

FEBRUARY 1974 • 75 CENTS  A HARCOURT BRACE JOVANOVIICH PUBLICATION

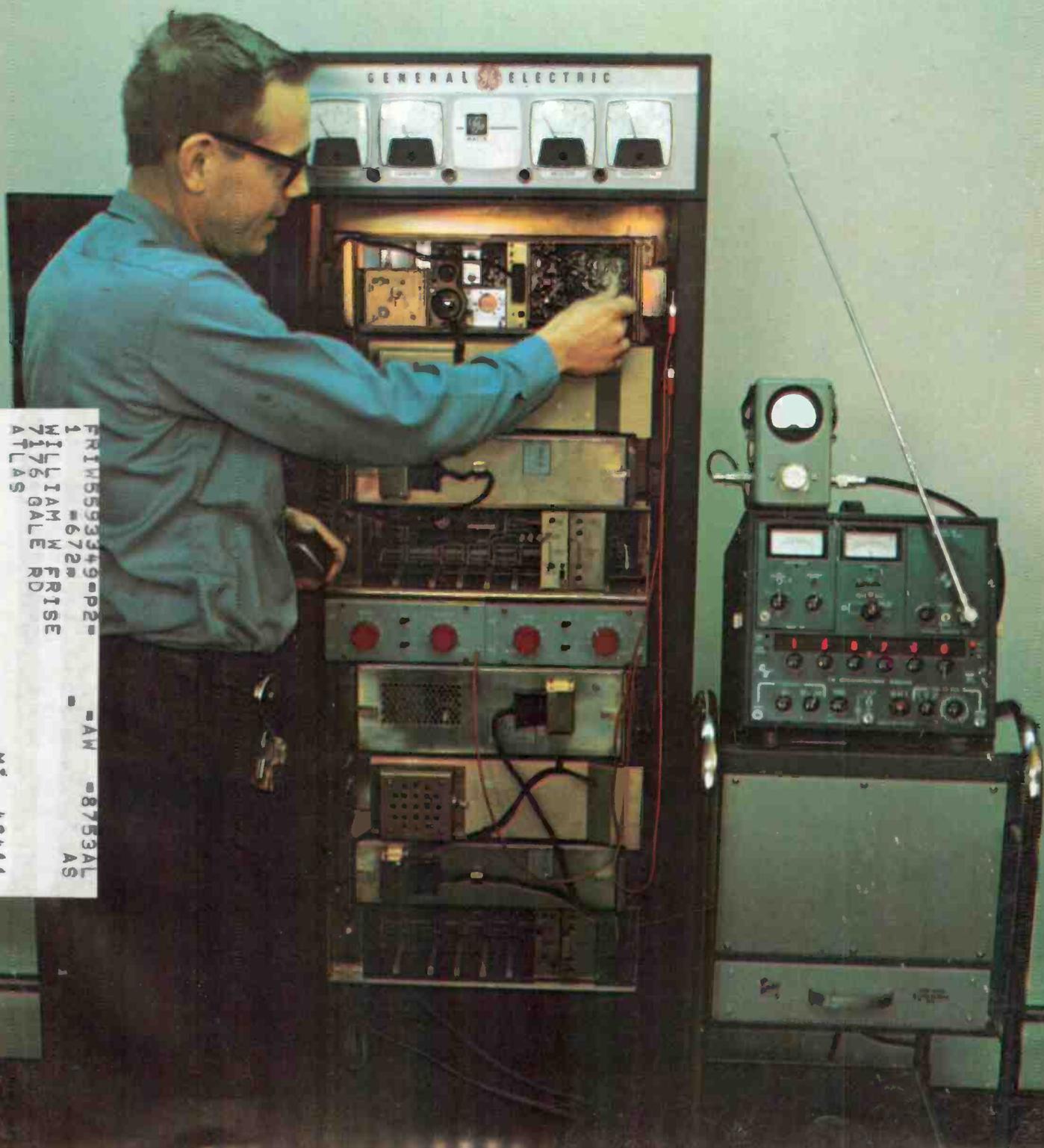
ELECTRONIC TECHNICIAN/DEALER

WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION

Servicing
Two-Way Radio

Magnavox's Color-TV
Chassis T982

How and Why
—Trapezoidal



FRIM5593349-P2-
-672-
-AM -8753AL
AS
MI 48411

PTS ELECTRONICS

Precision Tuner Service



now available near you

OREGON:
PTS ELECTRONICS, INC.
5220 N.E. SANDY BLVD.
PORTLAND, OREGON 97213
TEL. 503, 282-9636

KANSAS:
PTS ELECTRONICS, INC.
3116 MERRIAM LANE
KANSAS CITY, KANSAS 66100
TEL. 913, 831-1222

MINNESOTA:
PTS ELECTRONICS, INC.
815 W. LAKE ST.
MINNEAPOLIS, MINN. 55408
TEL. 612, 824-2333

OHIO:
PTS ELECTRONICS, INC.
5682 STATE RD.
CLEVELAND, OHIO 44134
TEL. 216, 845-4480

NEW YORK:
PTS ELECTRONICS, INC.
993 SYCAMORE ST.
BUFFALO, N.Y. 14212
TEL. 716, 891-4935

MASSACHUSETTS:
PTS ELECTRONICS, INC.
191 CHESTNUT ST.
SPRINGFIELD, MASS. 01103
TEL. 413, 734-2737

NEW YORK CITY—NEW JERSEY:
PTS ELECTRONICS, INC.
158 MARKET ST.
E. PATERSON, N.J. 07407
TEL. 201, 791-6380

PENNSYLVANIA—EAST:
PTS ELECTRONICS, INC.
1921 S. 70TH ST.
PHILADELPHIA, PA. 19142
TEL. 215, 724-0999

PENNSYLVANIA—WEST:
PTS ELECTRONICS, INC.
257 RIVERVIEW AVE. W.
PITTSBURGH, PA. 15202
TEL. 412, 761-7648

MARYLAND:
PTS ELECTRONICS, INC.
1105 SPRING ST.
SILVER SPRING, MD. 20910
TEL. 301, 565-0025

COLORADO:
PTS ELECTRONICS, INC.
4958 ALLISON ST.
ARVADA, COLO. 80001
TEL. 303, 423-7080

CALIFORNIA—NORTH:
PTS ELECTRONICS, INC.
4611 AUBURN BLVD.
SACRAMENTO, CALIF. 95841
TEL. 916, 482-6220

CALIFORNIA—SOUTH:
PTS ELECTRONICS, INC.
5111 UNIVERSITY AVE.
SAN DIEGO, CALIF. 92105
TEL. 714, 280-7070

OKLAHOMA:
PTS ELECTRONICS, INC.
3007 N. MAY
OKLAHOMA CITY, OKLA. 73106
TEL. 405, 947-2013

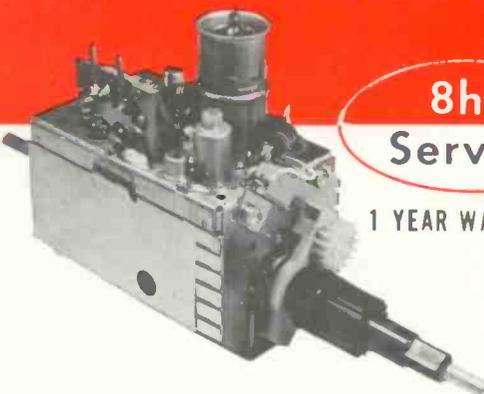
TEXAS—NORTH:
PTS ELECTRONICS, INC.
MOPAC LANE
LONGVIEW, TEX. 75601
TEL. 214, 753-4334

TEXAS—EAST:
PTS ELECTRONICS, INC.
4324-26 TELEPHONE RD.
HOUSTON, TEX. 77032
TEL. 713, 644-6793

LOUISIANA:
PTS ELECTRONICS, INC.
2914 WYTCWOOD DRIVE
METAIRIE, LOUISIANA 70033
TEL. 504, 885-2349

INDIANA:
PTS ELECTRONICS, INC.
5233 S. HWY 37
B. OOMINGTON, IND. 47401
TEL. 812, 824-9331

FLORIDA:
PTS ELECTRONICS, INC.
1918 BLANOING BLVD.
JACKSONVILLE, FLA. 32210
TEL. 904, 389-9952



8hr Service

1 YEAR WARRANTY



PARTS

PTS is the only tuner service to publish an 80-page Tuner Replacement Guide and Parts catalog—and sell you any or all parts (3rd edition of top information available for one dollar)

8hr Service

1 YEAR WARRANTY



12⁵⁰IF-SUBCHASSIS

PTS was 1st to repair IF modules and make a success of it. We do it right the 1st time. (All prices are dealer net! Major parts, tubes and transistors charged at net cost)

9⁹⁵VHF-UHF-FM
16⁹⁵UV-COMB.

PTS will repair any tuner—no matter how old or new—black & white or color—transistor or tubes—varactor or detent UHF—8 hour service is a must!

PTS-NUMBER ONE

AND STILL TRYING HARDER!

(NOT A FRANCHISE COMPANY)
... for more details circle 121 on Reader Service Card

We help him make it easier for you.

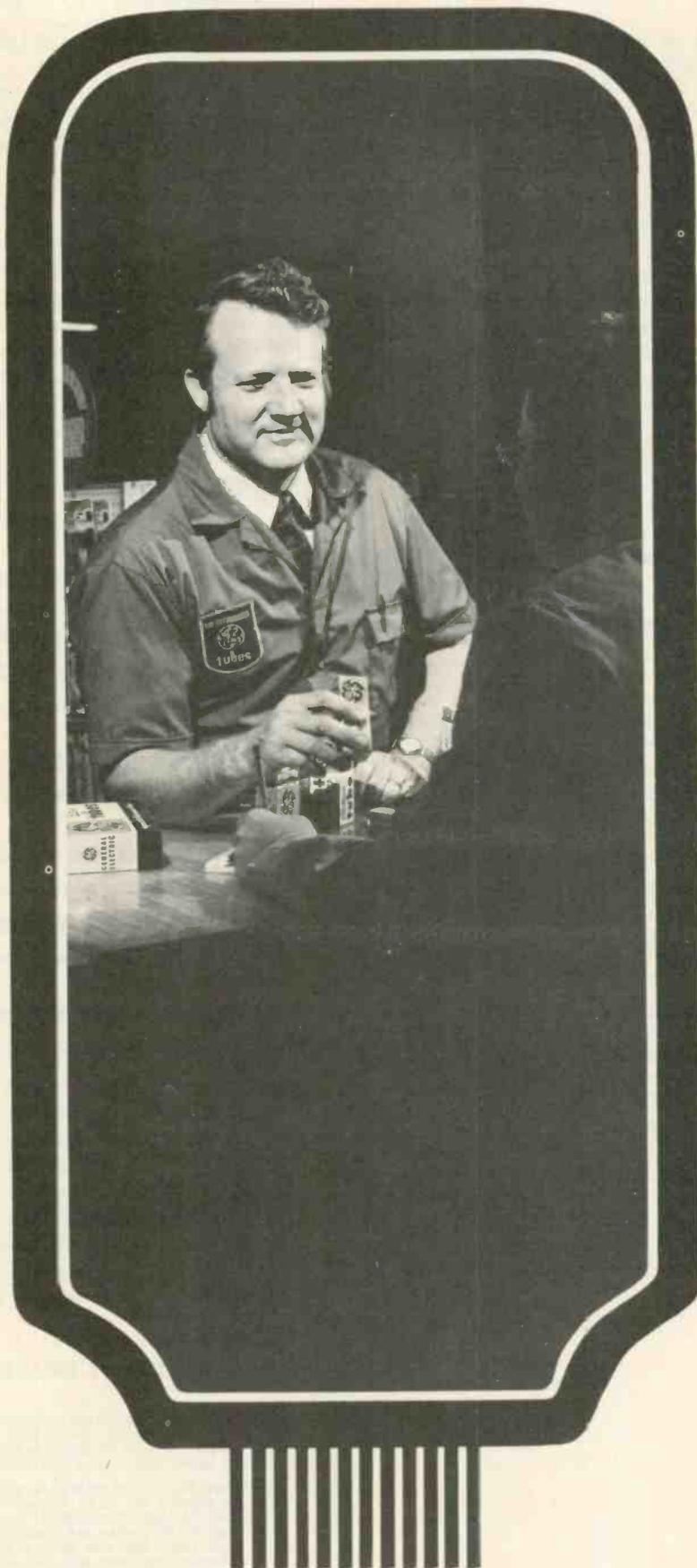
Your GE tube distributor is always there when you need him. With a complete line of GE entertainment receiving tubes, replacement semiconductors and ULTRACOLOR® or all-new Spectra-Brite® picture tubes.

Competitively priced. With fast delivery assured by his balanced inventory and the GE tube warehouse network. Along with all the technical information, business and technical aids you'll ever need. You can depend on him and GE tube products.

Tube Products Department,
General Electric Company,
Owensboro, Kentucky 42301

We're in this business together.

GENERAL  ELECTRIC



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

ELECTRONIC TECHNICIAN/DEALER

FEBRUARY 1974 • VOLUME 96 NUMBER 2

J. W. PHIPPS

Editor
1 East First Street
Duluth, Minn. 55802
(218) 727-8511

ALFRED A. MENEGUS

Publisher
757 Third Avenue
New York, N.Y. 10017
(212) 572-4839

TOM GRENEY

Publishing Director

JOSEPH ZAUHAR

Managing Editor

BERNICE GEISERT

Production Manager

JOHN PASZAK

Graphic Design

LILLIE PEARSON

Circulation Fulfillment

GENE BAILEY

Manager, Reader Services

MANAGERS

DAVE HAGELIN

43 East Ohio Street
Chicago, Ill. 60611
(312) 467-0670

CHUCK CUMMINGS

Ad Space South/West
613 North O'Connor
Irving, Texas 75060
(214) 253-8678

KEN JORDAN

DONALD D. HOUSTON
1901 West 8th Street
Los Angeles, Calif. 90057
(213) 483-8530

CHARLES S. HARRISON

CY JOBSON
57 Post Street
San Francisco, Calif. 94104
(415) 392-6794

ROBERT UPTON

Tokyo, Japan
C.P.O., Box 1717

This month's cover shows one of the Dual 72MHz Link Transceivers being serviced for installation, in various State of Minn. Highway Patrol Headquarters throughout the state. The unit will be installed by JayEn Inc., Two-Way Radio Sales and Service, located in Duluth, Minn.

-
- 6 LETTERS: Pertinent comments concerning past issues.
 - 9 PUBLISHER'S MEMO: Moving Forward with ET/D Magazine.
 - 10 READER'S AID: What you need or have for sale.
 - 14 BOOK REVIEWS: Our appraisal of recent publications.
 - 16 NEWS: Events of interest to our industry.
 - 18 NEW AND NOTEWORTHY: Merchandise of special interest.
-

FEATURES

23 TEKLAB REPORT

First-hand observations when examining Magnavox's Color-TV Chassis T982 employing an In-Line System.

27 HOW AND WHY—TRAPEZOIDAL

Gayle Morris describes some of the transient waveforms required for more effective servicing of TV picture tube circuitry.

30 GOING TO REMODEL THE STORE? HERE'S A GOOD CHECK LIST

Ernest Fair tells of some techniques to get the most from your dollar when remodeling.

31 SUPERIOR BABY FOODS

This article describes how a CCTV system can provide fail-safe security and slash manpower needs.

33 HOW TO TACKLE A REAL DOG

Jim Osborne offers a new approach to tough service problems.

34 SERVICING TWO-WAY RADIO

The minimum requirements and basic test instruments needed to service two-way radios.

36 TEST INSTRUMENT REPORT

Reviewing specifications for Hickok's Model 239 Color Bar Generator.

-
- 43 COLORFAX: Tips for easier color-TV set repair.
 - 47 TECHNICAL DIGEST: Hints and shortcuts for more effective servicing.
 - 48 NEW PRODUCTS: Instruments and components to make your job easier.
 - 52 DEALER SHOWCASE: These items may increase your sales revenue.
 - 54 TECHNICAL LITERATURE: Informative material that you may need.
 - 56 ADVERTISER'S INDEX: Manufacturers concerned about you.
 - 59 READER SERVICE: A source of additional information.
 - 61 TEKFAQ: Up-to-date schematics for easier servicing.
-



A HARCOURT BRACE JOVANOVIICH PUBLICATION



HARCOURT BRACE JOVANOVIICH PUBLICATIONS: James Milholland, Jr., Chairman; Robert L. Edgell, President; Lars Fladmark, Senior Vice President; Richard Moeller, Treasurer; John G. Reynolds, Vice President; Thomas Greney, Vice President; Ezra Pincus, Vice President; Bruce B. Howat, Vice President; James Gherna, Vice President.

ELECTRONIC TECHNICIAN/DEALER is published monthly by Harcourt Brace Jovanovich Publications. Corporate Offices: 757 Third Avenue, New York, New York 10017. Advertising Offices: 43 East Ohio Street, Chicago, Illinois 60611 and 757 Third Avenue, New York, New York 10017. Editorial, Accounting, Ad Production and Circulation Offices: 1 East First Street, Duluth, Minnesota 55802. Subscription rates: One year \$5, two years \$8, three years \$9, 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 © 1974 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.

Take a leaf from the Mallory Money Tree and save on famous Mallobins.[®]

Our Mallobin benchtop organizers are worth many times their modest cost in keeping electronic components neatly sorted, labeled, protected and ready for use. Now, you can save on buying them, too. For

instance, this PTC semiconductor Mallobin organizer can be purchased at a special discount at your Mallory Distributor. Just present the Mallory Money Tree coupon below.



MALLORY

MALLORY DISTRIBUTOR PRODUCTS COMPANY

a division of P. R. MALLORY & CO. INC.

Box 1284, Indianapolis, Indiana 46206; Telephone: 317-636-5353

Batteries • Capacitors • Controls • Security Products • DURATAPE[®] • Recorders • Resistors • SEMICONDUCTORS • SONALERT[®] • Switches • Timers

Money Tree Coupon

This coupon valid through Sept. 1, 1974. Only one coupon valid on each purchase. This coupon not valid where prohibited or taxed by law. Coupon does not apply to sales tax, if applicable.

TO MALLORY DISTRIBUTOR

This coupon redeemable for \$1.00 credit towards the purchase of any Mallory products or \$1.00 in cash provided it is tendered to Mallory Distributor Products Company, a division of P. R. Mallory & Company Inc., Indianapolis, Indiana prior to Oct. 1, 1974. Invoices showing purchase of Mallobin organizers sufficient to cover coupon must be shown on request.

Worth

\$100
OFF

on any purchase of any Mallory Mallobin organizer at a Mallory Distributor.



DURATAPE[®] and SONALERT[®] are registered trademarks of P. R. Mallory & Co. Inc.

ET 24

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

UNTIL RECENTLY, THERE WERE OVER 22,500 TRANSISTOR PART NUMBERS TO WORRY ABOUT IN THE SERVICE BUSINESS.

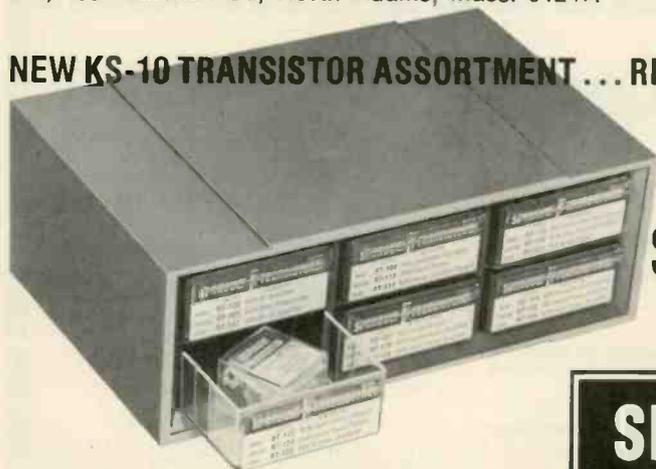
Now, only 47 types
put an end to the nightmare.

Sprague's concise but complete line of 47 replacement transistors (24 small-signal, 18 power, and 5 field effect) is designed to do the work of over 22,500 O.E.M. transistors. But don't just take our word for it. The 'Fantastic 47' are on the self-service Semiconductor Q-Mart at your Sprague distributor's, ready to help you now.

And here's more good news! To help you keep the most-frequently-used transistors handy in your shop, we've got a new KS-10 Transistor Assortment. The Keen 18 . . . 10 small-signal transistors and 8 power transistors . . . give you a working inventory that replaces thousands of the most popular domestic and foreign O.E.M. part numbers. They come in an attractive, blue, durable plastic cabinet . . . you pay for transistors *only* . . . cabinet is yours at no additional cost!

See the KS-10 with a special introductory price at your distributor's. While you're there, pick up a free copy of the 48-page Sprague K-500 Semiconductor Replacement Manual. Or . . . write to Sprague Products Co., 65 Marshall St., North Adams, Mass. 01247.

NEW KS-10 TRANSISTOR ASSORTMENT . . . REGULARLY \$34.11



special
introductory
price . . .

\$24⁹⁹



THE BROAD-LINE PRODUCER OF ELECTRONIC PARTS

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

LETTERS

Reader comments concerning past feature articles, Editor's Memos, previous reader responses or other subjects of interest to the industry.

Wants More Information Concerning Satellite TV

In the April 1972 issue of *ELECTRONIC TECHNICIAN/DEALER* there was an article on Satellite TV by Isaac S. Blonder that aroused my interest very much. Then an editorial in the November 1972 issue by you, followed by a news item in the February 1973 issue concerning "Telesat Canada," and a news item in June 1973.

What I am interested in is building such a receiver for private experimenting, or purchasing same if building it is out of the question. I would appreciate a schematic of such a receiver or an address for purchasing a receiver to accomplish this purpose.

I would suggest an article on this subject in a coming issue, although a direct reply would be very much appreciated. Thanks.

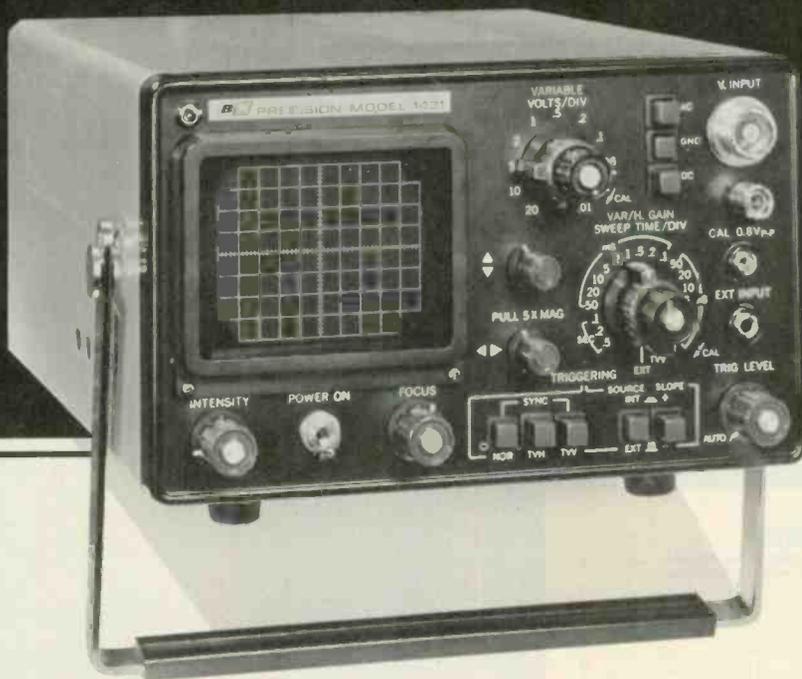
BARNEY MAZANEK

We are literally as disappointed as you that we have been unable to publish more concerning satellite TV. One of our California readers even wanted to close up shop and campaign for satellite TV, but we told him that we felt it too daring a venture for but one individual to handle.

Satellite TV was to have been tested in the Rocky Mountain states prior to the sale of such a system to India. We suppose politics prevented this from happening, since those initially using the system in this country would want to keep it, rather than merely selling it to another country. It could also spread in this country, "hurting" UHF and VHF stations now in existence, as well as the future growth of CATV systems. We do, however, know that the CATV receiver designed for receiving the satellite signal and sending it on to TV sets in India is expected to cost only about \$500.00. (We have also been advised that a CATV system serving less than 50 customers is not subject to federal CATV regulations, thus permitting practical city-block systems.)

We have been advised that the Canadian government has become very secretive concerning its satellite TV system. However, direct reception of that country's satellite TV signals would be of little interest to you anyway since it would not be possible to receive them in any states south of Minnesota. Ed.

This 10 MHz Triggered Scope is 1/3 the size of comparably performing scopes.



MODEL 1431 \$399.95

It's a lightweight 13 pounds in your hand and a heavyweight performance wideband scope with a 35 nanosecond rise time on your bench or jobsite. Whether you're servicing or designing industrial equipment or TV, there's the right sweep speed and sync for easiest operation. If you know our Model 1460, the leader in wideband 5" CRT scopes, you know our new 3" Model 1431 which gives you the same high performance in one third the size. (Only 4 3/4" H x 7 1/8" W x 12 1/8" L)

Servicing, production, inspection, quality control and lab applications are all easier with this versatile all solid-state instrument. Triggering is accomplished with only 0.5V peak-to-peak. Ten millivolts per division sensitivity, 0.5 usec/cm to 0.5 sec/cm automatic and triggered sweep in 19 calibrated ranges, and external trigger input are just a few of the reasons you'll like it.

If you have been waiting to buy a portable scope until you could get all the features you'll ever need at a price you want to pay, you've been waiting for Model 1431. Contact your distributor or write Dynascan Corporation.



Shown with optional carrying cover and probe pouch.

B&K PRODUCTS OF
DYNASCAN

1801 W. Belle Plains Ave.
Chicago, IL 60613 • (312) 327-7270

... for more details circle 103 on Reader Service Card

IC replacement guide

INDEX

Integrated Circuit Replacement Guide by Part Number	2
Integrated Circuit Replacement Guide by Equipment	
Manufacturer	4
Admiral	4
Automatic Radio	4
Bendix (Auto Radio)	4
Chrysler (Auto Radio)	5
Curtis-Mathes	5
Delco (General Motors)	5
Electrohome	5
Fisher	5
General Electric	5
Heathkit	5
H. M. Scott	5
K.L.H.	5
Magnavox	5
Marantz	6
McIntosh	6
Motorola	6
Packard-Bell/Teledyne	6
Philco	
Home Entertainment Products	6
Automobile Radio	7
RCA	7
Sears	7
Sylvania	7
Voice Of Music (V-M)	7
Waller	7
Wells-Gardner	7
Zenith	8
Imported "IC" Replacement Guide	8
Auto Radio Kit	8
Major Brand Home Entertainment Kit	8

SYLVANIA
ECG™
semiconductors

Here's one book you can really tell by its cover.

We don't have to waste time telling you about our new integrated circuit replacement guide.

Just read the index on the cover.

If that doesn't convince you, nothing will.

Available from your local Sylvania distributor.

Sylvania Electronic Components, 100 First Ave., Waltham, Mass. 02154

GTE SYLVANIA



Moving Forward with ET/D Magazine

J. W. Phipps is the new editor of ELECTRONIC TECHNICIAN/DEALER.

I have been associated with Jay in the past and know him to be thoroughly knowledgeable in the home entertainment electronics equipment and "parts" industry. The change was made January 7th as the Harcourt Brace & Jovanovich Publications, Inc., magazine changes its editorial needs to meet the ever-changing trends of the industry.

Jay is well known in the electronics field, having been engaged in editorial and managerial functions as well as handling technical training assignments in private industry. He also was with the Indiana Electronic Service Association (NEA) as an executive director. Prior to becoming an editor, Jay had been in the U.S. Air Force as an electronics technician and specialist, his duty locations including bases and radar sites in the U.S., Europe, Middle East, Africa and Labrador for a 10-year span.

The new editor of ELECTRONIC TECHNICIAN/DEALER has also conducted electronic servicing training seminars in cooperation with product engineering, developing efficient techniques for servicing consumer electronic products.

Joseph Zauhar will continue as managing editor of ELECTRONIC TECHNICIAN/DEALER. In addition to handling all the technical requirements for the magazine, Joe is also well known to television set manufacturers for his comprehensive Teklab Reports which appear regularly in ELECTRONIC TECHNICIAN/DEALER.

Another former managing editor to join the ELECTRONIC TECHNICIAN/DEALER marketing team is David Hagelin who has rejoined HBJ Publications as Midwest District Sales Manager headquartered in its Chicago office at 43 E. Ohio Street. A graduate of the University of Minnesota-Duluth, Dave has also been associated with WEBC Radio and the Duluth Herald and News-Tribune.

With an eye to serving our readers even better in the future, we have assembled this excellent editorial and marketing team of personnel with expertise in the electronics servicing and publishing field. Thus we feel certain that ELECTRONIC TECHNICIAN/DEALER will continue to serve the industry as the No. 1 publication in its vertical field.

As you note the changes in the editorial format while continuing to serve you—the thousands of subscribers who read ELECTRONIC TECHNICIAN/DEALER, we welcome your comments. A trade publication, such as ET/D, has as its editorial mission to supply articles of a technical interest on the latest developments of servicing home entertainment electronics equipment such as TV sets, provide a platform of exchanging latest service techniques and tips, inform the readers of new products to facilitate their work, etc. We know you will welcome the improvements in our editorial environment.

Al Menegas

The practical cordless original

When the Wahl Iso-Tip® Cordless Soldering Iron was introduced, it became practical to eliminate the cord from soldering.

Weighing only six ounces, compact and fast heating, the Iso-Tip can make up to 125 electronic joints (or more) per charge.

Its recharging stand repowers its batteries overnight. And its worklight lets you see what you're soldering.

Accessories include carrier storage tube, auto charger, and 4 replacement tips. For all the details, see your local electronic component distributor.

Still the greatest advance in soldering since electricity.

General Purpose Tip .156
 Heavy Duty Tip .187
 Fine Tip .070
 Tuner Extension Tip .070
 Protective Carrier/Storage Tube
WAHL®
 CLIPPER CORPORATION
 Department 4 2902 Locust Street
 Sterling, Illinois 61081 815-625-6525
 Auto Charger Plug Assembly (lighter)
 (For use only on irons coded D72 and up)

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

READERS' AID

Space contributed to help serve the personal needs of you, our readers.

For Sale

I have for sale a Ham Transceiver, Model NCX-3, and Power Supply with instruction books.

BOB BEASLEY

Minerva International Inc.
 P.O. Box 756
 Brentwood, Tenn. 37027

I have for sale an Accurate Instruments Co. Signal Generator/Tracer Combination, Model 153, and a factory wired EICO Model 955 Capacitor Tester, plus Sams Photofact No. 191 and 612.

DAVID MURPHY

Box 105
 Prattsville, N.Y. 12468

I have a number of ballists for sale. Please write for list and price.

MIKE AUSTIN

Box 172, East Main
 Gravette, Ark. 72736

I have quite a number of scarce tubes and components for sale. Please write for list and price.

ROBERT DUNN

Corner Buck and Oak Streets
 Millville, N.J. 08332

I have for sale a mixed number of Sams Photofacts. Please write for list and price.

VANCE I. JONES

Rt. 2, Box 90
 Tulalake, Calif. 96134

Wanted

I would like to obtain service instructions or a schematic for a Digital Voltmeter, Model 900, made by Electro Instruments Inc. of San Diego, Calif.

L. J. QUINN

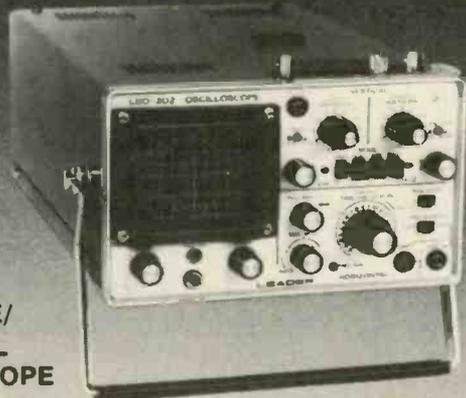
7836 Clearview Dr.
 Citrus Heights, Calif. 95610

I need RCA servicing manuals 1923-1928, 1929-1930, also, Atwater Kent radio manuals covering sets prior to 1931. I also have ELECTRONIC TECHNICIAN/DEALER magazines from 1955 through 1970 and many early

continued on page 12

Our little "3-incher" is bigger than anybody's!

LBO-302
**3" DUAL TRACE/
 DUAL CHANNEL
 TRIGGERED SCOPE**



\$699.⁹⁵
 With accessories

Conquer the test bench squeeze! Obtain lab-grade quality! Here's solid state accuracy plus push-button convenience for trig. & auto. sweep & "free run" momentary function. • 10MHz b'width • 10mVp-p/div to 5Vp-p/div Vert. Sen-

sitivity, 9 steps. • Sep. or simult. sweep display, ch 1 & 2 - alt, chopped, algebra added and X-Y vector. • Sweep range from 1 μ s/div (0.2 μ s w/5X mag) to 0.2s/div, 17 steps. • Polarity Inversion on ch 2. • 4 $\frac{1}{2}$ "H, 10 lbs.

LEADER

INSTRUMENTS CORP. 151 Dupont St., Plainview, L.I., N.Y. 11803 (516) 822-9300

"Put us to the test"

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



When the big name companies fail you, come to the Solid State of Workman.

It happens. Boy, does it ever happen.

Well, next time call Workman. Off-the-shelf delivery has been our stock in trade for years.

And our new WEP semiconductor line is going to carry on the tradition. It's got a few other things going for it too:

The packaging does a lot of work for you — cross-referenced to all major lines right on the face of the card. The back of the card has basing diagram and full specifications with symbol and ratings.

About 200 WEP numbers offer one-for-one replacement against competitive lines and our complete cross referencing enables them to replace up to 1000 numbers in other lines.

The whole line is fully warranted and we've designed it to make life as easy as possible for you.

Which is a pretty good reason for not waiting for someone else to flop before you call us.

After all, things are complicated enough today.



Packaging on Workman's WEP Semi-conductors tells you all you need to know—cross referencing, specs, basing diagram, symbol and ratings.

Workman. Your first second resource for replacement components.

Workman Electronic Products, Inc. Box 3828, Sarasota, Florida 33578 A subsidiary of IPM Technology, Inc.

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

READERS AID...

continued from page 10

Sams folders. Make offer.

E. T. MONTGOMERY

1092 Willowbranch Ave.
Jacksonville, Fla. 32205

I would like to obtain an instruction manual for a Philco-Ford Visual Alignment and Marker Generator, Model No. 7008C.

ELMER M. KUNATH

6911 W. Tallmadge Place
Milwaukee, Wisc. 53218

I would like the names of manufacturers selling commercial receiving tube testers (the type placed in stores for customer use). Also, I would like to obtain an updated roll chart for a Triplett Tube Tester, Model 3413-B.

CHARLIE E. HALL

1504 Indiana Ave., Box 465
Palm Harbor, Fl. 33563

I would like to obtain a used B & K TV Analyst.

DON MORAR

Rt. 2, Hipsley Mill Rd.
Woodbine, Md. 21797

I would like to obtain a schematic for a U.S.L. "Contact 8" Citizen-Band radio.

ABE K. PIERCE

Rural Route 2
Guymon, Okla. 73942

I would like to obtain parts and service data, schematic or any service instruction manual for a Dumont Portable C-R Oscillograph, Type 331.

JIMMIE SELLERS

P.O. Box 158
Cypress, Calif. 90630

I would like to obtain any service information for a scope, Model 308, manufactured by Precise Development Corp., Oceanside, N.Y.

J. S. SQUILLACE

201-5th Ave.
Troy, N.Y. 12180

I would like to obtain a power transformer for a World Wide 9 radio manufactured by McMurdo Silver.

PAUL CAPITO

637 W. 21 St.
Erie, Pa. 16502

I would like to purchase "Muntz" tape players and recorders with the following model numbers: A-12, M-60, AR-500 and HW-512. Please state price and condition.

S. A. ELOSH, JR.

231 Gladstone
Campbell, Ohio 44405

I would like a schematic and service information for a Hycon Model 616 Dot Bar Generator.

TV LEASE CO.

5758 E. 4th St.
Tucson, Ariz. 85711

I would like to obtain a schematic or any service information for a Philco Model 42-1008, Code 122, and a General Electric Radio, Model K-64.

ETC DENNIS F. SAUNDERS, SR.

Fleet Electronics Calibration Fact.
NavSuBase, Box 300
Groton, Conn. 06340

I would like to obtain a schematic and service information for a Grunow Teledial Radio Receiver, Model 1291, manufactured by General Household Utilities Co., Chicago, Ill.

EDWARD JUZUMAS

88-57 57th St.
Woodhaven, N.Y. 11421



Will you be prepared to handle her business when it comes your way?

...remember...there's an Amperex replacement tube for any socket in any set you're likely to service. TV, Hi Fi, FM or AM, House Radio, Car Radio, P.A. System or Tape Recorder. Imported or Domestic!

Amperex®

TOMORROW'S THINKING IN TODAY'S PRODUCTS
A NORTH AMERICAN PHILIPS COMPANY



AMPEREX ELECTRONIC CORPORATION, DISTRIBUTOR AND ENTERTAINMENT PRODUCTS DIVISION, HICKSVILLE, N. Y. 11802

... for more details circle 102 on Reader Service Card

Winegard challenges the competition

with the new, low cost

DA-825B...



a cost breakthrough in distribution amplifier design!

Winegard's engineers have done themselves proud with this one — an amplifier that does the job at $\frac{2}{3}$ the cost of competition* — and more importantly, without sacrificing all these important features:

HIGH OUTPUT LEVEL: 46 dbmv (200,000 microvolts) on each of 7 VHF channels at 0.5% cross modulation; 45 dbmv (178,000 microvolts) on each of 5 UHF channels at 0.5% cross modulation . . . enough to handle up to 48 taps without additional line amps.

HIGH INPUT LEVEL: Allows use in strong signal areas. 20 dbmv (10,000 uv) on each of 8 VHF channels, 22 dbmv (12,000 uv) on each of 5 UHF channels, both at 0.5% cross modulation.

HIGH GAIN: 26 db on VHF, 23 db on UHF for use in most reception areas.

LOW NOISE FIGURE: 3.6 db VHF, 6.0 db UHF for perfect color fidelity.

PASSES MID & SUPER BANDS (108-174 & 216-300 MHZ) — compatible with any CATV system.

LINE AMPLIFIER VOLTAGE to operate model L-213B or L-483B line amplifiers.

PLUS BUILT-IN FM TRAP, REGULATED POWER SUPPLY, LIGHTNING PROTECTION and more!

*Ask your distributor for full specs and prices, or write direct.



WINEGARD
TELEVISION SYSTEMS

Winegard Company
3000 Kirkwood Street
Burlington, Iowa 52601

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

BOOK REVIEWS

ABC'S OF INDUSTRIAL ELECTRONICS by J. A. "Sam" Wilson, CET, published by Howard W. Sams, 96 pages, softbound \$3.95.

Although not publicized as a study guide for those interested in passing the Industrial CET Exam, the author of this book is chairman of the Examination Committee for the Industrial CET Program, and thus the information contained in this book should at least offer some assistance to those preparing for the exam.

In general terms the author defines industrial electronics as all types of electronic systems that are not primarily designed for home entertainment—including garage door openers, two-way radio and medical electronics. However, he indicates that the book is primarily concerned with the circuits and applications of electronics used in manufacturing—including power supplies, amplifiers, logic and switching circuitry and numerical control.

Unfortunately some of the electronic symbols used in industrial electronics differ from those that we are familiar with for consumer electronic circuitry. The first illustration compares these two sometimes conflicting sets of symbols so that one will not make the mistake of, say, confusing a coil for a resistor.

The author goes into much detail concerning fundamentals. One portion of the book is concerned with capacitive, inductive, resistive, optical, elec-

tromagnetic, piezoelectric and thermoelectric transducers. Another portion provides an excellent description of switching and logic circuits. Still another describes the numerical control of a drill press, lathe, shaper, planer, milling machine and punch press.

This book should not be considered a complete text, providing all basic information required for servicing industrial electronic products. However, it is certainly an excellent introduction to this vast, rapidly expanding field.

125 TYPICAL ELECTRONIC CIRCUITS ANALYZED & REPAIRED

by Art Margolis, published by Tab Books, 208 pages, hardbound \$7.95, softbound \$4.95.

The title of this book is actually misleading since most of the circuits included in this book are described in detail without mention of repair—at least based on the many that we covered. However, this still does not detract from the value of the book for the beginning electronic technician that still might not understand the function of many basic circuits.

Very little circuit description is actually related directly to the function of radios and TV sets, but would apply more to the construction of hobbyist type circuitry. Even in this area we feel that the author's imagination ran a little wild. As an example: On page 135 of the book the author says, "Bugging rooms seems to have become a national pastime." He then describes the function of a number of simple FM transmitter circuits, including one that he says can be placed in the mouthpiece of a telephone—driving it with electricity provided by the telephone company. For the description of another circuit he also writes, "This illegal jamming circuit is quite simple."

The book should prove to be of some value to the electronic technician that might wish to review some basic circuitry without the use of any mathematics.

RADIO OPERATORS LICENSE HANDBOOK, Second Edition, by Edward M. Noll, published by Howard W. Sams, 168 pages, softbound \$3.95.

The author indicates that this handbook is concerned with the nonlicensed operator through the lower-grade FCC licenses, up to, but not including the second-class radio license. He adds: "These licenses are concerned with radio operation only and do not involve the technical aspects of two-way equipment."

Although there is no substitute for a copy of FCC Regulations as updated with the use of transmittal sheets sent

out in regular mailings by the FCC, that material typically represents a great deal of rather dull material. This handbook *must not* be considered a substitute for actual FCC material, which should most definitely be studied by all operators and technicians concerned with two-way radio. However, the book is well written and should be considered useful reading for those interested in knowing what may be required of them before they take the time to dig through the FCC material.

The book appears well written and quite useful—under the conditions just mentioned.

MATV SYSTEMS HANDBOOK—DESIGN, INSTALLATION & MAINTENANCE by Allen Pawlowski, published by Tab Books, 176 pages, hardbound \$7.95, softbound \$4.95.

We can safely say that of all the books that we have reviewed to date concerning the installation of MATV systems, this one is the *very best!* It should be considered *must reading* for every electronic technician that installs antenna systems, even the simple ones.

The author begins the book with a rather brief description of decibels—the fundamental unit of measure for all antenna systems. For those that have some difficulty with logarithms, a table in the back of the book converts between decibels and microvolts for every decibel between -40dB and +80dB, a far greater range than would normally be encountered in any conventional system. Sample problems are frequently solved in detail to further assist the reader in learning how to handle this system of measurement.

The proper function of virtually every component required for just about any MATV application is described in detail, using Blonder-Tongue, Channel Master, Finco, Jerrold and Winegard products as examples. MATV/CATV installations and MATV/CCTV installations are also covered. All necessary electronic calculations are provided for vertically stacking antennas for greater gain, horizontally stacking them for greater directivity (or the rejection of unwanted signals from a specific direction) and stagger stacking them to improve the rejection of unwanted signals from behind.

The author rejects the common claim that a nearby mountain may usually be the cause of ghosts, providing a ghost displacement chart with which the difference in multipath signal distances can be determined by measuring ghost displacements in the TV picture.

This book should most definitely be added to your reference library.

**DISCOUNT
TEST
EQUIPMENT
SPECIALISTS**

B&K

SENCORE

TEICO® Leader

COMPLETE LINE OF ELECTRONIC SUPPLIES
ICC/Mullard & Raytheon Tubes
Telematic Test Rigs

FREE CATALOG

FORDHAM

Radio Supply Co., Inc.
558 Morris Ave., Bronx, N.Y. 10451
Tel: (212) 585-0330

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

Stocking these 9 ECG™ semiconductors is like having hundreds of solid-state deflection circuit devices on hand.

GTE Sylvania has checked out hundreds of different TV set models to find out what they have in common.

And we've been able to boil down practically all of their deflection circuit needs to just nine parts.

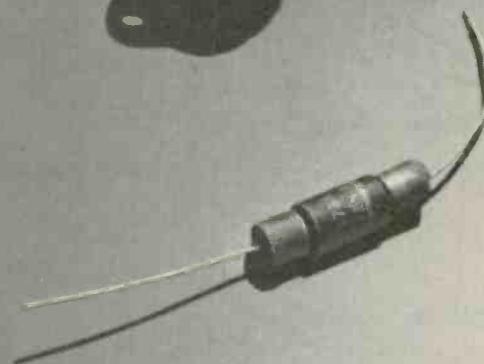
Then, we put together a brand-new cross-reference guide (ECG-212E) that tells you which of the nine units replaces which numbers.

But, we didn't stop at deflection circuits. Our new guide also covers over 75,000 other parts including industrial components as well as all types of home and auto entertainment equipment.

Because we've reduced the number of parts that you have to have on hand, it's easier to keep a complete stock.

And that makes it easier for you to be sure you have the part you want when you want it.

GTE SYLVANIA



NEWS OF THE INDUSTRY

NARDA's School of Service Management Will Feature Solutions to Problems

The servicer on the firing line will ask the questions at NARDA's three-day School of Service Management. Their panel of interrogators will pose the problems and expert speakers will provide the answers. This question and answer approach will surface the basic problem that servicers are facing and establish a dialogue between the speakers and the group.

The School of Service Management is now in its 16th year, annually providing top-flight experts on provocative subjects. This year it will be presented in two sections in two entirely different parts of the country. It will be held February 3-5, 1974, at the Sheraton Chicago Hotel in Chicago, Ill., and Feb. 24-26, 1974, at the Los Angeles Sheraton Airport Hotel in Los Angeles, Calif.

[We did not receive this news release in time to be included in the January issue, and this issue comes off the press after the Chicago school has been held. Thus we are printing only the program announced for the Los Angeles school, Ed.]

Sunday, Feb. 24, 1974

- 6.00 p.m. **Dinner**
- 7.00 p.m. **"The Future of Independent Service"**
Richard A. Schaub
Waste King Universal
3300 E. 50th St.
Los Angeles, Calif. 90058

7.45 p.m. **Bull Session**

Monday, Feb. 25, 1974

- 8:00 a.m. **Breakfast**
- 9:00 a.m. **Panel A**
Interrogator—Stan Essig
Sid's Home Entertainment Center
3242 E. Speedway
Tucson, Ariz. 85716
- "How Can I Become More Profitable by Studying My Records?"**
Larry Menough
Sony Corp.
57-57 Van Dam St.
Long Island City, N.Y. 11101
(Is there too much or too little capital invested? Is working capital too tight or too loose? Is there too much or too little inventory? How is the gross profit and equity growing?)
- "How Should I Establish My Service Rates?"**
Walter Layton
KitchenAid Div., Hobart
Troy, Ohio 45374
(How much income goes to pay off technicians? Is there a formula for this? How do I measure overhead? Is there a step-by-step formula for coming up with the rate? Should I use a door knocker? What kind of increments should I use? What about flat rates? Where can I get help in establishing flat rates?)
- "Am I Ready for Service Contracts?"**
Tony Fahratt
A-TV Service Co.

1229 N. Highland Ave.
Los Angeles, Calif.

(What things do I have to do before I set up a service contract program? Is there a plan for creating a service contract program? Can I make sure I don't lose money selling contracts? How do I set charges? Who sells them?)

12:00 noon **Lunch**

- 1:30 p.m. **Panel B**
Interrogator—Paul Goldenberg
Paul's TV
420 N. Harbor
La Habra, Calif. 90631

"What's the Best Method for Spotting Unprofitable Technicians?"

John Gooley
NARDA Staff
(How can you quickly and easily record the information you need? How many calls should be completed on the first visit? What percentage of time should be productive? What should be the return on wage investment?)

"How Do I Compensate My Technicians?"

Oran Bridges
So Cal Service
1521 Beach St.
Montebello, Calif. 90640
(Do bonus systems really work? Are there people who won't work under them? What are the advantages to the store? What are the advantages to the technician? What kind of plans are there?)

"How Do I Find New Service Customers?"

Arthur Schwartz
Electrical Industries Assn.
6055 E. Washington Blvd.
Los Angeles, Calif. 90040
(What should my advertising budget be? How can I plan my advertising in advance? How important is truck lettering? Does Yellow Page advertising pay off . . . advertising in newspapers . . . radio/TV? How about special promotions?)

- 6:00 p.m. **Dinner**
- 7:00 p.m. **"The Manager as a Manager"**
H. W. (Mickey) Walther
NARDA Staff
- 7:45 p.m. **Individual Counseling Sessions**

Tuesday, Feb. 26, 1974

- 8:00 a.m. **Breakfast**
- 9:00 a.m. **Panel C**
Interrogator—Ron Riddle
Riddle Appliance Service
9572 Oasis Ave.
Garden Grove, Calif. 92641
- "How Do I Keep My Truck Expense Down?"**
Ford Motor Co.
Dearborn, Mich.
(Are there any guidelines for selecting the right body style or the right engine? What kind of maintenance programs should I be using? Should the men take care of their own trucks or should the manager? Should I lease or buy?)

continued on page 42

RCA's in-depth system for solid-state servicing.

SK leads the way in solid-state servicing with its strong in-depth coverage replacement system.

Now 218 SK devices replace over 87,000 types, both foreign and domestic, and they are all listed in the new SK Replacement Guide, SPG-202P.

SK provides top-of-the-line replacements for the types you are most likely to encounter in day-to-day servicing. For example, it has in-depth:

Matched audio pairs Most popular IC's RF and Video Types TV Deflection Systems

IF, Chroma, Audio and High-Voltage Types Rectifiers/Diodes.

That's why SK's provide you with strong in-depth solid-state replacement coverage for the most popular-selling consumer electronics equipment:

TV, Color & BW Audio Equipment Hi-Fi Systems Tape Recorders Radio Receivers Citizens Band Gear.

And there are many more reasons for the growing popularity of the SK in-depth coverage system. They include RCA's out-

standing top-of-the-line product quality, its full complement of solid-state hardware, and its unmatched information support that backs the entire system.

Get all the details on SK in-depth coverage system from your RCA Distributor. Contact him today and ask, too, for your copy of the new 1974 RCA SK Replacement Guide, SPG-202P.

RCA I Distributor Marketing
Somerville, N.J. 08876.

RCA Solid State



SK

NEW AND NOTEWORTHY

For additional information on products described in this section, circle the numbers on Reader Service Card. Requests will be handled promptly.

FOR MORE NEW PRODUCTS
SEE PAGE 48



DIGITAL VOM 700

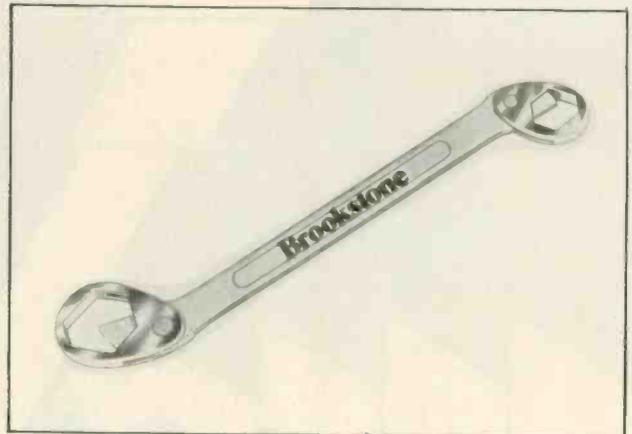
Battery powered unit weighing only 1 lb

A portable Digital VOM, called the Danameter, is designed with the versatility of analog instruments. The power requirement is reportedly less than 1mv and the need for a line cord or rechargeable batteries are eliminated because the battery is said to last *one year* under normal conditions! The digital readout is a seven-segment liquid crystal display. The decimal points are automatically positioned and the polarity is instantly determined, then displayed as either positive or negative. The unit is said to offer a high input impedance—10M dc, 2M ac—plus independence from power line interference. One millivolt resolution vdc and vac plus dc current ranges from 10na to 2a permit measurements of minute leakage currents. The ohms ranges cover 0.1Ω to 200M. The instrument has one function selector that is recessed behind the molded edges of the cyclocac case. Dana Laboratories, Inc.

SELF-ADJUSTING WRENCH 701

Fits all size nuts and bolts

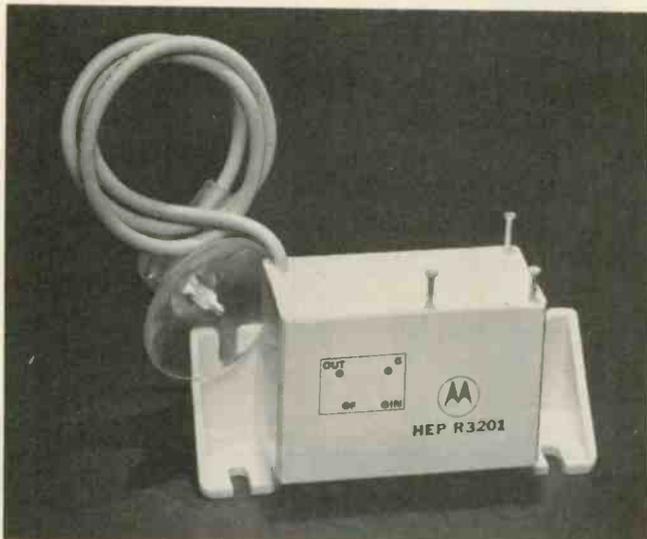
A tool that reportedly takes the place of an entire set of wrenches automatically adjusts itself for handling all nuts and bolts $\frac{3}{8}$ -in. by $\frac{7}{8}$ -in. across flats, including metric. The tool is said to operate like a ratchet wrench, without the need to remove and re-grip with each stroke. The tool grips at least three surfaces without rounding or damaging corners, and the grip increases as turning gets tougher. It is excellent for removing or tightening damaged or rusted bolts that ordinary socket wrenches won't even fit and is reportedly made of high quality chrome vanadium tool steel polished heads and measures $8\frac{1}{2}$ in. long. Brookstone Co.



TV HIGH-VOLTAGE TRIPLER 702

*Interchangeable with units
used in many current TV sets*

TV High-Voltage Triplers, designated HEP R3201 and R3203, are reportedly designed to be directly interchangeable with such units used in many current TV sets. It is encased in an epoxy housing which is arc-track resistant, plus a focus tap yielding 8kv, with a 25kv output at the high-voltage terminal. A moded-in high-voltage output lead terminating in the picture tube anode connector helps eliminate corona and arcing. The R3201 internal circuit employs five diodes and the R3203 employs six diodes and six capacitors. The safety margin built into the units is said to include a current output rating twice that of the original equipment on the focus tap and 150% on the high-voltage tap. Motorola.



INTRODUCING THE NEW HICKOK LINE OF TEST INSTRUMENTS



For over 50 years Hickok has been a leading U.S. developer of precision test instrumentation for industrial and military requirements. Now all this experience and quality are available to you in our new line of servicing equipment.

LAB QUALITY EQUIPMENT... AT COMPETITIVE PRICES.

We've engineered into our new line industrial performance and rugged reliability. Our service instruments are built, calibrated and inspected by the same people who build our industrial and military equipment. To assure maximum reliability and high performance we use glass-epoxy PC boards. We make extensive use of IC's including custom MOS and CMOS, and when required fully regulated power supplies. All our test equipment is easy-to-use, light weight and portable.

TWO-YEAR WARRANTY.

We stand behind our test instruments with the best warranty in the business. Instead of the usual 60 to 90 days, Hickok's warranty protects you for a full 2 years (unconditionally for the first year, only a nominal service charge during the second year). In every way, you get more from Hickok.

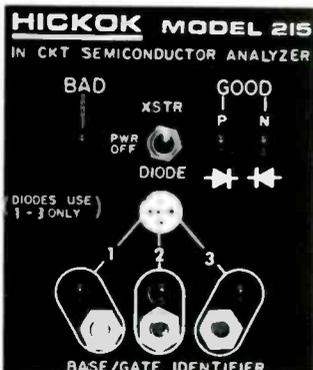
FULLY AUTOMATIC SEMICONDUCTOR TESTER



It's as easy to use as it is to carry. This lightweight, easy-to-use portable gives instant Good/Bad analysis of NPN's, PNP's, FET's and diodes, in or out of circuit. The palm-sized Model 215 weighs just 12 ounces and slips easily into your pocket. The 215 operates anywhere on two standard 9V batteries. It's the same compact size and weight as our Model 239 Pocket Color Bar Generator also featured on this page.

You'll find this semiconductor tester the easiest and fastest of all to use. No searching through data books and service manuals to find basing diagrams. No switches to operate, no buttons to push. Easy no-hands operation allows you to use both hands for probing or making lead connections. Just connect the 215 to the device leads in any order, in/or out of circuit. Instantly and automatically, the 215 determines the lead configuration, and tells you in bright LED displays if the semiconductor is GOOD or BAD. If GOOD, it further identifies which lead is the base (gate for FET's) and whether NPN or PNP.

The solid state design of the Model 215 is based on low power CMOS circuitry that greatly extends battery life. This instrument will not damage transistors, diodes or circuits under test.



\$129⁰⁰

(without batteries — test leads included)
A recharger is available for Models 215 and 239 when using nickel-cadmium batteries.

POCKET COLOR BAR GENERATOR

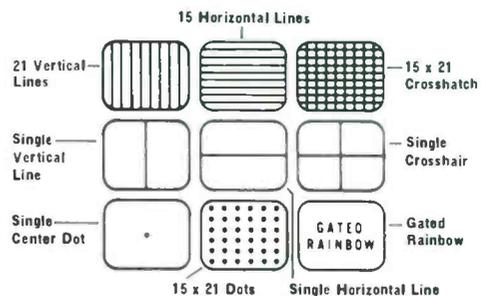


All the performance features you need in the palm of your hand. This portable, battery-operated Model 239 Pocket Color Bar Generator weighs only 12 ounces, yet we've engineered into it industrial performance, rugged reliability and bench instrument quality... with half the size and weight. Take a close look at these features.

- Small size, light weight design — only 5 3/4" x 3 3/8" x 1 1/8" (fits jacket pocket), 12 ounces.
- Exclusive Hickok-developed MOS LSI IC provides these unique advantages: low component count for high reliability... extremely low battery drain... rock-stable signals from -50° to +150°F; all digital timing circuits for solid pattern stability... and small package size.
- Simplified controls. Two matrix slide switches select any of the nine patterns.
- Chroma level adjustable from 0-150% for bright, sharp patterns.
- RF adjustable, Channels 2-4.
- Crystal controlled chroma and timing oscillators.
- Powered by two standard 9V batteries.
- Rugged polypropylene case.

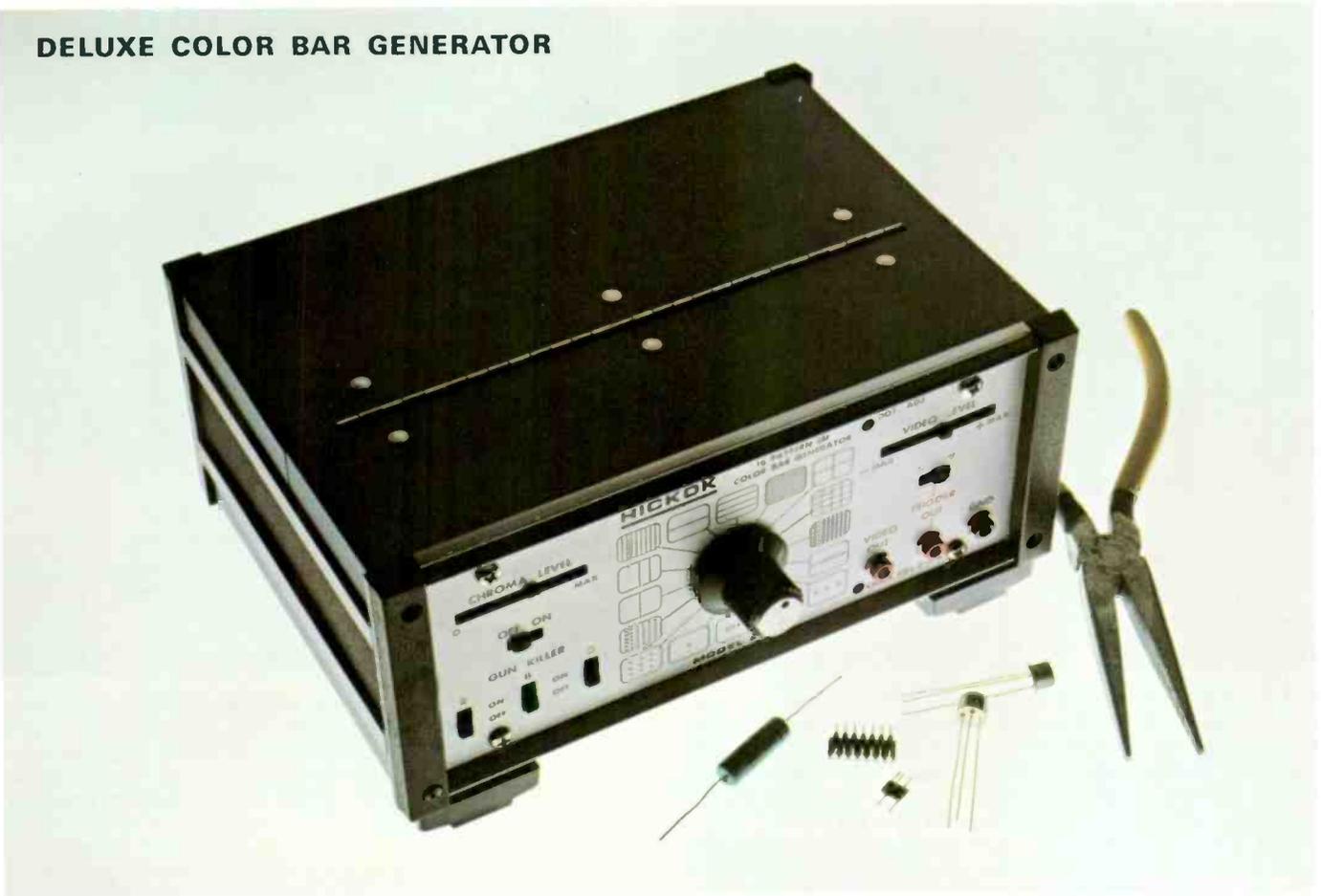
\$109⁰⁰

(without batteries)



only our unique MOS LSI circuitry can give you these nine, stable, FCC-Specification signals in so small and rugged a unit.

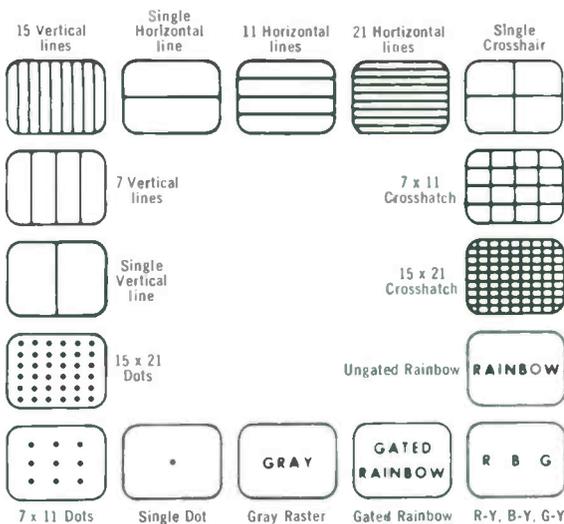
DELUXE COLOR BAR GENERATOR



It has everything you ever wanted. It does everything you'll ever need. The small-cube Model 246 Deluxe Color Bar Generator with advanced solid state circuitry provides 16 stable patterns including a gated rainbow for testing/aligning color circuits. Its three gun killers with piercing clips let you selectively kill the red, blue and green gun grids in the set you're testing. There's even a handy storage compartment for cables, leads and line cord.

Compare these features:

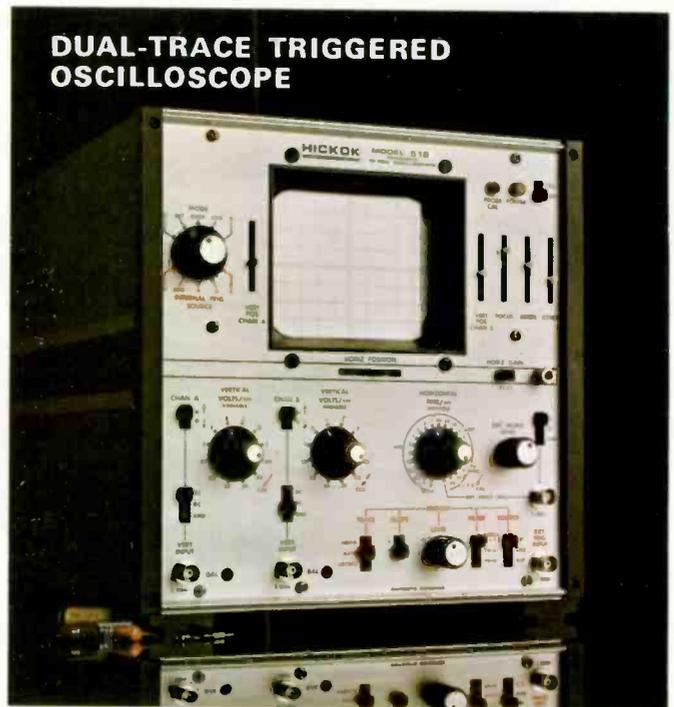
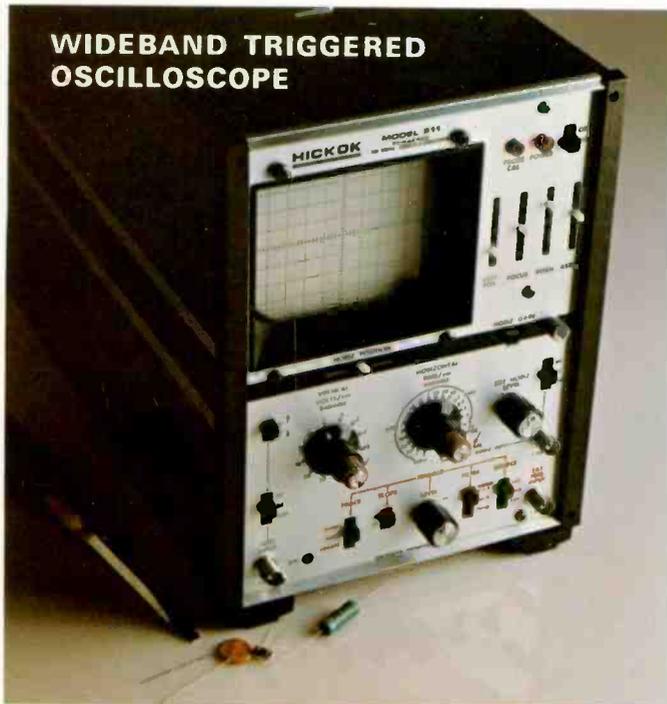
- Exclusive Hickok-developed MOS LSI IC provides digitally controlled stable patterns from -50° to $+150^{\circ}\text{F}$. The lower component count with this IC also increases overall reliability and permits a smaller package size.
- A full 16 patterns gives maximum versatility and minimum distraction when making critical checks and adjustments.
- Chroma level adjustable from 0-200% for bright, sharp patterns.
- RF adjustable, Channels 2-4.
- Crystal controlled chroma and timing oscillators.
- Gun killers are switch-selectable from front panel; leads and piercing clips provided.
- Adjustable dot size.
- Video output, $\approx 3\text{V}$ peak-to-peak.
- Horizontal and vertical oscilloscope triggering outputs.



Maximum versatility with all these patterns.

\$175⁰⁰
(all leads included)

HICKOK
the value innovator



Lab quality and performance in an economical serviceman's scope. A good wideband triggered oscilloscope can be the most valuable signal tracing instrument you own for servicing TV, audio and radio equipment. On the other hand, a cheap, unreliable scope can frustrate you, lie to you and let you down when you need it most. It's your choice.

The Hickok Model 511 Oscilloscope combines economy with the reliability, ruggedness and advanced solid state circuitry built into our laboratory and industrial oscilloscopes.

\$425⁰⁰

A value-loaded scope with all the quality, precision and features of our Model 511. This is the ultimate signal tracing instrument for all TV, audio and radio servicing jobs. The Model 512 has all the features of our lab quality single trace Model 511 plus the versatility of four dual trace modes.

When the relative phase of two signals must be known, or when the condition of two waveforms must be analyzed simultaneously only a dual trace scope will do the job. One of the most obvious advantages of dual-trace operation is in analyzing circuits like chroma and video which have keying or blanking from horizontal pulses. More and more technicians are finding practical and essential uses for a dual-trace scope. If you haven't tried a dual-trace and think you need its added capabilities try the new Hickok 512. You'll find it to be your best buy.

\$575⁰⁰

Both Model 511 and Model 512 have all these important features . . . and many more!

- 10 MHz response flat within 3 dB for all signal levels. Excellent pulse response minimizes overshoot and ringing.
- Foolproof triggering to 15 MHz.
- 5 mV/cm sensitivity, very useful for solid state work.
- Bright 8 cm x 10 cm display. High 2.5 kV accelerating potential and P31 phosphor provide a clear, high contrast trace even for low repetition rate signals.
- Beam finder quickly locates off-scale traces.
- Simplified front panel controls are color coded and convenient to use.
- Unique VITS synch separator automatically locks on Field 1 or Field 2 VITS for video response checks.
- Line and field triggering for TV service work.
- Regulated power supply maintains amplifier gain and sweep rate within 0.1% with changes in line voltage from 105 to 125 volts.
- Industrial quality and construction. Glass-epoxy PC boards used throughout.

HICKOK HAS 50 YEARS OF EXPERIENCE IN DEVELOPING TEST INSTRUMENTATION AND A 50 YEAR REPUTATION FOR SUPERB CRAFTSMANSHIP.

Our new line of test equipment will also include a unique, full feature, in/out of circuit semiconductor analyzer and a deluxe automatic CRT tester-rejuvenator. Add to this our standard line of tube testers, signal generators and other world-famous service equipment and you'll understand why Hickok is your best value. Call your nearest distributor or write for complete specifications on any of this equipment.

HICKOK

the value innovator

Instrumentation & Controls Division
 The Hickok Electrical Instrument Co.
 10514 Dupont Avenue—Cleveland, Ohio 44108
 (216) 541-8060—TWX: 810-421-8286

TEKLAB REPORT

Magnavox's Color-TV Chassis T982 Employing an In-Line System

by Joseph Zauhar

Part 1—Preset controls in conjunction with an LDR to monitor room light form a circuit that automatically adjusts the color picture and yet allows for minor personal preference adjustments

■ To meet the growing demand for small screen TV sets, Magnavox has introduced a new solid-state chassis to be used with in-line picture tubes. The chassis is constructed for serviceability and features partial modular construction.

The new in-line system will allow the installation and set-up of a color picture tube to be comparable to that in a B/W-TV set. This new chassis employs an RGB system to drive the picture tube cathodes, and the overall length of the new picture tube will allow for a smaller cabinet on small screen portable TV sets. Another advantage of the new picture tube is the elimination of the dynamic convergence correction circuitry. The new deflection yoke is cemented permanently to the picture tube and is smaller and lighter than conventional yokes.

We received for lab purposes a Magnavox model CD4360 portable color-TV employing the T982 chassis. Taking a look at the front of this TV set, we noted that it

has a clean uncluttered appearance since most of the customer controls are located at the top rear edge of the cabinet. There is a good chance that these controls will seldom be used by the owner since the set employs the Videomatic system—and the pushbutton to activate the PRESET controls is located on the front control panel. Another important feature found in the lower right corner of the front panel is a Light Dependent Resistor (LDR) which is physically very small but performs the important task of monitoring all

changes in room lighting.

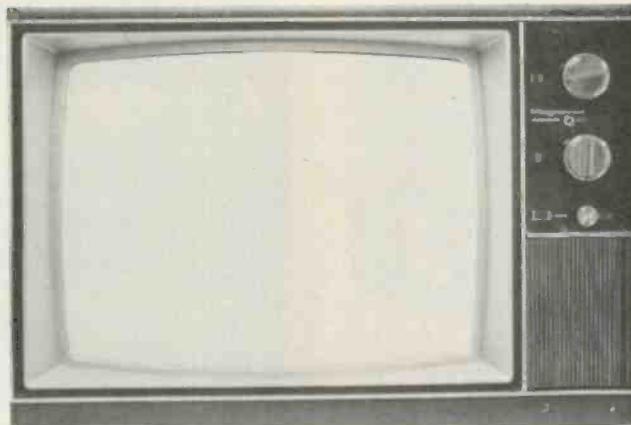
Upon removing the cabinet back we noted how completely exposed the "U" shaped chassis becomes to simplify any necessary servicing. The chassis consists of two main circuit boards and 14 plug-in modules. The signal board assembly is mounted vertically and contains modules and components for the IF, video, sound, chroma, AFT and signal-processing circuits. The new Videomatic board is now mounted on the top edge of this signal board because of the change in the location of the PRESET controls.

It can no longer be considered a plug-in module, having 21 wires soldered to it. The scan board assembly is mounted horizontally and contains modules and components for the vertical- and horizontal-sweep circuits and the video output circuits.

Each module contains circuitry for one particular function or a related group of functions. The modules are designed with edge connectors, plug-in, and can be removed or replaced without special tools or the necessity of soldering. Many problems encountered in the home can now be corrected by adjustment and the simplified module substitution method of troubleshooting.

There are six transistors which are not located on modules. These transistors are mounted in sockets and can be replaced without the use of a soldering iron. A few of the transistors are mounted on heat sinks and located under the chassis. To replace them the chassis must be removed.

The AGC DELAY con-



Magnavox's Model CD4360 Portable Color-TV employing an In-Line picture tube and Videomatic Color System.

control and the TONE control have been combined in a double potentiometer with the AGC DELAY adjustment being rotated through the hollow TONE control shaft. Other service adjustments that require frequent access are located on the rear apron of the chassis and are accessible without removing the cabinet back. These include: AFT DEFEAT switch, SHARPNESS, COLOR KILLER, DRIVES, MASTER

SCREEN, SERVICE switch, HORIZONTAL HOLD, VERTICAL LINEARITY, HEIGHT, FOCUS and HORIZONTAL CENTERING.

The sound, high-voltage, vertical-scan and video-output circuits and parts of the horizontal-scan circuit are quite similar to those used in the T989 or earlier models.

As we review some of the new and important circuits, they can be followed in the simplified sche-

matics included in the article or the complete diagram in Tekfax Schematic No. 1498.

Videomatic Color System

The T982 chassis employs a new Videomatic Color System, as compared to previous models. In some earlier models, such as the T989 chassis, the circuitry would monitor the ambient room light and automatically adjust the picture BRIGHTNESS, CONTRAST and COLOR to give a well balanced color picture, while the station signal was automatically fine tuned. The new Videomatic Color System employed in this chassis still uses the Light Dependent Resistor (LDR) to monitor room light and adjust the picture, but now a number of new features has been added. Now when the Videomatic button is pressed, the receiver is automatically fine tuned and the BRIGHTNESS, CONTRAST, COLOR and TINT controls are switched to preset levels. Even if all the customer controls are misadjusted, pushing the one VIDEOMATIC button will restore a sharp, clear picture tailored to the amount of light in the room.

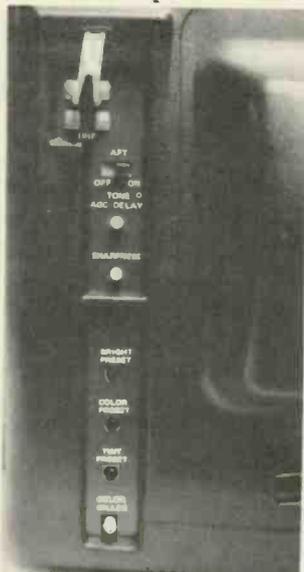
When the Videomatic circuit is switched ON, the BRIGHTNESS, COLOR, and TINT adjustments are controlled by factory preadjusted controls. If preferred, the customer can still use the manual controls to adjust COLOR, TINT, CONTRAST and BRIGHTNESS settings for desired preference, but these controls are now limited to about 30 percent of their normal range. The factory PRESET controls may be readjusted by the electronic technician.

The Videomatic preset controls have been moved to the vertical panel in the rear of the chassis where they can be adjusted without removing the cabinet back. The circuitry employed has two functions: First, an LDR ambient-light sensor drives a photocoupler to control the CONTRAST and COLOR settings with variations in room lighting. The second function of the circuitry is to decrease the range of customers' BRIGHTNESS, CONTRAST, COLOR and TINT controls. The optimum setting of these controls is adjusted at the factory by a set of DC CENTERING controls (preset).

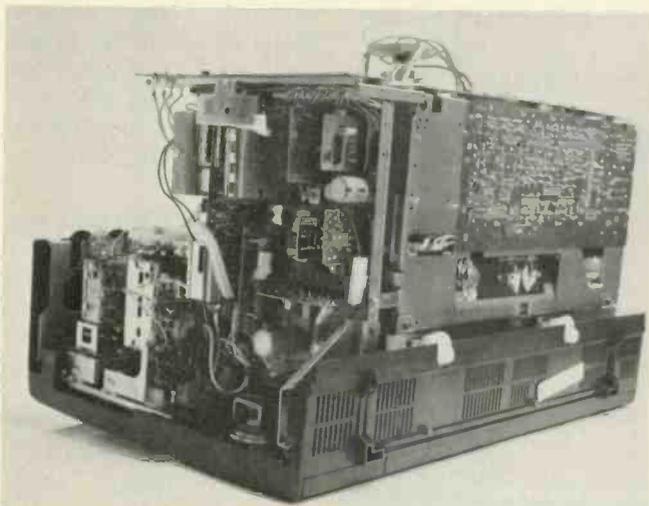
When the VIDEOMATIC switch, S401, is in the OFF position, 22v are applied



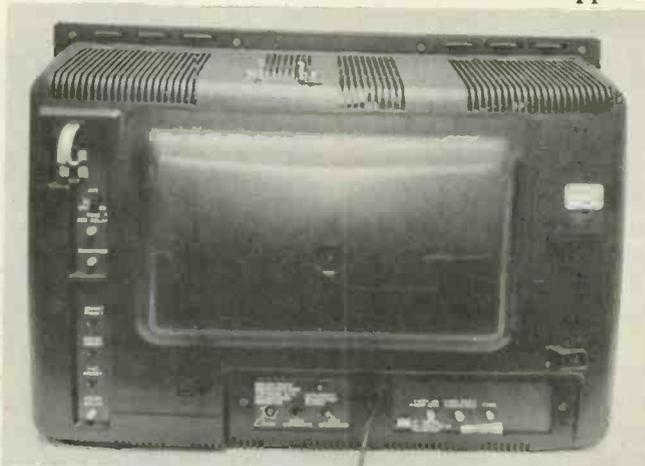
The front control panel has a clean uncluttered appearance and the channel number indicators are of the lighted window type. Also shown is the Videomatic pushbutton to activate the preset controls.



The Videomatic preset controls are located on the rear chassis panel to permit the adjustment of the controls without removing the cabinet back.



The chassis consists of two main circuit boards and 14 plug-in modules. The Signal board assembly is mounted vertically and the Scan board mounted horizontally.



Rear view of the color-TV set showing service adjustments, plus the customer adjustments at the top rear of the cabinet.

through switch S401B and resistor R16 to the Light Emitting Diode (LED) in photo coupler PC1. At this time, the LED glows at maximum brightness and is unaffected by the LDR Sensor. This causes the LDR in RC1 to have minimum resistance, approximately 150Ω. Maximum composite video is coupled through capacitor C2, photo coupler PC1 and CONTRAST control R316 to the base of Delay-Line transistor Q1 on Video Delay Module 105. The CONTRAST control determines the amount of video applied to the base of Q1.

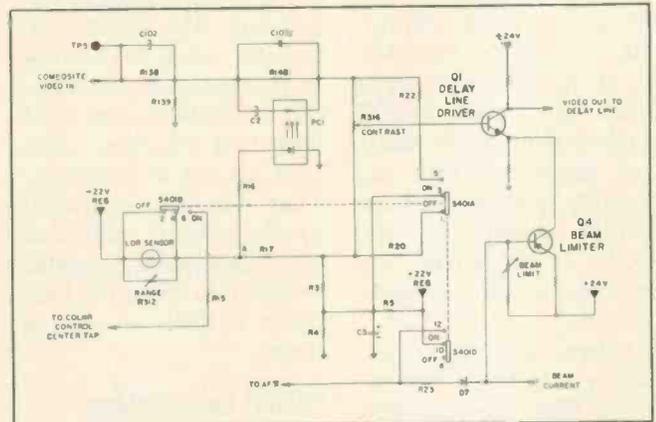
When the Videomatic switch is in the ON position, 22v are applied to the series combination of the LDR Sensor, R16 and the LED in PC1 to

ground. The resistance of the LDR is dependent on the amount of room lighting, and will change from about 150Ω in bright light to over 1M in darkness. Therefore, the current through the LED in PC1 will change accordingly, dependent on the setting of the RANGE control. The LED will glow in proportion to the current. The resistance of the LDR in the PC1 varies inversely with the light from the LED, controlling the amount of video coupled to the base of Q1.

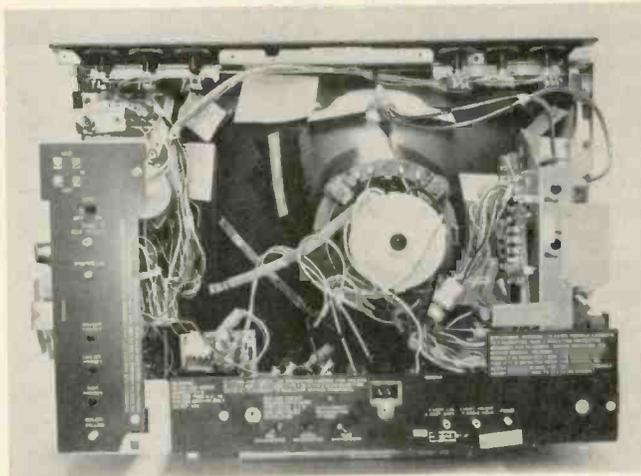
The dc voltage from the LDR Sensor at point A is also coupled through resistor R17 to the bottom of the CONTRAST control, which holds the black level in the video essentially constant. This has the effect of lowering the

overall brightness level as the video decreases. The dc voltage applied through switch S401D, resistor R23 and diode D7 to the base of the Beam Limiter transistor Q4 prevents it from conducting during normal change in brightness level and from counteracting the effects of the voltage through resistor R17. (Resistor R20 is

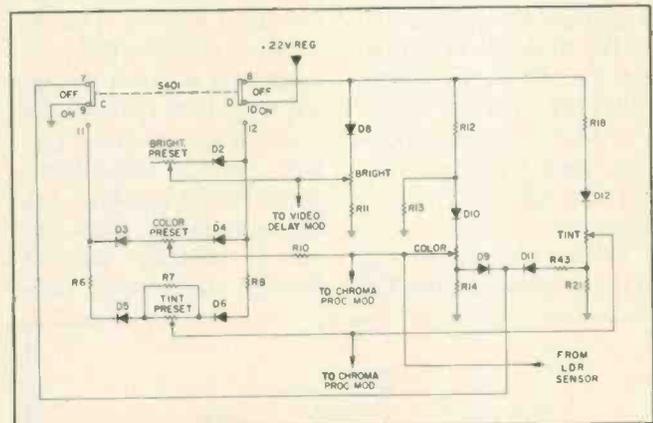
used to set the ac operating range of the CONTRAST control when S401A is OFF.) The voltage from point A is also coupled through switch S401B (when ON) and resistor R15 to the center tap of the COLOR control. This dc voltage, applied to the Chroma Processor, causes color intensity to decrease as room light decreases.



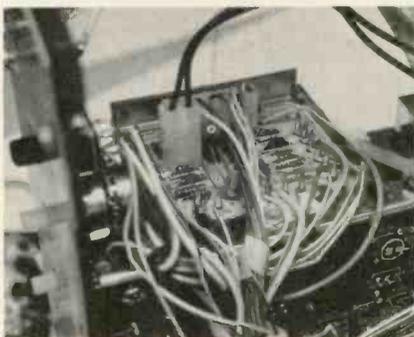
Schematic of the Videomatic Light Dependent Resistor (LDR) circuit. Courtesy of Magnavox.



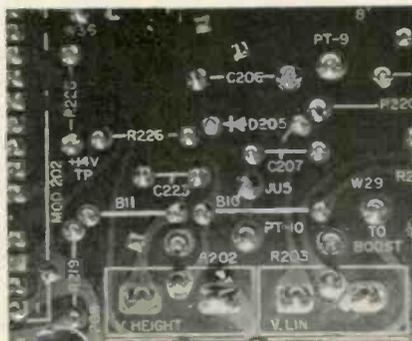
Rear view of the "U" shaped T982 color-TV chassis, which is completely exposed with the cabinet cover removed.



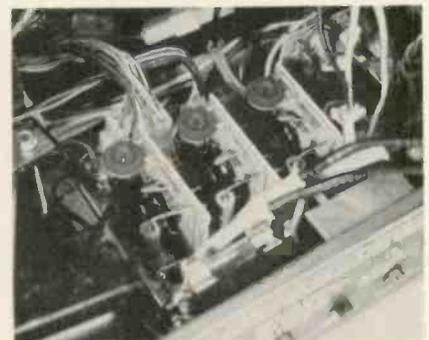
Schematic of the Videomatic Control Preset Centering circuit. Courtesy of Magnavox.



The Videomatic board was redesigned because of the location of the PRESET controls and is not pluggable as was the earlier version.



The components and connections are clearly roadmapped with identification numbers to aid any required servicing.



The three Video Output Modules are shown with their DRIVE numbers and associated controls.

And 22v are applied through switch S401D to activate the AFT circuit when the Videomatic circuit is ON.

Videomatic Control Preset Centering Circuit

As shown in the preset circuitry schematic, the BRIGHTNESS, COLOR and TINT controls provide dc bias voltages to the circuits they control, which are obtained from the center tap of each control. The controls are essentially in parallel with each other from switch S401D pin 8 to ground. The resistors associated with the controls provide voltage divider action. All the diodes in the circuit are used for isolation between controls.

When the Videomatic switch is in the OFF position, 22v are applied through switch S401D to the top of each control circuit. In addition, a ground is applied through switch S401C to the diodes at the bottom end of the COLOR and TINT controls. Thus, with S401 in the OFF position, each customer control has full range of adjustment.

When switch S401 is in to the ON position, the 22v

are removed from the tops of the customer controls and applied to the PRESET controls through switch S401D. The ground is removed from the diodes at the bottom of the COLOR and TINT controls and applied instead to the COLOR and TINT PRESET controls. Each PRESET control drops the voltage that is divided through it to allow a limited range of adjustment. The preset controls are set at the factory to provide optimum COLOR, BRIGHTNESS and TINT when the customer controls are set at midrange. They may be readjusted by the service technician to suit individual customer preferences when the customer controls are out of range.

"RGB" Color System

The T982 color-TV chassis employs color processing circuits known as the RGB system. The luminance signal is still processed by a series of signal amplifiers such as the previous conventional system, but the large luminance power amplifier has been eliminated. This signal is instead coupled through the DRIVE con-

trols into the three Video Output Modules. The three color difference signals are obtained from a chroma demodulator IC and also coupled to the three Video Output Modules—The Color Difference Amplifiers having been eliminated. Each of the Video Output module inputs are matrixed, or mixed, within the amplifier stage on the module. The output signals obtained from the modules are the actual red, green and blue signals that drive the cathodes of the picture tube. The control grids are tied together and controlled by a fixed dc potential.

There are a few minor variations in the "RGB" system from the one used in the T989 chassis to accommodate the use of the in-line picture tube. The video driver transistor, Q2, provides the luminance signal to all three modules. The color difference signal, R-Y, is applied to the base of transistor Q1. Because of the output signal being received at the collector, the R-Y signal will be inverted and become Y-R. The luminance signal, -Y, from the Video Driver is applied to the emitter of transistor Q1 and therefore will not be inverted at the collector. The Y-R and -Y signals at the collector mix and the Y signals cancel, leaving only the -R signal, which is applied to the cathode of the red gun in the picture tube. This same action takes place in the Blue and Green Video Output Modules.

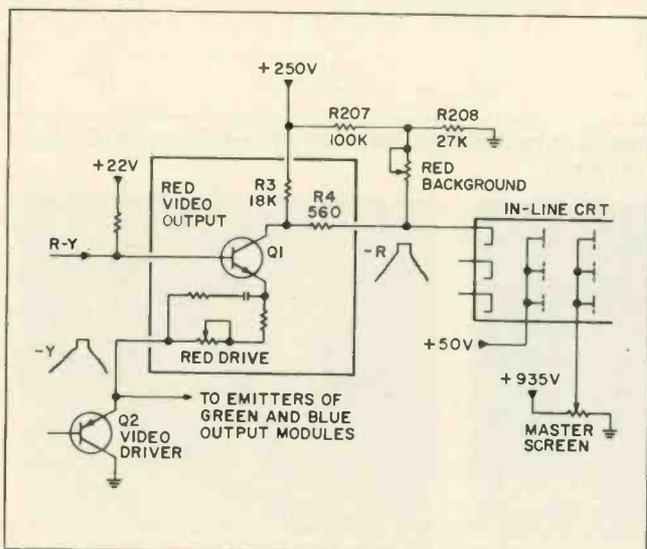
The three control grids of the in-line picture tube are electrically common inside of the tube and tied to a fixed dc potential. The screen grids are also common inside the pic-

ture tube and are controlled by a MASTER SCREEN control. To properly set the grey scale tracking, it is necessary to control the dc conduction of each gun individually with the BACKGROUND controls, varying the dc voltage applied to the cathode to set the dc bias of each gun separately.

The DRIVE controls, which are found on the top of the chassis, are in series with the emitter resistor of transistor Q1 in each Video Output Module and vary the gain of Q1.

This chassis uses dc coupling throughout the luminance stages and the Video Output Modules to the picture tube. The common control grid has approximately 50v dc applied to it and therefore the cathodes must be at a potential higher than the 50v level to control the conduction of the guns. The cathodes vary from around 150v dc at maximum brightness to around 225v dc at cutoff. Whenever transistor Q1 conduction is increased, the voltage at the picture cathode is decreased and gun conduction is increased. When a Video Output Module is removed from its socket, the path through resistors R3 and R4 is broken and voltage at the cathode goes down because of the large value of resistor R207. This action causes the gun to saturate and the screen of the picture tube will be the color of the module removed.

Next month we continue this article by covering some more of the important new circuits in this chassis, which will include: the video-delay, signal-processor, chroma-demodulator, horizontal-oscillator, high-voltage circuits and the Pincushion Correction Circuits. ■



Simplified schematic of the Red Video Output circuit employed in the T982 color-TV chassis. Courtesy of Magnavox.

How and Why - Trapezoidal

by Gayle S. Morris

An understanding of transient waveforms is required for more effective servicing of TV picture tube sweep circuitry

■ Transient waveforms provide a very interesting and challenging study in the field of electronics. Such waveforms as the sawtooth, square, rectangular, peaked pulse and trapezoidal can be used to perform such functions as trigger, gating and sweep when developed within properly engineered circuits.

The sine wave (Fig. 1A) has been around since even before Marconi developed the quarter-wave antenna, the "ole sawtooth" (Fig. 1B) just seemed to happen along with the gas diode, the square wave (Fig. 1C) "dropped into sight" from the over driven Class A amplifier, the rectangular waveform (Fig. 1D) is a "hoss" out of the mono-stable multivibrator string, and the "peaker" or pulse wave (Fig. 1E) came into view in a "short time constant."

In developing all of these waveforms, the "basic ingredient" (be-

lieve it or not) is the sine wave. It is not the purpose of this article, however, to spend time on the various circuits involved in converting fundamental and harmonics of a sine wave to sawtooth-, square-, rectangular-, or pulse-type waveforms; but it is interesting to note that the trapezoidal waveform (Fig. 1F) is the "sum" of the sawtooth or triangular waveform, *plus* the square or rectangular waveform and can be developed in either a "reactive" or an "active" circuit. (Note: Reactive circuits employ L-C-R components only. Active circuits use the vacuum tube plus components, or semi-conductors with gain plus components.)

Webster defines the noun Trapezoid as: "a quadrilateral having only two sides parallel." That is a big word, quadrilateral, but Webster says that it is simply a "polygon of four sides." Polygon seems even big-

ger! But, Webster says that polygon is simply "a closed plane figure bounded by straight lines." Before we let this "tall terminology" throw us to the mat, let us take a second look at the trapezoidal waveform in Fig. 1F. It is trapezoidal in form since it has only two sides that are parallel and/or it is a plane figure bounded by straight lines. But what makes the derivation of terminology even more interesting is that if we take a simple trapezoid as in Fig. 2A, invert it and shift the dimensions to reflect degrees of travel (motion) as might be expressed in comparing the now familiar circle to the sine wave (Fig. 2B), we do in fact have a trapezoidal "expression" or "form." Why do we call the waveform trapezoidal? Because it looks like a trapezoid!

After all this, the question is asked: "Where is there a need for

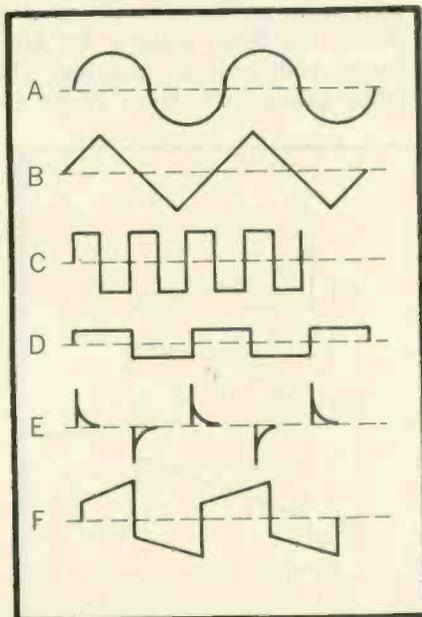


Fig. 1—Some of the transient waveforms found in circuitry currently requiring servicing.

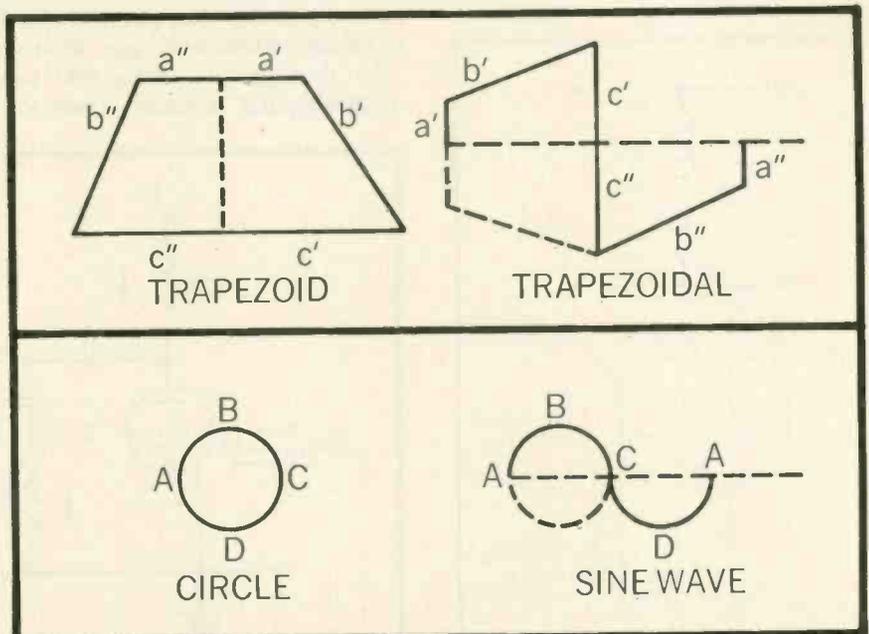


Fig. 2—Components of a trapezoidal waveform can be analyzed in the same manner as those of a sine wave.

the trapezoidal waveform?" Obviously in Fig. 2A we seem to have a linear slope at b' along with a sharp jump at a' and a decline at c'. This type of waveform resembles the very familiar sawtooth with its ramp and fast flyback or decline. The sawtooth has been used in electrostatic sweep circuits since the CRT (cathode ray tube) came into existence and has done a good job. However, with the advent of television and radar, sweep circuits had to undergo a modification program.

The larger radar sets use magnetic deflection (coils around the neck of the CRT) for sweep of the beam and although the sawtooth functioned satisfactorily for long range sweeps, the short range sweeps needed a special sweep voltage with a trapezoidal waveform to overcome the effect of the L-R (inductance and series resistance) formed by the sweep coils.

A similar problem existed in larger TV sets, in that early experimentation and marketing of CRT's (picture tubes) utilized electrostatic (plates in the CRT) sweep of the beam. The industry was able to use the sawtooth for a linear sweep because the CRT's were small in diameter. However, with the development of the larger CRT's to provide more viewing area for the consumer, it was found that the sawtooth voltage could no longer be used to pro-

vide linear sweep of the beam in the CRT. This was based primarily on the findings that a wide-angle sweep, necessitated because of the larger CRT and shorter necks, could best be obtained by electromagnetic deflection of the beam rather than by the usual electrostatic deflection. As a result, the television industry developed the larger CRT with its associated pairs of vertical and horizontal deflection coils for electromagnetic deflection of the CRT beam; placed them on the neck of the CRT like a yoke on the neck of a cow, and, indeed, turned around and labeled the coils a *yoke!* The larger CRT's (face area), along with the shorter necks of today's compact TV sets, makes a return to electrostatic deflection highly improbable.

As previously mentioned, larger radar and TV sets must employ electromagnetic deflection for linear sweep across the face of the CRT. Since this study is devoted to the television field, we will confine this article to the picture tube normally used in the larger TV sets and/or the compact sets.

How is the trapezoidal waveform developed? First, let us consider the theoretical development of a trapezoidal waveform in a "reactive circuit." If we construct the circuit shown in Fig. 3 using an inductor (coil) and a resistor and inject a sawtooth current at points A-B, the resultant waveforms are shown at (b) through (d). Note that when nonsinusoidal current (sawtooth)

flows through an inductor having minimal resistance, the voltage waveform developed at (b) as a result of the reactance in the coil is a typical unsymmetrical square (rectangular) wave. On the other hand, the same sawtooth current through the resistor produces a voltage waveform at (c) similar to the applied current, since there is no reactance in the resistor. Further, if we add (algebraic or vectorial) voltage waveforms (b) and (c), then we have essentially the trapezoidal waveform (d). This is significant since the resistance in series with the inductor actually simulates the resistance of the inductor and the combination of R and L represents a typical deflection coil used in developing sweep voltages for electromagnetic deflection of the CRT beam.

With this in mind, consider the waveforms developed in Fig. 3. If you will note, the result of applying a sawtooth current to an R-L circuit would be to produce a trapezoidal voltage *or* (now watch this) a trapezoidal voltage must be applied to an R-L circuit in order to obtain a sawtooth (linear) current! This is most important, since the sawtooth (sweep) current through the deflection coils on the CRT produces the magnetic field that causes the beam to be deflected at a linear rate. The deflection coils, normally referred to as the yoke, are used to deflect the beam linearly for horizontal and vertical scanning. The latter action provides a raster for

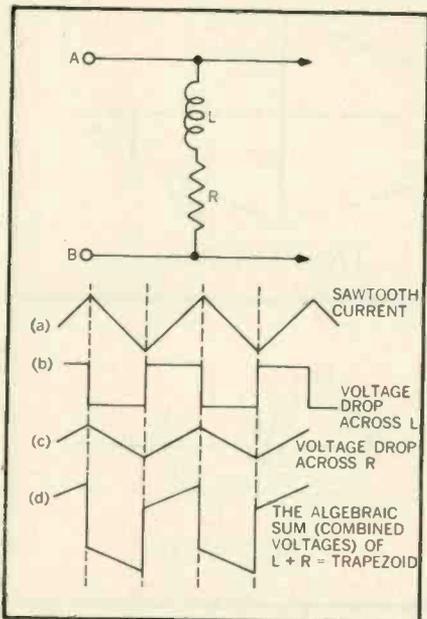


Fig. 3—The formation of a trapezoidal voltage waveform using a reactive circuit.

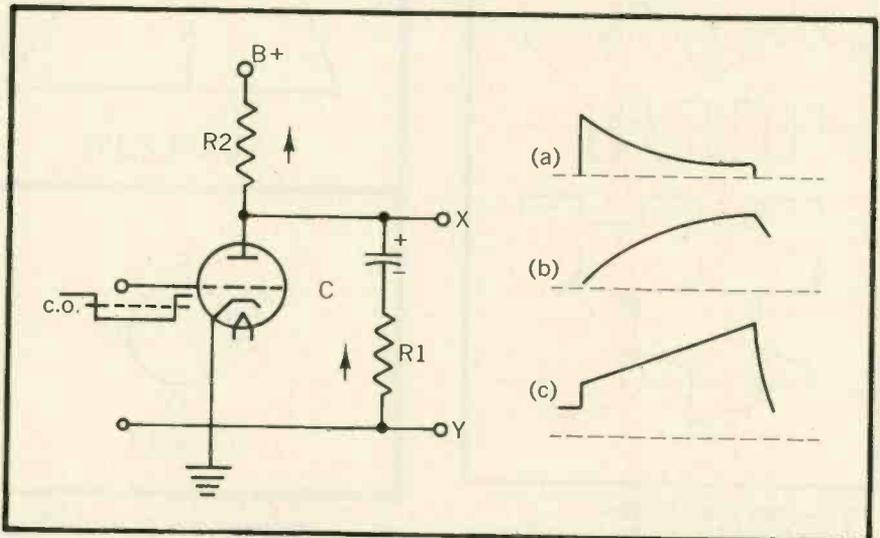


Fig. 4—The formation of a trapezoidal voltage waveform using an active circuit.

the picture tube and successfully "paints" the video.

Let us also consider the development of a trapezoidal waveform using an active circuit. Fig. 4 depicts a simple vacuum-tube circuit with associated components. A careful study of the circuit and associated waveforms will reveal some degree of similarity between the reactive and the active theory.

Theoretically, the incoming signal drives the tube OFF. The plate voltage of the tube then begins to increase to that of the B+ voltage. Note that the plate is also connected to ground through an R-C circuit which will govern the rate of voltage change at the plate. The capacitor will begin to charge toward B+ potential and since R1 is in the charge path, a typical voltage curve reflecting a decreasing rate of charge through resistor R1 is depicted at (a). The capacitor exhibits the typical exponential charge curve at (b). When the two voltages are added, the output across points X-Y will be trapezoidal. There are, of course, other more sophisticated active circuits for the development of the trapezoidal waveform.

So far, we have looked at ways to develop the trapezoid. Now let us take a long look at why we need the trapezoid.

In Fig. 5 we again have the typical R-L circuit (A) representing the deflection coil positioned on the neck of the CRT—the small series resistance actually being the resistance of the copper in the inductor.

Note that with the application of the applied voltage (B), the actual rate of current flow (C) through the coil is typical of an L-R circuit. The initial rate of current flow is high during the first portion of the input voltage and then increases exponentially thereafter. This is the direct result of the voltage drop across the resistance opposing the applied voltage and leaving less voltage applied to the coil to maintain a linear current rise through the coil. (This is an expression of the typical Universal Time Constant Chart for an L-R circuit where the exponential increase in current through the coil also is representative of the voltage drop across the resistor—refer to Fig. 6.)

Theoretically, if there was no resistance in the circuit (impractical since all coils at temperatures above those approaching absolute zero have some resistance), the current rise through the coil would continue at a linear or initial rate as shown in Fig. 5C. However, the rate of increase is exponential and roughly only the first 10 percent of the current curve could be considered as fairly linear. Obviously, if a linear current curve of proper duration is needed to develop a stronger magnetic field to scan a larger diameter picture tube, a voltage waveform must be used that will overcome the resistive element of the deflection coils. If the resistive element can be minimized—as is being done in some of the newer yokes that contain less wire—then the current through the coil (inductor) would continue at a near linear rate for a larger magnitude of current, thus providing the stronger magnetic field for scanning of the wide-angle CRT's. Remember, it is current through the coil that produces the magnetic field for deflection of the beam.

In previous descriptions relative to Fig. 3 we found that sawtooth (linear rise) current through a coil would actually generate a typical unsymmetrical square wave (rectangular) of voltage across the coil. (As a matter of review, this type voltage waveform across the coil was produced because of the reactive properties of the inductor to a nonsinusoidal current.) And further, we found that if the procedure was reversed, that is, apply an unsymmetrical voltage to a coil, the current increase through the coil would occur at a linear rate. We found the latter

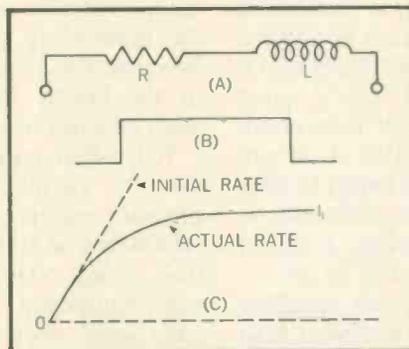


Fig. 5—The resulting current with the application of a trapezoidal voltage waveform to a CRT yoke.

to be impractical because of the presence of resistance in the coil. There, however, is a way to overcome or minimize the effect of the resistance in the coil and this leads directly to the—"Why Trapezoidal?"

If we rearrange this trapezoidal waveform as in Fig. 7, positioning the waveform with respect to a 0v or dc reference, an analysis of a typical trapezoidal and subsequent current flow in a coil (L-R) is easily understood.

Regardless of how the trapezoidal waveform is developed (reactive or active circuits), the straight lines are significant and are instrumental in overcoming the opposition (CEMF and resistance) of a coil in order to provide a linear sawtooth current through the coil.

Consider the straight line a', normally referred to as the "jump" voltage. As you can see, the vertical rise of a' is rapid, virtually within zero time. When this voltage is applied to the coil, it has the effect of initiating linear current flow through the coil by overcoming the counter-electromotive force (CEMF) which offers the immediate opposition. (Remember—inductance is that property in a circuit which opposes any change in current.) The straight line b', normally called the "ramp" or "slope," is a linearly increasing voltage being applied to the coil. As an increasing source voltage, b' has the effect of overcoming the voltage

continued on page 55

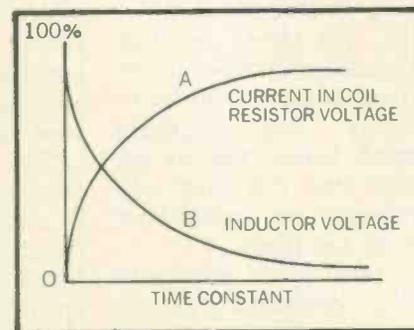


Fig. 6—Typical Universal Time Constant Chart.

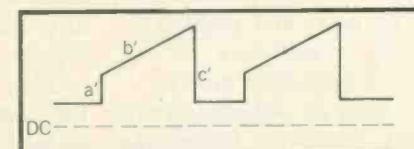


Fig. 7—Rearranging the trapezoidal waveform with respect to a dc reference.

Going to Remodel the Store? Here's a Good Check List

by Ernest W. Fair

Is it about time you did some remodeling work on your store/shop layout? Watch out for some of those pitfalls which can make the effort produce half results and call for doing it all over again all too soon.

■ The check list which follows should assure any shop or store owner that he is securing the most from every dollar he spends when remodeling.

Stay clear of remodeling plans developed entirely in your mind; put it all down on paper and go over it again and again until you are completely satisfied.

Even the first ideas should be sketched out on a piece of paper. All elements involved appear in much better perspective with respect to one another than could ever be achieved mentally alone.

Doing so also makes very obvious that many of the "big ideas" you had planned will have to be toned down or adjusted to reality. This is always much better done at the very start than half way through or even after work has begun.

Take every step with your customers first in mind. Forget your own personal tastes and preferences as the sole guide lines of what is to be done. The likes and dislikes of those customers is of first importance always.

Such an attitude should not, however, discourage originality on one's part in making it a better lay-

out. But even these remodeling changes should always be keyed to customer likes and dislikes if they are to be successful.

Look first for space saving possibilities that can be developed within the dimensions of the present layout. Using this step provides one of the foremost opportunities for saving many dollars with the overall design.

They invariably point out good guide lines toward greater efficiency in use of every square inch of the space that is available.

Ask employees how you can improve the areas where they work in particular. They will usually come up with things that you could very well overlook yourself.

The employee spends far more time on the floor in every place than does the shop owner ordinarily. Many, in fact, have developed some pretty good ideas of their own about what should be done and will be most happy to offer them as a contribution to any remodeling program if only asked to do so.

Plan beyond handling the present customer load to facilities for taking care of an even greater volume a year from now. Usually

one's reason for remodeling is primarily because of too crowded conditions in the layout today. Where more than enough accommodations to handle even bigger future volume is neglected in the planning, it is most likely that another remodeling cost will be required very soon.

Spend some time looking around in other shops/stores for ideas; particularly in nearby areas where you visit infrequently.

Some may be worth copying but generally this is frowned upon. Adaptation of the ideas one discovers to the specific conditions within one's own business is a much more advantageous step in remodeling.

Planning on purchasing some new fixtures and equipment also as part of the remodeling program? Schedule this carefully into the layout for maximum effective use thereof.

It is often good procedure to decide upon a general concept of what remodeling is to be done, then select the fixtures and equipment needed, and adapt these to the initial concept.

What is the biggest one thing that is wrong with

the present layout? This is almost a must question to ask. It can be the key to establishing the master plan for the change to most economical advantage.

Is cramped storage and supply space one of the big current problems with the layout's efficiency? Beware of going overboard in providing for new areas to handle these functions. Do, however, give such an area room in which to grow within the new plan as the business itself grows, or crowding therein which exists at present will be right back before only a few months time have passed.

Ask a few good customers every now and then if they have any ideas to contribute to the remodeling program. The best one you will add may very well come from one of these men or women.

The customer's viewpoint is always of utmost importance. He or she may see something of great value that would not be apparent to either oneself or employees.

Tell the supplier salesman that you are planning to remodel very soon. Ask them for suggestions. They also may come forth with some very worthwhile ideas.

These men will have seen a lot of good ideas elsewhere as they travel, calling on others. Some of the ideas they will tell you about can probably be adapted profitably to your own layout and remodeling is the time to do so.

Stay away from any ideas that you may have developed about out glamorizing others in the area. Work solely for a maximum use of space to fit the needs of your business

continued on page 47

Superior Baby Foods

A comprehensive, five-camera closed-circuit TV system is providing Baker/Beech-Nut Corp., one of America's leading producers of superior baby foods, with a fail-safe security system, slashing manpower needs in the process

■ The closed-circuit TV system by Motorola Communications and Electronics has vastly increased the security at the Canajoharie, N.Y. plant, according to Safety and Security Manager Paul R. Loadwick.

"We know, for instance, that the officer manning our communications console can view about 95 percent of our total plant perimeters through the use of the closed-circuit television," Mr. Loadwick explained. "And the capability of each of the five cameras to pan, tilt or zoom in for close-up usage is another advantage that places the monitoring officer virtually on top of any activity on our premises."

From a standing security force of 28 men only five years ago, Mr. Loadwick noted, the use of CCTV has allowed Baker/Beech-Nut to exactly halve its guard forces with 14 officers now employed at the food-processing company—a 50 percent saving in labor costs.

The camera responsible for this impressive gain in efficiency and equally impressive reduction in manpower need is Motorola's S-1140B CCTV camera. When Baker/Beech-Nut

made its initial purchase of three of the versatile cameras five years ago, it was earmarked for use largely in the truck yard area, monitoring the shipping and receiving operations. The addition of two more of the cameras enabled the company to expand its coverage to electronically-operated entry gates and also created a near total coverage of the Baker/Beech-Nut property by the cameras.

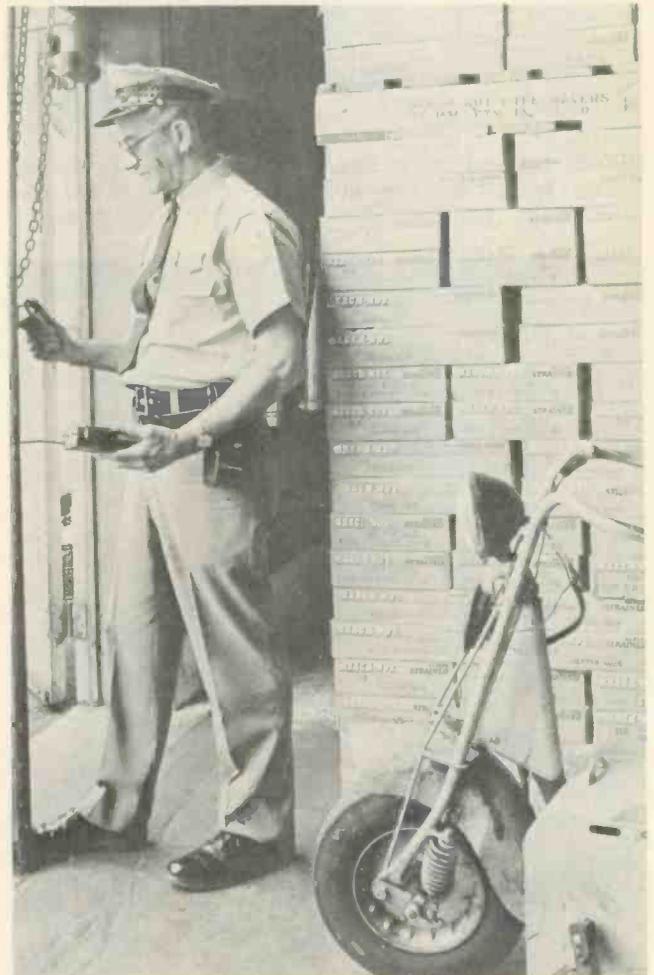
Loadwick explained that the manpower savings, which were accomplished through attrition, found two security officers performing the tasks which previously required the services of eight men for day shift coverage. Another three jobs were found to be superfluous on the night shift, Mr. Loadwick noted.

"The way we man it now," Mr. Loadwick explained, "is with one officer on the communications console reviewing the five monitors and maintaining our radio and paging communications."

"The officer at the console maintains constant contact with a single officer in the field, using a Motorola HT-220 Handie-Talkie two-way portable radio. The officer in the



Communications center at Baker/Beech-Nut Corp. plant in Canajoharie, N.Y. with security officer monitoring five Motorola CCTV cameras as they observe virtually all of plant area. Center also includes radio and paging dispatch facility.



Security guard at Baker/Beech-Nut plant makes his rounds on three-wheeled scooter, checking locks on warehouse doors. Guard carries Motorola HT-220 Handie-Talkie two-way portable radio, allowing him total contact with officer manning Motorola CCTV monitors. If emergency or alert arises, he is immediately available for response.

field uses a three-wheel motorbike to cover the ground and is able to respond quickly to any situation the console operator observes.”

The CCTV system fits nicely into the balance of the Baker/Beech-Nut communications network,

a system which also includes additional Motorola HT-220 Handie-Talkie two-way portable radios and Motorola Pageboy I tone and voice pagers. The radios and pagers are maintained on a frequency separate from that used by the CCTV system.

The radios and pagers are not only used by the security division at Baker/Beech-Nut but are also utilized by the company's maintenance division. Both devices—radios and pagers—are credited by Beech-Nut management with sharply reduc-

ing “down time” on the high-speed production lines. A single Mocom 70 radio is used in the Baker/Beech-Nut maintenance bus.

The overall radio and paging system operates from a 90w base station *continued on page 47*



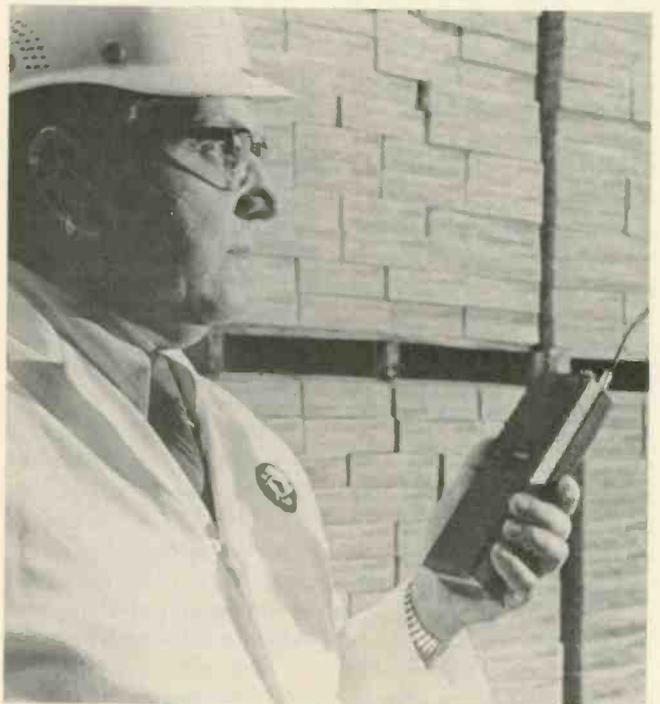
Electrical Supervisor Charles Conboy receives a call on his Motorola Pageboy I tone and voice pager as he observes activities of production facility at plant. Bottles are loaded at rate of 1100 jars per minute.



Motorola S-1140B CCTV camera mounted on roof of plant views activity on ground below. Four more cameras, mounted in strategic locations, give monitoring officer view of all that goes on over approximately 95 percent of company facility.



Area Supervisor Ron De Vost is shown in jar labeling area of plant. Jar Labeling Inspector Thelma Fredericks is shown checking labeling process. Motorola two-way radios and pagers enable maintenance personnel to arrive promptly in event of a malfunction on production line and have sharply reduced “down time” at plant.



Paul R. Loadwick, manager of safety and security at Baker/Beech-Nut plant, uses a Motorola HT-220 Handie-Talkie two-way portable radio to contact security officers from warehouse. Mr. Loadwick indicated that Motorola CCTV system has enabled company to increase security efficiency impressively and has also allowed a 50 percent reduction in size of firm's security force.

How to Tackle a Real Dog

by Jim Osborne

For those of us in the TV service industry, a "Real Dog" is the most gruesome animal alive

■ A "Real Dog" is time consuming, and since time means money and money means profit . . . you get the point! Not only does this animal cost us money, more often than not it also results in poor customer relations . . . the worst enemy of your business. Enough said.

It's late in the afternoon and you are ready for a good cold Coke when the boss walks in with a customer on his heels and says, "This is Mr. Egan. He left his set here three weeks ago. He is leaving for Europe tomorrow and I've promised him we would have his set ready by noon tomorrow. Would you see that it is ready?"

You know the set alright. It's stuck way back in the corner where your old buddy Harry hid it after you and he spent the better half of a day going over it with a "fine tooth comb" but no results. Harry's on vacation now and also happens to be the best bench technician you know. If he couldn't fix it after five hours of concentrated effort, what the @#*% are you going to do with it.

If this sounds familiar or you happen to have a "Real Dog" laying around, I suggest you try the following procedure. You may surprise yourself.

First, get rid of any negative attitudes and think positively. You are paid to fix TV sets and that is what you are going to do. Find a clear bench and go find that "Real Dog," wherever it is hiding. Get your scope and VTVM set up and turn them on. These two instruments are going to be your eyes. Pull out your "Sams" or whatever service literature you have and check to see that it is correct for the chassis you are going to repair . . . chassis you are going to repair . . . chassis you are going to repair.

Two very important points to

check before you proceed are good lighting and accessibility to the chassis. Too many easy problems are made into hard ones simply because some critical test points are inaccessible without proper orientation of the cabinet . . . like having the cabinet on its side with the bottom cover removed, or actually removing the chassis from the cabinet and using extension cables or a test jig. Get this animal where you can see it and work on its interior easily.

Now "old buddy," whether you know it or not, the job is more than half done. If you have the right frame of mind and have set up properly, it is only a short matter of time before this animal will be purring like a kitten, your bank account a few dollars richer, and most of all, you will have transcended that obscure "image" of some clown tube jockey and joined the ranks of the biggies . . . professional color-TV technicians.

Before we start, let's make a few assumptions. First, the chassis is economically repairable, meaning that it is not of World War II vintage. Second, it hasn't been butchered by some clown tube jockey. Third, a thorough visual inspection has been made. And fourth, if it is tube or hybrid, a complete tube inspection has been made. In other words, we are looking for a component failure, not an oversight by a rank amateur. This is not a TV maintenance course, rather it is a reminder to good TV technicians and good TV technicians soon to be, that proper procedure is the difference between professionalism and failure.

Now let's get rid of that dog so we can get that Coke and get home in time for "Monday Night Football." What section of the receiver are we looking at? If we don't know by now, we're hurting. We only

have a couple of thousand components to check. Let's isolate the stage. We have filaments and good B+. The scope showed the B+ ripple too as within tolerance. Always check B+ ripple on "Real Dogs," it will save you a lot of wasted time and money.

Now that "big green eye" that you just used to check B+ ripple can tell you a lot of other things too. With the animal's innards hanging out, it should take you less than five minutes to compare all waveforms on your schematic to those actually being produced in the chassis, and all this shouldn't really be necessary because, buddy, if you don't have some idea by now in which stage the probe problem originates in, forget that Coke and football game.

Let's go back before we troubleshoot a specific stage. If we had been loading that B+ in any way, we should have seen that on initial inspection of the power supply, either by a reduced voltage reading on your VTVM or increased ripple. At that time we would have checked the filters or disconnected each B+ branch to determine which branch was defective, or replaced a leaky diode. In other words, for all practical purposes, if we are looking at a vertical sync problem, we are no longer concentrating on the B+ supply as the source of the problem.

Another "for instance": If the problem was no video to begin with, we probably wouldn't have started in the B+ supply, but rather would have whipped that "big green eye" on the video detector and went from there. If there was no video but sound, you are down to a few components—that is unless some engineer has gone off the beaten track and pulled the sound off further up the line, then it is up to your experience to analyze the situation

continued on page 55

Servicing Two-Way Radio

by S. D. King

Let's begin at the beginning

■ First you must have a second class phone license. This is the minimum requirement for making any measurement that isn't meaningless, as far as remedial measures are concerned. And if you cannot adjust the unit, why make any investigative measurements? So, a second class phone license.

Next you need a frequency meter with the twice accuracy of the equipment that you intend to check or put on frequency. Some of these instruments will also act as a signal generator.

In addition to these instruments, you will require the following: A moderately good scope for modulation pattern examination (almost any type will do, when modified for this purpose); a good VOM, or a good VTVM with low DC reading full scale, is es-

sential; a simple dummy load, non-radiating type such as a Heath Antenna or its equivalent; a good audio generator with adjustable output, attenuation pads, or boxes—but be sure they are properly constructed; as accurate an RF output meter as you can afford (there are several on the market, but be sure you can measure low power with it, as most are for higher power); a power supply (a battery will do if kept charged); probes; patch cords; soldering equipment; etc. There are no type acceptance equipment, as listed by the FCC. All that is important is that it meet certain standards; and most important, that you understand its use fully.

Now as for the frequency meter, the requirements are simple. It must be guaranteed by the manufacturer to have an accuracy that is double

that of the equipment you intend to adjust. If the tolerance under consideration is .002, the meter's warranted accuracy must be .001—that is .001 percent or a maximum error that is .00001 times the measured frequency or one cycle per 100,000 cycles or 10 parts per million. Off frequency is measured in parts per million in most instances and in all instances where CB equipment would be concerned. Bandwidth measurements are made with your frequency meter in most cases and in all cases applying to CB. This is one reason you must fully understand your own test instruments and how to use them.

Now comes the technical requirements. As stated before, know your equipment and what you can do with it or cannot do with it. Never start making adjustments without the manufacturer's service material at hand. It will be complete, step by step and detailed with measuring points designated. In this manner you can, without too much trouble, make complete and accurate adjustments. To do otherwise, you are tinkering, asking for trouble, and are sure to get it!

Get manufacturer service manuals for all equipment that you intend to service—and keep it handy. Next obtain from the government printing office a copy of the rules and regulations pertaining to your requirements. If you have proceeded this far, you may well subscribe to Volume V, FCC Rules and Regulations, and study it. It is not hard to get used to the form used in setting out the rules and regulations. These items are a must.

Complying with the FCC rules and regulations, while sometimes complicated, is not too hard if you will go to the trouble of learning them. And the only way to know them is to study them. Notice that I said study, not just read them.

Test bench details are for you to work out, and there are many items not mentioned that will ease your work. You will recognize the need as you advance. Some you will build and some you will buy. There is no such thing as enough coax patch cords, connectors or combinations thereof.

Whenever you use signal-generator leads, remember to use 50Ω or 75Ω impedances, or whatever is called for. These leads must be terminated properly or your input or output is meaningless. For instance, applying a .5μv signal from your RF signal generator to the input of your receiver to check receiver sensitivity will tell you absolutely nothing—unless applied directly to the antenna terminals through 50Ω (usually) cable. A measurement of the transmitter output into a dummy load is also meaningless unless the 50Ω connections and leads are adhered to. SWR, voltage and current measurements, which are so very important for proper operation, must also be made with these considerations being given impedance.

When the lead from the RF signal generator to the antenna terminal of your receiver is made with 50Ω coax, the shield going to ground and the center lead to the terminal are not properly terminated unless the input to the receiver is internally de-

signed to have a 50Ω impedance, which is usually the case. However, many times you will wish to apply the signal to the base of the RF amplifier, bypassing the receiver input impedance. Now in this case you will need to terminate your lead with a shunted 50Ω resistor. So, to make sure your impedance is always correct, keep your terminals shunted at all times. These are just some of the things that you will have to remember. Input and output impedances are always important—throughout all checks.

You have probably been involved with the reception of signals of one type or another of various composition and bandwidth. Now you are involved with the proper generation of these signals and propagation thereof. It is different, and since it is the very origin of communications of some kind, it must be done correctly in such a manner that it will contain all the information required without undue harmonics, spurious radiations and with a proper bandwidth.

The FCC says that to be allowed to do these things you must show a level of knowledge concerning what you are doing. Enough knowledge to enable you to do them correctly. Therefore the Phone 1 and Phone 2 licenses. They are an absolute must, first, last and always. By the way, "under direct supervision" means just what it says. The supervision must be direct. In fact it must be done in the room where the work is being done.

If you are interested in becoming involved with servicing communications equipment, which is what

we are talking about, be it CB or other types of equipment (if you are qualified for one you are qualified for all), then here are some suggestions. Don't ask someone else to look up your requirements for service equipment, technical requirements or procedures, look them up for yourself! In this way you will have a better chance of knowing them and remembering them when needed.

Where do you find them? Well look for them just where you have been looking for information all your life—wherever you can find it. The thing is to know what to look for, like frequency meter advertisements, signal generator specs. They are advertised in current publications like the one you are now reading. Forget much of the test equipment you have been using in servicing TV sets, stereo systems, etc. They aren't applicable. All manufacturers will furnish specification sheets. Learn to comprehend them and what they mean.

Many times you have been able to put a TV set back to work with only a general knowledge, using a new tube or two and maybe a squirt of tuner dope. Not so now. Before you can adjust even one transmitter, you must measure up to certain standards, these standards being certified by your license. You must be able to determine the quality of your radiated signal, the center frequency of the signal, as well as the bandwidth of the signal. You must also know its percentage of modulation and quality, the input power to the final amplifier, and finally the RF output or radiated power

to the antenna—properly tuned and installed in the vehicle or base station. Does this sound complicated? Well it is! Do not be misled by someone's sketchy article describing how simple it is to service CB, or any two-way radio equipment for that matter. It just ain't so! Do not listen to anyone who implies that there are certain things that you do without being licensed. There is nothing that you can do, that an honest person can charge for, so why do it.

If you are still bound and determined to service two-way communications equipment, get with it. But get ready for lots of work and study. You will be in a different world. It is interesting, and in some cases you can make some money.

Some time ago this publication printed a letter from a man that stated that he was the holder of a second class phone license. He then went on to ask that an article be printed in this magazine telling him just what he would need, and the approximate cost of the equipment. How, I ask, did this person come about obtaining a license without knowing just exactly what he would need, or having a good idea of where to obtain such equipment. That particular license is in fact just a slip of paper as of yet. The need for some more studying and comprehending is surely indicated by this request. In fact, all the finest test equipment in the world would not enable this person to do a professional job on the simplest of communications equipment.

Then there was the letter from one who wanted to know how much there

was in it for him before he made a decision as to whether he wanted to go further and obtain his license and equipment. There isn't an answer for this one. Any article that will simplify the situation or lead this one to thinking all is rosy and easy will only lead to disappointment and possibly trouble.

Most of the questions asked in the letters that I have read sure do indicate an intense interest in the servicing of CB equipment. But they stop there. Let it be known that there is as much involvement in servicing CB as there is in the servicing of any other two-way communications equipment. The qualifications are identical. The servicing equipment are identical, and the professional approach should be identical.

The author has refused to service CB equipment for the following reasons: (1) Few CB'ers come to the service shop until they have thoroughly misadjusted their own unit and it will not function at all. (2) When they do come, they come scared, knowing of the mess the thing is in, but hopeful that the service man is knowledgeable and can change all that by a few moments work—his interest in the hobby type work resulting in but a very small charge, if any. (3) Most of these customers take up too much of your time just visiting, trying to come about some useful knowledge free of cost. (4) Then there is the guy who wants an illegal power amplifier tied onto his unit.

The next article in this series is concerned with some thoughts regarding the FCC License and how it may be obtained. ■

TEST INSTRUMENT REPORT

Hickok's Model 239 Color Bar Generator

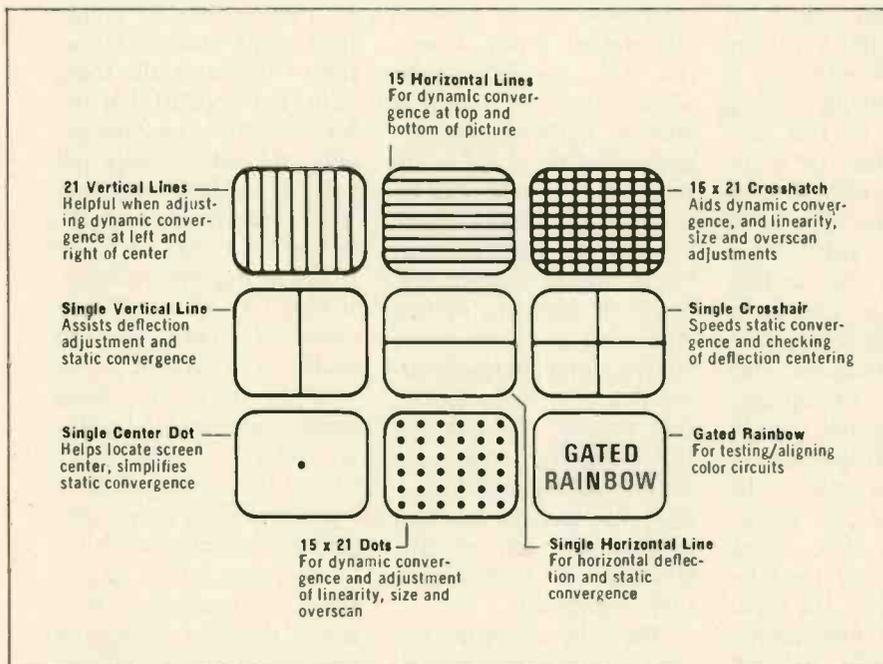
Uses custom MOS LSI IC for drastic reduction in both size and weight

■ The development of increasingly sophisticated integrated circuits has permitted the design of instruments that we could hardly dream of a few years ago. Hickok's pocket color bar generator is an excellent example.

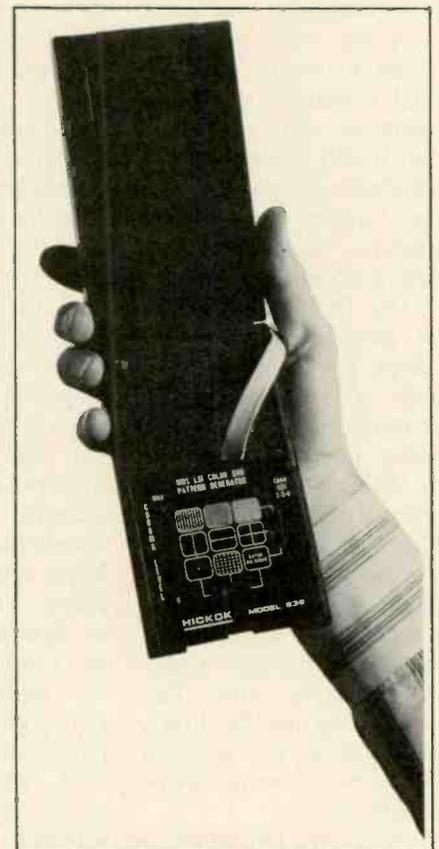
This instrument is designed around a custom MOS LSI IC that required nearly a year to develop, but which is said to permit inherently high reliability due to the resulting low component count. The manufacturer indicates that the instrument contains only 67 components including the switches, crystals and glass-epoxy printed-circuit board. Thus they are able to announce that the entire instrument weighs only 12 ounces, measures only 5¾ in. by

3¾ in. by 1⅞ in. and is rock stable over a temperature range from -50°F to +150°F (-46°C to +66°C)—all for a little over a hundred dollars.

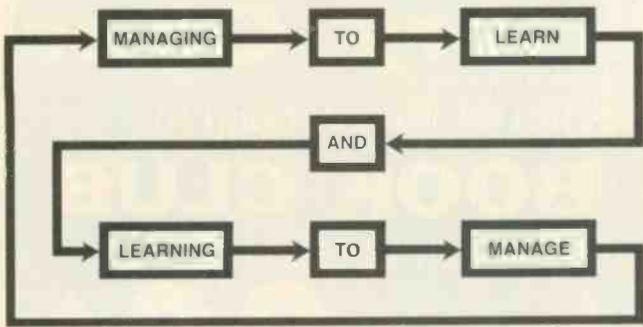
Additional manufacturer specifications indicate that the instrument contains two matrix slide switches for selecting any of the nine patterns shown below; adjustable chroma level from 0 to 150% for bright, sharp patterns; adjustable RF to cover channels 2 through 4; crystal controlled timing and chroma oscillators; and a rugged polypropylene case. It is reportedly powered by two standard 9v batteries with Ni-Cad batteries and recharger being optional. ■



The nine FCC-Specification patterns produced by this instrument.



Hickok's Model 239 Color Bar Generator. For more details circle 900 on the Reader Service card.



by Ray Sawyer

Managing to learn and learning to manage—a vicious circle? Not so vicious, but indeed a circle. The management process—as much as the technical process—is one that builds progressively upon capabilities and knowledge

■ Dick is a color-TV technician in a medium-sized service shop. The shop engages in both sales and service. The locale is a rural town of 7,000 with a trade area of about 18,000. The owner points out with pride his belief that the business has maintained close identification with the customers, even though the shop has grown quite rapidly in a period of five years from one man to seven.

Customers are in the habit of traipsing down to Dick's area and discussing their problems with him and watching him work on the set. He is a very congenial fellow and very easy to talk to. He enjoys talking and enjoys serving the customers.

Dick's output is low—in part because of his interaction with these customers. This has become a problem for the service manager. How would you solve it? ■



Mr. Ray Sawyer
 c/o Editorial Department
ELECTRONIC TECHNICIAN/DEALER
 1 East First Street
 Duluth, Minnesota 55802

The New Heathkit® Semiconductor Curve Tracer



\$89.95*

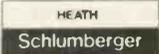
at this price no shop should be without one!

This easy-to-build kit is an invaluable servicing tool. Hook up the Heathkit IT-1121 to an oscilloscope and you observe the fundamental operating parameters of virtually all types of semiconductors — bipolar transistors, diodes, SCRs, triacs, FETs, etc. The IT-1121 can be used to select devices for specific applications or for sorting, inspecting and testing. Extra leads are included for testing large devices or for in-circuit testing. The kit includes a comprehensive, fully illustrated manual showing how to interpret each display.

Any scope with horizontal sensitivity of 0.5 V/div. and vertical sensitivity of 1 V/div. can be used with the IT-1121. Connecting to the scope is easy with the cables supplied, and an external switch permits fast and accurate scope calibration. All major controls are stepped in a 1, 2, 5 sequence for maximum parameter resolution.

The Heathkit IT-1121 lets you take a good look at your solid-state servicing problem. Cuts trouble-shooting time and helps eliminate returns. And that can mean money in your pocket. Order an IT-1121 for your shop today.

Kit IT-1121, 11 lbs. **89.95***



Heath Company
 Dept. 24-2
 Benton Harbor, Michigan 49022

Please send latest Heath catalog.

Enclosed is \$ _____, plus shipping.

Please send model(s) _____

Name _____

Title _____

Company/Institution _____

Address _____

City _____ State _____ Zip _____

*Mail order prices; F.O.B. factory. **TE-302R**

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

An Extraordinary Offer

to introduce you to the benefits of Membership in

ELECTRONICS BOOK CLUB

for a limited time only you can obtain

ANY **3** OF THESE UNIQUE BOOKS . . . yours for only **99¢** each . . . with Trial Club Membership (Combined List Price \$40.85)

May we send you your choice of any three books on the facing page 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.

These handsome, hardbound books are indicative of the many other fine offerings made to Members . . . important books to read and keep . . . volumes with your specialized interests in mind.

Whatever your interest in electronics—radio and TV servicing, audio and hi-fi, industrial electronics, communications, engineering—you will find Electronics Book Club will help you.

With the Club providing you with top quality books, you may broaden your knowledge and skills to build your income and increase your understanding of electronics, too.

How You Profit From Club Membership

This special offer is just a sample of the help and generous savings the Club offers you. For here is a Club devoted exclusively to seeking out only those titles of direct interest to you. Membership in the Club offers you several advantages.

1. Charter Bonus: Take any three of the books shown . . . plus the FREE Bonus book worth \$7.95 (combined values to \$40.85) for only 99¢ each with your Trial Membership.

2. Guaranteed Savings: The Club guarantees to save you 15% to 75% on all books offered.

3. 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 which you may choose from a special list provided members.

4. Wide Selection: Members are annually offered over 50 authoritative books on all phases of electronics.

5. Bonus Books: If you continue in the Club after fulfilling your Trial Membership, you will receive a Bonus Dividend Certificate with each addi-

SPECIAL FREE BONUS

. . . if you act now!

Yes, if you fill in and mail the Membership Application card today, you'll also get this Bonus Book, FREE!

TV TROUBLESHOOTER'S HANDBOOK

Revised Second Edition

A completely updated quick-reference source for solutions to hundreds of tough-dog troubles.

Regular List Price \$7.95

tional Club Selection you purchase. For the small charge of only \$1.99, plus three (3) Certificates, you may select a book of your choice from a special list of quality books periodically sent to Members.

6. Prevents You From Missing New Books: The Club's FREE monthly *News* gives you advance notice of important new books . . . books vital to your continued advancement.

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.

How the Club Works

Forthcoming selections are described in the FREE monthly *Club News*. Thus, you are among the first to know about, and to own if you desire, significant new books. You choose only the main or alternate selection you want (or advise if you wish no book at all) by means of a handy form and return envelope enclosed with the *News*. 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.

Limited Time Offer!

Here, then, is an interesting opportunity to enroll on a trial basis . . . to prove to yourself, in a short time, the advantages of belonging to Electronics Book Club. We urge you, if this unique offer is appealing, to act

promptly, for we've reserved only a limited number of books for new Members.

To start your Membership on these attractive terms, simply fill out and mail the postage-paid airmail card today. You will receive the three books of your choice for 10-day inspection. **SEND NO MONEY!** If you are not delighted, return them within 10 days and your Trial Membership will be cancelled without cost or obligation. Electronics Book Club, Blue Ridge Summit, Pa. 17214.

Typical Savings Offered Club Members on Recent Selections

Cassette Tape Recorders	List Price \$7.95; Club Price \$4.95
Introduction to Medical Electronics	List Price \$9.95; Club Price \$6.95
MATV Systems Handbook	List Price \$7.95; Club Price \$4.95
Pictorial Guide to Color TV Cir. Troubles	List Price \$7.95; Club Price \$4.95
10-Min. Test Tech. for PC Servicing	List Price \$7.95; Club Price \$4.95
Understanding & Using the Oscilloscope	List Price \$7.95; Club Price \$4.95
How to Repair Small Gasoline Engines	List Price \$8.95; Club Price \$4.95
Miniature Projects for Elect. Hobbyists	List Price \$6.95; Club Price \$3.95
Acoustic Techniques for Home & Studio	List Price \$7.95; Club Price \$4.95
Svcg. New Modular Color TV Recvrs. (2 Vols.)	List Price \$15.90; Club Price \$7.95
Everyman's Guide to Auto Maintenance	List Price \$7.95; Club Price \$4.95
Pictorial Guide to CB Radio Inst./Repair	List Price \$7.95; Club Price \$4.95
Zenith Color TV Service Manual—Vol. 3	List Price \$7.95; Club Price \$4.95
Mobile Radio Handbook	List Price \$7.95; Club Price \$4.95
Understanding & Using the VOM & EVM	List Price \$7.95; Club Price \$4.95
125 Typical Elect. Cir. Anal. & Repaired	List Price \$7.95; Club Price \$4.95
Jap. Radio/Rec./Tape Player Serv. Man.	List Price \$7.95; Club Price \$4.95
Marine Electronics Handbook	List Price \$7.95; Club Price \$4.95
Basic Electronic Test Procedures	List Price \$9.95; Club Price \$6.95
Troubleshooting Solid-State Amplifiers	List Price \$7.95; Club Price \$4.95
How to Repair Musical Inst. Amplifiers	List Price \$8.95; Club Price \$5.95
Kwik-Fix™ TV Service Manual	List Price \$8.95; Club Price \$5.95
How to Build Solid-State Audio Circuits	List Price \$8.95; Club Price \$5.95

SEND NO MONEY! Simply fill in and mail postage-paid Airmail card today!

How to Use Color TV Test Instruments



Here's an opportunity to close whatever gaps there are in your ability to use modern, up-to-date equipment designed specifically to save you time and money. You'll quickly grasp the author's common-sense approach to using the right instruments, thereby getting the most out of your investment in test gear. You'll improve your ability to use an oscilloscope, color bar generator, alignment generators, vectorscope, TV Analyst and sine square-wave generators. The author also has included a description of his "curve tracer." With this simple scope attachment, you can rapidly assess the condition of diodes, transistors—even ICs—in or out of the circuit. 256 pps., over 230 illus. Hardbound. List Price \$7.95 • Order No. 577

Installing Hi-Fi Systems



The world of high fidelity doesn't stop with the purchase of equipment. This book explores the many aspects of in-home music reproduction, from acoustical considerations to structural requirements. Now in its fourth printing, this timeless and ever-popular guidebook has helped thousands to achieve studio quality sound at home. Includes details on building your own hi-fi furniture, setting up a sound room, eliminating interference and hum, how best to route wires and interconnecting cables, speakers, and speaker enclosures (with information on how to build your own), and much more. Tells all you need to know. 224 pps., 153 illus. Hardbound. List Price \$8.95 • Order No. 86

Radio & Television: Principles & Applications



A complete electronics library in a single volume! From raw ac and dc fundamentals to advanced hi-fi, shortwave, and TV theory, the complete spectrum of electronics is covered in depth. Prepared in Great Britain, this book amounts to a full course in electricity written in extremely readable language. It starts with a description of the manner in which current flows, progresses to wave generation, electron activity in tubes and transistors, and then into the more advanced principles of electronics, its practical applications. Includes comparative descriptions of U.S. and British standards. 400 pps., 286 illus. Hardbound. List Price \$8.95 • Order No. 296

Fire & Theft Security Systems



A handy guidebook on the selection, installation, and general maintenance of home and business security devices and systems. Describes many newly introduced systems from simple door and window switches to ultra-sensitive microwave sensing systems. There's also a wealth of information for those who would like to get into sales, installation, and maintenance services—how to design the most effective and economical installation for any situation. And, you'll know where to find the components needed for fire and theft protection, because the equipment section includes data on a myriad of devices, with most of the principal suppliers represented. 176 pps., over 100 illus. Hardbound. List Price \$7.95 • Order No. 556

How to Solve Solid-State Circuit Troubles



A troubleshooter's "dreambook" complete with 161 circuit descriptions and step-by-step troubleshooting procedures—for anyone who occasionally or regularly repairs solid-state entertainment equipment of any kind—TV receivers, AM-FM radios (including auto radios), tape recorders, record players, etc. Very probably the most complete work of its kind ever published, it will serve as an excellent reference and study guide for those desiring to learn more about solid-state circuits and how they work. Hobbyists and experimenters alike can use it to design and build complete solid-state circuits. 304 pps., 5 1/2 x 8 1/2, 161 illus. Hardbound. List Price \$8.95 • Order No. 624

Small Appliance Repair Guide



Learn to repair dozens of small household appliances with the use of this authoritative, low-cost handbook. Profusely illustrated, the text tells how to find the cause of trouble in minutes, and how to go about making the required repairs. You'll also pick up helpful hints on disassembly, one of the real "tricky" aspects of many appliance repair jobs. General troubleshooting procedures are explained to familiarize you with the techniques of appliance repair. Succeeding chapters deal with thermostats, skillets, sauce pans, irons, toasters, coffee makers, blankets, mixers, knives, deep fryers, hair dryers, electric shavers, and small motors found in countless appliances. 111 chapters, 224 pps. Over 150 illus. Appendix and Index. List Price \$7.95 • Order No. 515

Electronic Circuit Design Handbook



New Fourth Edition—A brand-new, enlarged edition of the ever popular circuit designer's "cookbook," now containing over 600 proven circuits, for all types of functions, selected from thousands on the basis of originality and practical application. Now you can have, at your fingertips, this carefully planned reference source of tried and tested circuits. Selected on the basis of their usefulness, this detailed compilation of practical design data is the answer to the need for an organized gathering of proved circuits... both basic and advanced designs that can easily serve as stepping stones to almost any kind of circuit you might want to build. 416 pps., 19 big sections, over 600 illus. 8 1/2" x 11". List Price \$17.95 • Order No. T-101

Dictionary of Electronics



You'll find this huge volume extremely useful in whatever connection you have with electronics. This dictionary of electronics defines most all of the electronic terms you will run across in your everyday reading... from alpha particles through zoom lens terms you need and use most often, including those found in radio, TV, communications, radar, electronic instrumentation, broadcasting, industrial electronics, etc. It provides full, complete and easily-understandable explanations of thousands of specific electronics terms (such as transistors, acoustic feedback, cathode ray tube oscillator, final anode, electrostatic lens, nonlinear resistance, etc.). 420 pps., 487 illustrations. Hardbound. List Price \$8.95 • Order No. 300

The Fascinating World of Radio Communications



Covers the romance of short-wave listening, DXing, specialized bands such as the Coast Guard, radio amateurs, the broadcast band, foreign broadcasts, etc. It also delves into the fascinating developments of radio pioneers... Tesla, Loomis, Galvani... and shows how their discoveries worked to bring us radio as it is today. Also described are the interesting installations of the National Bureau of Standards, plus WWV services used by industries, citizens and even governments all over the world. Citizens Band? You bet... and how to get your license, what to look for in CB gear and how to pick a CB receiver. 176 pps., illus. List Price \$6.95 • Order No. 586

Sylvania Monochrome TV Service Manual



Complete service, alignment, parts and schematic data for all Sylvania black-and-white sets introduced during the last 5 years—from the A01 through B14, and 572 through 578 chassis. Contains everything you need including techniques for setup, preliminary adjustments, tuner alignment, and repair and system alignments. Also included are the latest factory-recommended modifications to help you eliminate "bugs." 19 complete schematic diagrams are printed on big double foldout sheets with waveform illustrations. 196 pages, 8 1/2 x 11", including 36-page schematic foldout section; and complete parts list for all chassis. Leatherette cover. List Price \$7.95 • Order No. 599

Practical Color TV Servicing Techniques



This brand-new updated and expanded second edition contains troubleshooting guidelines and case histories on the latest solid-state receivers, including a 4-color section with 32 trouble-symptom photos and a foldout section with 6 complete TV receiver service schematics. Now included are service tips and techniques on RCA, Motorola and Zenith solid-state chassis, plus a host of case histories and current data on G.E. chassis. In fact, each of the 12 chapters is filled with information applicable to virtually any brand of color TV receiver, enabling you to solve tough-dog troubles quickly. 404 pps., 250 illus. Hardbound. List Price \$8.95 • Order No. 436

Amateur Radio General-Class License Study Guide



A new and unique text—the only one entirely devoted to the subject—for anyone who wants to pass the FCC General-Class exam successfully. Each question is dealt with individually, and the answers are explained in depth at a level that can be easily understood by relatively inexperienced readers. Even if you have no interest in "ham" radio, you'll find the content of this well-written text is an excellent source of information of value to anyone in electronics. Pertinent facts are grouped into palatable, easy-to-assimilate doses. The conversational style keeps the material fresh and interesting from the first page to the last. 320 pps. Hardbound. List Price \$8.95 • Order No. 551

Reliable Electronic Assembly Production



Here is one of those rare books which successfully bridges the gap between design and production technologies, thereby providing guidelines for choosing the best design to achieve the least expensive and most reliable product. The content provides information on material and methods employed in mass production, giving the designer in-depth knowledge of the broad range of processes he should consider in evolving a final product concept. Not only does the content define the best materials for each given application, and detail the best choice for fabricating but it also points out incompatibilities which may evolve between design and production. 208 pages. Hardbound. List Price \$12.95 • Order No. 287

Practical Electronic Servicing Techniques



Here is a new and unique handbook that will sharpen your electronics troubleshooting ability. Yes, you can learn to whip those tough dogs and prepare yourself for any electronic gear that comes your way with the "inside" information presented in this handbook. You'll be surprised how simple and logical the professional techniques really are. Begins with an analysis of what troubleshooting really is; to condition your thinking (which is part of the secret), the author begins with the analysis of troubleshooting logic; then he tells you how to think like a tough-dog expert. Also logical service approaches to DC circuits, tube circuits, and transistor circuits. 256 pps., 138 illus. Hardbound. List Price \$7.95 • Order No. 547

Transistor Projects for Hobbyists & Students



If building useful electronic gadgets and projects turns you on, your imagination will be triggered into conduction the moment you pick up this book. Build all sorts of devices with SCR's, LASCR's, transistors, Triacs, Diacs, Triacs, and integrated circuits. The first section offers suggestions for building or breadboarding these circuits. Sections 2 through 4 describe a wide range of devices for your car, home, office, or wherever electronics can serve you. Section 5 describes Triacs and how to use them in a variety of circuits for switching and control functions. Section 6 is devoted to integrated-circuit projects. 192 pps. Over 100 illus. Hardbound. List Price \$7.95 • Order No. 542

Hi-Fi for the Enthusiast



Expert practical guidance for the audiophile who wants to achieve first-class reproduction from radio, tape or records. Content is truly unique—main emphasis is on the efficient selection, assembly and use of modern commercial hi-fi units, modules and construction kits; you will be able to build a system that both suits your individual needs, and gives a high standard of reproduction at an economical price. Room acoustics, amplifiers, pickups and loudspeakers, links with visual sources such as TV, film and slides, are dealt with in detail. Technicians, too, will find this book packed with invaluable advice. A practical book, written by a hi-fi professional. 176 pps., 42 illus. Hardbound. List Price \$6.95 • Order No. 596

AN EXTRAORDINARY OFFER...

... for more details circle 104 on Reader Service Card

continued from page 16

"How Do I Keep My Parts Expense from Getting Out of Hand?"

John Miller
Philco-Ford
1400 Union Meeting Rd.
Blue Bell, Pa.

(How expensive is it to carry inventory? Is there a formula for optimum inventory? How do I know which parts to cull? How do I get rid of overstock? Which parts go on the truck? How do I keep track of truck stock?)

"How Much Profit Should I Make?"

Miles Sterling
Electro-TV
12760 Nutwood St.
Garden Grove, Calif. 92640

(How much do other operators make? What kind of return on investment should I get? What kind of net profit does that require? Why do so many service departments fail to get the profit they need? How can I set a profit objective?)

12:30 p.m. Lunch

1:15 p.m. Graduation Address
James Renier
NARDA President

1:45 p.m. Field Trip
A-TV Service Co.
1229 N. Highland Ave.
Los Angeles, Calif. 90038

Registration for the school is \$100.00 for NARDA members and \$130.00 for non-members. Those interested may write NARDA, 318 W. Randolph St., Chicago, Ill. 60606.

Plans Go Smoothly to Unite Ohio Associations

Pursuant to an appeal by Morris L. Finneburgh, Sr., E.H.F., during his keynote address at the recent TSA of Ohio State Convention—hosted by ETA of Toledo—newly elected TSA of Ohio President Larry Porter aggressively followed through and called for an "Ohio Key Men" Conference, which was held Dec. 2, 1973, at the Hospitality Inn outside Columbus, Ohio. The prime objective of the meeting was to lay the groundwork for an acceptable common denominator designed to bring together in enthusiastic cooperation TSA of Ohio, ARTSD of Columbus, Electronic Technicians' Assn. of Toledo and other state locals such as Akron, Canton, Cincinnati, Cleveland, etc.

Possibly the most difficult problem was solved after several hours of intelligent discussion—"Changing of TSA of Ohio annual dues from \$36.00 to \$18.00"—thus, making it more feasible for the local chapters to belong to both the state association (TSA) and the national (NESDA). This change in dues was passed by a vote of 54 to 3, to be effective as of the new business year.

A surprise feature of the meeting was the appearance of Harold Seales, Executive Director, and Patrick Creagh of the Kentucky Electronic Technicians' Assn. (KETA). He stressed the vital importance of complete cooperation and membership at the local, state and national (NESDA) levels of Independent Service. His presentation was warmly received. Mr. Finneburgh, Chairman of the Board of the Fin-

continued on page 47

SYSTEMS have... SCOPE you need!

A wide range of quality 'Scopes at a price that satisfies



\$280.00
SYSTEMS 27 SOLID STATE DC-2.5 MHz SERVICE SCOPE
FEATURES: • 13 cm (5") CRT • Solid state circuitry • High sensitivity • TV line and field synchronization • Elegant finish • Easy-grip handle-cum-tilt stand • Compact size • Low cost.



\$165.00
SYSTEMS 37, 5 Hz-2.5 MHz MINI SCOPE
FEATURES: • 7 cm (3") CRT • High sensitivity • Elegant finish • Attractive metallic brush-finish anodized front panel • Truly portable • Low cost • Easy-grip handle-cum-tilt stand.



\$275.00
SYSTEMS 57 PORTABLE DC-3 MHz TRIGGERED SCOPE
FEATURES: • 7 cm (3") CRT • High sensitivity • Portability • Low cost • Elegant finish • Easy-grip handle-cum-tilt stand.

It's time a Lab or Service Tech owned one!



Systems Electronics Inc.
OF CALIFORNIA
makers of fine oscilloscopes

9727 Inglewood Avenue, Inglewood, California 90301

Tel: (213) 671-8231 • Telex: 67-7459

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

COLORFAX

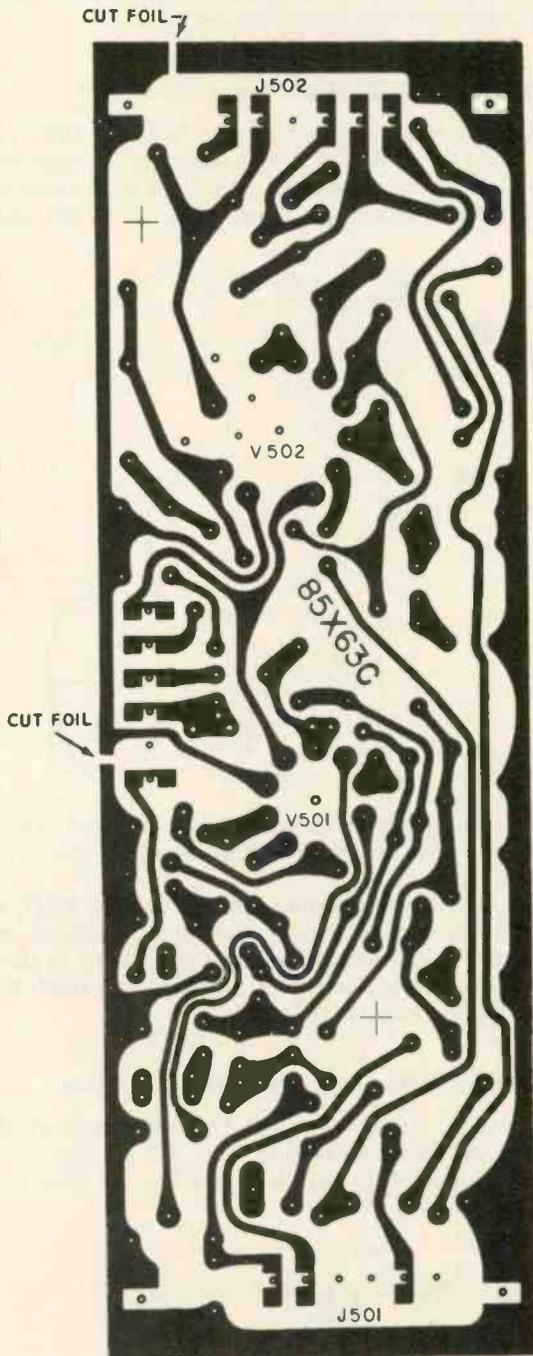
The material used in this section is selected from information supplied through the cooperation of the respective manufacturers or their agencies.

MGA

Color-TV Model T50 Chassis—Horizontal Weaving

Some reports have been received from field service personnel of this symptom. There can be several causes that result in the same general appearance of the picture and it is important to recognize the cause in order to take the proper corrective action.

If you are in a CATV area, some cable signals contain hum modulation and/or have a reduced sync percentage that result in this type of display. A determination can be made by observing the signal on a scope at the TP301 picture detector. If these conditions are present on a CATV



signal, then the enclosed modification will usually correct the condition if the signal degradation is not too severe.

There is a possibility of heater ground currents on the PW500 (P156) deflection board, having a common path to ground with the horizontal oscillator automatic phase control circuit returns. This condition can come and go depending upon the contact resistance of the four ground pins on the corners of the boards.

It is a good practice to eliminate this common path possibility by cutting the foil with a sharp instrument at the two locations shown on the illustration.

Under these (cut) conditions, the heater currents are isolated from the APC circuits and the contact resistance of the four ground pins will not be a contributing factor.

A factory modification has been included on all chassis with Serial No. 825200 and above and/or with a red paint mark to the right of the ac cord connection and a red paint mark on the serial number label on the outside of the carton.

There is a possibility in a very small percentage of the receivers that a poor common internal weld on the ground side of the four-section can electrolytic 45X0536-001 may exist. This can cause hum in the system resulting in horizontal displacement of the picture and on some occasions result also in hum in the sound.

The AGC control on the picture IF board must be properly adjusted. While the service manual describes both a visual and/or a scope adjustment, the visual adjustment by an inexperienced person will quite often result in the receiver being in a semi-overloaded condition. This results in crushed sync and causes video to be recovered on the separated sync, resulting in picture weaving.

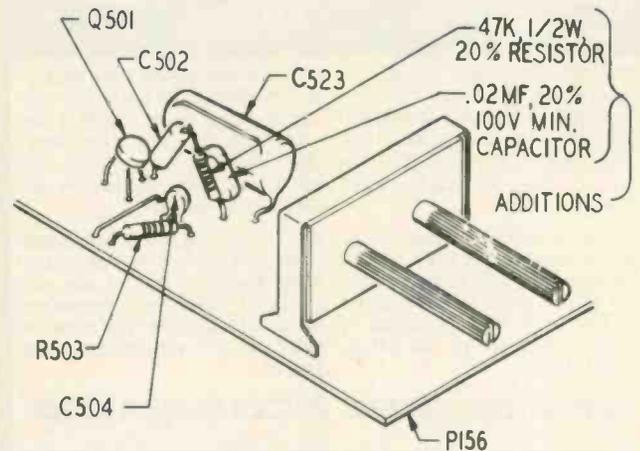
The adjustment must be made so that there is no sync crushing on the strongest signal in, the area ($20\mu\text{v}$ to $50\mu\text{v}$ preferred), and at the same time the detector level must be maintained so as not to suffer a loss in contrast. The best method for correct adjustment is to use a scope.

In some areas and during some transmissions, the non-synchronous hum can be actually transmitted by the stations. The best way to check this is to look at other channels making sure the receiver is not in a semi-overloaded condition. Refer back to AGC adjustment.

Modification for CATV Systems (T50 Series Chassis)

Modifications on P154 IF Board—Remove C321, $.22\mu\text{f}$ capacitor. In its place solder a $.01\mu\text{f}$, 20% capacitor.

Modifications on P156, Sweep Board—Unsolder and lift

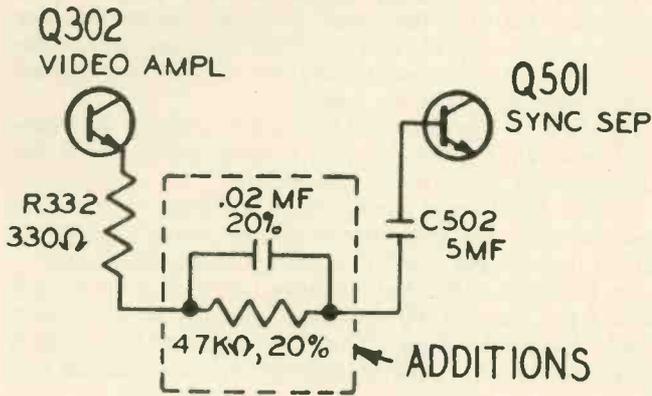


from the board the end of capacitor C502 which is close to the dual control. Insert between the end of capacitor C502 and the hole from which it was removed a 47K, $\frac{1}{2}\text{w}$ 20% resistor and a $.02\mu\text{f}$ 20% 100v minimum capacitor

continued on page 44

COLORFAX...

continued from page 43



tor in parallel. Change transistor Q501 to an 86X0048-001 transistor. Cut foil on the PW500 board as shown to eliminate a common-ground path between the heater returns and APC circuits.

MAGNAVOX

Color-TV Chassis T979/989—Board and Module Modifications

Engineering evaluation of certain audio and vertical problems occurring in these chassis have been traced to a resistive contact between the module and its socket or the panel and chassis connector. In the past removing and

cleaning the connector in some cases resulted in only a temporary cure for the problem. A recommendation made earlier to solder a jumper across the faulty connector solved the problem but defeated the plugability feature.

To solve both problems, alterations have been made to the modules and panels involved. A pigtail lead has been attached to the module or panel and a push-on connector fastened to the free end of the lead. This permits bridging the connector at fault while retaining its interchangeability feature.

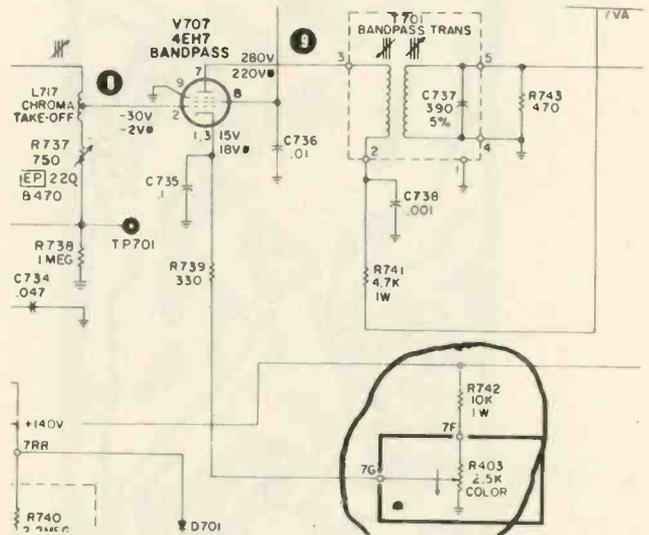
Descriptions of the changes and instructions on their adaptation to the chassis are detailed in the following modifications:

Color-TV Chassis T989—Excessive Contrast

Correction of an excessive contrast condition in the T989 chassis can be accomplished by increasing the resistance of resistor R128 from 150 to 390Ω. The range of the CONTRAST control is increased in the Videomatic Mode to allow the customer to achieve the contrast desired. This change was incorporated into production on 9/19/73.

Color-TV Chassis T924/939/950—Failure of Resistor R742

Two cases involving the failure of R742, a 10K, 1w resistor, have been noted. The symptom was no reduction in color saturation when the COLOR control was turned counterclockwise. Investigation showed that R742 was opened

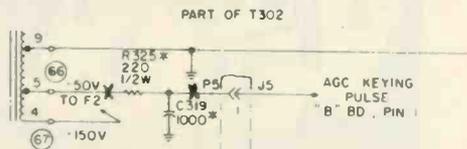


and in one case the COLOR control was damaged. The failure resulted from current flow in excess of the power rating of the resistor.

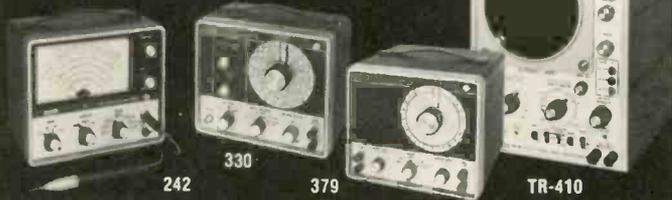
Should you have occasion to replace resistor R742, a 2w unit should be used. If the COLOR control is replaced, make certain that the chassis ground lead is soldered to the low side of the control. A no-color condition will result if this lead is left disconnected.

Color-TV Chassis T989—Ringing Bars on Left Side of Picture

A few early production T989 TV chassis may exhibit a condition of horizontal ringing. This will be evidenced by multiple vertical bars appearing on the left side of the



4 Money-saving reasons to buy EICO's Solid State Test Equipment.



EICO 242 FET-TVOM. Peak-to-peak measurements of AC volts and milliamps. 6½" meter. 7 non-skip ranges. High input impedance. Low 1 volt scale. DC/AC Multi-Probe. AC or battery operated. Kit \$79.95, Wired \$109.95.

EICO 330 RF Signal Generator. 5 bands cover a range from 100 kHz to 54 MHz. Calibrated modulation adjustment control. 400 Hz audio output. Provision for modulating RF with internal or external signal source. Kit \$64.95, Wired \$99.95.

EICO 379 Sine/Square Wave Generator. Simultaneous sine and square wave outputs. Covers 20 Hz to MHz in five ranges. Low distortion sultzer feedback circuit. Square wave rise time better than 0.1 microseconds. Kit \$74.95, Wired \$109.95.

EICO TR-410 Triggered Sweep Scope. 100% solid state. DC to 10MHz bandwidth. Sweep synchronized gate output. Z-Axis input. Use as vectorscope for color TV servicing. One probe for direct and 10:1 measurements. Wired \$429.95.

FREE 32 PAGE EICO CATALOG

For latest catalog on Eico Solid State Test Equipment, Automotive and Hobby Electronics, Burglar-Fire Alarm Systems, Stereo, and name of nearest EICO Distributor, check reader service card or send 25¢ for fast first class mail service.

EICO, 283 Malta Street, Brooklyn, N.Y. 11207



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

screen. The problem can be eliminated by connecting a 220Ω, ½w resistor in series with the AGC pulse line from Pin 5 of the horizontal-output transformer and connecting a .001μf, 500v capacitor from the wire side of the resistor to ground. This change was incorporated in production on June 15, 1973.

Vertical Oscillator/Drive Module 703616-1

Early production units exhibited a vertical jitter created by a resistive contact at pin 9 of this module. Future replacement modules will bridge pin 9 directly to pin 22 on the "D" panel using the pigtail, push-on connector arrangement.

ZENITH

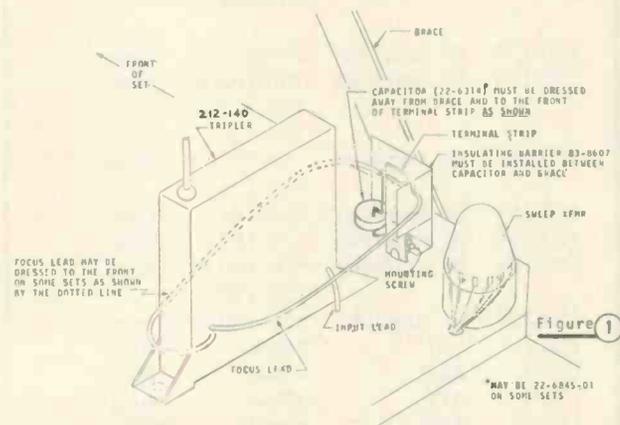
Color-TV Chassis 19DC12/22/28—Dressing of Focus Capacitor

On 19DC12, 19DC22 and 19DC28 chassis using a red high-voltage tripler (212-140), a separate focus capacitor (22-6314 or 22-6845-01) was used. In some instances this capacitor has been improperly dressed too close to a metal bracket or too close to the cabinet surface, adversely affecting capacitor reliability.

Whenever one of these chassis is serviced, it should be inspected to see whether it contains the red tripler (212-140) and associated separate focus capacitor (22-6314 or 22-6845-01). (The capacitor is used only with part number 212-140 tripler, not with other part number triplers.)

If the 212-140 tripler and separate capacitor are present, and if either one is defective, replace both with a 212-130X tripler, which does not require a separate capacitor.

If these parts are present, and neither is defective, the capacitor location or dressing should be checked and corrected if necessary in accordance with Fig. 1 of these in-



structions. Also, an insulating barrier (83-8607) should be installed in accordance with the instructions (Fig. 2) if one is not already present. A supply of 83-8607 is available from your Zenith distributor without charge.

This procedure will minimize the likelihood of a capacitor failure.

Instructions

The installation of insulating barrier 83-8607 is recommended to ensure the proper location of the capacitor and to prevent damage to the capacitor due to high voltage arcing, which may occur if the capacitor is not properly located.

Prepare the insulating barrier for installation by making two right-angle folds along the perforation as shown in Fig. 2.

Refer to Fig. 1. Dress the capacitor (22-6314) away from the brace and to the front of the vertically mounted

terminal strip as shown. Remove screw holding the terminal strip to the chassis. Place the insulating barrier under the terminal strip mounting tab, align holes and replace mounting screw.

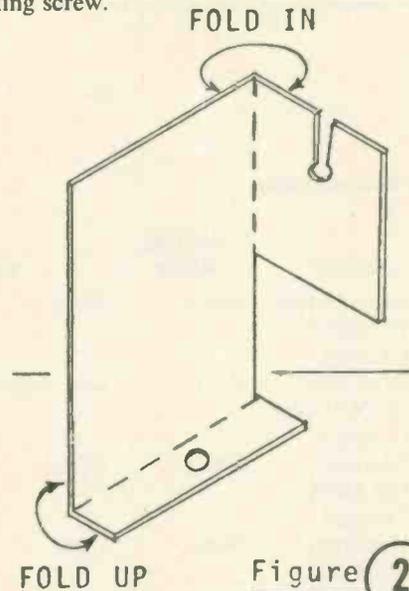


Figure 2

Providing the tripler white focus lead is routed toward the back of set, position the lead through the notch provided in the insulating barrier as shown. Should the focus lead be routed to the front of set, the lead is not positioned through the notch in insulating barrier.

continued on page 46

NOW A PROFESSIONAL BURGLAR-FIRE ALARM SYSTEM YOU CAN INSTALL YOURSELF.



Save hundreds of dollars in alarm installation and monthly service charges. The EICO SS-500 "install-it-yourself" burglar-fire alarm system offers you the kind of professional protection you have been looking for, at a price you can afford. The SS-500 has been designed on the EICO "Expandability Concept" that enables you to "add-on" protection to meet your own special needs. Before you purchase any security system, we suggest you read the EICO Security Handbook and see how easy EICO makes it to "Do-it-Yourself."

FREE EICO CATALOG/SPECIAL OFFER!

Security handbook (Reg. \$2.95) only \$1.50 with this ad. Includes a catalog on EICO Security Systems, Test Instruments, Stereo, Hobby Kits and name of nearest distributor. For catalog only, check reader service card or send 25¢ for first class mail service.



EICO, 283 Malta Street, Brooklyn, N.Y. 11207

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

ZENITH

Module Cross-Reference Guide

Original Module	Function	Substitute Module	Notes
9-22	Video Sound (22AB55 Chassis)	None	None
9-23	Sync AGC (B/W/Color Chassis)	9-76	One way only
9-24	Vertical (22AB55 Chassis)	None	None
9-25	Horizontal (22AB55 Chassis)	None	None
9-26	Second Color Amplifier & Demodulator	9-47	Inter-fit either way
9-27	Sub-Carrier Regenerator	9-27X or 9-69	Inter-fit either way. Shield must be used with 9-27X.
9-37	Chroma Amplifier	9-97	Resistor 8.2K (R919) must be clipped.
9-37	Chroma Amplifier	9-82	"D" line chassis or later
9-47	Second Color Amplifier	9-26	Either way
9-48	Video Processor	9-91	Resistor 2.2K (R419) must be clipped
9-49	Color Demodulator	None	None
9-50	Chroma Amplifier & Demodulator	9-50A	Must also change 9-77A to match
9-50A	Chroma Amplifier & Demodulator	9-50	Must also change 9-77A to match
9-57	Horizontal	9-70	Either way
9-58	Vertical Miller	None	None
9-59	Nerve Center	None	None
9-67	Horizontal	9-25	One way only
9-69	Sub-Carrier Regenerator	9-27X	Inter-fit either way. 9-27X requires shield.
9-70	Horizontal	9-57	Inter-fit either way
9-75	Vertical Oscillator	9-80	Either way
9-76	Sync AGC	None	None
9-77	Crystal Ringing	9-77A	Must change 9-50 to 9-50A
9-77A	Crystal Ringing	9-77	Must change 9-50A to 9-50
9-78	Vertical	None	None
9-79	Varactor Control	None	None
9-80	Vertical	9-75	Either way
9-82	Chroma Amplifier	9-97	Either way
9-83	Vertical Switch	None	None
9-91	Video Processor	None	None
9-97	Chroma Amplifier	9-82	Either way
9-103	Audio Detection + Output	None	None
150-12	IF Amplifier	None	None
150-14	IF Amplifier	None	None
150-18	IF Amplifier	None	None
150-20	IF Amplifier	None	None
150-104	IF Amplifier	150-112 or 150-106	None
150-106	IF Amplifier	150-112	None
150-108	IF Amplifier	150-162 or 150-160 or 150-182 or 150-186	None
150-110	IF Amplifier	150-162 or 150-182 or 150-186	None
150-112	IF Amplifier	None	None
150-114	IF Amplifier	150-164 or 150-184	None
150-152	IF Amplifier	None	None
150-160	IF Amplifier	150-162 or 150-182 or 150-186	None
150-162	IF Amplifier	150-182 or 150-186	None
150-164	IF Amplifier	150-184	None
150-166	IF Amplifier	150-180	None
150-176	IF Amplifier	150-190 or 150-190A	None
150-190	IF Amplifier	150-190A	None
150-1	AFC	None	None
150-3	AFC	150-9	None
150-4	AFC	150-6	None
150-7	AFC	None	None
150-9	AFC	150-9-01	None
150-10	AFC	None	None
150-201	Audio Detection	150-208	None
150-204	Audio Detection	None	None
150-206	Audio Detection	None	None
150-208	Audio Detection	15-208X	None
150-211	Audio Detection	None	None
150-214	Audio Detection Output	None	None

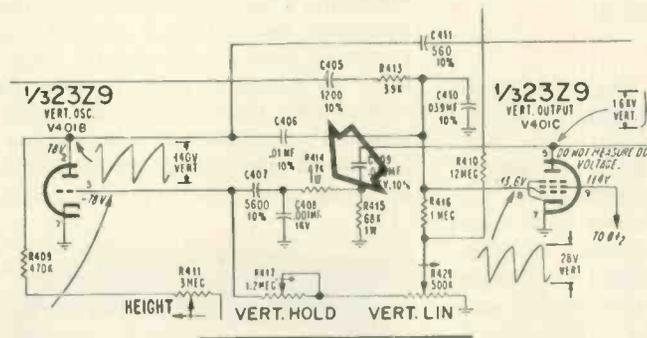
TECHNICAL DIGEST

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

ADMIRAL

TV Chassis TK-3—No Vertical Sweep

The probable cause of a no vertical sweep complaint is resistor R414, 47K, 1w being open. There have been several reports that this resistor has been found open, although it



may not show any external evidence of failure. Replace it with the same type and value, Admiral Part No. 60A14-473.

On some of the other monochrome chassis, the equivalent value of the resistor was 100K, 1w, Admiral Part No. 60A107-104.

Console Cabinets—Lid Supports

If you need a replacement lid support for a console TV or stereo cabinet, please specify not only the part number shown in the parts list, but also give the type of mechanism and the color of the spring.

There are two basic types of mechanisms: Tension (spring stretches when lid is lifted) and Compression (spring is compressed as lid is lifted). The paint color on the spring is a code for its strength.

Because both of the above factors can vary within a model run, both of the above factors are needed to provide a suitable replacement support.

ZENITH

TV Chassis 12CB12ZX and 16DB12X—Fuse and Resistor Modification

On any of the current 12v and 16v B/W receivers being serviced for any reason, an 11Ω 5w resistor (Zenith Part No. 63-10442-49) should be added in the heater string connected between the series diode and the 38HE7 tube. If the fuse is 1.25a, it should be replaced with a 1.8a slow blow fuse (Zenith Part No. 136-65).

If the service is as a result of either a fuse or series heater diode failure, the 38HE7 should be replaced.

MOVING?

Be sure to let us know your new address. Please enclose a complete address label from one of your recent issues.

NEWS...

continued from page 42

ney Co., indicated that there was the possibility of S.I.S. (Superior Independent Service) financial support for both Ohio and Kentucky projects.

As Moderator, Mr. Finneburgh emphasized the need for a strong, unified TSA of Ohio and expressed gratification at the fine spirit of cooperation throughout the meeting and especially the reducing of TSA of Ohio dues from \$36.00 to \$18.00 per year, which should excite Ohio Service Dealers into building TSA of Ohio into a "service unit" of stature similar in strength and leadership to California, Texas, Virginia, Wisconsin, etc.

SUPERIOR BABY FOODS...

continued from page 32

and possesses a 22 mile range throughout the ruggedly mountainous upstate area. Since the facility itself is spread over a three mile area, contact is virtually certain.

Mr. Loadwick said that one impressive facet of the CCTV, radio and paging programs embraced by the baby food company was the consistently high level of service—and the

speed with which it is delivered by Mid-state Electronics of Shirrell, N.Y.

"We haven't really given them too much cause to come out here," Mr. Loadwick said. "Our repair cases have been very minimal. That in itself is remarkable when you stop to realize that we've had three of the CCTV cameras in their outdoor environment five years." ■

REMODEL...

continued from page 30

and provide satisfaction for your good customers. Glamorize within those limits only.

Get some expert advice on new color schemes and decor for the building. It is a specialized area in itself and of enough importance to be certain that the right things are chosen. Definitely beware of the well meaning amateur or relative whose suggestions too often look great on paper but are ghastly when transferred to reality.

Study the remodeling plan from the angle of step saving by every person on the staff as well as yourself. This means cutting down overhead and making it easier to pay for the whole thing with more net profit from sales and/or servicing during the months after the remodeling has been completed.

Remodel with the idea that you may have to live with it for a long time. Plan to take care of all requirements that growth of the business will develop during that period of time.

Plan generous use of sound-proofing materials where it is advisable to cut down noise that not only comes from outside the building but originates within. It is much cheaper to do this during the overall remodeling than later on.

If one phase of the activity of the business must be restricted for space, choose that used most infrequently and easiest to alter later on.

Above all, talk with a contractor who specializes in remodeling of commercial buildings. This is no spot for the handyman, no matter how proficient he may be. ■

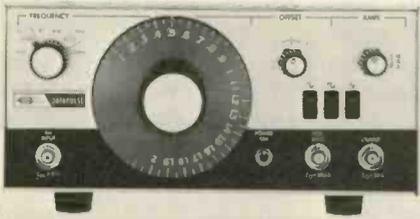
NEW PRODUCTS

For additional information on products described in this section, circle the numbers on Reader Service Card. Requests will be handled promptly.

FUNCTION GENERATOR 703

Range coverage
from 20Hz to 20kHz

A Function Generator, designated the Model 400, reportedly features 0.02 to 2MHz frequency performance; a dial accuracy of $\pm 2\%$ of full scale; 1000-to-1 frequency modulation; sine, square and triangle wave-

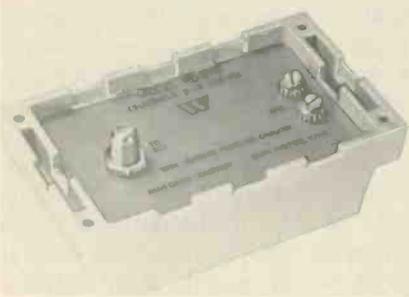


forms with sine distortion less than 1%; and dc offset variable from -10v to +10v open circuit. Amplitude is 20v p-p (open circuit) and 10v into 50 Ω or 600 Ω . The output impedance is internally selected for 50 or 600 Ω . Waveform selection is accomplished by pushbutton control. Datapulse.

VHF/FM ANTENNA PREAMPLIFIER 704

Designed for noisy
signal areas

A VHF-FM antenna preamplifier, Model RD-375, features a 75 Ω output for noisy signal areas or where use of 300 Ω twinlead is undesirable. The circuitry is said to incorporate



highest quality components and a new RF technique uses an A-210 overlay transistor for increased input, output and gain. High input capability (228,000 μ v) reportedly eliminates strong signal overload in tough, noisy, low-signal areas where reception from a distant station is desired. A high gain of +16dB cuts TV snow and in-

terference and helps pull in hard-to-get channels. The high output level (1,350,000 μ v) provides enough signal to operate several TV sets in most areas. The unit comes with a handy five-way mounting bracket and no-strip screw terminals. The system is ac powered with an isolation transformer to eliminate polarity problems and shock hazard. Winegard Co.

DESOLDERING TOOL 705

Exhaust control valving slows
vacuum stroke for delicate
desoldering



The improved Soldapull desoldering tool, No. DS017, reportedly incorporates a number of new features. A low-friction plunger with a floating seal ring, high-impact one piece main barrel, extra-strong low-friction return shaft and easy exhaust control valving, which slows the vacuum stroke for delicate desoldering and yet retains its former qualities. Edsyn Inc.

SCOPE 706

DC to 10MHz bandwidth
with recurrent sweep

Recurrent sweep with automatic synchronization and phasing control are included in the Model LBO-511, wideband solid-state, general-purpose oscilloscope/vectorscope. The sweep frequency of the unit is in four ranges from 10Hz to 100kHz, while the phasing control is continuous from 0 to 140° and includes a calibrated vertical input and with 20mv p-p/cm to 10v p-p/cm sensitivity. The FET input



stages plus dc coupling and push/pull amplifiers are said to account for un-

wavering stability and distortion-free displays of this unit. Special inputs are also included to allow its use as a vector scope. The instrument weighs 15 lb and measures 7 $\frac{3}{8}$ in. H by 9 $\frac{7}{8}$ in. W by 16 $\frac{1}{2}$ in. D. Leader Instruments Corp.

SPEECH RECOGNITION SYSTEM 707

Responds only to the
programmed information

An automatic recognition system represents a broad new concept in the automatic recognition of speech. The system is designed to actually recognize the discrete spoken word or words, and unlike a simple sound-actuated switch, the unit will reportedly respond only to that specific word, or group of words programmed into



it. The system consists of an analog-to-digital converter which converts the applied speech waveforms into a corresponding digital format. In turn, this information is applied to the memory/logic system for speech pattern identification and storage. Operation of the unit consists simply of speaking into the microphone. The speech sounds are analyzed and stored in the unit's memory. The unit may now be actuated at any time by depressing the "access" button and repeating the stored information. Shields Products, Inc.

ELECTRONIC WATCHMAN 708

Keeps an eye on property
while you are away

A sophisticated, integrated-circuit monitoring/dialing system called "The CareTaker" employs both built-in and external sensing devices. When the temperature falls too low or rises too high, smoke or gas leakage occurs, or water floods your basement floor, the unit is designed to automatically open a phone line and dial any preset number. When the phone dialed is answered, one of the two signals indicates the problem so that one can take appropriate action. The unit can reportedly be simply plugged into any phone jack or connected to a phone



line junction block with the supplied adapter. The unit continues to redial until the call is completed and listener uses the remote shut-off signal. It is powered by four standard "D" cells and measures 16 in. long by 7 in. wide by 3 in. deep. Dytron Inc.

ELECTRONIC CHEMICALS 709

Service chemicals to aid all types of repairs

Five new electronic chemicals have been added to a company's line of service products. Blast-Off dispenses dry air under pressure to remove dust and loose oxide deposits from delicate electronic and mechanical assemblies. Stik-E Spray Adhesive is used for permanent or temporary bond on almost any kind of material. Corona Dope is a high-voltage insulating spray that

helps to prevent arcing and corona. Slic-Spray is a silicone spray that helps stop squeaks, prevents rust and lubricates. A lubricant and moisture displacer, WE40, cleans, lubricates and



frees rust from tools and other metal products. It will also help prevent electrical shorts because of moisture. Workman.

DIGITAL CLOCK/CALCULATOR

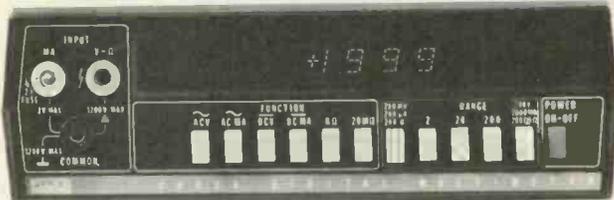
An eight-digit readout that can also tell the time 710

A Digital Clock/Calculator, Model 3C3030, represents one of the latest technological advancements. When mathematical problems are not being solved, it functions as a digital clock,

automatic calendar, electronic timer or as a date reminder unit. As an electronic calculator it remembers the decimal point to 16 places in large, eight-digit displays. As a calculator it adds, subtracts, multiplies and divides plus doing complicated chain or mixed calculations. There is a center key touch reminder that helps eliminate entering errors due to the wrong positioning of fingers or keyboard. The full floating decimal feature automati-



cally sets the decimal in the correct place in the answer. As an automatic calendar it stays up to date. Only once every four years, on Leap Year Day, does it need to be adjusted. The timer/ *continued on page 50*



Think of it as the best tester in your bag. Only \$299

Now you can get a high performance Model 8000A Digital V.O.M. from Fluke, America's foremost maker of quality digital multimeters, especially designed for TV, radio, stereo and audio service. No other digital V.O.M. gives you the resistance range to check breakers and switches, the high resolution voltage to look at emitter base and other transistor voltages, excellent ac accuracy and full accuracy with a 30 second warm-up.

Measures in 26 ranges 100 μ V to 1200 V, 0.1 μ A to 2A, and 100 milliohm to 20 megohm with a basic dc accuracy of 0.1%. Full year guarantee. Low cost options include rechargeable battery pack, printer output, deluxe test leads, HV, RF & 600-amp ac current probes, carrying case, and rack mount. Unique self zero eliminates offset uncertainty. Electronics securely mounted in high-impact case. Service centers throughout U.S., Canada, Europe and Far East for 48-hour turnaround repair.



P. O. Box 7428,
Seattle, Washington 98133.

Get all the details from your nearest Fluke sales office. Dial toll-free 800-426-0361 for address of office nearest you.

... for more details circle 110 on Reader Service Card

THERE IS A SHORTAGE OF TWO-WAY TECHNICIANS



In public safety services the life and safety of people depends upon the operation of the radio.

EMPLOYMENT OPPORTUNITIES NATIONWIDE

Here's the Answer!

A TWO-WAY RADIO HOME STUDY COURSE

COMPLETE 40 LESSON TWO-WAY RADIO COURSE FOR ONLY \$275.00



MOTOROLA TRAINING INSTITUTE

COLLEGE HILL ROAD, SUMMERDALE, PENNSYLVANIA 17093

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

NEW PRODUCTS...

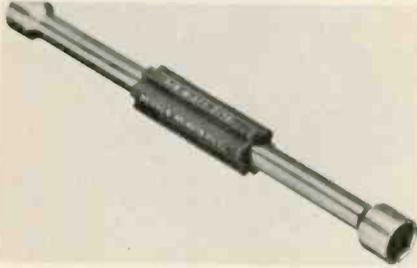
continued from page 49

stopwatch feature of the unit includes a quiet "beep-beep" alarm signal. It measures 10 in. by 5½ in. by 2¼ in. RCA Parts and Accessories.

SOCKET WRENCH 711

Permits reaching into small narrow openings

The Model N-311 wrench features ¾-in. and 7/16-in. hex sockets that reportedly meet Telco standards for hex nuts and bolt heads. The end



shafts are hollow so nuts and long screws can be reached without difficulty. The handle, having only 11/16 in. outside diameter, allows the user to reach into narrow openings. Being only 2-in. long encourages only fingertip pressure as opposed to unnecessary greater tightening force. P. K. Neuses, Inc.

DESOLDERING KIT 712

Designed to handle virtually all desoldering or resoldering jobs

A 12-piece desoldering kit reportedly includes everything needed to handle virtually any desoldering and resoldering job. Designated Model 500K, the kit includes the Model 500 desoldering/resoldering iron, eight different



sized tips, a stand for the iron and a cleaning tool. The inside diameter of the tips range from .025 to .090 in. The 12 pieces come in a sturdy lifetime metal storage box with hasp. Designed for heavy-duty professional use, the iron is said to feature a safety indicating light in the handle, flexible burn-resistant neoprene two-wire cord set, cool unbreakable polycarbonate

handle and stainless steel construction. Enterprise Development Corp.

FREQUENCY COUNTER 713

Designed for use in the mobile communications band

A 512MHz Frequency Counter, Model 6252, is designed for monitoring and measuring frequency carriers in the mobile communications bands. This unit is designed to FCC requirements and offers the following features: a level meter coupled to the input for indication of signal level, an overload relay circuit to prevent damage to the input when overloads occur, plus a frequency multiplier with a phase-locked local oscillator for making highly accurate direct reading measurements of tone and LF inputs. The input sensitivity of the unit is reportedly 25mv rms to 50MHz and 50mv rms for inputs above 50MHz.



The measurement is displayed by a solid-state eight digit readout which includes leading-zero suppression for error-free readings. This new counter can be powered by ac as well as by two optional dc sources—such as an external dc power supply or a built-in rechargeable battery. Systron-Donner Corp.

DIGITAL MULTIMETER 714

Available in kit form or factory assembled

The DVM 1600 digital multimeter is designed to measure alternating and



direct current in five ranges from .1ma to 1a; ac and dc voltage in four ranges from 1v to 1000v and resistance in

six ranges from 100Ω to 10M. Specifications indicate that low-end resolution is 10mv, 10ma or 1Ω. The instrument has a rated accuracy of ±.5% for dc voltages and ±1% for all other measurements. It is said to have an input impedance of 10M for dc voltages and 1M for ac voltages. Other features reportedly include automatic polarity and 100% overrange capability on all ranges. MITS, Inc.

VOM 715

Does the job of three testers

A versatile multiple-range VOM, Model 615, is designed for varied requirements, providing functions usually requiring three different test units. The instrument is said to measure ac or dc voltage, resistance, ac current leakage, plus temperature. Specifications indicate that it handles the following ranges: DC volts—0 to 300v; ac volts—0 to 600v; resistance—0 to 1M; temperature—-50°F to +150°F and -50°F to +1500°F; ac current leakage—0 to 6ma. The meter reportedly features a 50μa suspension move-



ment with a 4½-in. scale length. It is said to come complete with 48-in. leads, 6-ft. thermocouple probe, alligator clips, batteries and instruction manual. Triplet Corp.

DISTRIBUTION AMPLIFIER 716

Features individual outputs for maximum isolation

A new distribution amplifier, Model DA-6BR, features six balanced 600Ω outputs with six individual front panel LEVEL controls. The low cost unit reportedly employs individual output amplifiers for maximum isolation. Fusing and audio input/output barrier strips are provided on the rear of the unit. The manufacturers' performance characteristics include ±0.5dB response over 10Hz to 20kHz; 26dB gain; balanced bridging or matching input; ±20dBm output maximum;



0.1% or less distortion; 80dB channel separation; plus an internal power supply. Ramko Research.

HIGH-VOLTAGE REPAIR KIT 717

Contains the most popular high-voltage repair parts

Introduced is a repair kit, Model HVK630, which is said to contain the



most popular high-voltage repair parts. The kit contains an assortment of anode wire, filament wire, high-voltage spaghetti and the new popular styrene anode caps—all original equipment rated at 40kv. TeleMatic.

PICTURE TUBE TESTER 718

Tests single- and tri-gun picture tubes with a simple push of a button

A new picture tube tester called "Big Mack" is designed with many unique features. Its most outstanding



feature is the automatic color tracking test, which enables the user to test single- and tri-gun picture tubes with the same simple push of a button test through a computer type memory bank. All tests are made alike, whether checking B/W tubes or any type of color picture tube. Shorts test have also been moved to the meter, rather than using neon lights. Sencore Inc.

INVEST 5 MINUTES READING. (ADD \$150 OR MORE TO YOUR EARNINGS PER WEEK.)

Chemtronics chemicals can do that for you.

Starting with Tun-O-Wash. Our exclusive premium degreaser can help make a lot of jobs faster, better and less expensive.

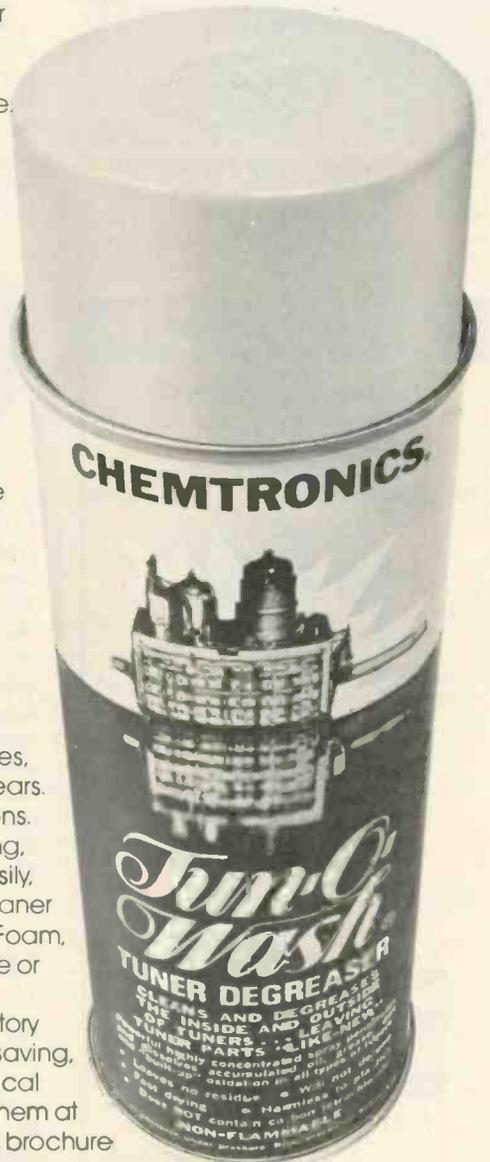
Got a really dirty tuner? Tun-O-Wash degunks it like an ultrasonic bath—removing dirt, oxide and caked-on lubricant. Without drift. Without harming plastics. Without causing intermittents. And no need to pay another guy to do the job.

But Tun-O-Wash's powerful spray is good for lots of other things. Like cleaning tube pins and sockets, to restore proper operation. Degreasing of those encrusted switches you find on hi-fi components and appliances. For removing grease from practically anything, the premium electronic solvent in Tun-O-Wash just can't be beat.

Cleans tape heads, motor drives, brushes, linkages, cams and gears. Has dozens of other applications.

When you're finished cleaning, you can re-lubricate just as easily, with Chemtronics premium cleaner lubricants. Like Tun-O-Foam, Tun-O-Brite, Tun-O-Lube or Color Lube.

Why not get the full story on Chemtronics time-saving, money-making chemical problem-solvers. See them at your distributor's, or write for our brochure



CHEMTRONICS
INCORPORATED

1260 RALPH AVE., BROOKLYN, N.Y. 11236
Our business is improving yours.

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

FEBRUARY 1974, ELECTRONIC TECHNICIAN/DEALER | 51

DEALER SHOWCASE

For additional information on products described in this section, circle the numbers on Reader Service Card. Requests will be handled promptly.

STEREO SYSTEM 719

Includes AM/FM receiver, phonograph and tape player

A six-piece stereo system, Model E1018, features a stereo FM/AM radio, eight-track tape player, record



changer and stereo headphones, plus a mobile cart made of vinyl-clad hardboard and metal for easy moving. Other features reportedly include a

solid-state tuner/amplifier with no-drift FM automatic frequency control (AFC), continuous variable BASS and TREBLE controls, VOLUME controls for both channels and an FM stereocast indicator. The eight-track stereo cartridge player is said to have an illuminated program indicator, program selector, automatic program change and continuous play, while the record player is said to have three speeds, automatic size select, 10½-in. diameter turntable, diamond stylus, ceramic pickup, slide-latch mounting, four-pole motor and automatic shutoff. A protective dust cover is included. Magnavox Co.

TAPE PLAYER/RECORDER 720

*Fast-forward mode
3½ times regular speed*

Performance comparable to that of top-quality cassette recorders is reportedly produced by the Model 8075 Two-channel Recorder/Playback Deck. The unit incorporates Dolby noise suppression circuits that have been designed to use a new proprietary ferric-oxide tape, which will reported-



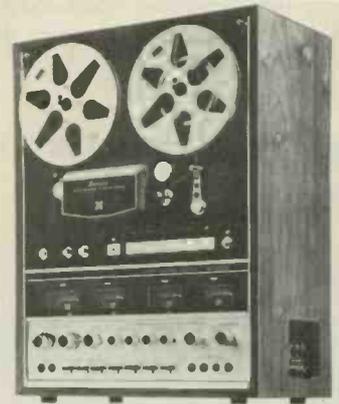
ly boost the frequency response to the 15kHz range. A tape selector switch enables it to record and play either standard or special cartridge tapes. The Dolby circuits function in both the recording and playback modes and in conjunction with Dolbyized FM broadcasts. The circuits reportedly reduce background noise, improving the signal-to-noise ratio by 10dB at 4kHz and above. The unit is said to have an exceptionally accurate minutes and seconds timer to insure precise timing of recordings and a fast-forward mode 3½ times regular speed. 3M Co.

TAPE DECK 721

Hard permalloy heads offer improved tone and longer life

The Model QD-5500 Tape Deck is said to have record/playback capability in both four- and two-channel modes with auto reverse operating for two-channel record/playback. The unit reportedly employs a wide core four-/two-channel playback head yielding a frequency response of 20Hz to 20kHz ± 3dB at 7½ ips. The signal-

to-noise ratio is said to be 60dB with 3% THD level to weighted signal. The three-motor is designed to assure precise tape speed, core and convenience.



The capstan motor is a four-/eight-pole hysteresis type, while the reel motors are six-pole induction types. The transport mechanism operates by push-buttons and electro-magnetic relays are provided with a built-in delay circuit to prevent undue pressure on the tape. Other manufacturer's specifications include: frequency response at 3¾ ips of 30Hz to 12kHz ± 3dB; wow and flutter less than 0.12% wrms at 3¾ ips; cross talk between adjacent tracks at 1,000Hz better than 60dB; and channel separation of better than 50dB at 1,000Hz. Sansui Electronics Corp.

STEREO CASSETTE DECK 722

With noise reduction system and high-energy tape switches

The Model 160 Stereo Cassette Deck is designed with a noise reduction system which de-processes Dolby-encoded cassettes, or records them. Separate bias and equalization switch-



es are included for use with new chromium-dioxide high-energy or standard tapes with optimum results. Other features include all straight-line LEVEL controls—two for record and two for output—on one console for "see-at-a-glance" operation. The two-head, one-motor cassette deck comes complete with automatic shut-off at the end of the tape. It reportedly also features

FINCO

Handy-Helper DOLLY

For MOVING and LIFTING

• TV • APPLIANCES • FURNITURE • LARGE CARTONS

Model TC-1 DEALER NET **\$9700**

WRITE FOR CATALOG 20-621, Dept. ET/D 2/74

The FINNEY Co.

34 West Interstate Street
Bedford, Ohio 44146

... for more details circle 108 on Reader Service Card

wow and flutter of 0.15 percent and a frequency response from 30Hz to 13kHz with standard tape; 30Hz to 14kHz with chromium dioxide tape. Its signal-to-noise ratio is rated at 58dB with the Dolby process. Input sensitivity is 0.1v and output level is 0.30v. Dimensions of the unit are: 16½-in. by 4¾-in. by 10¼-in. TEAC Corp. of America.

ANTENNA 723

Designed for travel trailers, mobile homes, campers and boats

Two new TV antenna kits are designed specifically for travel trailers, mobile homes, campers and boats. Called Travelon, the antenna kit can reportedly be installed in a few minutes. When not in use it can be folded down and strapped securely to the mast for minimum wind resistance. The antenna is designed for channels 2 through 83, plus FM; and the periodic design provides the high gain and



flat response needed for color reception. All elements are made of heavy gauge aluminum with weather resistant finish, reportedly permitting them to hold up well in salt air and other corrosive atmospheres. The Model TOTE-5K Travelon kit is said to include the antenna and a 5-ft gold alodined mast, 15 ft of coaxial cable with factory assembled connectors, an antenna matching transformer, a TV-set matching transformer U/V splitter, a neoprene grommet to take the lead-in through the skin of the vehicle, and all necessary mounting hardware. Jerrold Electronics Corp.

For more information concerning DEALER SHOWCASE Use pages 59 & 60 for READERS SERVICE

These new IR devices make replacing Zenith Semiconductors a local buy... everywhere!



Now you can buy International Rectifier's "Guaranteed" replacements for the most popular Zenith semiconductors right at your local IR distributor. Besides cutting days from the usual ordering-shipping cycle, they're priced locally too — more than competitive with the Zenith pricing structure.

Like everyone, we recognize Zenith's equipment is top quality, and we're not about to compromise their name, or ours. We analyzed circuits and devices for five months before we guaranteed that IR's devices will match, and meet or exceed Zenith's electrical and physical parameters in all applications.

Right now you can pick up a kit* of 23 IR semiconductors, and save an additional 10%.

Add it all up: Local availability. Local price: Guaranteed IR replacements for Zenith semiconductors. You can't lose.

* 13-Transistors; 5-ICs; 3-Rectifiers; 1-Diode; 1-Crystal.

INTERNATIONAL RECTIFIER



Semiconductor Division

233 Kansas Street, El Segundo, California 90245, Phone (213) 678-6281

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

TECHNICAL LITERATURE

Broadcast and CCTV Equipment

A second-edition, 256-page catalog features new and used broadcast and closed circuit television equipment together with many pages of technical information. Denson Electronic Corp., Longview St., Rockville, Conn. 06066.

Recorder Test Tape

A new two-color brochure, designated Form No. 7334, details the company's comprehensive line of test and alignment tapes for cassette, eight-track cartridge, reel-to-reel and broadcast spot announcer recorders. There is also a brief section describing other QM-Series recorder care products. Nortronics Co., Inc., Recorder Care Div., 8101 10th Ave., N., Minneapolis, Minn. 55427.

Electronic Kits

A large selection of electronic kits can be found in this 1974 catalog. More than a dozen pages are devoted to test and service instruments, plus educational kits for students of all ages. Heath Co., Benton Harbor, Mich. 49022.

Rectifiers

A catalog describes Solid-Tube, silicon, plug-in, replacement rectifiers, technical hints and kinks, plus including a substitution chart. Solid-Tubes are excellent replacements in sets where X-radiation is high, since unlike vacuum type tubes they do not emit such radiation. No-filament construction, surge resistance and extremely

long life of the tubes makes them excellent replacements in sets that experience frequent rectifier burn-outs because of surge currents or voltage fluctuations. Sales Manager, Electronic Devices, Inc., 21 Gray Oaks Ave., Yonkers, N.Y.

CCTV Accessories

A new 12-page full-line closed-circuit TV and CCTV accessory brochure is now available. The brochure entitled "Visual Communications" describes the many state-of-art features that make CCTV equipment ideal for a variety of important applications. The color brochure covers all the equipment needed for an effective CCTV installation from low-light-level and high-resolution cameras, to video monitors, camera control consoles and other video accessories. Motorola Communications and Electronics, Inc., 1301 E. Algonquin Rd., Schaumburg, Ill. 60172.

Dealer Aids

A 28-page dealer aids catalog of service, advertising and sales promotion materials for use by independent electronic service dealers is now available. General Electric Co., 3800 N. Milwaukee Ave., Chicago, Ill. 60641.

Stock Business and Tax Forms

A completely revised 1973 edition of the Watts Stock Business and Tax Forms catalog is now available. Featured are: Newly designed forms with three-color custom look printing, custom design letterheads, and business cards. Other forms for industry include: Voucher and payroll checks, purchase orders, envelopes, etc. Watts Business Forms, Inc., Gettysburg St., Dillsburg, Pa. 17019.

Consumer Electronics

A 52-page booklet describes a complete line of consumer electronics. The 1974 product line is shown in full color photos, while important features and descriptions are described. The brochure includes TV sets, radios, tape recorders, stereo music systems, automotive sound products and audio components. Sanyo Electric Inc., 1200 W. Artesia Blvd., Compton, Calif. 90220.

Master Catalog

A 108-page Master Catalog is available containing comprehensive technical information on panel meters, meter relays, controllers, recorders, digital instruments and test equipment. In loose-leaf form, this catalog is bound in a durable hard cover, three-ring binder for long lasting service and easy data change. Simpson Electric Co., 853 Dundee Ave., Elgin, Ill. 60120.

Security Systems

A handy 176-page guidebook completely covers the selection, installation and maintenance of home and business security systems. Entitled "Fire and Theft Security Systems," it tells how an individual can protect his family and property, what equipment is needed, what type systems are available, how alarms work and how to maintain such a system. Mountain West Alarm, 4215 N. 16th St., Phoenix, Ariz. 85016.

Two-Way TV Systems

A 12-page brochure explains a patented J-Jacks system which reportedly provides unusual flexibility and ruggedness to educational and medical TV systems. The system permits distribution of UHF, VHF, FM, closed circuit video and audio signals simultaneously throughout the school or hospital with two-way signal carrying capability. The system puts the circuitry into convenient, modular plug-in units and modifying the function of a particular outlet involves simply plugging in a new module. The J-Jacks wall plates are made of steel and the plug-in modules are heavily chrome plated steel castings. Jerrold Electronics Corp., 401 Walnut St., Philadelphia, Pa. 19105.

General Catalog

A 32-page illustrated, discount mail-order catalog is available which has been specifically designed as a quick reference ordering guide for use by radio/TV servicemen and other elec-

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

- ★ 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

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

Your Order FREE if Not Shipped in 24 Hours

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

tronic technicians. Included are tools, service and repair kits, speakers and microphones, antennas, components and many other servicing aids of various major manufacturers. Fordham Radio Supply Co., 558 Morris Ave., Bronx, N.Y. 10451.

TRAPEZOIDAL ...

continued from page 29

drop across the series resistance (subtractive) and tends to keep the resulting applied voltage at a constant level for linear current increase (sweep) through the coil. At this point, we have the sawtooth current through the deflection coil for proper sweep of the CRT beam. The remaining straight line c' represents a virtually "zero time" function normally referred to as "flyback" or rapid current decay in the deflection coil.

As to how the trapezoidal waveform is produced, we have found this possible by the use of either reactive or active circuits theoretically involving the sum (algebraic or vector) of an unsymmetrical square wave and a sawtooth-triangular waveform. As to why the trapezoidal waveform is needed . . . simply to provide a sawtooth current through a coil for electromatic deflection (sweep) of the picture tube. ■

REAL DOG ...

continued from page 33

correctly or spend unnecessary time in component substitution.

When working in an IF stage, keep that #@&% "diddle stick" out of those transformers. Only as a last resort should you do any tweaking. Once you tune that IF out, you had better have a sweep generator and know how to use it or hang it up buddy, you are finished on this gig.

To me, transistor troubleshooting is easier than that on tube-type receivers. Shorting the base to the emitter changes any transistor's operating characteristics and this can readily be seen on the face of the CRT. A multitude of transistor problems can be located by this technique. [Just be sure that before

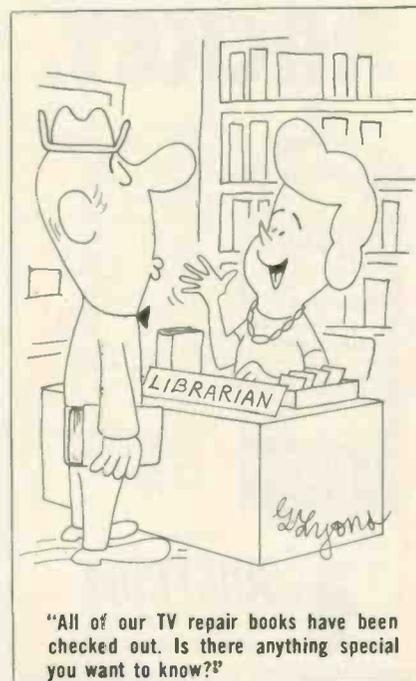
you perform this test that you know for certain that this component really is a conventional bipolar transistor! Ed.] I do not advise this test in high-voltage applications, but very seldom can damage be done in low-voltage amplifiers or gating circuits.

Now I could go on and on about specific TV problems stage by stage from the tuner right on through to the flyback and damping circuit, but that is not the purpose of this article. The purpose is to remind you, the person that is interested enough in reading and is already a good technician, that proper technique and application is the only way to repair "Real Dogs" at a profit.

I purposefully did not go into the use of freeze spray or heating techniques to find these tough intermittent problems. Nor did I go into signal substitution with any list, or bridging filters, or a couple of thousand other procedures that any good technician should be aware of. In fact, I haven't even told you one thing about fixing that "Real Dog." What I have told you is how to get set up and to use your extra eyes

. . . the ones that, if you use correctly, are going to lead straight to the problem. Remember this the next time you get a "Real Dog." ■

- D—Determination
- O—Organization
- G—Gratification



FREE...

1974 Heath/Schlumberger Electronic Instruments Catalog

One-stop shopping for virtually all your test equipment needs:

80 MHz frequency counters from \$295* . . . 200 MHz counters from \$495* . . . 600 MHz counter only \$795* . . . 600 MHz scaler just \$365* . . . programmable timer only \$395* . . . dual trace 15 MHz scope, \$595* . . . sine, square, triangle wave generator, \$245* . . . high and low voltage power supplies from \$34* . . . multimeters from \$65* . . . DVMs from \$285.*

The new 74 Heath/Schlumberger catalog describes all these and many more . . . all factory assembled and aligned . . . all specification-guaranteed for one full year . . . and all available at low mail-order prices. Use the coupon below and send for your FREE copy now.



FREE...
1974 Heath/Schlumberger Electronic Instruments Catalog.
Send coupon now.

Heath/Schlumberger Instruments
 Dept. 199-2
 Benton Harbor, Michigan 49022

Please send 1974 Electronic Instruments Catalog.

Name _____

Address _____

City _____ State _____ Zip _____

Prices & specifications subject to change without notice.
 *Mail order prices; F.O.B. factory.

EK-409

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

SPRAY AWAY THE RACKET.



Squeak. Whine. Whirr. Pssst! Silence. Quietrol did it again. Silenced those moving T.V. parts, with one squirt from the handy spray pack. Cleaned away dirt, dust, and crud. Without damaging anything... in any black and white or color set. Silence is golden. So is Quietrol.

Also available in bottles, and the new Silicone—"Silitron."

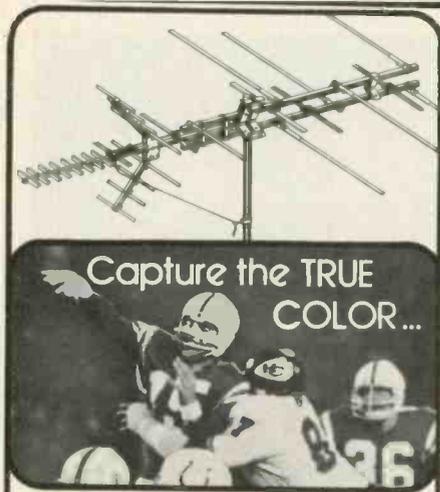
Product of

QUIETROL
COMPANY

Spartanburg, South Carolina



... for more details circle 122 on Reader Service Card



Capture the TRUE COLOR...

with a new
FINCO '80 Series
COLOR SPECTRUM-TV/FM ANTENNA

9 NEW MODELS AVAILABLE

FINCO'S NEW '80 SERIES COLOR SPECTRUM ANTENNAS consist of models combining various levels of VHF and UHF signal responsiveness. Thus there are models to fill the specific needs of signal frequencies and strengths as found in varying reception areas.

Write for Catalog No. 20-658. Dept. ET/D 2/74

The FINNEY Co.

34 West Interstate Street
Bedford, Ohio 44146

... for more details circle 109 on Reader Service Card

READERS SERVICE INDEX

ADVERTISER'S INDEX

101	Alco Electronic Products	56
102	Amperex Electronics	12
103	B & K Division, Dynascan Corp.	7
104	Book Club—Tab Books	38-41
105	Chemtronics, Inc.	51
106	Cornell Electronics	54
107	EICO Electronic Instruments	44-45
108	Finney Company	52
109	Finney Company	56
110	Fluke Mfg., John	49
111	Fordham Radio Supply	14
112	General Electric	3
	GTE Sylvania, Consumer Renewal	8 & 15
113	Heath Company	37
114	Heath/Schlumberger	55
115	Hickok Electrical Instrument Co.	19-22
116	International Rectifier	53
117	Jensen Tools & Alloys	56
118*	Leader Instruments	10
119	Mallory Distributor Products Co.	5
120	Motorola	49
	Panasonic	Cover 3
121	PTS Electronics	Cover 2
122	Quietrol Co.	56
	RCA Semiconductors	17
123	Sprague Products Co.	6
124	Systems Engineering	42
125	Triplett Corp.	Cover 4
126	Wahl Clipper Corp.	10
127	Winegard Company	13
128	Workman Electronics Products, Inc.	11

NEW PRODUCTS

700	Digital VOM	18
701	Self-Adjusting Wrench	18
702	TV High-Voltage Tripler	18
703	Function Generator	48
704	VHF/FM Antenna Preamplifier	48
705	Desoldering Tool	48
706	Scope	48
707	Speech Recognition System	48
708	Electronic Watchman	48
709	Electronic Chemicals	49
710	Digital Clock/Calculator	49
711	Socket Wrench	50
712	Desoldering Kit	50
713	Frequency Counter	50
714	Digital Multimeter	50
715	VOM	50
716	Distribution Amplifier	50
717	High-Voltage Repair Kit	51
718	Picture Tube Tester	51
719	Stereo System	52
720	Tape Player/Recorder	52
721	Tape Deck	52
722	Stereo Cassette Deck	52
723	Antenna	53

TEST INSTRUMENT

900	Hickok's Model 239 Color Bar Generator	36
-----	--	----



"I'll buy your service contract if you'll refund the money if I don't need any repairs."



"Necessities come first. By having a meatless month we can pay you for fixing it."

FREE CATALOG

HARD-TO-FIND PRECISION TOOLS

Lists more than 1700 items—pliers, tweezers, wire strippers, vacuum systems, relay tools, optical equipment, tool kits and cases. Also includes four pages of useful "Tool Tips" to aid in tool selection.

JENSEN TOOLS
4117 N. 44th Street, Phoenix, Ariz. 85018

TOOLS



... for more details circle 117 on Reader Service Card

"GROUNDED" OUTLET TESTER



New! GT-20 Tester tells if your AC outlets are safely grounded. Just plug in and

follow label instructions. Ideal for home, shop, campers, electricians, maintenance men. \$7.95 prepaid. Adapter plug \$.75.

ALCO BOX 1348-ET
Lawrence, Ma. 01840

... for more details circle 101 on Reader Service Card

READER SERVICE INFORMATION CARD 2-74

This card is usable until May 1, 1974. For those countries outside the U.S., please apply appropriate postage before mailing.

For more information on products or services mentioned in this issue, simply circle the appropriate numbers below, type or print your name and address, apply postage, and drop in the mail.

ADVERTISED PRODUCTS

101	109	117	125	133	141	149
102	110	118	126	134	142	150
103	111	119	127	135	143	151
104	112	120	128	136	144	152
105	113	121	129	137	145	153
106	114	122	130	138	146	154
107	115	123	131	139	147	155
108	116	124	132	140	148	156

TEST INSTRUMENTS

900	908	916
901	909	917
902	910	918
903	911	919
904	912	920
905	913	921
906	914	922
907	915	923

NEW PRODUCTS

700	708	716	724	732	740
701	709	717	725	733	741
702	710	718	726	734	742
703	711	719	727	735	743
704	712	720	728	736	744
705	713	721	729	737	745
706	714	722	730	738	746
707	715	723	731	739	747

NAME _____ POSITION _____

COMPANY _____ STREET _____

CITY _____ STATE _____ ZIP CODE _____

Please describe your type of business or industry _____

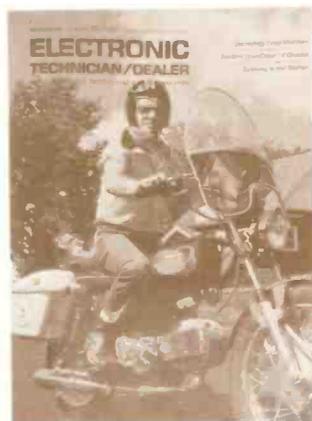
Your signature _____

PLACE
STAMP
HERE

Reader Service Department

ELECTRONIC TECHNICIAN/DEALER

POST OFFICE BOX 6016, DULUTH, MINNESOTA 55806



For those countries outside the U.S., please apply appropriate postage before mailing.

PERSONAL SUBSCRIPTION CARD

3 Years \$9 2 Years \$8 1 Year \$5

Payment Enclosed Bill Me

IMPORTANT! Please check your business classification.

Type of Business

Check One

- | | |
|---|--|
| A. <input type="checkbox"/> Independent or Self-Employed Service Technician | D. <input type="checkbox"/> Electronics, Radio, TV Manuf |
| B. <input type="checkbox"/> Independent Electronic Service Organiz. | E. <input type="checkbox"/> Industrial Electronic Service |
| C. <input type="checkbox"/> Retailer with Electronic Service Dept. | F. <input type="checkbox"/> Wholesale, Jobber, Distributor |
| | G. <input type="checkbox"/> Other (Specify)..... |

Position—Check One

- H. Technician I. Owner, Manager, Buyer, J. Service Manager K. Other
Be sure you have checked appropriate boxes above.

NAME _____ STREET _____

FIRM _____ TITLE _____

CITY _____ STATE _____ ZIP _____

Circle the Reader Service numbers of those items of interest to you.

GET MORE FACTS

Your own personal copy for only pennies per issue

PLACE
STAMP
HERE

Reader Service Department

ELECTRONIC TECHNICIAN/DEALER

POST OFFICE BOX 6016, DULUTH, MINNESOTA 55806

GET MORE FACTS

READER SERVICE INFORMATION CARD 2-74

This card is usable until May 1, 1974. For those countries outside the U.S., please apply appropriate postage before mailing.

For more information on products or services mentioned in this issue, simply circle the appropriate numbers below, type or print your name and address, apply postage, and drop in the mail.

ADVERTISED PRODUCTS

101	109	117	125	133	141	149
102	110	118	126	134	142	150
103	111	119	127	135	143	151
104	112	120	128	136	144	152
105	113	121	129	137	145	153
106	114	122	130	138	146	154
107	115	123	131	139	147	155
108	116	124	132	140	148	156

TEST INSTRUMENTS

900	908	916
901	909	917
902	910	918
903	911	919
904	912	920
905	913	921
906	914	922
907	915	923

NEW PRODUCTS

700	708	716	724	732	740
701	709	717	725	733	741
702	710	718	726	734	742
703	711	719	727	735	743
704	712	720	728	736	744
705	713	721	729	737	745
706	714	722	730	738	746
707	715	723	731	739	747

NAME _____ POSITION _____

COMPANY _____ STREET _____

CITY _____ STATE _____ ZIP CODE _____

Please describe your type of business or industry _____

Your signature _____

Circle
the
Reader
Service
numbers
of those
items of
interest
to you.

PLACE
STAMP
HERE

Circulation Department

ELECTRONIC TECHNICIAN/DEALER

POST OFFICE BOX 6016, DULUTH, MINNESOTA 55806

Your own
personal
copy
for
only
pennies
per issue

GROUP
258

SCHEMATIC NO.

SCHEMATIC NO.

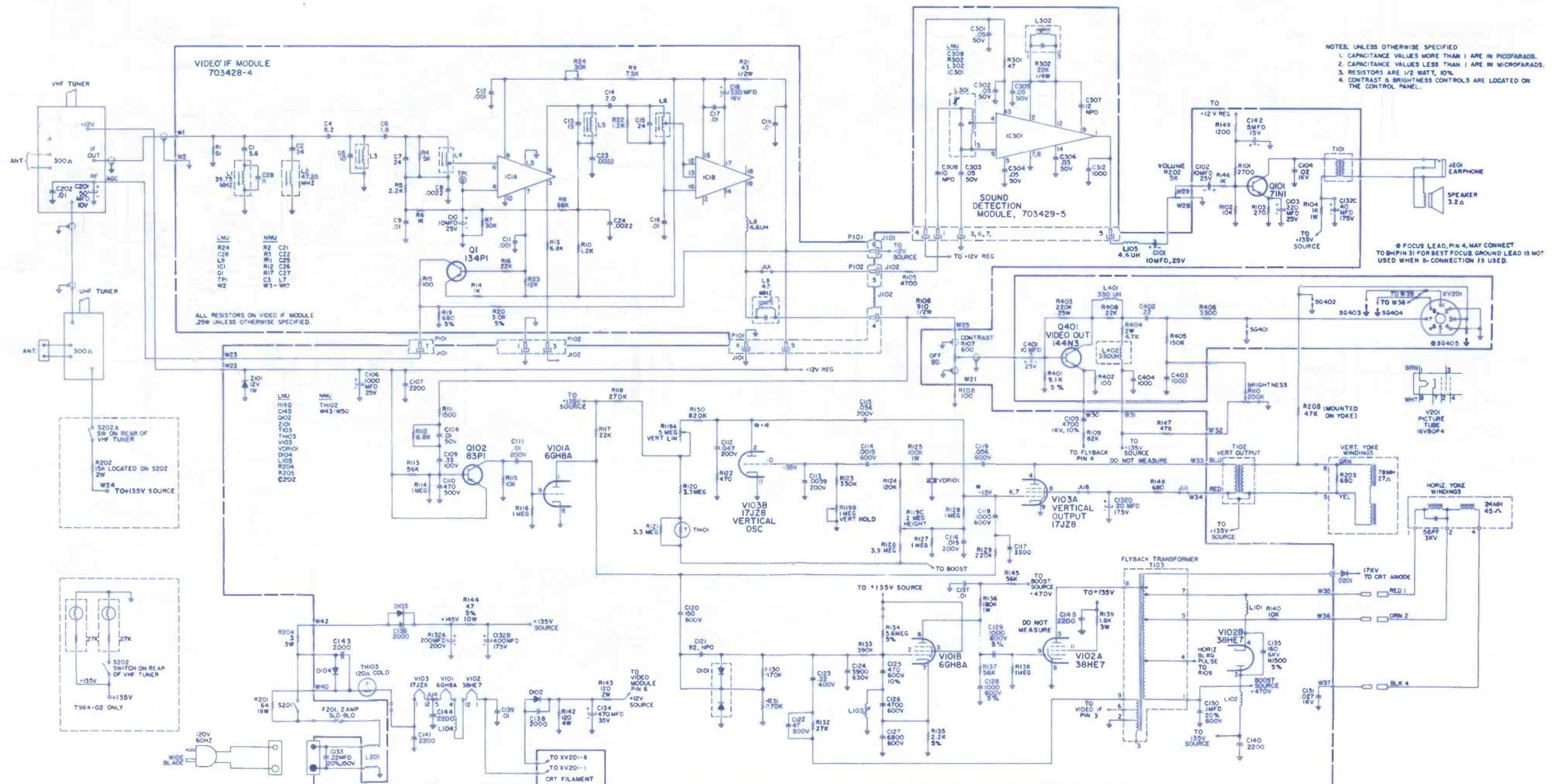
ADMIRAL 1510
Color-TV Chassis 12K18

MGA 1512
Color-TV Models CM-250A, 51A, 52A

GENERAL ELECTRIC 1511
Color-TV Chassis 10HE

SYLVANIA 1513
TV Chassis A12-1, -2

MAGNAVOX 1509
TV Chassis T984



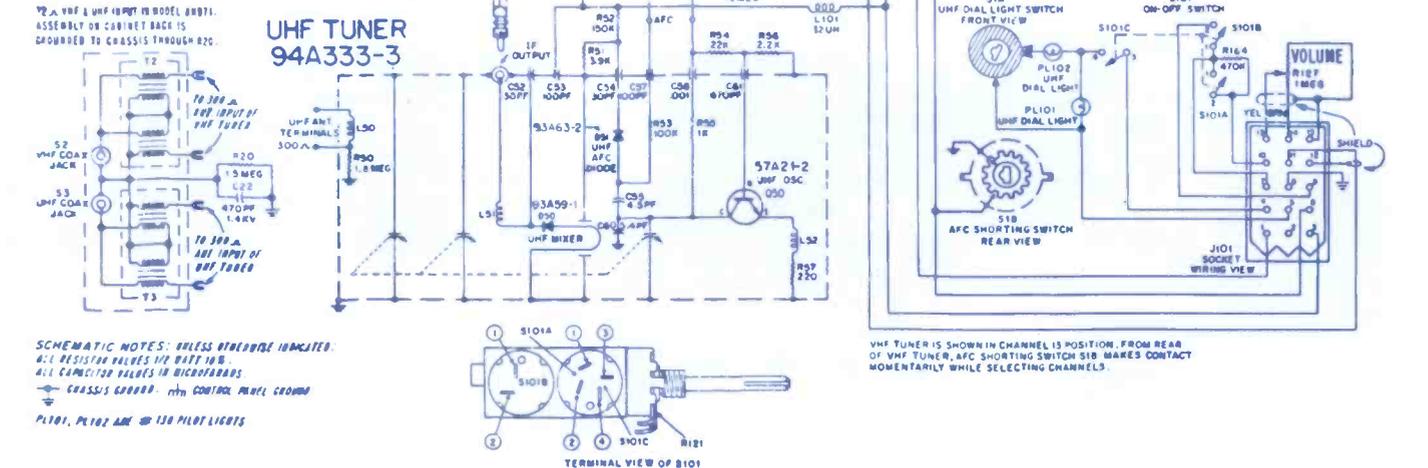
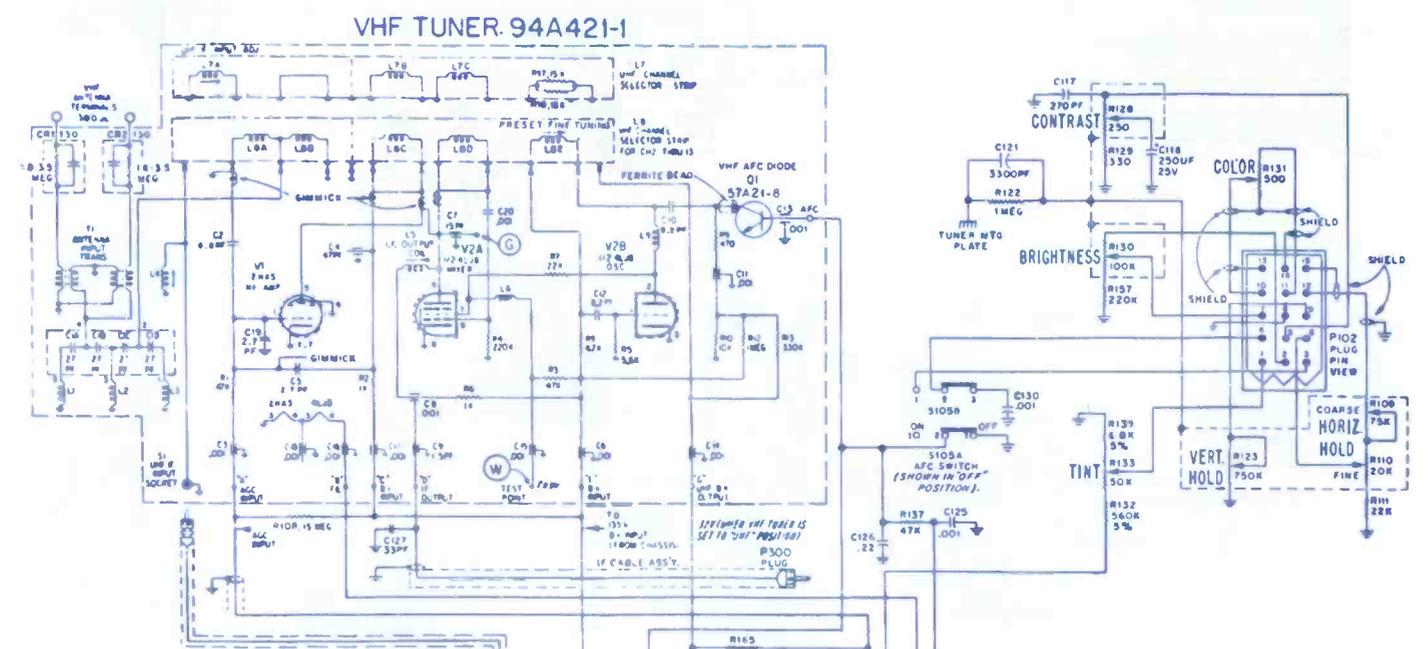
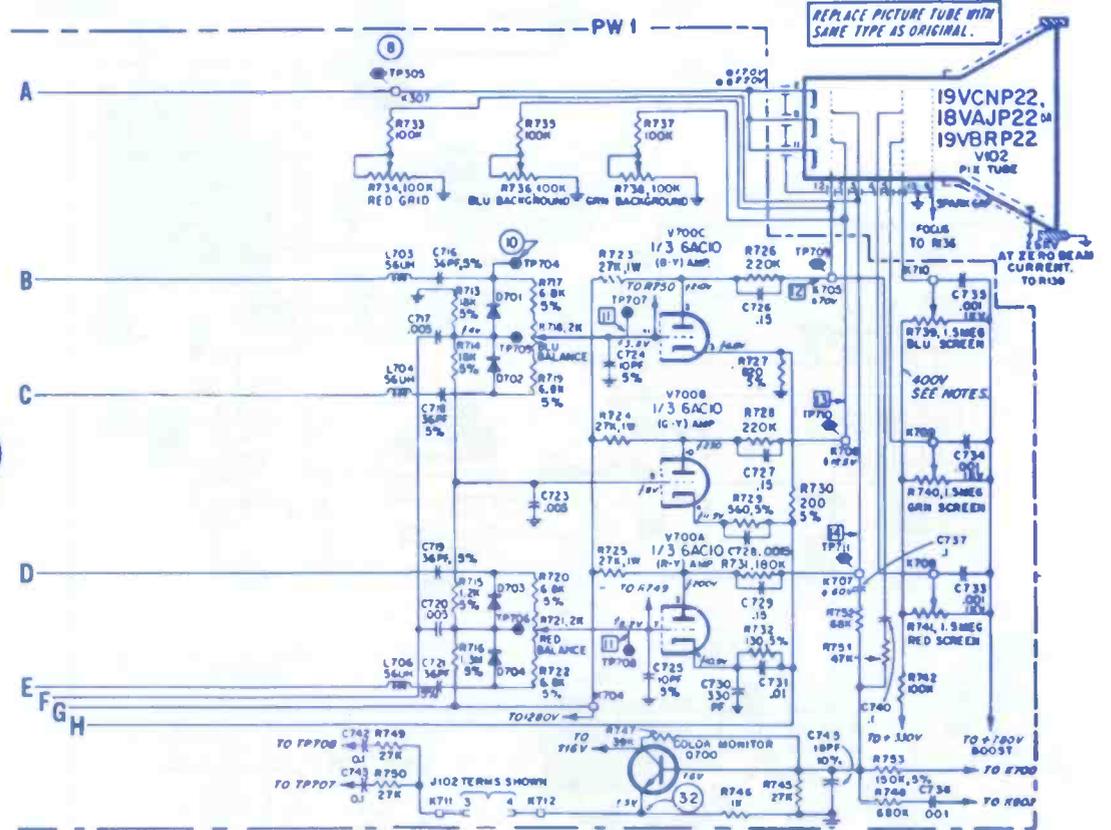
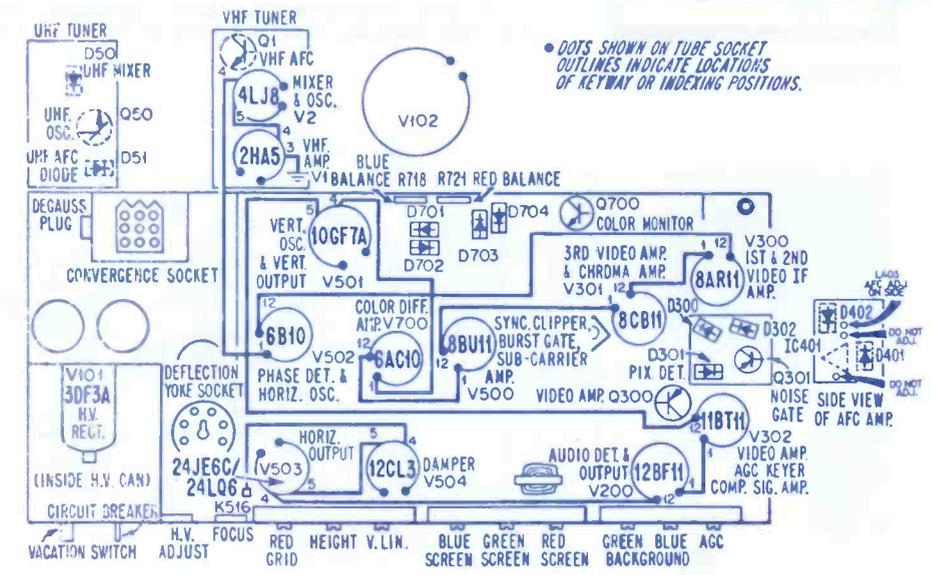
NOTES: UNLESS OTHERWISE SPECIFIED
1. CAPACITANCE VALUES MORE THAN 1 ARE IN MICROFARADS.
2. CAPACITANCE VALUES LESS THAN 1 ARE IN PICOFARADS.
3. RESISTORS ARE 1/2 WATT, 10%
4. CONTRAST & BRIGHTNESS CONTROLS ARE LOCATED ON THE CONTROL PANEL.

* FOCUS LEAD, PIN 4, MAY CONNECT TO B-PIN 3) FOR BEST FOCUS. GROUND LEAD IS NOT USED WHEN B-CONNECTION IS USED.

**ADMIRAL
Color-TV Chassis
12K18**

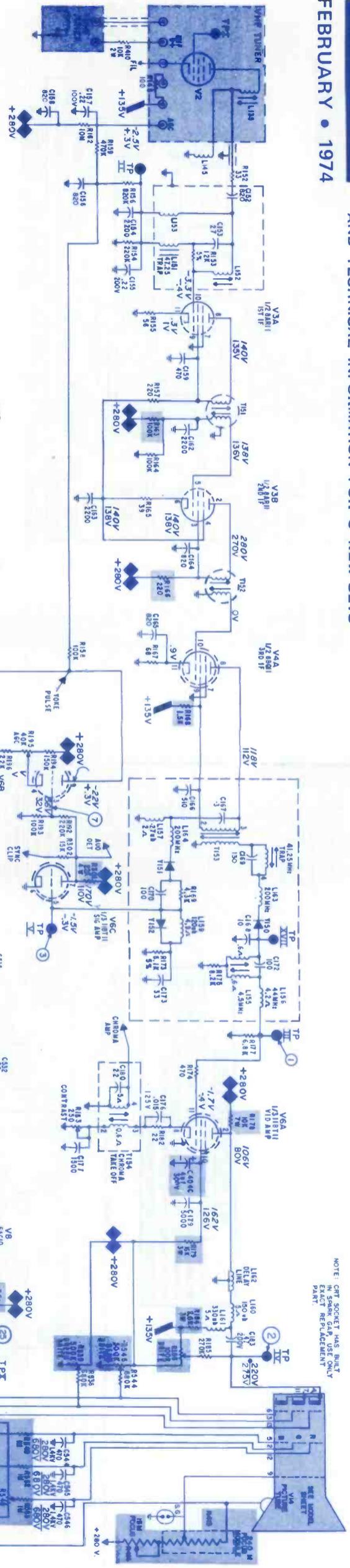
SAFETY NOTICE
THE DESIGN OF THIS RECEIVER CONTAINS MANY CIRCUITS AND COMPONENTS INCLUDED SPECIFICALLY FOR SAFETY PURPOSES. FOR CONTINUED PROTECTION, NO CHANGES SHOULD BE MADE TO THE ORIGINAL DESIGN. REPLACEMENT PARTS MUST BE IDENTICAL TO THOSE USED IN THE ORIGINAL CIRCUIT. SERVICE SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY.

SYMBOL	DESCRIPTION	ADMIRAL PART NO.
R112	500K, HV adj cont	75A159-12
R121	12M focus cont	75A157-14
R123	750K, vert hold cont	See Tuner
R127	1M vol cont	
R136	240M focus bleeder	61A66-2
R509	3.4M vert lin	75A155-8
R517	100K, vert height triple cont	75A155-8
R734	100K, red grid	75A155-8
R718	2K blue balance cont	75A101-40
R721	2K red balance cont	75A101-40
RV101	VDR	61A52-2
RV102	VDR	61A57-5
RT101	thermistor	61A65-1
RV500	varistor vert	84A379-4
L108	yoke deflect	72A366-1
L201	sound quad coil	67A15-410
C109A	80µf, 175v	67A15-410
C109B	100µf, 400v	67A15-410
C109C	30µf, 400v	67A15-410
C109D	10µf, 150v electrolytic	67A15-410
C110A	120µf, 400v	67A15-409
C110B	20µf, 400v	67A15-409
C110C	100µf, 150v	67A15-409
C110D	4µf, 300v electrolytic	67A15-409
L501A, B	horiz frequency sinewave coil	72A373-1
L701	3.5MHz trap coil	72A363-1
T101	power xformer	80C116-1
T102	vert output xformer	79D153-5
T103	horiz output xformer	79D162-2
T200	4.5MHz driver xformer	72A303-17
T201	audio output xformer	79A151-1
T700	chroma take off xformer	72A368-1
T701	chroma bandpass xformer	72A358-1
T702	crystal filter xformer	72A362-1
T703	chroma demod xformer	72A357-1
CB101	circuit breaker 1.5a	84A17-16
F101	4a fuse	84A7-12
F102	.35 fuse	84A28-8

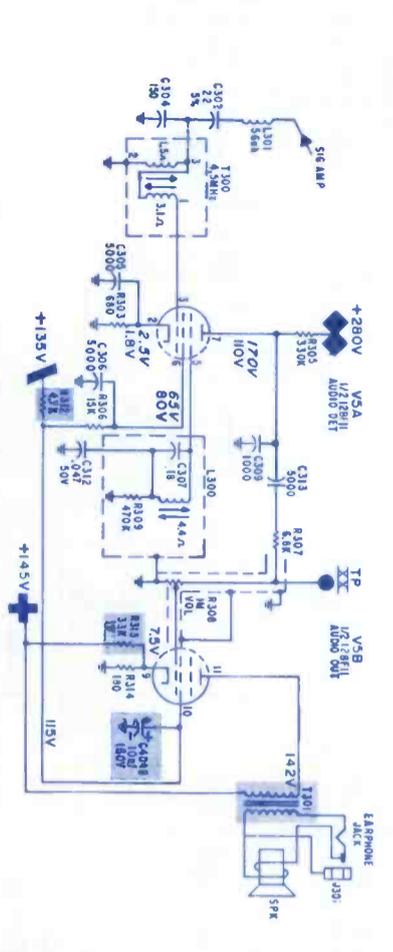


SCHEMATIC NOTES: UNLESS OTHERWISE INDICATED:
ALL RESISTOR VALUES ARE IN OHMS
ALL CAPACITOR VALUES IN MICROFARADS
CIRCUITS SHOWN WITH CONTROL PANEL GROUND
PI101, PI102 ARE 150 PILOT LIGHTS

1. VOLTAGE MEASUREMENTS MADE WITH A VTVM WITH RESPECT TO CHASSIS. MEASUREMENTS MAY VARY 1% AT 120V AC LINE VOLTAGE.
 2. WHERE ON-SIGNAL AND OFF-SIGNAL APPEARS IN ITALICS OVER OFF-SIGNAL MEASUREMENTS, ANTENNA DISCONNECTED AND ANTENNA TERMINALS SHORTED TOGETHER. ON-SIGNAL VOLTAGES AND WAVE SHAPES TAKEN WITH A NOISE FREE SIGNAL PRODUCING -2.5 TO -3.5 MC AT VHF TUNER.

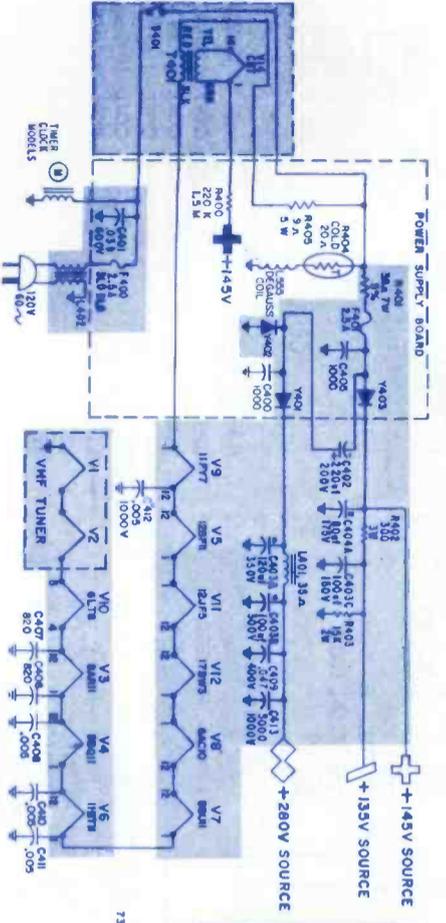


NOTE: CRT SOCKET WAS BUILT EXACT REPLACEMENT PART.



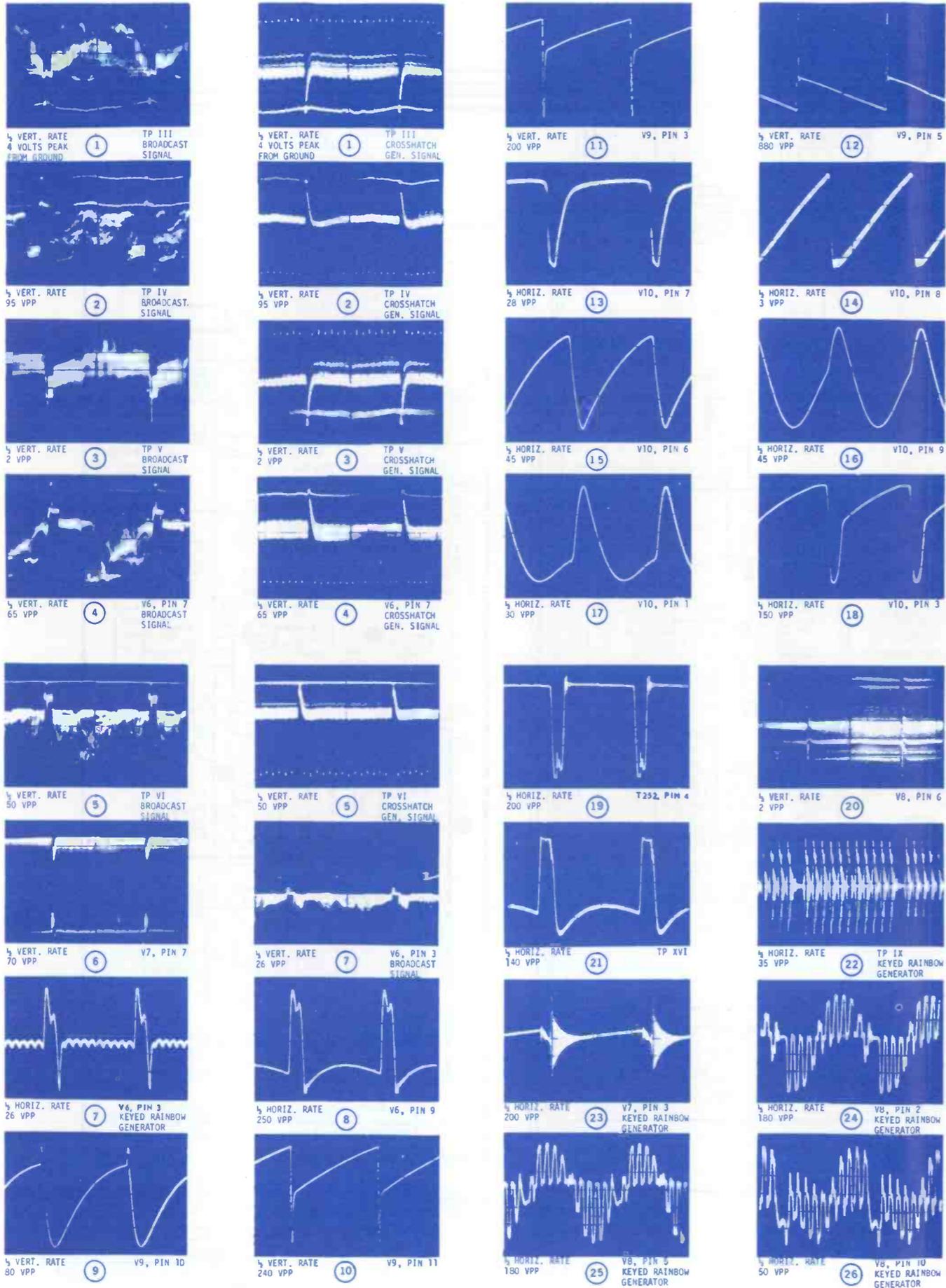
UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE M.I. 1000000000 CAPACITORS MORE THAN 1000000 RESISTORS ARE 1%.

PRODUCT SAFETY SHOULD BE CONSIDERED WHEN A COMPONENT REPLACEMENT IS MADE IN ANY AREA OF A RECEIVER. THE SHARDED AREA OF THIS SCHEMATIC SHOWS AN AREA OF THIS RECEIVER. THE SHARDED AREA IS NOT A WARNING OF SPECIAL DANGER. IT IS PARTICULARLY RECOMMENDED THAT GENERAL ELECTRIC CATALOG PARTS BE USED FOR COMPONENT REPLACEMENT. USE OF SUBSTITUTE REPLACEMENT PARTS CHARACTERISTICS AS RECOMMENDED IN FACTORY SERVICE INFORMATION MAY CREATE SHOCK HAZARD OR OTHER HAZARDS.

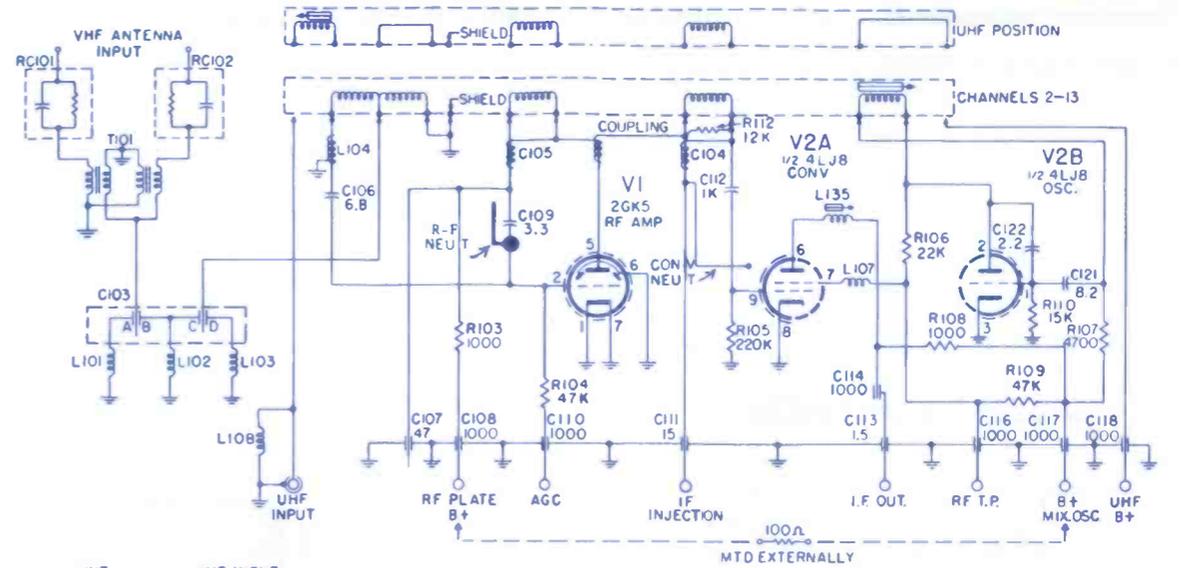


73W300037 REV. 4

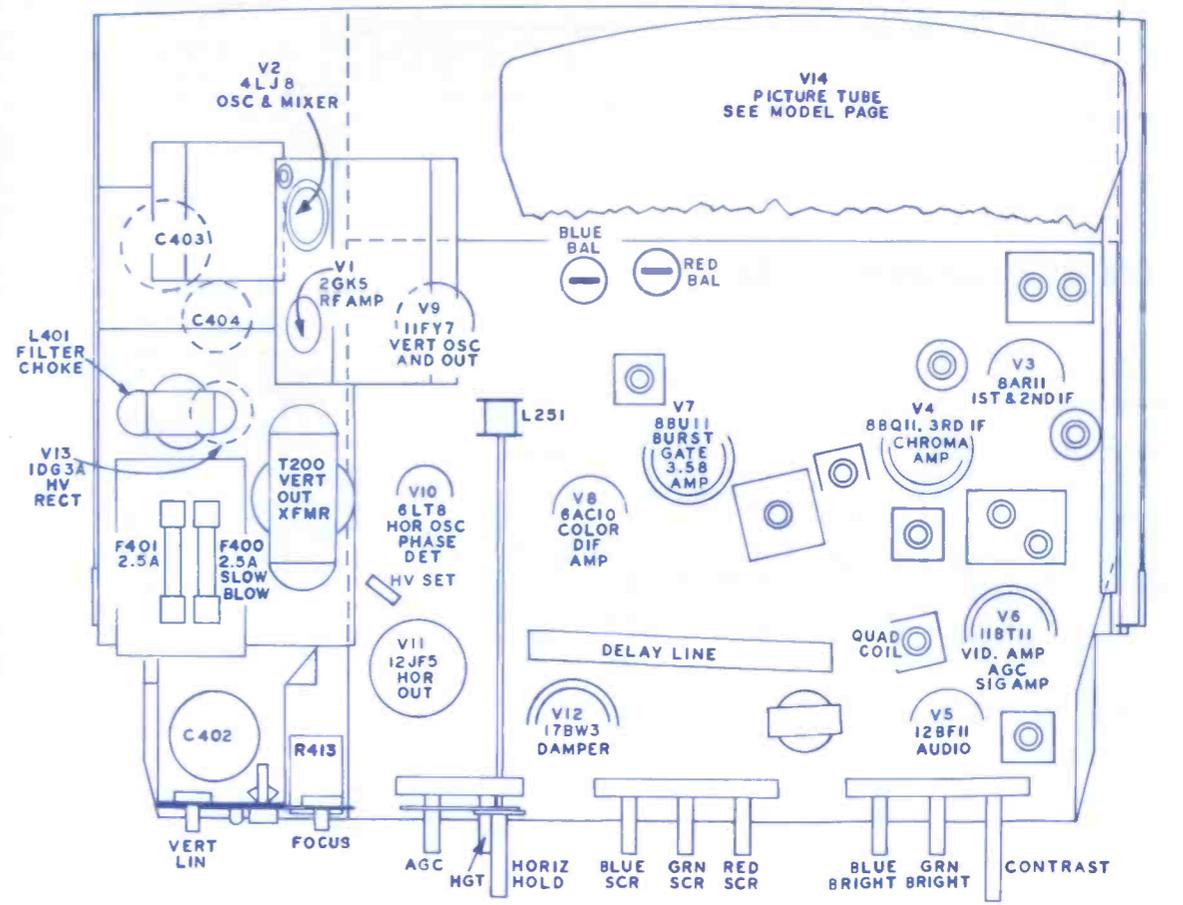
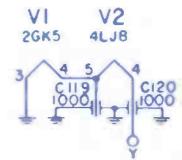
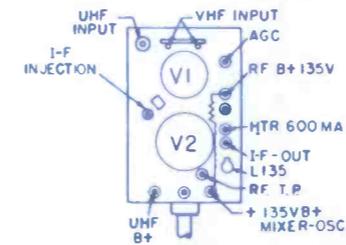
WAVEFORMS FOR POINTS INDICATED



GENERAL ELECTRIC
Color-TV Chassis
10HE

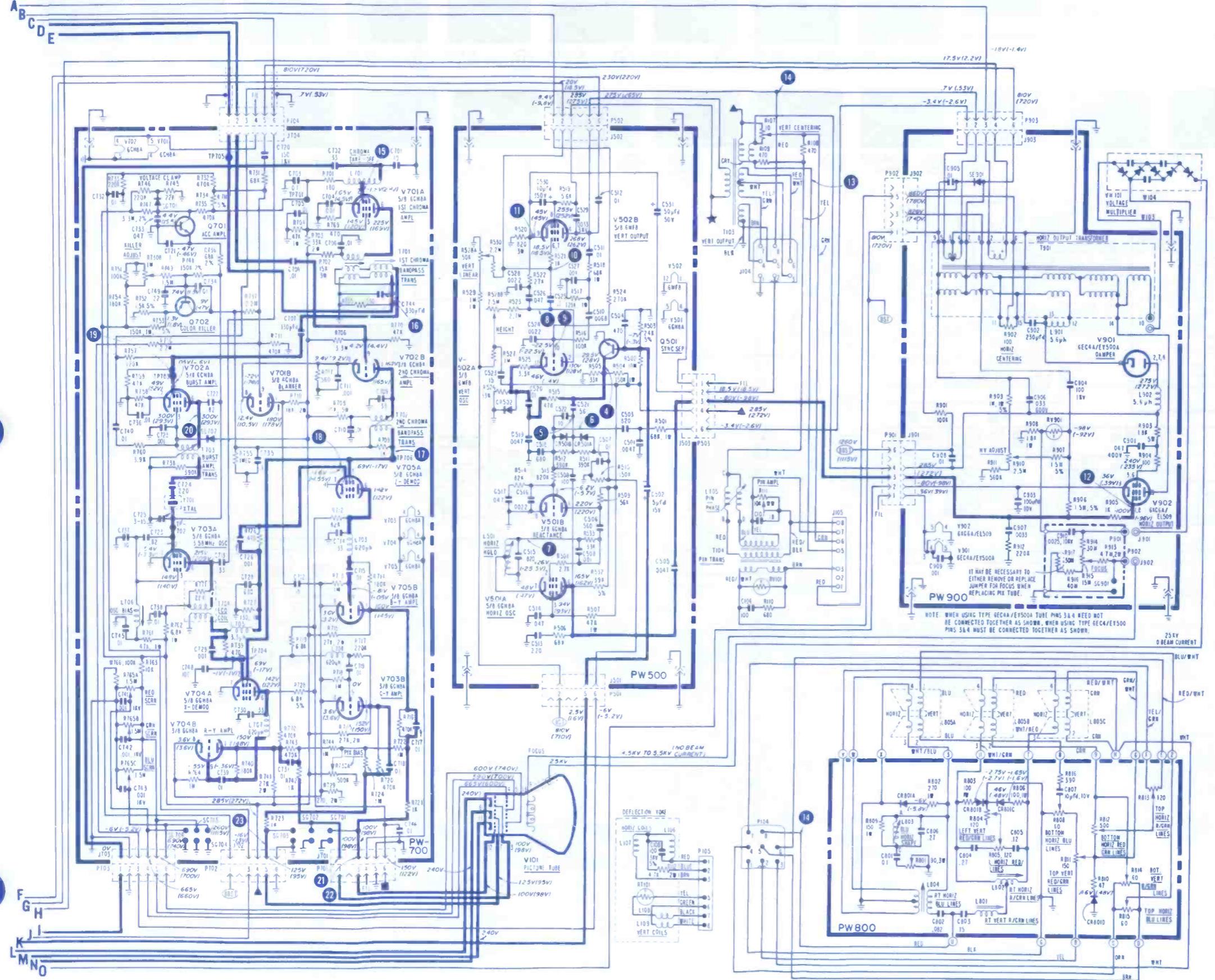
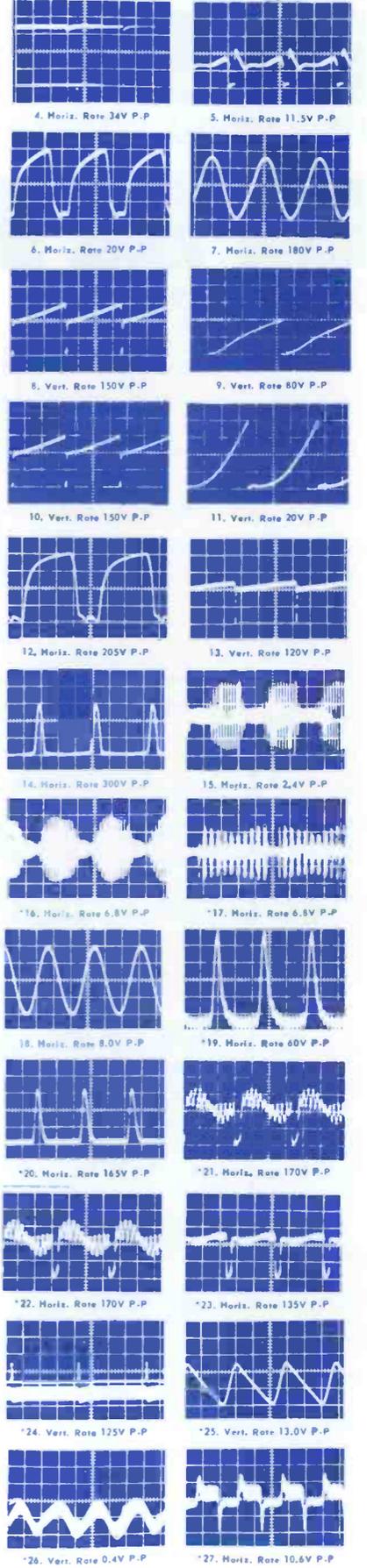
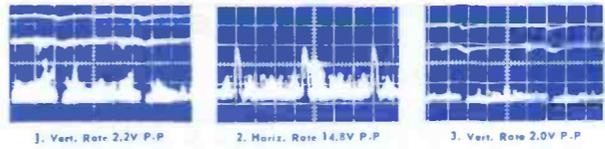


SCHEMATIC DIAGRAM



CHASSIS LAYOUT

MGA
Color-TV Models
CM-250A, 51A, 52A



ELECTRONIC TECHNICIAN

COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 5 NEW SETS

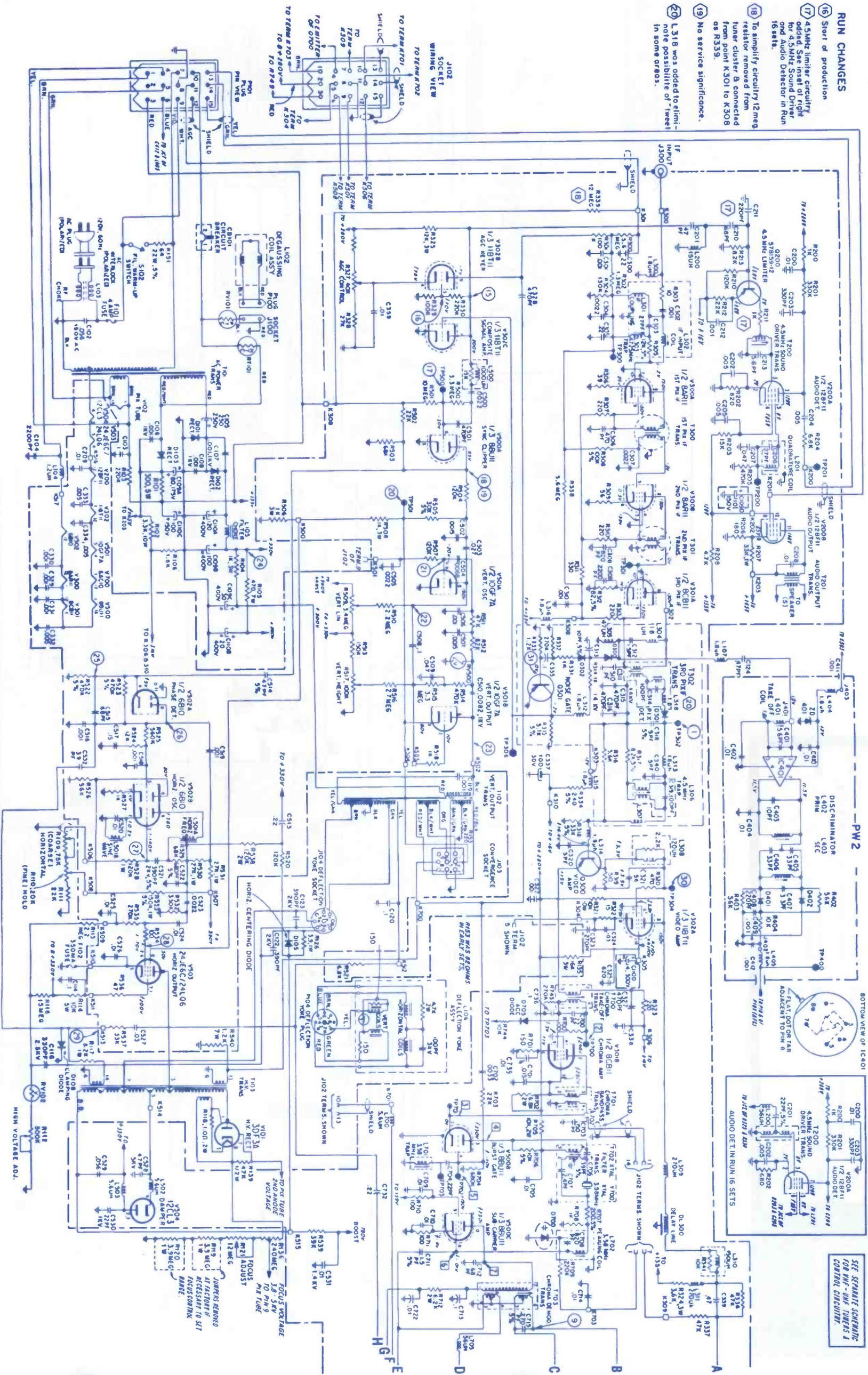
- NOTES:
1. ALL RESISTORS ARE 1/2 WATT, 5%, UNLESS OTHERWISE NOTED.
 2. ALL CAPACITORS ARE IN PFD, UNLESS OTHERWISE NOTED.
 3. CAUTION: USE ISOLATION TAPES WHEN WORKING ON CHASSIS.
 4. DC VOLTAGES MEASURED WITH VTM PLACED BETWEEN POINTS INDICATED BY CHASSIS GND, WITH NORMAL SIGNAL INPUT.
 5. INDICATES VOLTAGE READING TAKEN WITH BRIGHTNESS CONTROL AT MAXIMUM POSITION (FULL CRT).
 6. INDICATES VOLTAGE READING TAKEN WITH BRIGHTNESS CONTROL AT MINIMUM POSITION (FULL CCFL).
 7. (1) INDICATES THE VOLTAGE WILL VARY WITH FINE TUNING SETTING FROM 0V TO 23V. VOLTAGE AT PINS 4, 5, 6 & 9 OF PICTURE TUBE WILL VARY WITH SETTING OF SCREEN CONTROL.
 8. NUMBERS IN CIRCLES OR SQUARES INDICATE WAVEFORM OBSERVATION LOCATIONS. CONDITIONS FOR TAKING WAVEFORM MEASUREMENTS ARE GIVEN WITH WAVEFORM PHOTOGRAPHS.
 9. INDICATES VOLTAGES WILL VARY WITH VIDEO CONTENT OF PICTURE RECEIVED & ARE AVERAGE READINGS.
 10. INDICATES VOLTAGES WILL VARY WITH BACKGROUND CONTROL SETTING.

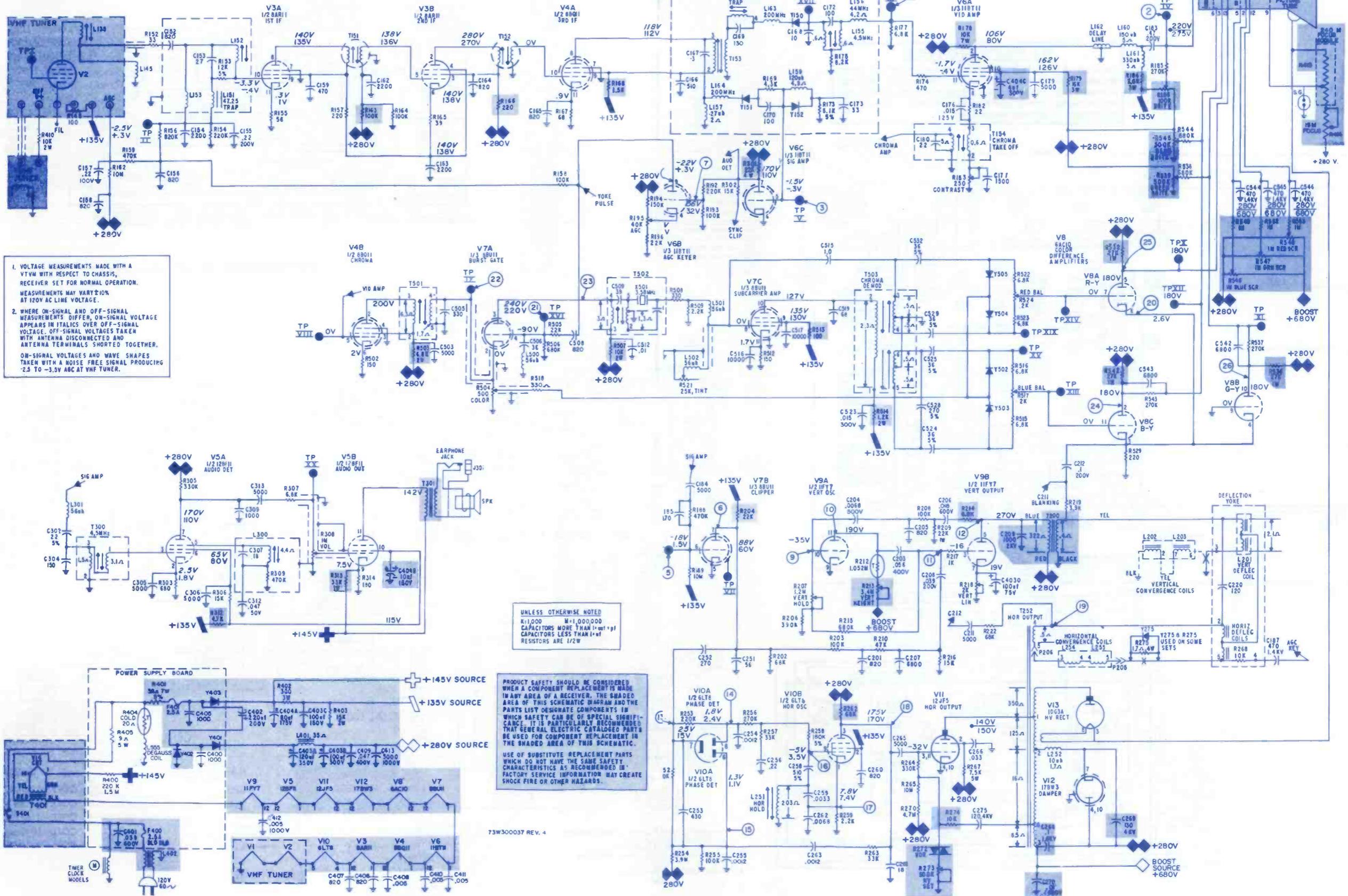
7. (1) INDICATES THE VOLTAGE WILL VARY WITH FINE TUNING SETTING FROM 0V TO 23V. VOLTAGE AT PINS 4, 5, 6 & 9 OF PICTURE TUBE WILL VARY WITH SETTING OF SCREEN CONTROL. NUMBERS IN CIRCLES OR SQUARES INDICATE WAVEFORM OBSERVATION LOCATIONS. CONDITIONS FOR TAKING WAVEFORM MEASUREMENTS ARE GIVEN WITH WAVEFORM PHOTOGRAPHS. INDICATES VOLTAGES WILL VARY WITH VIDEO CONTENT OF PICTURE RECEIVED & ARE AVERAGE READINGS. INDICATES VOLTAGES WILL VARY WITH BACKGROUND CONTROL SETTING.

SEE SEPARATE SCHEMATIC FOR PH-100 TUBES & CONTROL CIRCUITS.

RUN CHANGES

- (16) Short of production
- (17) 4.5MHz limiter circuitry added. See inset at right for 4.5MHz Sound Driver and Audio Detector in Run 16 sets.
- (18) To simplify circuitry 12 meg resistor removed from tuner cluster B connected from point K301 to K308 or R335.
- (19) No service significance.
- (20) L318 was added to eliminate possibility of "tweak" in some of 800's.





1. VOLTAGE MEASUREMENTS MADE WITH A VTVM WITH RESPECT TO CHASSIS, RECEIVER SET FOR NORMAL OPERATION. MEASUREMENTS MAY VARY 10% AT 120V AC LINE VOLTAGE.

2. WHERE ON-SIGNAL AND OFF-SIGNAL MEASUREMENTS DIFFER, ON-SIGNAL VOLTAGE APPEARS IN ITALICS OVER OFF-SIGNAL VOLTAGE. OFF-SIGNAL VOLTAGES TAKEN WITH ANTENNA DISCONNECTED AND ANTENNA TERMINALS SHORTED TOGETHER. ON-SIGNAL VOLTAGES AND WAVE SHAPES TAKEN WITH A NOISE FREE SIGNAL PRODUCING -2.5 TO -3.5V ABC AT VHF TUNER.

UNLESS OTHERWISE NOTED
 R=1,000 Ω M=1,000,000 Ω
 CAPACITORS MORE THAN 1 μF
 CAPACITORS LESS THAN 1 μF
 RESISTORS ARE 1/2W

PRODUCT SAFETY SHOULD BE CONSIDERED WHEN A COMPONENT REPLACEMENT IS MADE IN ANY AREA OF A RECEIVER. THE SHADED AREA OF THIS SCHEMATIC DIAGRAM AND THE PARTS LIST DESIGNATE COMPONENTS IN WHICH SAFETY CAN BE OF SPECIAL SIGNIFICANCE. IT IS PARTICULARLY RECOMMENDED THAT GENERAL ELECTRIC CATALOGED PARTS BE USED FOR COMPONENT REPLACEMENT IN THE SHADED AREA OF THIS SCHEMATIC.

USE OF SUBSTITUTE REPLACEMENT PARTS WHICH DO NOT HAVE THE SAME SAFETY CHARACTERISTICS AS RECOMMENDED IN FACTORY SERVICE INFORMATION MAY CREATE SHOCK FIRE OR OTHER HAZARDS.

73W300037 REV. 4

NOTE: CRT SOCKET HAS BUILT IN SPRING GAP. USE ONLY EXACT REPLACEMENT PART.

1513

SYLVANIA

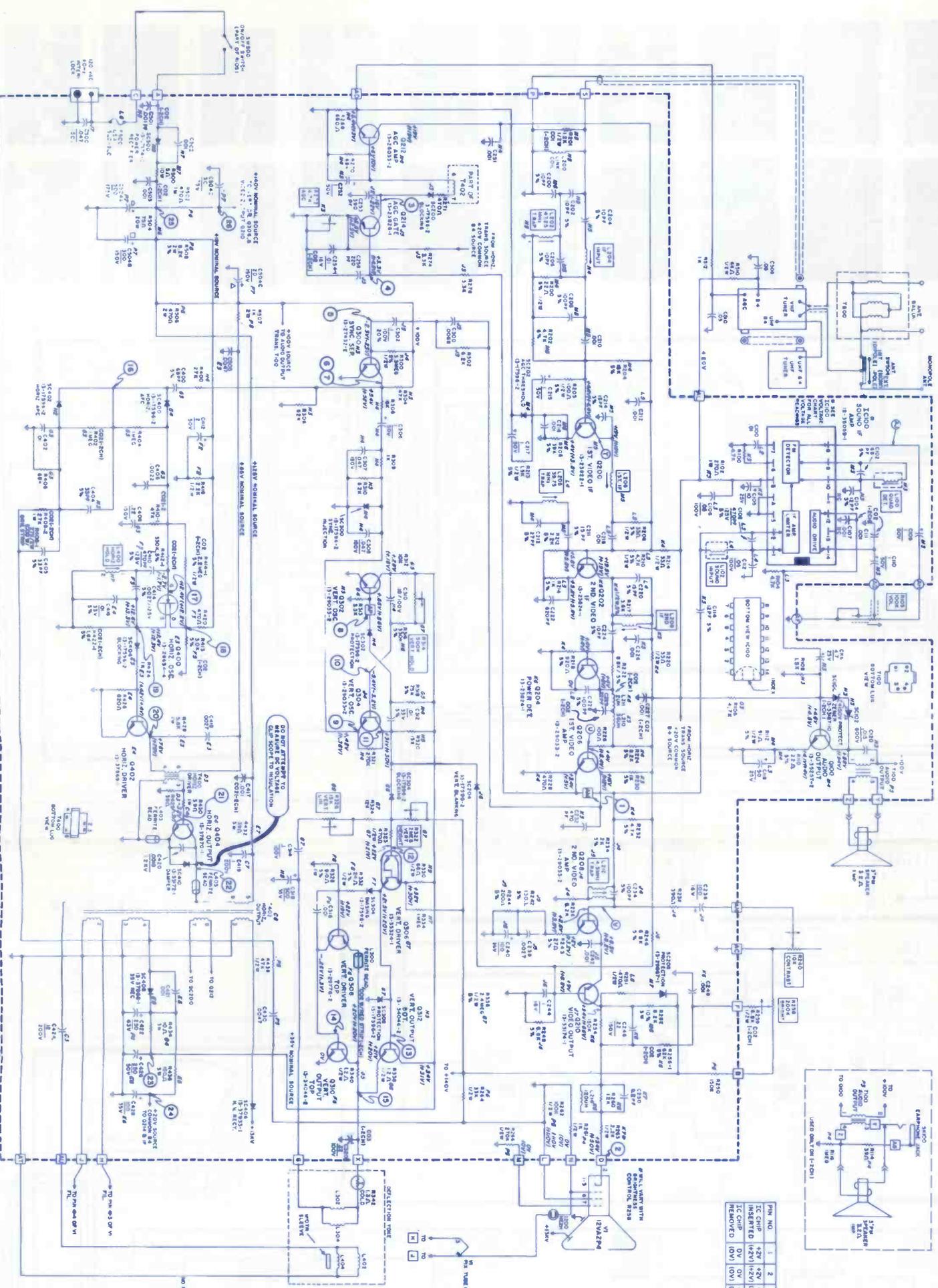
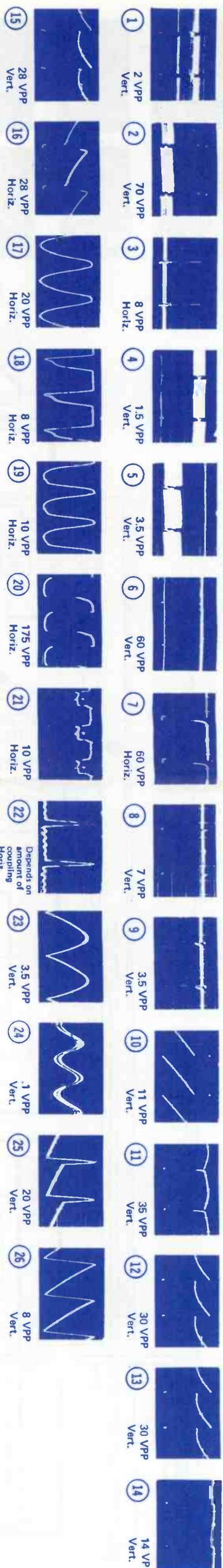
TV Chassis
A12-1,-2

ELECTRONIC **TEKTRAX**

TECHNICIAN/DEALER
FEBRUARY • 1974

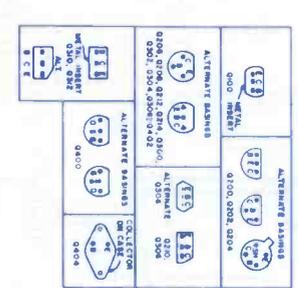
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS
AND TECHNICAL INFORMATION FOR 5 NEW SETS

SYMBOL	DESCRIPTION	PART NO.
C504-4 section elect.	41-37861-1	L100-coil, quad detector
A-500/175v		L402-coil, horiz hold
B-300/150v		L402-coil, horiz
C-20/150v		T100-xformer, audio output
D-30/175v		T402-xformer, horiz driver
		T402-xformer, horiz output
		R105-100k, vol
		50-33195-1
		50-33955-2
		part of yoke
		56-37872-1
		50-37922-1
		50-37934-1
		37-35105-10
		R240-10k, contrast
		R258-200k, brightness
		R272-47k, AGC
		R314-500k, vert hold
		R322-2M, vert height
		R326-15k, vert lin.
		VHF tuner
		37-27242-50
		37-27242-49
		37-14576-13
		37-30361-14
		part of R314
		54-37919-1



100V VOLTAGE CHART

PH. NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
TC CHIP	+3V	+3V	0V	+3V	+3.2V	+3.3V								
RESERVED	(+3V)	(+3V)	(0V)	(+3V)	(+3.2V)	(+3.3V)								
IC CHIP	0V	0V	0V	+2.4V	+3.3V									
REMOVED	(0V)	(0V)	(0V)	(+2.4V)	(+3.3V)									



NOTES:

1. CONDUCTORS ARE IN 1/16" SPACES UNLESS OTHERWISE SPECIFIED.
2. ALL RESISTORS ARE IN OHMS UNLESS OTHERWISE SPECIFIED.
3. ALL CAPACITORS ARE IN P.F. UNLESS OTHERWISE SPECIFIED.
4. DIMENSIONS ON COMPONENTS INDICATE POSITION OF COMPONENTS.
5. DIMENSIONS ON COMPONENTS INDICATE POSITION OF COMPONENTS.
6. DIMENSIONS ON COMPONENTS INDICATE POSITION OF COMPONENTS.
7. DIMENSIONS ON COMPONENTS INDICATE POSITION OF COMPONENTS.
8. DIMENSIONS ON COMPONENTS INDICATE POSITION OF COMPONENTS.
9. DIMENSIONS ON COMPONENTS INDICATE POSITION OF COMPONENTS.
10. DIMENSIONS ON COMPONENTS INDICATE POSITION OF COMPONENTS.

If you had to name the top electronics service company who would it be?

That's a tough question, because when it comes to service, it's hard to compare apples to apples. Some companies offer you many services—others very few. So before you make up your mind, we'd like to tell you about some of the services Panasonic has developed. Services that can make both our jobs a lot easier.

Like offering complete technical back-up information and assistance. We make available detailed service manuals on every product we've ever sold—over 11,000 since 1959. And if

you need more information, call the regional office in your area. And if you still want assistance, we'll send out one of our traveling field service specialists as your personal problem solver. And there's more. We hold annual training seminars to acquaint you with our products, inside and out. And at industry conventions, you'll find a Panasonic representative to explain our latest service advances.

At the core of it all are our products. All designed with a high level of serviceability—meaning

less time and effort for you. For instance, our Quatecolor TV sets scored 94.6 in the NEA serviceability tests of January 1973. And we're continually looking for new improvements.

The fact is that Panasonic pays as much attention to service as it pays to sales. And everybody is profiting—consumers, dealers and service technicians.

So before you consider who to name as the top electronics service company, run through the facts. The more you know about Panasonic, the better it is for everybody.



Panasonic
just slightly ahead of our time



If your problem
is burned-out
V-O-M's...
Solve it with
Triplet's 630-PLK

Model 630-PLK
\$113

1. Burnout-proof solid-state overload protection.
2. Single range switch minimizes error; DC polarity-reversing switch.
3. 4 ohmmeter ranges with 4.4 ohms center scale.

Its exclusive, patented, transistorized switching circuit gives the Model 630-PLK virtually fail-proof protection against overloads. Result: fewer repair bills, less down-time for service, no more bent pointers, damaged pivots or burned-out components.

Triplet's Model 630-PLK is yours for \$113. Its twin, the Model

630-APLK, offers exactly the same ranges and protection circuit plus 1 1/2% DC accuracy (vs. 2% for the 630-PLK), a mirrored scale and a rugged suspension-type meter and sells for \$123. If you feel you can do without the overload protection, ask for Triplet's Model 630-PL at \$73 or 630-APL (with 1 1/2% accuracy, mirrored scale and suspension-

type meter) at \$83. See all four models at your local Triplet distributor. For a free demonstration see him or your Triplet representative. Triplet Corporation, Bluffton, Ohio 45817.

TRIPLET
The World's most complete line of V.O-M's...
choose the one that's just right for you

For full details, Dial Toll-Free 800-645-9200 for nearest Triplet Representative. New York State—Call Collect 516-294-0990

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