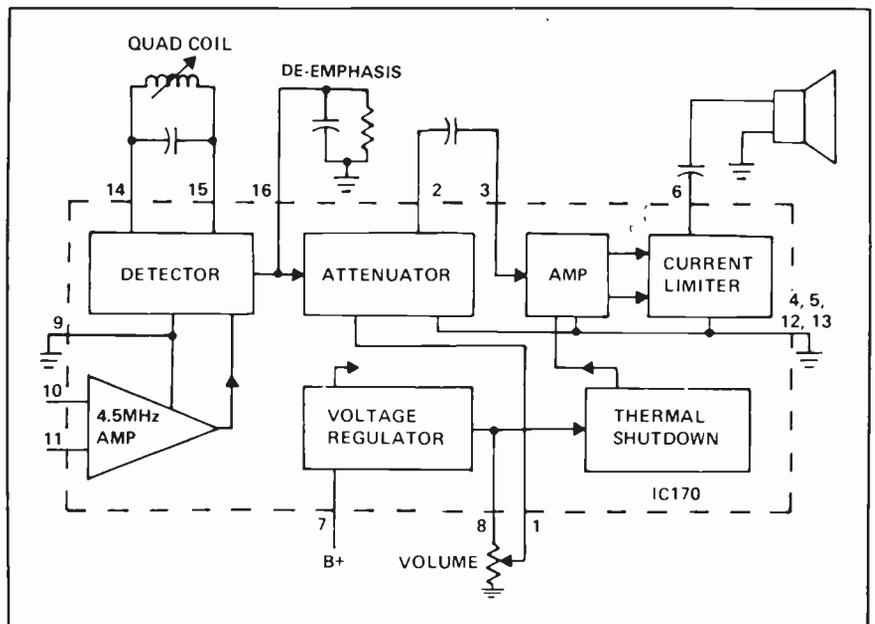


Fig. 7—Almost all of the audio circuitry in the AA chassis is contained in IC 170.

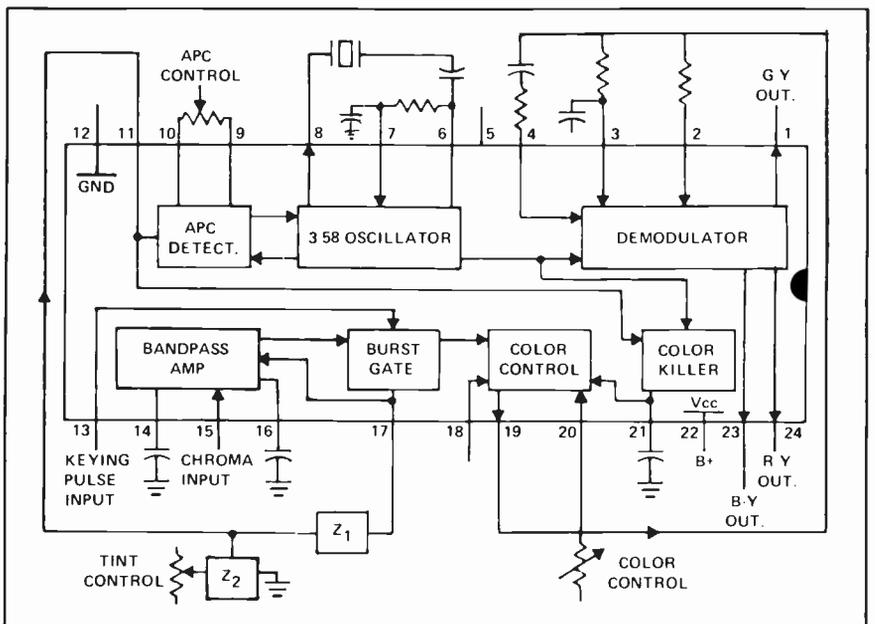


Fig. 8—Almost all of the chroma functions are included in IC 300.

# Ballantine's Digital Multimeter Model 3028B



■ Ballantine Laboratories have just introduced a new portable rms responding digital multimeter with a sensitivity of 10 mV Full Scale and it is their claim that it is the only 3½ digit DMM to have 10 uV resolution and the capability to measure 10 milliohms.

The new Model 3028B DMM uses pushbutton controls for measurements covering 35 ranges: AC/DC voltages from 100 μV to 1200 V in six ranges; AC/DC current measurements from 10 nA to 2 A in six ranges; resistance from 10 milliohms to 20 megohms in 11 ranges. Automatic polarity indication is provided for all DC functions.

In its AC voltage and current modes, the 3028B provides rms response for waveforms that have significant distortion (up to 10% and crest factors of 1.2 to 1.6) beyond 110 KHz. The bandwidth has a low end of 15 Hz and is usable at the upper end to more than 200 KHz. Zero drift is prevented with auto-zeroing circuitry.

The ohmmeter circuit functions on all ranges with a "HI" and "LO" voltage mode for in-circuit ohms measurements and diode checks. In the LO mode, less than 200 mV is applied, preventing semicon-

ductor diode turn-on. In the HI mode, less than 2 volts is applied, which allows for normal measurement and quality checks. Measuring current is always limited to less than 1 mA.

The Model 3028B offers full protection against continuous overloads up to 1200 volts on any AC or DC voltage range and 285 volts DC plus AC rms on any ohms range. Overload is signalled by display flashing. Recovery after overload is said to be fast and automatic to allow measurements to continue with little time loss. All current ranges are protected by a fast acting circuit breaker resettable by a front panel pushbutton.

The Model 3028B weighs 2 lbs., 7 oz., without batteries. It is priced at \$295, with an optional internal rechargeable battery pack an additional \$45. Other options include an analog meter for easy peaking and nulling; a 20 amp current range; a universal tapped power transformer; and a full complement of accessories including a 700 MHz detector probe with 300 V capability; a 40 kV DC high voltage probe; a 10 kV AC probe; a soft vinyl carrying case, and rack-mounting kits for system applications. ■

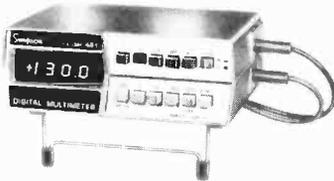


## NEW PRODUCTS

Descriptions and specifications of the products included in this department are provided by the manufacturers. For additional information, circle the corresponding numbers on the Reader Service Card in this issue.

### DIGITAL MULTIMETER 137

A new digital multimeter has been introduced by *Simpson Electric*. Called Model 461, the instrument features 0.5% DC V accuracy, automatic polarity and zeroing, LSI reliability with a single chip containing all A/D conversion components. The 3½-digit (1999 count) display has high-visibility 0.3 inch LEDs. Pushbuttons select all functions and 26 overload-protected ranges. The unit measures voltages from 100  $\mu$ V to 1 KV DC (600 V AC), resistance from 0.1 ohm to 20 megohms, AC or DC current from 10 nA to 2 A. The 461 has a fold-



ing bench stand and accessories that include an adapter for AC measurements up to 200 amps, a new 40 KV high voltage probe, an RF probe and a carrying case. Priced at \$130.

### SPECIAL EFFECTS PROJECTOR 138

A new special effects projection system for use in night clubs, discotheques, and meeting and convention centers has been introduced by *Roctronics Inc.* The new projector is a variable speed, dual disc, remote controlled system that can create a large variety of colorful, flowing images.



Discs are inserted into two slots on the projector top and their speeds and direction are varied to achieve the desired effect. The standard lens shows horizontal motion and the inter-

changeable kaleidoscope lens creates six-sided symmetry. The projector is portable, weighs 12 pounds, is a nine inch cube, has a carry handle, and uses a standard 300 watt quartz lamp. It sells at retail for \$500.

### CB MERCHANDISING PROGRAM 139

Two new merchandising programs for popular CB accessories have been introduced by *GC Electronics*. Both programs feature fast-moving items such as microphones, connectors, test meters, suppressors, cables, mounts and maintenance accessories. All items are 40-channel approved. Program 49-827 consists of a 4-foot by 4-foot self-service display of accessories. Program 49-825 is the larger



# Everything you've dreamed of in a scope...including a sensible price.



**WO-527A \$479.00**

See them at your VIZ distributor.

Whether it be for servicing or scientific research, the new WO-527A 15MHz 5" triggered-sweep oscilloscope is designed for a wide range of applications. With its host of useful functions and its advanced solid-state integrated circuits, it's hard to believe it's so reasonably priced.

- Easy-to-use pushbutton controls
- Triggered or automatic sweep; ac or dc triggered
- Unique trigger level control with LED polarity indicators
- 10mV to 20V/cm in 11 ranges
- 19 calibrated sweep ranges
- Preset, automatic TV sync separation circuits
- Built-in calibrated time-base
- Special line selector for TV line-by-line display
- 10 times sweep magnifier

**VIZ Test Instruments Group**  
of VIZ Mfg. Co.

335 E. Price St., Philadelphia, PA 19144

Formerly

INCA  
Instruments

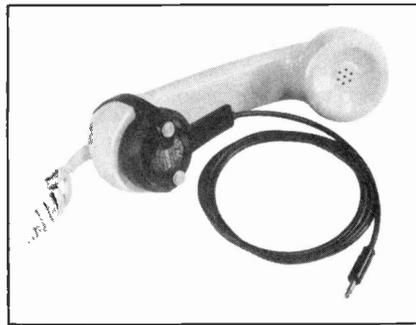
© VIZ  
6883

...for more details circle 132 on Reader Service Card

display incorporating a new device called Sound Around, which enables CB'ers to listen in simulated stereo. Also included is a regulated power supply, and an auto alarm.

### TELEPHONE ACOUSTIC COUPLER 140

A new telephone acoustic coupler for the feeding of recorded material into a telephone for remote broadcasting has been developed by *Shure Brothers*. Called the 50 AC, the new coupler may be strapped to any telephone in seconds. Connect it to a cassette tape recorder, flip the "play" switch and the recorded material is automatically fed



into the phone. There is no need to tie into the telephone wiring system or to remove the telephone mouthpiece. The 50AC completely covers the

mouthpiece. There is no background noise, no loss in intelligibility and the unit has no induction coils. A lever built into the 50AC also allows adding live commentary without interrupting the transmission of a taped interview or message. Priced at \$28.50.

### ALIGNMENT TOOL KIT 141

A new six-piece alignment tool kit for electronic technicians has been introduced by *Chemtronics, Inc.* Designated AK-6, the new kit is said to handle 90% of the alignment jobs commonly encountered. Each tool in the kit includes two to four alignment surfaces to cover a wide variety of alignment needs. Included are hexagonal,

# Intervox miniatures speak quality at unheard of prices.



The Intervox LS Series includes nine popular 8 ohm models for original and replacement use in alarm devices, intercoms, portable radios, tape recorders, TV, TV games and CB Radios. Other impedances including 3.2, 4, 16, 40 & 100 ohms are also available.

Choose from 1 1/4", 2", 2 1/4", 2 1/2", 2 3/4", 3 & 3 1/2" round frames plus 3" & 3 1/2" square frames. All with a fully enclosed 0.34 oz. Alnico V magnet.

Cone material is weatherproof paper with the frame of cadmium plated steel.

Rated power is between 0.1 and 0.8 watts. Frequency response is from 520 Hz - 4 KHz in the 1 1/4" model to 230 Hz to 5 KHz in the 3 1/2" model. Sensitivity is approximately 90 dB/watt in all models.

Each speaker is attractively housed in a secure, shrink-wrapped package. And their versatile shipping container, which holds twenty speakers, can be used as a colorful counter display or stock bin carton.

We don't know of any other miniature speaker series of this quality that is priced better. We'd be happy to give you all the facts. Write or call us today.

# International ©

International Components Corporation

105 Maxess Road, Melville, New York 11746 (516) 293-1500/TELEX # 143130

MINIATURE, GENERAL REPLACEMENT & PROFESSIONAL AUTO SPEAKERS

...for more details circle 119 on Reader Service Card



square and rectangular tips, screwdrivers, metal tips and mini-nuts for use in mini-slot cores. All of the tools are made of space age, virtually unbreakable materials. The AK-6 kit is available at a net price of \$2.49.

### CB CARRYING CASE 142

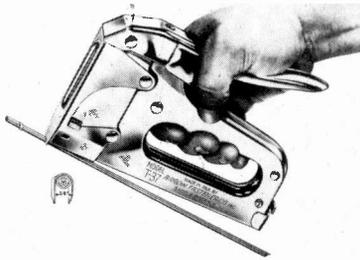
A new universal carrying case for mobile CB radios has been introduced by *Motorola*. Billed as the "ultimate in CB security", the new case permits easy removal of the CB radio so it can be taken with the driver. It is designed so that the radio can be operated with-



out removing the unit from the case. Openings at the top and bottom of the case allow the speakers to be heard, and a large opening at the back of the case permits antenna and power connections. The front flap folds down so radio controls and mike jack are accessible. A heavy duty handle is connected to the case, which is covered with durable Texion vinyl. It is designed for use with all major brands of CB.

**STAPLE GUN TACKER 143**

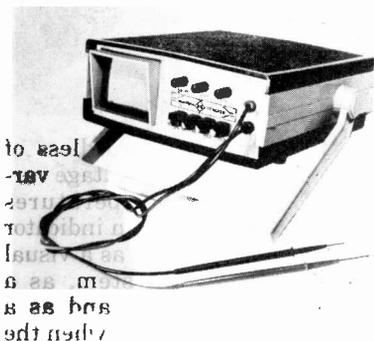
A new staple gun fastener designed to fasten electronic/electrical wire up to 5/16 inches in diameter, has been introduced by *Arrow Fastener*. Designated model T-37, the new tool has a tapered striking edge for getting into



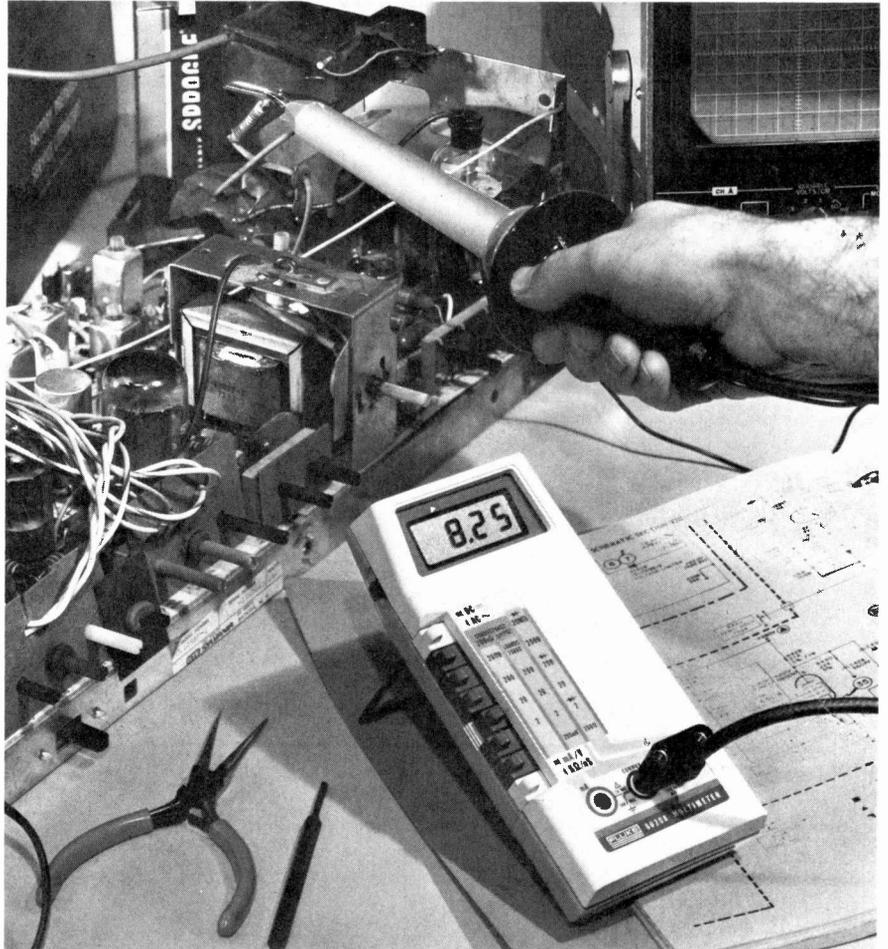
close corners, and features a projected groove guide that covers the wire to prevent damage and shorts. The tacker comes with round crown staples in 3/8 inches, 1/2 inch and 9/16 inch leg lengths. It is of all steel construction with chrome finish.

**SOLID-STATE TESTER 144**

A new test instrument for trouble shooting solid-state components—in or out of circuit—is now available from *Huntron Instruments, Inc.* Called the Tracker, the new instrument is said to speed isolation of defective devices, reduce equipment equipment down time and eliminate wasteful discards. A special comparator function in the Tracker permits printed circuit of IC testing against known good units. A visual scope display indicate condition of IC's, bipolars, F.E.T.'s, diodes, di-



# How do you really use a multimeter?



Usually at your bench, in the shop, shared with others. And, if it's a Fluke multimeter, you use it with confidence.

Now you can carry that same bench precision on the job. Introducing the new Fluke 8020A DMM for only \$169.\*

This rugged beauty packs more field-valuable features than any other DMM available, at any price. And that means field versatility when you need it most.

The 8020A has six resistance ranges, including a 20 megohm range for those special high-resistance TV components. Plus, you can measure focus dividers, pcb and capacitor leakage clear up to 10,000 megohms with the new conductance function. And conductance allows you to measure transistor beta—unique

with the 8020A.

Ever damaged your meter in the fly-back circuit? Rest easy. The 8020A is MOV-protected to 6000V against hidden spikes and transients.

Your 8020A comes with a full-year warranty, with worldwide service backup. Regardless of what happens to it, we'll fix it inexpensively and quickly, making the 8020A a truly cost-effective investment.

Call (800) 426-0361, toll free. Give us your chargecard number for immediate delivery. Or, we'll tell you the location of the closest Fluke office or distributor. (Buy ten 8020As for only \$1521!\*)

\*U.S. price only.

**Command Performance: Demand the Fluke 8020A.**

1807-7007



...for more details circle 115 on Reader Service Card



## Seeking Original Japanese Replacement Parts for CB Repair Use?

**CB REPAIR PACKAGE**  
\$80.00 value for only \$59.00

Now repair almost all CB's with this package of Japanese Transistors

2SK 19 FET	2 pcs	2SC 1306	4 pcs
2SD 235	4 pcs	2SC 1239	3 pcs
2SC 710	10 pcs	2SC 1307	4 pcs
2SC 1678	4 pcs	2SC 756	3 pcs

**SPECIAL PACKAGE OF MOST COMMON DRIVERS & FINALS**

This kit contains 6 each of:

2SC 1678	2SC 756
2SC 1018	2SC 799
2SC 1226	2SC 1239
2SC 1306	2SC 1307

\$145.00 value for Just \$99.95

**CHECK OUR NEW REDUCED PRICES!** COD ORDERS WELCOME  
Under \$500 no deposit required

**Original Japanese Transistors, FET, IC, Diodes**

TRANSISTORS		FET		DIODES	
2SA 415	70	2SC 509	90	2SC 776	2.65
2SA 495	70	2SC 517	3.95	2SC 777	3.50
2SA 562	59	2SC 536	70	2SC 778	3.60
2SA 628	59	2SC 562	2.15	2SC 781	2.65
2SA 634	90	2SC 582	1.00	2SC 784	59
2SA 640	59	2SC 619	59	2SC 785	70
2SA 643	70	2SC 620	59	2SC 789	1.00
2SA 683	70	2SC 668	59	2SC 793	2.80
2SA 719	70	2SC 696	1.95	2SC 799	3.60
2SA 720	70	2SC 711	59	2SC 802	3.60
2SA 721	70	2SC 712	59	2SC 815	59
2SA 733	59	2SC 717	59	2SC 828	59
2SB 54	59	2SC 732	59	2SC 838	59
2SB 75	59	2SC 733	59	2SC 839	59
2SB 77	59	2SC 734	59	2SC 900	59
2SB 186	59	2SC 756	2.80	2SC 930	59
2SB 324	70	2SC 757	59	2SC 943	1.20
2SB 337	1.60	2SC 773	70	2SC 1014	1.20
2SB 367	1.50	2SC 774	1.60	2SC 1017	1.40
2SB 368	2.15	2SC 775	1.95	2SC 1018	1.20
2SB 405	70	2SC 495	1.00	2SC 1674	59
				2SC 1060	2.25
				2SC 1061	1.40
				2SC 1096	1.00
				2SC 1166	59
				2SC 1173	90
				2SC 1175	90
				2SC 1189	1.40
				2SC 1213	70
				2SC 1226	1.00
				2SC 1237	4.25
				2SC 1239	3.50
				2SC 1306	4.40
				2SC 1307	4.90
				2SC 1317	59
				2SC 1318	59
				2SC 1330	1.50
				2SC 1359	1.40
				2SC 1364	1.40
				2SC 1377	4.90
				2SC 1449	1.00
				2SC 1475	1.40
				2SC 1674	59
				2SC 1678	2.25
				2SC 1679	4.25
				2SC 1684	59
				2SC 1728	2.00
				2SC 1760	2.00
				2SC 1816	4.25
				2SC 1908	5.90
				2SC 1909	4.40
				2SC 1957	1.20
				2SC 1975	4.40
				2SD 77	1.00
				2SD 142	2.00
				2SD 180	2.50
				2SD 187	56
				2SD 188	3.00
				2SD 227	59
				2SD 234	1.00
				2SD 235	1.00
				2SD 313	1.10
				2SD 325	1.10
				2SD 360	1.20
				ZSK 19	1.60
				ZSK 30	90
				ZSK 33	1.10
				ZSK 34	1.10
				ZSK 47	1.20
				ZSK 49	1.30
				ZSK 55	1.30
				ZSK 68	1.30
				ZSK 22	2.55
				ZSK 35	2.25
				ZSK 39	2.25
				ZSK 40	2.25
				ZSK 41	2.50
				ZSK 45	2.50
				MK 10	2.00
				IS 84	1.00
				IS 188	.45
				IS 332	.45
				IS 953	.45
				IS 1007	.45
				IS 1209	.45
				IS 1211	.45
				IS 1555	.32
				IS 1588	.32
				IS 1885	.45
				IS 2076	.45
				IS 2093	.45
				IS 2473	.45
				IN 60	.25
				IN 30	.25

PRICES MAY CHANGE WITHOUT NOTICE

**IMMEDIATE DELIVERY WITHIN 48 HOURS ON ALL TRANSISTORS IN STOCK**

Minimum order \$10.00. Ohio residents add 4% sales tax. Add \$1.00 postage and handling. Quantity discount prices.

ASK FOR OUR COMPLETE PRICE LIST

MANUFACTURER INQUIRIES WELCOME

All Parts Guaranteed Against Factory Defects

**FUJI-SVEA ENTERPRISE**

Dept. ET  
P.O. Box 40325  
Cincinnati, OH 45240  
(513) 874-0220  
(513) 874-0223

...for more details circle 118 on Reader Service Card

# SUBBER®

MARK IV-CUVB

**A TIMESAVING INSTRUMENT BY CASTLE**



UHF-VHF TV tuner and i-f signal analyst  
Incorporates these important features:

- Tunes all UHF & VHF Channels
- Electronic Fine Tuning
- Dual 40 MHZ IF Output Jacks
- Battery Condition Indicator

**MARK IV-CUVB**  
(BATTERY POWERED ONLY)

**Net \$64.95**



## CASTLE ELECTRONICS

5233 Old South Highway 37 Bloomington, Indiana 47401

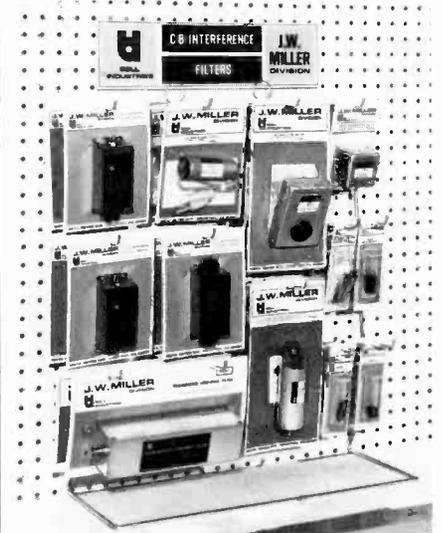
For More Details and Specifications Contact Your Nearest Distributor  
In Canada: Len Finkler Ltd; Ontario

...for more details circle 107 on Reader Service Card

odes back-to-back, L.E.D's, zeners, unijunctions, and seleniums with shunt resistances as low as 10 ohms and operational power factors range from only .0019 watts to .284 watts. The scope is 2 inches by 3 inches.

**CB FILTER MERCHANDISER 145**

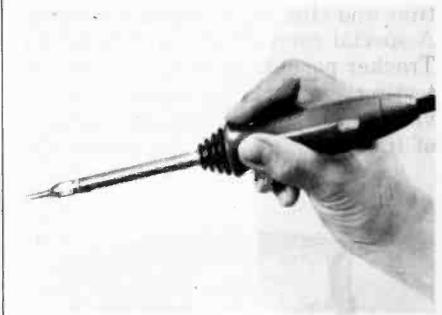
A new rack for merchandising CB interference filters has been introduced by *Bell Industries*. The filters involved have been designed to eliminate or greatly reduce virtually any type of interference to TV sets, FM



receivers and audio equipment caused by CB or amateur radio transmitters. An assortment of high pass, low pass, AC power line and audio interference filters is displayed on the compact counter type rack.

**TEMPERATURE CONTROLLED SOLDERING IRON 146**

A new soldering iron with thermostatic control built into the handle is being introduced by *Oryx, U.S.A.* The new iron, the Oryx 50-3, keeps the

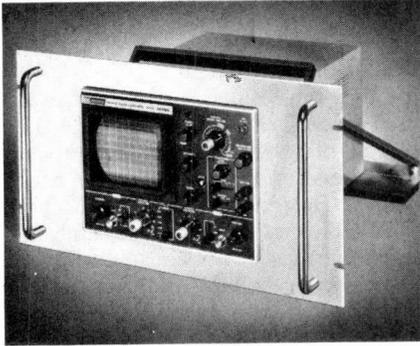


temperature constant regardless of speed of soldering, or line voltage variations. Operating temperatures range from 400° to 750°. An indicator light in the handle serves as a visual guide to the control system, as a temperature-setting aid, and as a safety feature by indicating when the

iron is left on. The iron comes complete with an iron-coated tip and a four foot 3-wire cord. Other style tips and a safety stand are optional accessories.

#### OSCILLOSCOPE MOUNTING KIT 147

A new kit for the rack-mounting of B&K Precision oscilloscope models 1474, 1472C, 1471B or 1461 is now available. Designated the RM-14 kit, the kit is designed for industrial users who require a rack-mounted instru-



ment. The kit includes everything needed to mount the 5 inch scopes on a standard 19 inch rack. Panel, hardware and instructions are included. Priced at \$50.

#### CB TRANSCEIVER TESTERS 148

Three new CB transceiver testers designed for monitoring RF output, modulation level and antenna SWR have been introduced by *Robyn International*. The MT model series feature neon transmit light, battery or AC operation, illuminated multi-colored meters, battery-saving meter lamp switch, a 10-100-1000 power scale, and

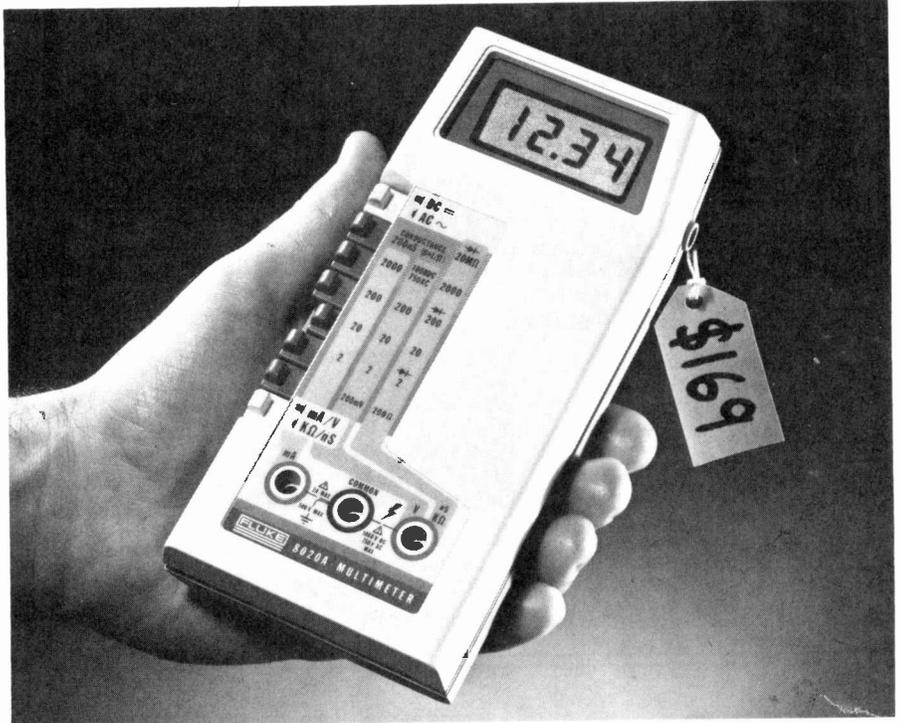


numbered CALIBRATE and SET controls for SWR and MOD meters. The testers may be left connected permanently for use as a constant monitor. The model MT-701 has one combination meter and is priced at \$59.95. Model MT-702, with two meters, is priced at \$64.95, and Model MT-703 is a deluxe three meter tester, priced at \$69.95.

#### TAP WRENCHES 149

A new line of 13-inch plain and ratchet tap wrenches, especially designed for work in inaccessible areas, has been introduced by *General*

# Don't let size and price get in the way of digital.



The new 8020A, at only \$169,\* packs a lot of capability for a small, lightweight (13-oz.) digital multimeter.

Carry it in your pocket, or your parts caddy. Anywhere. But it's in your hand that you'll appreciate the 8020A's performance, reliability and ease of operation.

And the 8020A is as simple to repair as it is to operate. Fix it yourself if you like, with all 47 parts available at Fluke service centers worldwide. But for the first year, don't worry—our solid guarantee covers it.

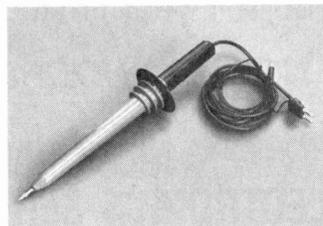
The 8020A's usefulness is extensive—use it with our 80K-40 high voltage

probe, for example—a good match. With accuracy of  $\pm 1\%$  at 25 kV, it's just right for precise CRT measurements.

And for a limited time, buy both the 8020A and the 80K-40 for only \$199,\* and save \$20 off the price of individual units.

Clip the special coupon below and rush to your local Fluke office or distributor. Call (800) 426-0361, toll free. We'll tell you the closest office. Or, give us your chargecard number and we'll ship both today!

\*Price and offer good in U.S. only.



## SAVE \$20

off the list prices of the 80K-40 probe and the 8020A DMM by presenting this coupon to your local Fluke office or distributor.

Price and offer good in U.S. only; coupon expires October 31, 1977.

3

1807-7009

**FLUKE**®

...for more details circle 116 on Reader Service Card

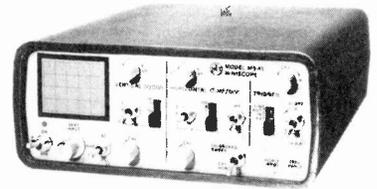
OCTOBER 1977, ELECTRONIC TECHNICIAN/DEALER / 41

**MINIATURE OSCILLOSCOPE 150**



*Hardware.* The plain tap wrench, No. 166-L, is made of polished tool steel with equalizing jaws, knurled chuck sleeve and sliding T-handle. The ratchet tap wrench, No. 161-LR, is instantly adjustable for either left or right ratcheting, or locking in a central non-ratchet position.

A new miniature cathode ray oscilloscope that weighs only 3 pounds has been developed by *Non Linear Systems*. The new miniscope, designated model MS-15, is only 2.7 inches high by 6.4 inches wide by 7.5 inches deep. Vertical bandwidth is 15 megahertz. The graticuled rectangular viewing area is four divisions high by five divisions wide. Division spacing is 0.25 inches. Internal and external triggering is provided along with automatic and line synchronization modes as well as a horizontal input. There are 12 vertical gain settings from 0.01



volts to 50 volts per division. Twenty-one time base settings from 0.1 microseconds to 0.5 seconds per division are included. MS-15 is portable and operates from batteries or a line cord.

**SPECTRUM MONITOR 151**

A new type of test instrument to assist two-way radio technicians to find and identify interfering signals has been developed by *Cushman Electronics*. Designated the CE-15 spectrum monitor, the new unit combines many features of a spectrum analyzer and a radio receiver. It allows audible as well as visual investigation of AM

**CORNELL ELECTRONICS COMPANY**  
4213 N. UNIVERSITY AVE. SAN DIEGO CALIF. 92105

**THE ORIGINAL HOME OF**  
**36¢ PER TUBE**  
UNLESS OTHERWISE PRICED  
**100 TUBES OR MORE 33¢ PER TUBE**

**Same Low Price East or West Coast!**

- ★ Bargain Tools
- ★ Transistor Tester
- ★ Technician's Library

**SEND FOR FREE NEW 48 PAGE COLOR CATALOG**

ONE YEAR GUARANTEE  
INDIVIDUALLY BOXED  
5 DAY MONEY BACK OFFER  
LAB TESTED USED

★ Dumont Picture Tubes  
★ Diodes—Transistors—Kits  
★ Tube Cartons

**SPECIAL OFFER**  
ON ALL ORDERS OVER \$10.00  
**25¢ PER TUBE (NO LIMIT) FROM THIS LIST**

6AG5	6CB6
6AU6	6J6
6AX4	6SN7

**Your Order FREE if Not Shipped in 24 Hours**  
...for more details circle 109 on Reader Service Card

**FREE ALARM CATALOG**

Huge selection of burglar & fire systems, supplies. Motion detectors, infrared beams, controls, door switches, bells, sirens. 900 items, 64 pp. packed with technical details, notes.  
Phone (602) 263-8831

**mountain west alarm**  
4215 n. 16th st., phoenix, az. 85016

...for more details circle 124 on Reader Service Card

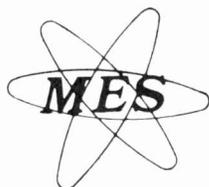
# RELY ON THE MODULE REBUILDER

**TO REBUILD YOUR MODULES AND SPEED-UP YOUR SERVICE ON MODULAR TV'S**

**HIGHER PROFITS - NO INVENTORY NEEDED**

- WE: - Specialize in all Magnavox & G.E. modules
- Service all Magnavox remote controls
  - Final check all modules on an operating chassis
  - Use only factory specs parts for repairs
  - Have been in TV servicing for 20 years
  - Are factory trained, CET's & state licensed
  - Give you a 1 year limited guarantee

**SEND YOUR MODULES NOW - 48 HOURS IN SHOP SERVICE**



**MODULAR ELECTRONICS SERVICES, LTD**

4024 W. 10th St.  
Indianapolis, Ind 46222  
(317) 243-8347

...for more details circle 123 on Reader Service Card

or FM signals within its 1 to 1000-MHz frequency range. The CE-15 can be used to check transmitters for spurious outputs and harmonics, to identify interference, measure distortion characteristics of signals, detect leakage from receiver local oscillators, and can be used as a troubleshooting tool for tracing signals in IF and RF circuits.

**CUTTING/CRIMPING PLIER 152**

A new rugged, forged 9 inch side cutter and crimper plier has been introduced by *Klein Tools*. Designated model D213-9NECR, the new plier features the same high-leverage de-



sign and mechanical cutting advantage as the previous Klein plier, Model 213-9NE, but has the added feature of a crimping die just behind the hinge to crimp sleeve connectors. The new plier also has yellow plastic-dipped handles.

**CB SERVICE MONITOR 153**

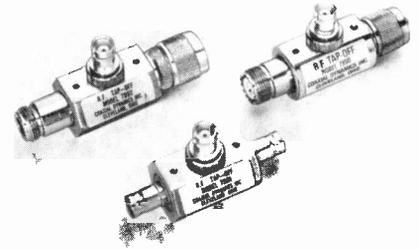
A new service monitoring instrument for CB transceivers has been introduced by *Com-Ser Laboratories*. Designated Model CB -2700, the new instrument features a frequency sweep across the CB band and across any IF up to 12 MHz. The swept RF output may be attenuated to give a rapid check of sensitivity on all chan-



nels, and permit visual alignment of IF filters. CB-2700 also includes a phase locked loop oscillator permitting on knob selection of any of the present 40 channels with LED display of the channel. Priced at \$990.

**SIGNAL SAMPLERS 154**

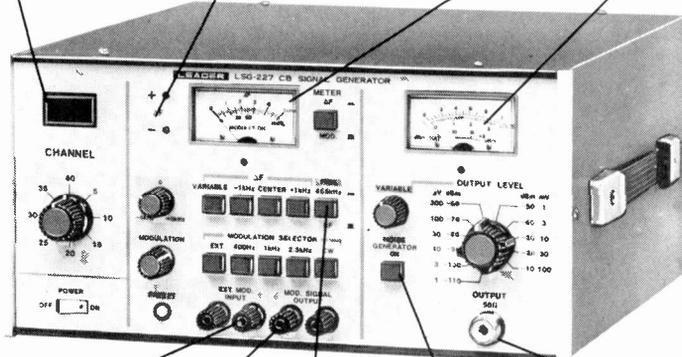
A new line of adjustable tap-offs that will pick up small samples of R.F. signal from a coaxial transmission line system has been announced by *Coaxial Dynamics*. Designated models 7990, 7991 and 7992, the new signal samplers feature variable couplings which can be set to the right signal



level to drive a frequency counter or spectrum analyzer, feed an oscilloscope, operate a receiver, or be sensed by a crystal detector. They provide a non-directional, continuously vari-

**INTRODUCING THE NEW LEADER  
40-Ch PLL CB  
Signal Generator**

40-Ch. Digital Readout in FCC Sequence. ±1KHz Program Freq. Shift for SSB. Modulation Meter. Calibrated RF Meter.



External Mod. Capability Audio Output 455KHz IF Output. Built-in Noise Generator Blow-out Proof.

**Now, service CB with speed and accuracy.**

Model LSG-227 . . . \$549.<sup>95</sup>  
See your distributor or write direct for details.

When Quality Counts . . .

**LEADER  
Instruments Corp.**

151 Dupont Street, Plainview, N.Y. 11803  
(518) 822-9300  
In Canada: Omnitronix Ltd., Montreal, Quebec

...for more details circle 120 on Reader Service Card



## NEW EICO 1200 30 MHz FREQUENCY COUNTER

3 Operating Modes: Freq., Period, Count

MOS/LSI IC design gives exceptionally high reliability and laboratory performance. Guaranteed to 30 MHz minimum, 45 MHz typical (250 MHz with EICO FE-250 Pre-scaler, \$39.95) with 1 Hz resolution. Sensitivity is a low 15 mV RMS. Period mode: Measures intervals up to 9.99999 seconds. Count mode: adds up event pulses up to a count of 999999. Features: Six 0.5" LED displays; Timebase Switch (KHz/MHz); input attenuator; overflow indicator; 120 VAC or 12 VDC mobile operation.

Assembled \$169.95

### FREE '78 EICO CATALOG

Check reader service card or send 75¢ for first class mail. See your local EICO Dealer or call (212) 272-1134, 9:00 a.m.-5:00 p.m. EST. Major credit cards accepted.

EICO—283 Malta St.,  
Brooklyn, N.Y. 11207

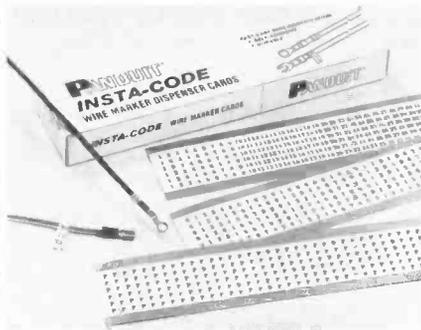


...for more details circle 112 on Reader Service Card

able coupling level related to the insertion depth of its sampling connector into the line section. Available with types of UHF, BNC, or N connector. Priced in the \$35 range.

### WIRE MARKER TAPE 155

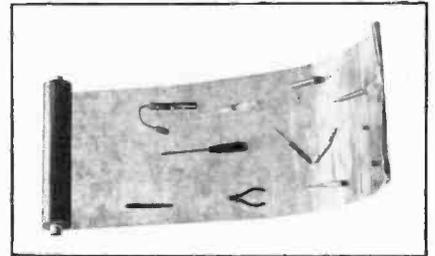
A new line of pre-printed, pressure-sensitive cloth markers for wire identification has been introduced by Panduit Corporation. Called Insta-Code, the new markers are mounted on smooth-coated cards for easy removal



and application to the wire. Available in all popular legends, the markers are 1½ inches long and will wrap around all wires up to 3/8 inches outside diameter. Material is vinyl impregnated cloth suitable for use in temperature ranges from -40°F to 250°F.

### SLIDEPROOF WORK PAD 156

A new, slide-proof plastic material for use on service benches and other work areas has been developed by Kager International. Called Slide-stop, the new material prevents tools and components from sliding or rolling off the bench, yet it is said to be completely non-sticky. It comes in rolls



and can be cut to any size desired. It is available in green, red, blue, yellow and white and is said to be non-toxic. Slidestop is also reported to reduce noise. ■

### ZENITH

continued from page 31  
tion in the detection system.

As pointed out in the Zenith Training Manual for the J-line, "The IF bandpass response which provides optimum peaking, video transient response, and the least amount of video background noise (which also occurs in the 1.5MHz to 2.0MHz range) is the "flat-top" If bandpass response (Fig. 6). This response decreases the peaking in the 1.5MHz to 2.0MHz video range by depression of the 'nose' of the bandpass."

### J Line Tuning Systems

The U/V Integral Tuning systems that were first introduced by Zenith in their H line of color receivers will be continued in the majority of J line receivers. However, not all receivers, for example the 13 inch size, can accommodate the new U/V integral type. These will continue to use the two separate VHF and UHF tuner systems.

The U/V Integral configuration of tuning systems features simplified interconnections between UHF and VHF tuners, reduced size, lower manufacturing cost, and improvements in serviceability and reliability.

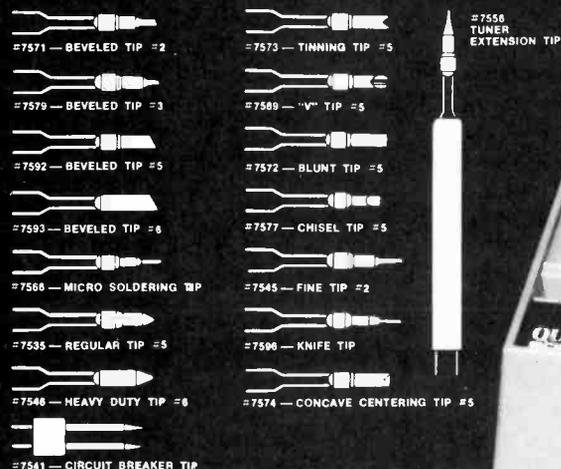
The integral system uses two basically different varactor diodes—the hyperabrupt junction varactor diode and the abrupt junction.

The hyperabrupt junction diode,

## QUICK CHARGE IRON- QUICK CHANGE TIPS

ISO-TIP® Quick Charge Cordless Soldering Iron recharges in 3-4½ hours. Uses any of Wahl's 16 snap-in tips.

Low voltage, battery powered, ground free isolated tip design.



**WAHL CLIPPER CORPORATION**  
ORIGINATORS OF PRACTICAL CORDLESS SOLDERING.  
Sterling, Illinois 61081 (815) 625-6525  
"Manufacturing Excellence Since 1919"

...for more details circle 133 on Reader Service Card

used previously in Zenith's G line, is now used in the J-line's Push Button Manual Varactor Tuning System and in the 14-position Space Command system (as pictured in Fig. 7).

These hyperabrupt diodes produce a large capacitance change per voltage change. In Fig. 8 the tuning curve illustrates how this relates to the frequency change of circuits to which these diodes are added. Channels 2 through 6 are tuned with an average voltage range of +1 to +9 volts. Channels 7 through 13 are tuned by voltage ranging between +10 and +24 volts.

The *abrupt junction* type of varactor diode is used in the J-line's 18 Position Rotary Channel Selector assembly. The chart in Fig. 9 illustrates the frequency versus voltage curves produced by the abrupt junction diode.

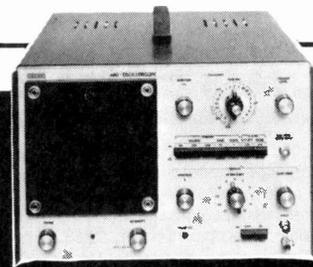
The curves demonstrate the fact that these abrupt junction diodes are less sensitive to voltage change. Almost the total tuning voltage range from +1 to +24 volts is required to tune the VHF low band channels 2 through 6.

And a larger tuning voltage variation is required by the high VHF band, channels 7 through 13.

Several changes have been made in the U/V Integral Tuners used in the J-line. For comparison, Fig. 10 shows the previous U/V tuner and the new 1978 U/V tuner side by side.

Notice, first of all, that an open IF output converter coil/transformer has been replaced by a shielded coil that mounts directly to the circuit board, thus wires that previously were easily broken are now protected by the shield.

Another change eliminates the feedthru capacitor in the FET RF Amplifier circuit that acted as the source bypass. Originally, the source lead was connected to the heat sink clamp, which in turn, was connected to the feedthru capacitor. Sometimes, when the RF transistor was changed, the feedthru capacitor was accidentally broken. In the new version, the feedthru capacitor has been replaced by a circuit board-mounted trapezoidal capacitor. Now, when the transistor is changed, the capacitor is not touched. ■



## NEW EICO 480 TRIGGERED SWEEP 10 MHz SCOPE

100% Solid State • Includes 10:1 Probe

More Professional scope performance for your money! DC to 10 MHz bandwidth, AC and DC coupling, 11 position calibrated attenuator, 10 mV/cm sensitivity, push-button operation. Outstanding features: Built-in TV Sync Separator; Digitally controlled trigger circuits; reference baseline display; calibrated 21 step sweep speed; Fully regulated power supply; Custom Bezel for standard camera mounting. **Assembled \$425.00**

### FREE '78 EICO CATALOG

Check reader service card or send 75¢ for first class mail. See your local EICO Dealer or call (212) 272-1134, 9:00 a.m.-5:00 p.m. EST. Major credit cards accepted.

EICO-283 Malta St.,  
Brooklyn, N.Y. 11207



...for more details circle 113 on Reader Service Card

# Your new RCA QT Parts Inventory Program with annual drop-ship updating.



**Here it is!** Your new RCA QT (Quick Turnover) Parts Program that assures you an up-to-date inventory of the most used RCA exact replacement TV parts.

**Simply contact your RCA Distributor** and register as a QT Dealer. You will receive your package of 150 of the most-needed, fastest-moving parts.

**Automatically, once a year, QT parts will be evaluated,** and the program will be updated to include only the 150 fastest-moving parts. You return the parts that are dropped from the fastest-movers list to your RCA Distributor, and get *full credit*. At the same time, the new parts added to the QT list will be *shipped directly to you from RCA*. A quick, automated inventory control system designed for your convenience.

**And, to keep your parts organized for fast servicing,** ask your RCA Distributor about the QT Parts Rack. It's sturdy, but light enough to hang on a wall. Saves you time and space.

**Call your RCA QT Parts Distributor** for all the details, or write to RCA Distributor and Special Products Division, Deptford, N.J. 08096.

## RCA QT Parts

...for more details circle 128 on Reader Service Card

# CLASSIFIED

**RATES:** 40 cents per word (minimum charge, \$10). Bold face words or words in all capital letters charged at 50 cents per word. Boxed or display ads charged at \$46 per column inch (one inch minimum). For ads using blind box number, add \$3 to total cost of ad. Send ad copy with payment to: Susan Hellerman. ELECTRONIC TECHNICIAN/DEALER, 757 Third Avenue, N.Y., N.Y. 10017.

**BOX NUMBER REPLIES:** Mail box number replies to: ELECTRONIC TECHNICIAN/DEALER, Classified Ad Department, One East First Street, Duluth, MN 55802. Please include box number in address.

## Business Opportunities

**TRANSFERRED** airline pilot has lucrative TV repair shop in beautiful colonial on 1/2 acre. \$49,900 for home, TV business **FREE**. Bruce Electronics, 10 White Birch Drive, Centereach, NY 11720, 516-585-6262. 10/77

T.V.-Stereo repair shop. Established 8 years. County has approximately 1M people. Untapped potential. \$11K complete. Terms. A & M T.V., 1116 Lincoln Avenue, Alameda, California, 94501. 11/77

**INCREASE YOUR INCOME!** Rent, Lease or Sell TV's New or Used; Anyone can! Easy to start and operate, part or full time; even from your home. Basic preliminaries \$4.00. Perry's TV Leasing, 308 N. McClelland, Santa Maria, Calif. 93454. 10/77

Long Beach, California TV Business. High Net. Large One Man Shop. Great Opportunity For Right Man. Make Your Move Now! 1-213-549-4427. 10/77

**MATV INSTALLERS. WANT MORE PROFITS WITH LESS HEADACHES? INFORMATION \$5.00. BOX 809, BOYNTON BEACH, FLA. 33435.**

## ATTENTION SERVICE DEALERS



Send your order in now to:



Now you can buy directly—at substantial savings—Top-Line PR brand professional Solid-State replacements for all entertainment and industrial types. These are professional devices which replace over 130,000 industry types, and you buy them at savings of approximately 40% below regular dealer cost. To order: Send us the ECG, SK or GE numbers that you need and we will promptly ship you the premium PR direct replacements—plus a free PR Replacement Guide. Remember, these are all premium, 2-year warranty devices—No Culls, No Seconds—only professional Top-Line quality. Orders over \$25.00 shipped free; orders up to \$25.00 add \$1.00 for UPS. Orders over \$100.000 receive 5% discount. To approximate amount of your order, deduct 40% from dealer cost of the ECG, SK, or GE types.

### DEVCO

P.O. Box 270, Garwood, NJ, 07027 • (201) 688-0300

**START ELECTRONIC FACTORY IN YOUR HOME. GET STARTED IN YOUR SPARE TIME. BIG PROFITS. ONE MAN OPERATION. EXPERIENCE NOT NECESSARY. WRITE FOR FREE LITERATURE TELLING HOW. ELECTRONIC DEVELOP. LAB, DEPT. B, BOX 1535, PINELLAS PARK, FLA. 33565.** TF

Stereo repair business for sale. Carry in; high end warranty station; high income neighborhood; good equipment and parts supply; good reputation, 7 years. Health forces sale. \$25,000. Bob Grady Electronics, 1059 Silber Road, Houston, Texas 77055. 10/77

**COMPUTER FUTURE**—We are looking for qualified independently owned radio-television and electronic shops to handle our Educational, Professional and Personal Computers. We provide training and a protected area. S/D Computer Technology, P.O. Box 1283, Albany, NY 12201. 10/77

### FERRIS STATE COLLEGE ELECTRICAL & ELECTRONICS DEPARTMENT DEPARTMENT HEAD

Effective December, 1977, or as soon thereafter as possible. Closing date for receipt of applications is November 1, 1977. Department has twelve faculty and offers programs in Avionics, Electrical Power Technology, Industrial Electronics Technology, Radio and Television Service, Broadcast Electronics Technology. Minimum of Masters degree in closely related field. Industrial technical experience and evidence of managerial and leadership skills. Salary commensurate with qualifications. Send resume and credentials to:

Associate Dean John C. VanderMolen  
School of Technical & Applied Arts  
Swan Building, Room 108  
Ferris State College  
Big Rapids, MI 49307

**AN EQUAL OPPORTUNITY/  
AFFIRMATIVE ACTION EMPLOYER** 10/77

TV tube rebuilding, make 15 tubes per shift. Automatic equipment. Will train new owner. \$7,000 plus stock. Breshears, 2333 South Compton, St. Louis, MO 63104. 10/77

**WORK AND PLAY IN THE FABULOUS FLORIDA RAYS**—Radio—TV—Communications Sales and Service. \$125,000. For further information write ET/D, Box 113. 12/77

2 way radio service shop, CB and FM Sales and Service. Six years in business, all up to date test equipment. Inventory is 40K and price 30K. Details write: P.O. Box 611, Delta, Colo. 81416. 12/77

**ELECTRONICS/AVIONICS EMPLOYMENT OPPORTUNITIES.** Report on jobs now open. Details **FREE**. Aviation Employment Information Service, Box 240 Y, Northport, New York 11768. 8/78

**FOR SALE:** TV Sales and Service. Sacrifice. Florida East Coast. Retiring—16 years—same location. Reasonable rent—\$18,500 cash or terms. 1-305-723-6161. 10/77

### Wanted

**WANTED: CB RADIO REPAIR CONTRACT WORK. A & R SERVICE, NORTH HAVEN, CONN. 203-239-0155 (evenings).** 10/77

send a message...  
...write here.

1. Number of insertions: (circle) 1 2 3 6 12  
2. Start with (month) \_\_\_\_\_ issue (Copy must be in by 1st of month preceding)  
3. Amount enclosed: \$ \_\_\_\_\_

PAYMENT MUST ACCOMPANY ORDER. WE'LL BILL RATED FIRMS. NO AGENCY COMMISSION.

NAME \_\_\_\_\_ COMPANY \_\_\_\_\_

STREET \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

MAIL AD COPY TO: SUSAN HELLERMAN, ELECTRONIC TECHNICIAN/DEALER, 757 THIRD AVENUE, NEW YORK, N.Y. 10017.

**RATES:** 40 cents per word (minimum charge, \$10). Bold face words or words in all capital letters charged at 50 cents per word. Boxed or display ads charged at \$46 per column inch (one inch minimum). For ads using blind box number, add \$3 to total cost of ad.

**ELECTRONIC TECHNICIAN/DEALER Classified**

### PICTURE TUBE MACHINE

We buy and sell NEW AND USED CRT rebuilding machinery. COMPLETE TRAINING. Buy with CONFIDENCE from the ORIGINAL MFR. For complete details, send name, address and zip code to:

#### LAKESIDE INDUSTRIES

3520 W. Fullerton Ave., Chicago, IL 60647  
Phone: 312-342-3399

### For Sale

**REM CRT TESTER OWNERS:** Update your unit to handle new inline CRT's. Send \$2.00 for plans and information on modification service. Write to R.J. Dowd, Box 315, Media, PA 19063. 10/77

FCC 1st, 2nd, 3rd questions, answers, "explanations" compiled from technical schools, colleges, avionics companies. \$11.00. S. Mager, Box 26151, Los Angeles, California 90026. 10/77

**REPLACEMENT COLOR YOKES-DEALERS ONLY.** Zenith 95-2501-2532-2638-2667-S89633 etc. \$16.95. Magnavox 361380-1 \$18.95 etc. Sylvania, G.E. etc. \$14.95 to \$19.95. Request for price list on your letterhead. David Sims Enterprises, Inc., 665 Jerricho Turnpike, Huntington Station, N.Y. 11746. TF

For Sale: Almost new B & K 1077B Analyst and 415 Sweep Generator. \$650. for the pair. Mobile Electronics Corp. Box 539, Margaretville, N.Y. 12455. 10/77

**TRANSISTOR REPLACEMENT. PHYLTRON ELECTRONICS LX REPLACEMENT LINE REPLACES THE MOST POPULAR REPLACEMENT TYPES AT OR BELOW DISTRIBUTOR COST.** One year unconditional guarantee. Buy direct and save. Write for free catalog. Phyltron Electronics, 487 Springfield Ave., Summit, N.J. 07901. 10/77

Seeking original Japanese transistors, IC, FET and diodes for CB repair use? Write or call for our list and compare prices. Fuji-Svea Enterprise, Dept. ET, P.O. Box 40325, Cincinnati, OH 45240. (513) 874-0220. 2/78

**FOR SALE: UHF TUNERS.** Complete line of solid state plus some RCA KRK66AM and Philco UT-51. \$10.00 plus postage and handling. Metropolitan TV, 3341 Kensington Ave., Philadelphia, PA 19134. Phone 215 423-2502. 10/77

Collector's Item for sale. Electronic Books. Riders Manual Vols. 2-27 w/Index. Sams Photofacts Service 1-150 w/Index. Make Offer. Write ET/D, Box 114. 10/77

**Transistors, IC's, Communications—CB Save—Low Costs—Direct**  
2SC1306—\$2.95, 2SC1307—\$3.85, 2SC799—\$3.00, BA511—\$3.30, TA7205—\$3.50  
More. Send for your dealer confidential price list.

**30** B&D Enterprises  
P. O. Box 32, Dept. 1  
Mt. Jewett, PA 16740

**REPAIR TV TUNERS—High earnings, Complete Course Details, 12 Repair Tricks, Many Plans, Two lessons, all for \$2. Refundable. Frank Bocek, Box 3236, Ent., Redding, CA 96001. T/F**

**RECORDACALL—Auto60-up to 120 calls, 24 hours, monitor, dictation, ff, rewind, erase, microphone, warranty. \$130.00 Postage cod. Illinois residents add sales tax. TERRY'S, Box 209A, Park Ridge, Illinois 60068. 12/77**

**TV AND RADIO TUBES .36¢ EA!!** Send for free color parts catalog. Your order free if not shipped in 24 hours. Cornell Electronics 4215-17 University San Diego California 92105. TF

**ORIGINAL JAPANESE TRANSISTORS, ICs for Stereo and CB. Repair for less. Example—2SC458 \$ .45, 2SD710 \$ .45, 2SC0313 \$1.10. Ship within 24 hours. Write or call MCM AUDIO, 1401 Patterson Rd., Dayton, Ohio 45420. (513) 252-5662. 11/77**

**BUGGING & WIRE TAPPING** is a growing public concern. Are you equipped to answer your customers' questions—and get your share of the 'de-bugging' profits? 'ELECTRONIC SPYING' is the most simplified and comprehensive book ever written on the subject of electronic surveillance, and will tell you all you need to know. Order direct from publisher for only \$6.00: MENTOR PUBLICATIONS, Dept. 120, 135-53 No. Blvd., Flushing, N.Y. 11354. 10/77

**RCA—ZENITH—PANASONIC EXACT REPLACEMENT PARTS.** Largest stock. Green Tele-Radio Distributors, 172 Sunrise Highway, Rockville Centre, NY 11570 UPS C.O.D. 10/77

### Alarm Systems

**EMERGENCY AUTOMATIC TELEPHONE DIALER, M-334.** FCC Registered. Panic switch or burglar alarm operation. Plug-in design. Many advanced features. Program it yourself. Professional protection. A price you won't believe. Free catalog. S&S Systems, 5619-B St. John, Kansas City, Mo. 64123, (816) 483-4612. 10/77

**ELECTRONIC TECHNICIAN/DEALER** is not responsible for any of the items, plans, courses or quality of products offered through our classified section.

## NEW & DAZZLING!!!

**MS-15 Miniscope—the Ultra Oscilloscope for \$289.00 from NLS**



#### Features Include:

- Truly portable.
- 15 megahertz bandwidth.
- External & internal trigger.
- Horizontal input.
- Automatic and line sync modes.
- Vertical gain - 0.01 to 50 volts per division - 12 settings.
- Time base - 0.1 microseconds to 0.5 seconds per division - 21 settings.
- 3% accuracy on all functions.
- Power consumption less than 15 watts.
- Battery or line operation with batteries and charger unit included.
- Weight only 3 pounds.
- Size: 2.7" H x 6.4" W x 7.5" D.
- Options include a 10 to 1, 10 megohm probe and leather carrying case.
- Parts and labor guaranteed for one year.

**A Silver Jubilee Product!**



**Non-Linear Systems, Inc.**

Originator of the digital voltmeter.

Box N, Del Mar, California 92014 Telephone (714) 755-1134

...for more details circle 127 on Reader Service Card

# Qualitone

SEND FOR OUR BIG

## FREE WHOLESALE CATALOG

FOR DEALERS ONLY!  
We do not sell the consumer!

SAVE ON  
THOUSANDS  
OF AUDIO AND  
ELECTRONIC PARTS,  
TEST EQUIPMENT  
AND  
ACCESSORIES.

QUALITONE INDUSTRIES, INC.  
696 Locust St., Mt. Vernon, N.Y. 10552

Please send FREE Catalog to:  
(Please use your business letterhead.)

Name.....

Company.....

Address.....

City.....State/Zip.....

...for more details circle 126 on Reader Service Card

### Don't cut yourself out of a career as a two-way radio technician...

MTI offers the only training for professional FM two-way radio available. Qualified technicians are employed in government, industry, and public service. But training is your key.

You could cut out a career as a two-way radio technician by cutting out this coupon. We'll send you information on how you can learn more about this specialized field, at home.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State/Zip \_\_\_\_\_

KK9

formerly

**MOTOROLA TRAINING INSTITUTE**

Summerville, Pennsylvania 17093

...for more details circle 121 on Reader Service Card

## READER SERVICE INDEX

### ADVERTISER'S INDEX

- 105 American Technology Corp. ....25
- 106 B & K Div., Dynascan Corp. ....6
- 107 Castle Electronics .....40
- 108 Channel Master .....14
- 109 Cornell Electronics .....42
- 110 Dana Laboratories, Inc. ....16
- 111 Dowd Enterprises, R. J. ....48
- 112-113 Eico Electronic Instruments Co. ....44, 45
- 114 Electronic Book Club .....33
- 115-116 Fluke Mfg., John .....39, 41
- 117 Fordham Radio Supply Co., Inc. .27
- 118 Fuji-Svea Enterprise .....40
- GTE Sylvania, EGC Consumer Renewal .....Cover 3
- General Electric, Tube Div. ....17
- 119 International Components Corp. .38
- 120 Leader Instruments Corp. ....43
- 121 MTI .....48
- 122 Mallory Distributor Products Co. ....13
- 123 Modular Electronics Services, Ltd. ....42
- 124 Mountain West Alarm Supply Co. ....42
- 127 Non-Linear Systems .....47
- 102 PTS Electronics, Inc. ....Cover 2, 1
- 125 Pomona Electronics .....21
- 126 Qualitone Industries, Inc. ....48
- RCA Corp. ....7
- 128 RCA - QT Parts .....45
- 129 Sencore, Inc. ....11
- 130 Simpson Electronic Co. ....3
- 131 Optima Electronics .....10
- 103 Triplett Corp. (for info.) .....Cover 4
- 104 Triplett Corp. (for demo.) .....Cover 4
- 132 VIZ Mfg. Co. ....37
- 133 Wahl Clipper Corp. ....44
- 134 Workman Electric Products, Inc. ....48
- Zenith Radio Corp., Consumer Div. ....9
- 135 Zenith Radio Corp., Service, Parts & Accessories Div. ....4-5

This index is furnished for the readers' convenience. However, the publisher can not guarantee its accuracy due to circumstances beyond our control.

**we specialize in CIRCUIT BREAKERS**

and over 3,000 other quality products for the electronic trade available through fine Electronic Distributors everywhere in the U.S.A.

**WORKMAN Electronic PRODUCTS, INC.**  
SARASOTA, FLA. 33578

P.O. Box 3828 (813) 371-4242  
TWX 810-864-0401 Workman Sara

...for more details circle 134 on Reader Service Card

## TEST JIGS

FROM \$39.95

## YOKE ADAPTORS

ALL \$4.95 EACH

## CONV. PLUGS

ALL \$1.50 EACH

**PLUS:**

HORZ. AND VERT. MATCHING SYSTEMS

CRT ADAPTORS

FOR ALL TEST JIGS



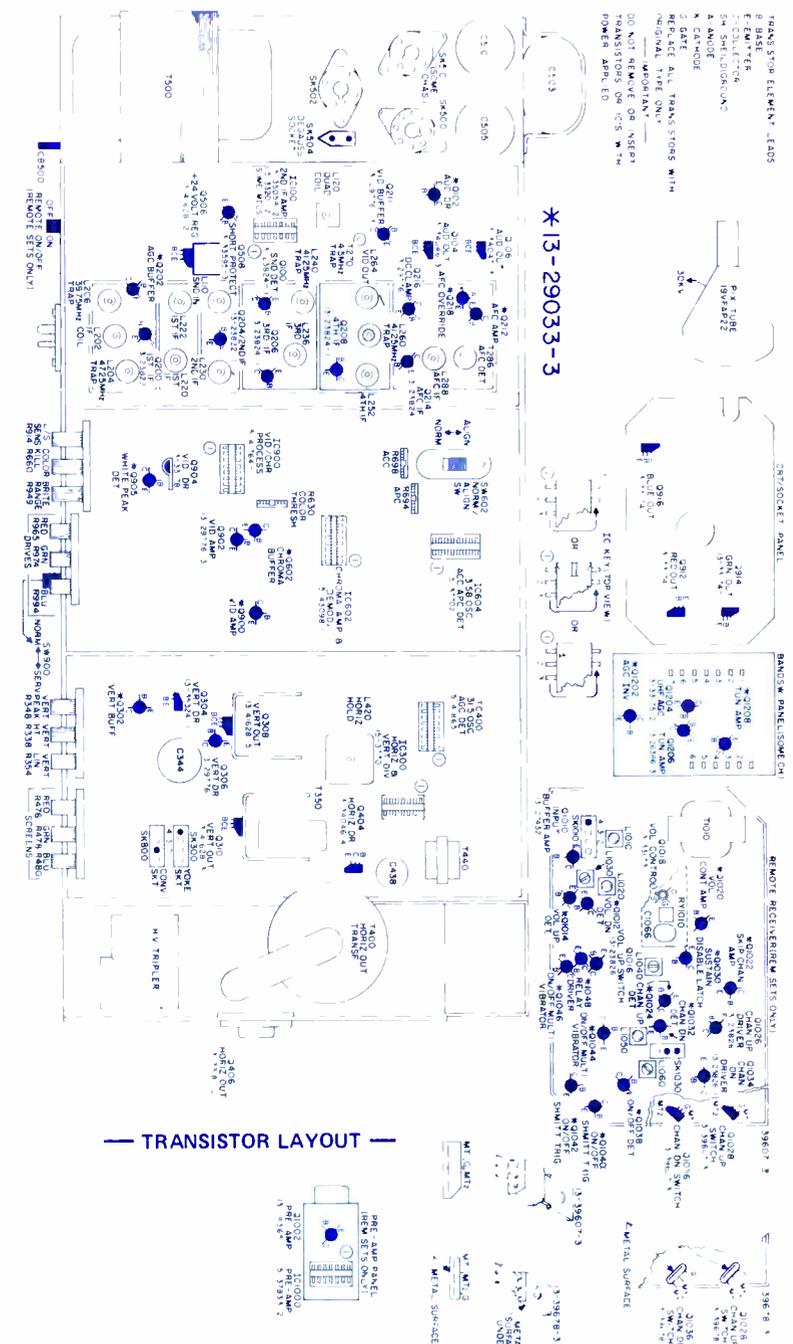
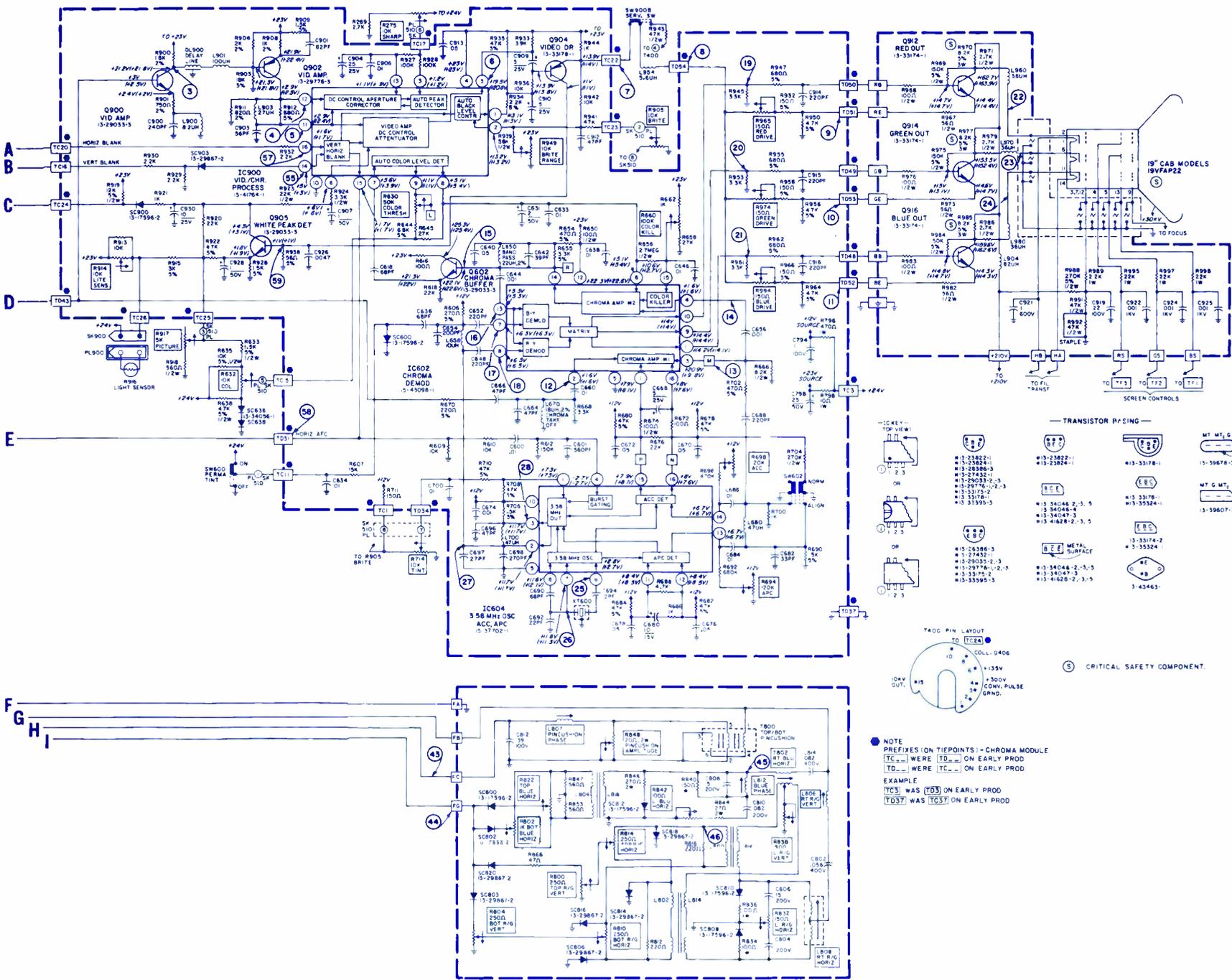
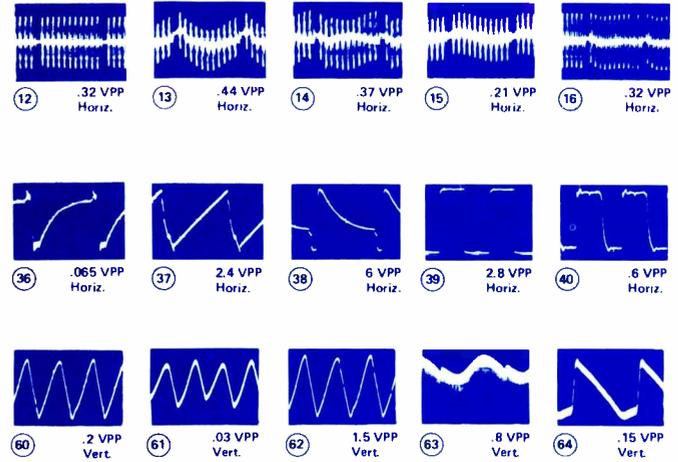
## DOWD ENTERPRISES

P.O. BOX 315  
167 HUNTING HILLS LANE  
MEDIA, PA. 19063

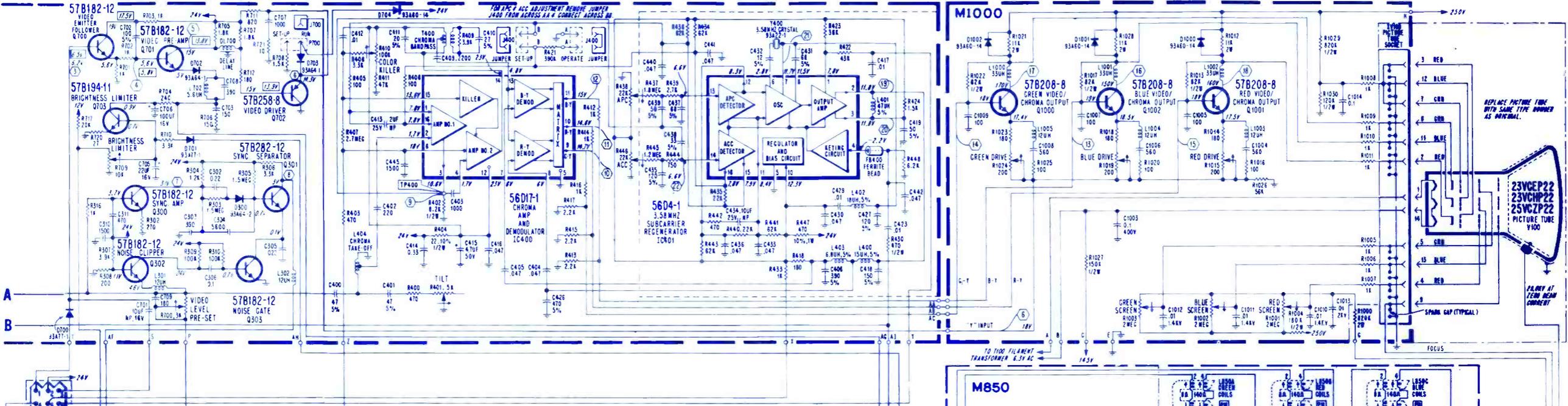
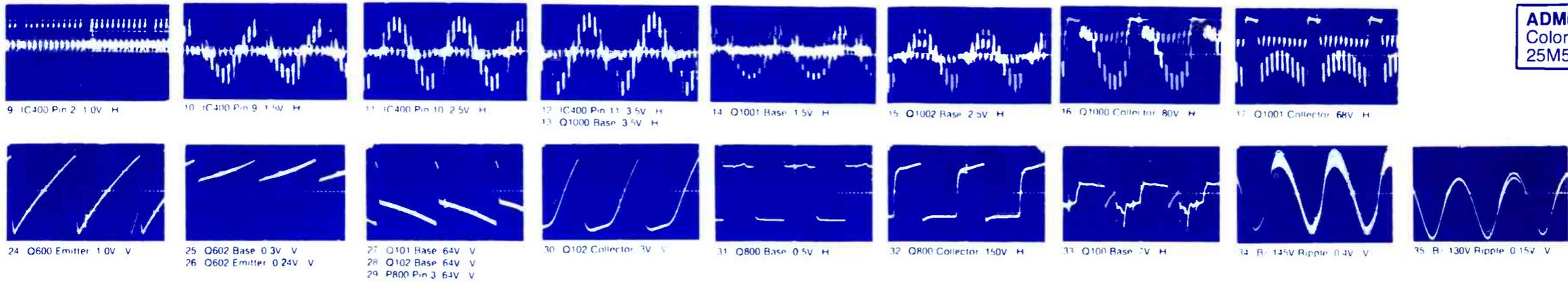
SEE YOUR DIST. OR WRITE FOR FREE CATALOG

...for more details circle 111 on Reader Service Card







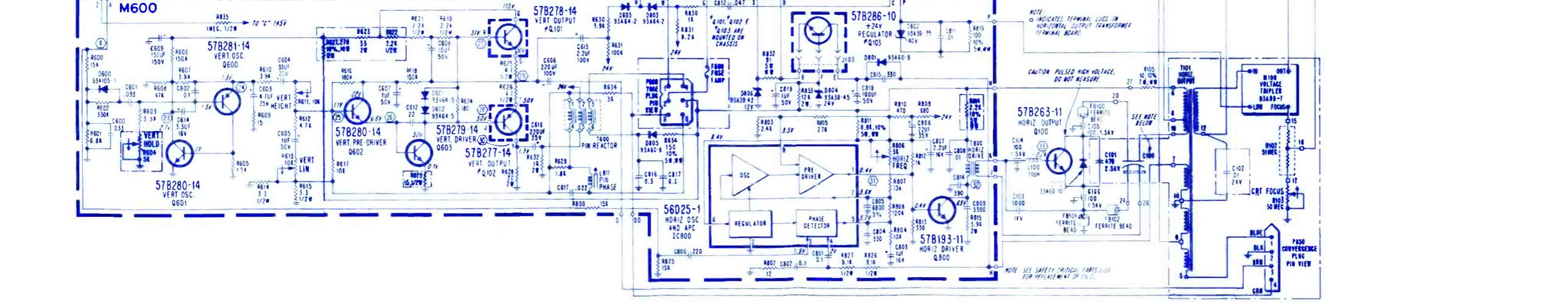
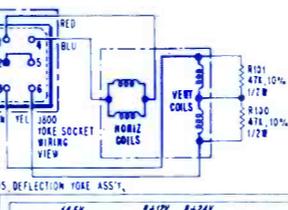


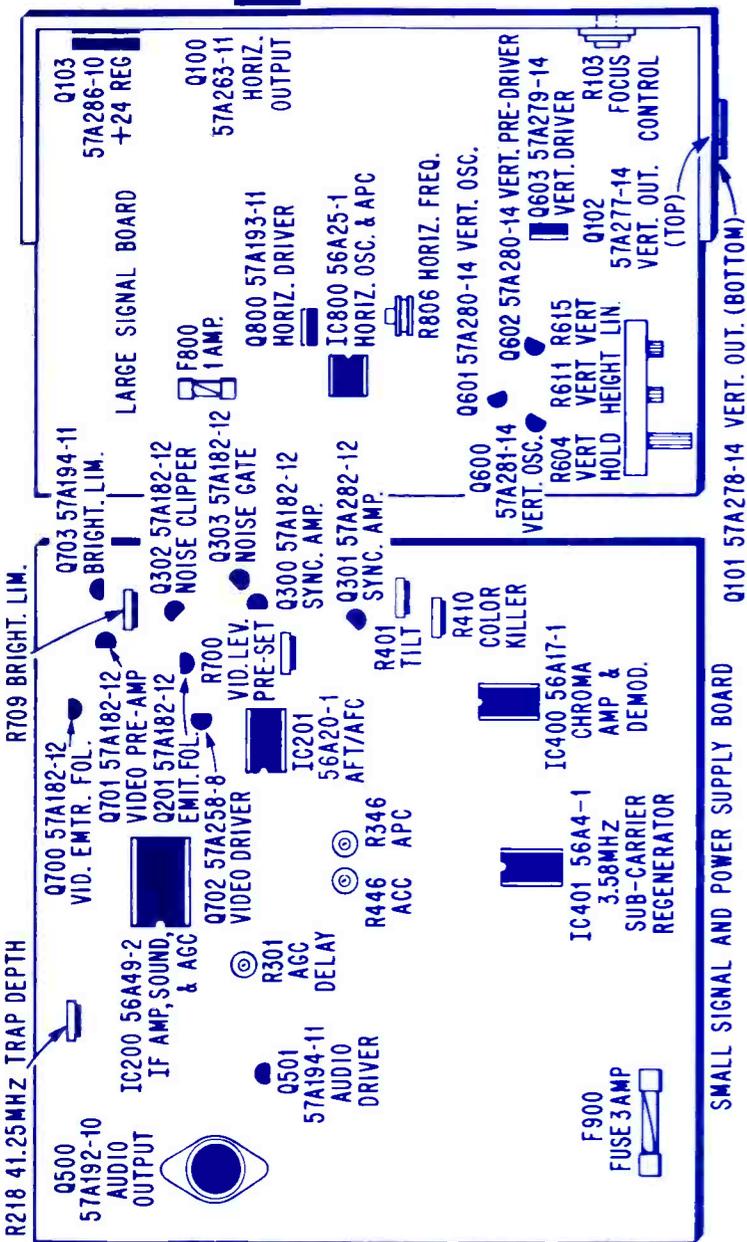
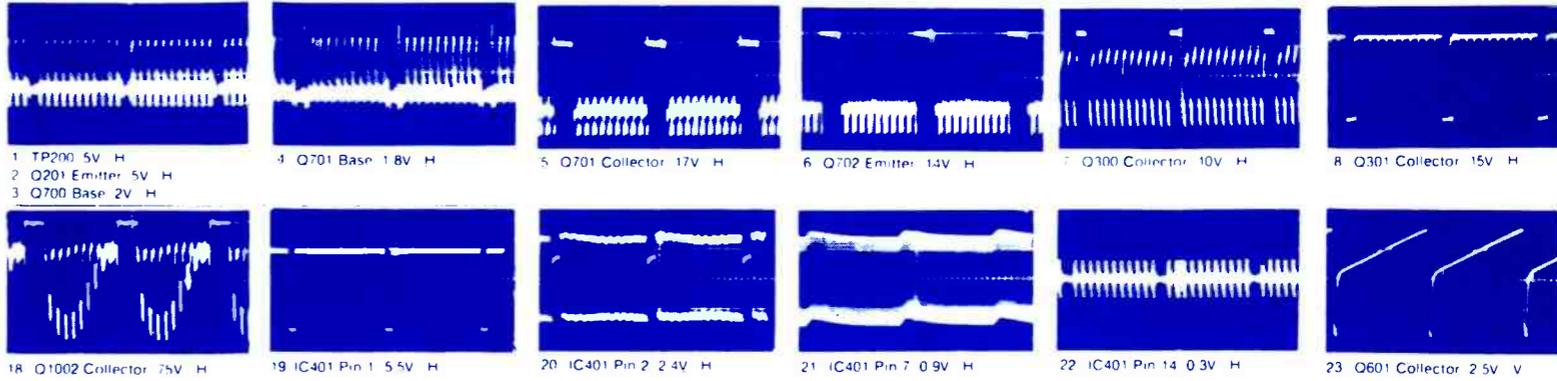
**SCHEMATIC NOTES**  
UNLESS OTHERWISE INDICATED:  
RESISTOR VALUES IN OHMS,  $\pm 5\%$ , 1/4W  
CAPACITOR VALUES IN OHMS,  $\pm 5\%$ , 1/4W  
IN USE  
OHM RESISTANCE VALUES LESS THAN 1 OHM, NOT SHOWN  
COMMON GROUND (B)  
COMPONENT NOT MOUNTED ON PRINTED CIRCUIT BOARD  
RUSH CURRENT INDICATES CHANGE IS INCORPORATED AS GIVEN UNDER THAT RUSH NUMBER, AS WELL AS ALL LOWER RUSH CHANGES  
SYMBOL INDICATES 1:1 POINT CONNECTIONS  
ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION

**SEMICONDUCTOR CAUTIONS**  
TO AVOID DAMAGE TO SEMICONDUCTOR DEVICES DO NOT ARC 2ND ANODE LEAD OR PICTURE TUBE ANODE TO GROUND. DISCHARGE ONLY TO PICTURE TUBE DAG OR DAG GROUND. DO NOT TURN SET ON WITH TRANSISTOR(S) REMOVED, OR PICTURE TUBE OR OTHER LEADS REMOVED OR UNSOLDERED. USE CAUTION TO PREVENT ACCIDENTAL SHORTS BETWEEN COMPONENT LEADS OR TO CHASSIS GROUND. MAKE CONTINUITY AND RESISTANCE MEASUREMENTS WITH VOM, FIELD EFFECT METER, OR OTHER HIGH INPUT IMPEDANCE METER. DO NOT USE A VOLT-OHM-METER HAVING LESS THAN 100K OHMS/VOLT FOR RESISTANCE MEASUREMENTS.

**WARNINGS**  
USE ISOLATION TRANSFORMER WHEN SERVICING CHASSIS!  
WHEN SERVICING, USE EXACT REPLACEMENT PARTS (EIE). ALSO PERFORM ALL SAFETY CHECKS SPECIFIED UNDER "IMPORTANT PRODUCT SAFETY INFORMATION" IN SERVICE MANUAL.

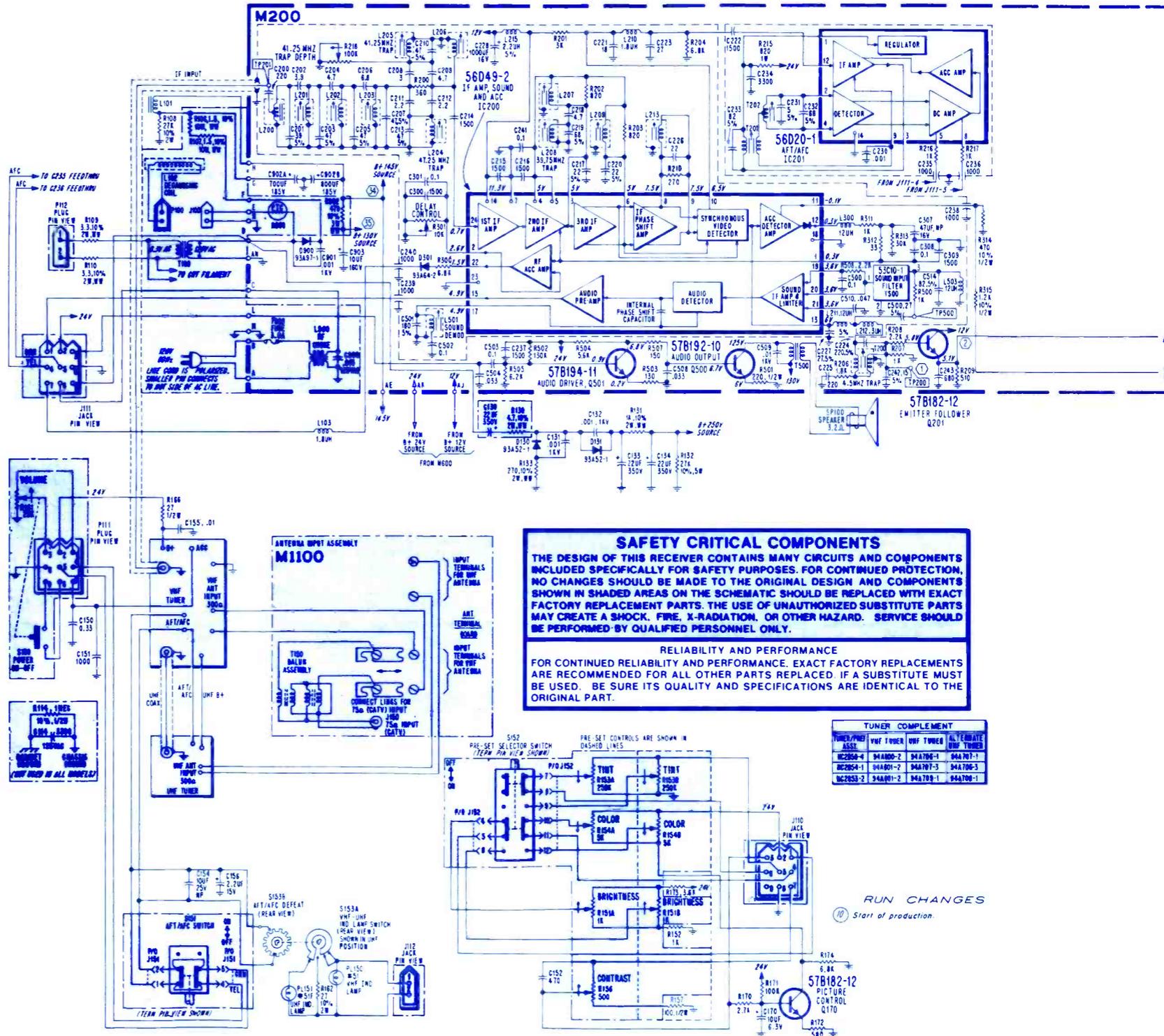
**VOLTAGE & WAVEFORM INFORMATION**  
DC VOLTAGES ARE MEASURED WITH RESPECT TO COMMON GROUND (B) USING A VOM. LINE VOLTAGE SET AT 120VAC AND ALL CONTROLS SET FOR NORMAL PICTURE. VOLTAGE READINGS TAKEN WITHOUT SIGNAL AND TUNER SET TO UNUSED CHANNEL. VOLTAGES IN BOX TAKEN WITH SET TUNED TO A COLOR SIGNAL.  
HEXAGONS IDENTIFY WAVEFORM OBSERVATION POINTS. ALL WAVEFORMS TAKEN WITH WIDE BAND OSCILLOSCOPE. SEE WAVEFORM PAGES FOR OTHER INFORMATION.

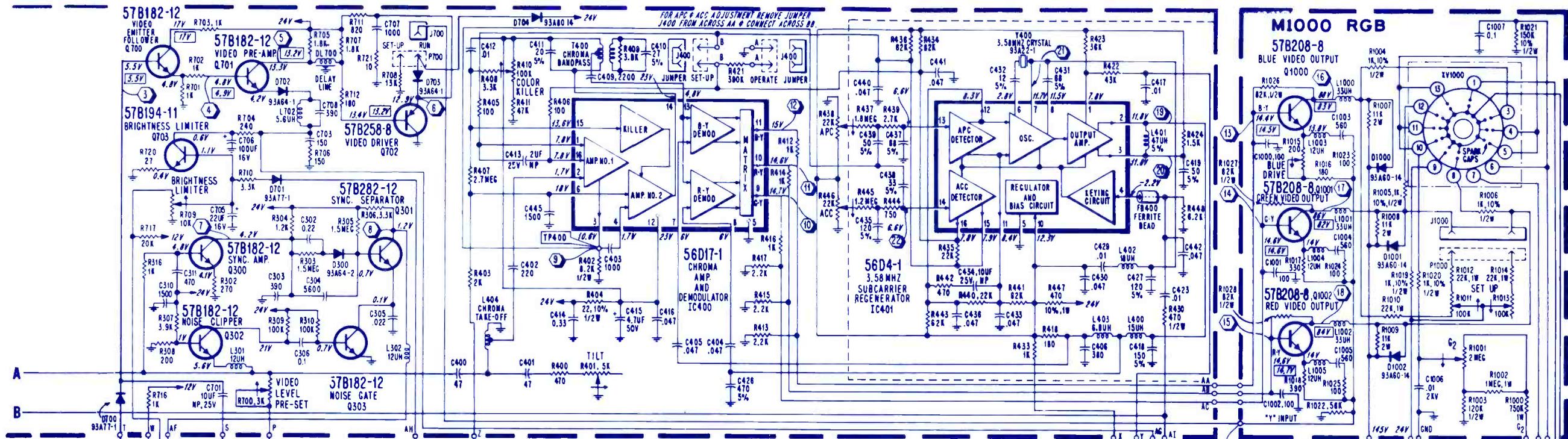




### CHASSIS LAYOUT

Locations of Transistors, Integrated Circuits, and Service Controls





**SCHEMATIC NOTES**  
(UNLESS OTHERWISE INDICATED)  
RESISTOR VALUES IN OHMS, 5%, 1/4W.  
CAPACITOR VALUES 1% OR HIGHER IN PF, LESS THAN 1 IN UF.  
COIL RESISTANCE VALUES LESS THAN 1 OHM, NOT SHOWN.  
⊕ COMMON GROUND (B-)  
\* COMPONENT NOT MOUNTED ON PRINTED CIRCUIT BOARD.  
Ⓢ RUN NUMBER INDICATES CHANGE(S) INCORPORATED AS GIVEN UNDER THAT RUN NUMBER, AS WELL AS ALL LOWER RUN CHANGES.  
Ⓜ SYMBOL INDICATES TEST POINT CONNECTIONS. ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION.

**SEMICONDUCTOR CAUTIONS**  
TO AVOID DAMAGE TO SEMICONDUCTOR DEVICES, DO NOT ARC 2ND ANODE LEAD OR PICTURE TUBE ANODE TO GROUND. DISCHARGE ONLY TO PICTURE TUBE DAG OR DAG GROUND. DO NOT TURN SET ON WITH TRANSISTOR (S) REMOVED, OR PICTURE TUBE OR OTHER LEADS REMOVED OR UNSOLDERED. USE CAUTION TO PREVENT ACCIDENTAL SHORTS BETWEEN COMPONENT LEADS OR TO CHASSIS GROUND. MAKE CONTINUITY AND RESISTANCE MEASUREMENTS WITH VTVM, FIELD EFFECT METER, OR OTHER HIGH INPUT IMPEDANCE METER. DO NOT USE A VOLT-OHM METER HAVING LESS THAN 100K OHMS/VOLT FOR RESISTANCE MEASUREMENTS.

**WARNINGS**  
USE ISOLATION TRANSFORMER WHEN SERVICING CHASSIS.  
WHEN SERVICING, USE EXACT REPLACEMENT PARTS (SEE "SAFETY CRITICAL COMPONENTS" NOTICE). ALSO PERFORM ALL SAFETY CHECKS SPECIFIED UNDER "IMPORTANT PRODUCT SAFETY INFORMATION" IN SERVICE MANUAL.

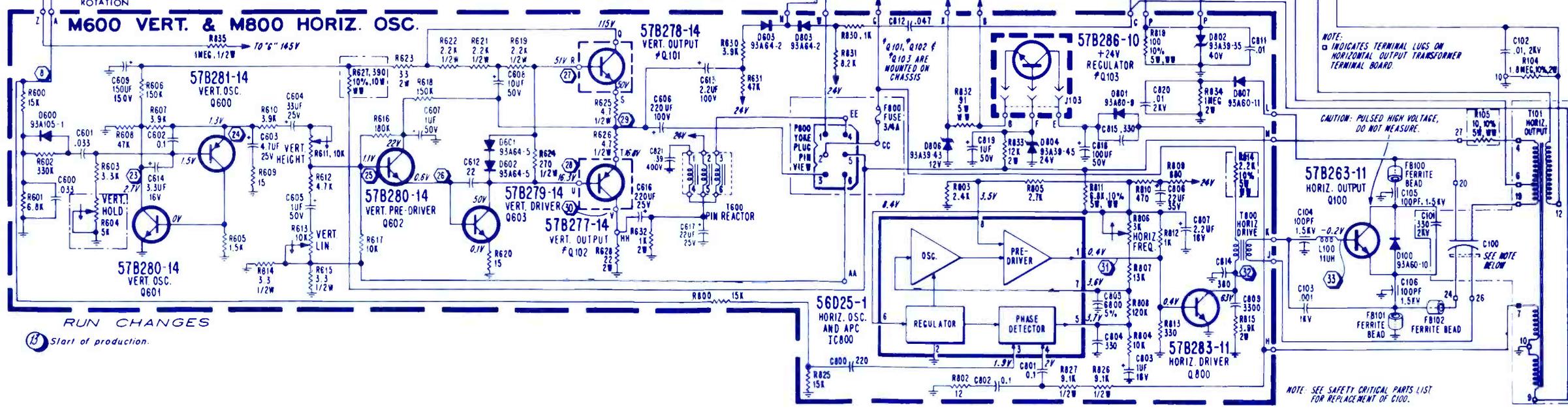
**VOLTAGE & WAVEFORM INFORMATION**  
DC VOLTAGES ARE MEASURED WITH RESPECT TO COMMON GROUND (B-) USING A VTVM, LINE VOLTAGE SET AT 120VAC AND ALL CONTROLS SET FOR NORMAL PICTURE. VOLTAGE READINGS TAKEN WITHOUT SIGNAL AND TUNER SET TO UNUSED CHANNEL. VOLTAGES IN BOX TAKEN WITH SET TUNED TO A COLOR SIGNAL.  
Ⓢ HEXAGONS IDENTIFY WAVEFORM OBSERVATION POINTS. ALL WAVEFORMS TAKEN WITH WIDE BAND OSCILLOSCOPE. SEE WAVEFORM PAGES FOR OTHER INFORMATION.

**DEFLECTION Yoke Ass'y. P/O V100**  
145V FROM SOURCE  
145V SOURCE SOURCE  
1.2K 1/2W  
1.2K 1/2W  
J800 SOCKET WIRING VIEW  
CRT FOCUS 30MEG  
JUMPER MAY BE REMOVED TO ASSURE ADEQUATE FOCUS RANGE.

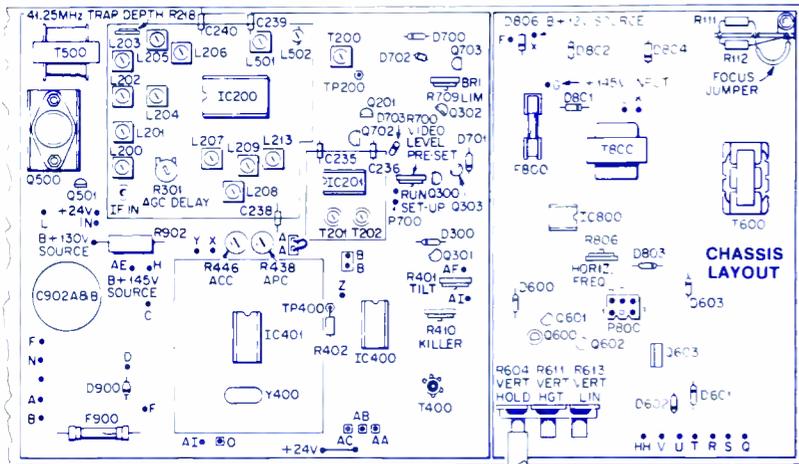
**510JUB22-TC03 PICTURE TUBE V100**  
HIGH VOLTAGE AT ZERO BEAM CURRENT 26.0KV

**NOTE:** ⊕ INDICATES TERMINAL LUGS ON HORIZONTAL OUTPUT TRANSFORMER TERMINAL BOARD.  
CAUTION: PULSED HIGH VOLTAGE, DO NOT MEASURE.

**NOTE:** SEE SAFETY CRITICAL PARTS LIST FOR REPLACEMENT OF C100.



**RUN CHANGES**  
Ⓢ Start of production.

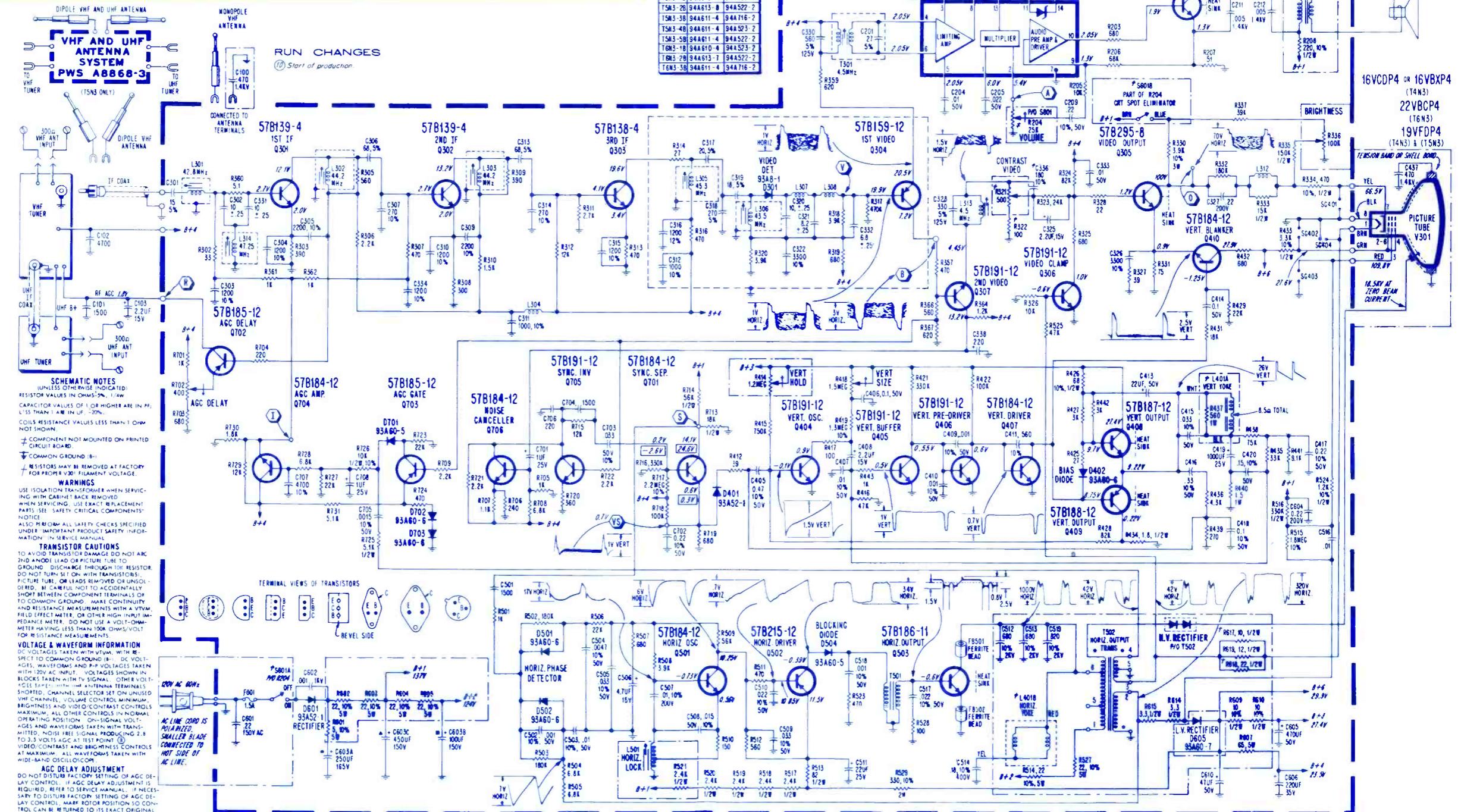


GROUP  
**302**

	SCHEMATIC NO.	SCHEMATIC NO.
ADMIRAL B/W TV Chassis T4N3/T5N3/T6N3	1715	BOHSEI B/W TV Chassis T-600
ADMIRAL Color TV Chassis 25M55M	1717	GTE-SYLVANIA Color TV Chassis E-44-3 -4
AIRLINE Color TV Chassis GAI-12917A	1716	

**SAFETY CRITICAL COMPONENTS**  
THE DESIGN OF THIS RECEIVER CONTAINS MANY CIRCUITS AND COMPONENTS INCLUDED SPECIFICALLY FOR SAFETY PURPOSES. FOR CONTINUED PROTECTION, NO CHANGES SHOULD BE MADE TO THE ORIGINAL DESIGN AND COMPONENTS SHOWN IN SHADED AREAS ON THE SCHEMATIC SHOULD BE REPLACED WITH EXACT FACTORY REPLACEMENT PARTS. THE USE OF UNAUTHORIZED SUBSTITUTE PARTS MAY CREATE A SHOCK, FIRE, X-RADIATION, OR OTHER HAZARD. SERVICE SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY.

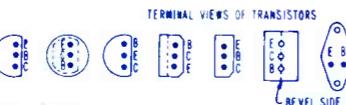
**RELIABILITY AND PERFORMANCE**  
FOR CONTINUED RELIABILITY AND PERFORMANCE, EXACT FACTORY REPLACEMENTS ARE RECOMMENDED FOR ALL OTHER PARTS REPLACED. IF A SUBSTITUTE MUST BE USED, BE SURE ITS QUALITY AND SPECIFICATIONS ARE IDENTICAL TO THE ORIGINAL PART.



**TUNER COMPONENT**

CHASSIS	VHF TUNER	UHF TUNER
T4N3-18	94A610-4	94A523-2
T4N3-28	94A613-8	94A522-2
T4N3-38	94A611-4	94A716-2
T4N3-48	94A611-4	94A523-2
T4N3-58	94A611-4	94A522-2
T5N3-18	94A610-4	94A523-2
T5N3-28	94A613-8	94A522-2
T5N3-38	94A611-4	94A716-2
T5N3-48	94A611-4	94A523-2
T5N3-58	94A611-4	94A522-2
T6N3-18	94A610-4	94A523-2
T6N3-28	94A613-8	94A522-2
T6N3-38	94A611-4	94A716-2

**SCHEMATIC NOTES**  
(UNLESS OTHERWISE INDICATED)  
RESISTOR VALUES IN OHMS-5%, 1% AWG  
CAPACITOR VALUES OF 1 OR HIGHER ARE IN P.F.  
LESS THAN 1 ARE IN U.F.  
COILS RESISTANCE VALUES LESS THAN 1 OHM  
NOT SHOWN.  
\* COMPONENT NOT MOUNTED ON PRINTED  
CIRCUIT BOARD.  
† COMMON GROUND (B+)  
RESISTORS MAY BE REMOVED AT FACTORY  
FOR PROPER VERT. FILAMENT VOLTAGE.  
**WARNINGS**  
USE ISOLATION TRANSFORMER WHEN SERVICING  
WITH CABINET BACK REMOVED.  
WHEN SERVICING, USE EXACT REPLACEMENT  
PARTS. SEE "SAFETY CRITICAL COMPONENTS"  
NOTICE.  
ALSO PERFORM ALL SAFETY CHECKS SPECIFIED  
UNDER "IMPORTANT PRODUCT SAFETY INFOR-  
MATION" IN SERVICE MANUAL.  
**TRANSISTOR CAUTIONS**  
TO AVOID TRANSISTOR DAMAGE DO NOT ARC  
2ND ANODE LEAD OR PICTURE TUBE TO  
GROUND. DISCHARGE THROUGH 10K RESISTOR.  
DO NOT TURN SET ON WITH TRANSISTORS.  
PICTURE TUBE, OR LEADS REMOVED OR UN-  
GROUNDED. BE CAREFUL NOT TO ACCIDENTALLY  
SHORT BETWEEN COMPONENT TERMINALS OR  
TO COMMON GROUND. MARK CONTINUITY  
AND RESISTANCE MEASUREMENTS WITH A VPM,  
FIELD EFFECT METER, OR OTHER HIGH INPUT IM-  
PEDANCE METER. DO NOT USE A VOLT-OMM-  
METER HAVING LESS THAN 100K OHMS/VOLT  
FOR RESISTANCE MEASUREMENTS.  
**VOLTAGE & WAVEFORM INFORMATION**  
DC VOLTAGES TAKEN WITH VPM, WITH RE-  
SPECT TO COMMON GROUND (B+). DC VOLT-  
AGES, WAVEFORMS AND P-P VOLTAGES TAKEN  
WITH 20V AC INPUT. VOLTAGES SHOWN IN  
BLOCKS TAKEN WITH TV SIGNAL. OTHER VOLT-  
AGE TESTS WITH ANTENNA TERMINALS  
SHORTED, CHANNEL SELECTOR SET ON UNUSED  
VHF CHANNEL, VOLUME CONTROL MINIMUM,  
BRIGHTNESS AND VIDEO CONTRAST CONTROLS  
MAXIMUM. ALL OTHER CONTROLS IN NORMAL  
OPERATING POSITION. ON-SIGNAL VOLT-  
AGES AND WAVEFORMS TAKEN WITH TRANS-  
MITTED, NOISE FREE SIGNAL PRODUCING 2.8  
TO 3.5 VOLTS AGC AT TEST POINT. (1)  
VIDEO CONTRAST AND BRIGHTNESS CONTROLS  
AT MAXIMUM. ALL WAVEFORMS TAKEN WITH  
WIDE-BAND OSCILLOSCOPE.  
**AGC DELAY ADJUSTMENT**  
DO NOT DISTURB FACTORY SETTING OF AGC DELAY  
CONTROL. IF AGC DELAY ADJUSTMENT IS  
REQUIRED, REFER TO SERVICE MANUAL. IF NECESS-  
SARY TO DISTURB FACTORY SETTING OF AGC DELAY  
CONTROL, MARK ROTOR POSITION TO CON-  
TROL CAN BE RETURNED TO ITS EXACT ORIGINAL  
SETTING.





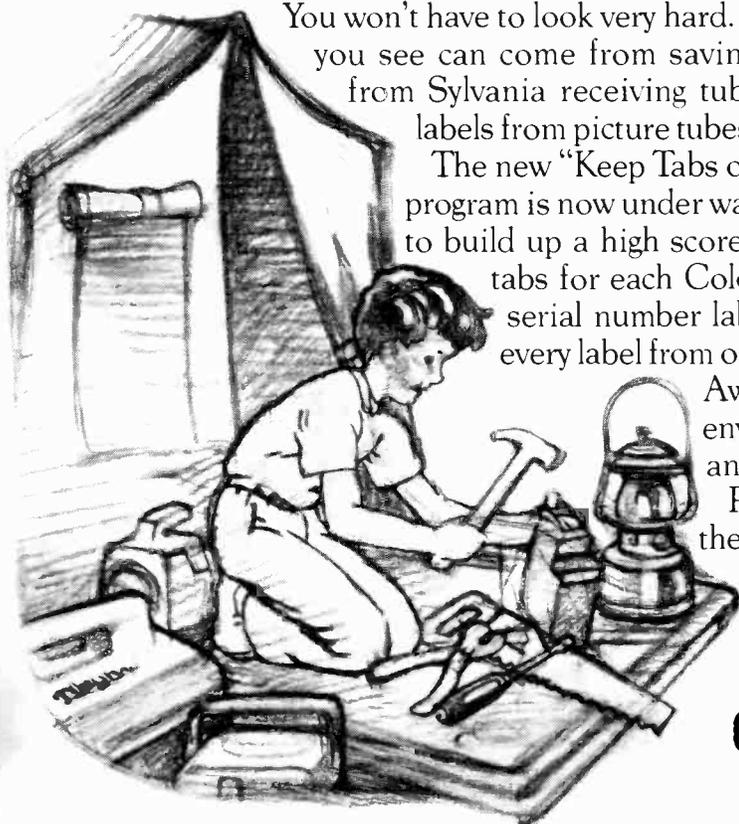
# How many things can you find on this page that start with Sylvania tabs?

You won't have to look very hard. Almost everything you see can come from saving address tabs from Sylvania receiving tube cartons and labels from picture tubes.

The new "Keep Tabs on Sylvania" awards program is now under way, and this year it's even easier to build up a high score. You get a bonus of 50 extra tabs for each Color Bright 85° picture-tube serial number label and 10 extra tabs for every label from other Sylvania color tubes. Pick up your

Award Catalog and special tab-saver envelope at your local Sylvania distributor and start collecting your tabs, now.

Put your tabs and award order form in the mail by Nov. 30, 1977 and you'll be able to find a lot of the things in the picture right in your own backyard.



**GTE SYLVANIA**



# The NEW MODEL 3300 POCKET SIZE DVOM for all occasions. \$175

## Triplett's New 3300 DVOM goes everywhere . . .

The brand new 5 function, 22 range Model 3300 DVOM has all the features you'll want at the bench . . . away from the bench. Like super readability, improved accuracy and extended battery life. And it's only 3" wide by 5-3/8" long by 1-3/8" deep.

This ultra-compact 3-1/2 digit DVOM offers a high intensity .3" LED display, low power ohms and typical DC accuracy of .5% of reading. You'll also get all the "automatics" that make life a lot simpler: Auto-polarity and auto-overrange.

1. HAND-SIZE, 3-1/2 DIGIT—Easy operation with 22 ranges including Hi/Low Power Ohms. Auto Polarity and overrange indication.
2. OVERLOAD PROTECTION—Protected up to 600 volts on all ranges with special 2A/600V fuse arrangement.
3. BATTERY-PAC™—Easily removed, snap-in Battery-Pac™ provides convenient field exchange for fully charged Pac. Battery-Pac™ rechargeable in tester or externally.

Complete with one year warranty, test leads, rechargeable Ni Cad batteries, AC Adapter Charger and instruction manual.

Ask your Triplett distributor to demonstrate the rugged little Model 3300 DVOM and show you our complete line of handy accessories, too.

**TRIPLETT**  
BLUFFTON, OHIO 45817

Phone (419) 358-5015

...for more details circle 103 on Reader Service Card  
...for FREE demonstration circle 104 on Reader Service Card

