


ELECTRONIC TECHNICIAN / DEALER

WORLD'S LARGEST TV-RADIO SERVICE & SALES CIRCULATION

APRIL 1969  A MCGRAW-HILL PUBLICATION



XX
FRISBURY
WILLIAM
7176 GALE RD
ATLAS MT
FRISE
52509AD5A17966B
48411

TWO-WAY RADIO ON THE GO | INSTALLING HOME MATV | TV SERVICE IN CATV AREAS

Color Power.

EICO gives you the most professional color power for your instrument dollar.



INTRODUCING THE VALUE LEADER IN BATTERY-OPERATED PORTABLE SOLID STATE COLOR GENERATORS — EICO 385!

Exclusive Features

- Compact "Tote-Easy" Design • Computer-Type Circuitry • Double Sided PC Board Construction • Low Price

The versatile "go everywhere" EICO 385 solid state color generator, packaged in an exclusive compact portable/storage case, has been designed to furnish the service technician with five essential functions. The generated patterns are the standard offset carrier-type 10 color bars, precision dots, crosshatch, and an individual series of vertical and horizontal lines.

Advanced computer-type circuitry, coupled with three temperature compensated crystals, provides the drift-free stability inherent in this instrument. A multipurpose color-coded gun killer with its convenient socket-adaptor assembly, (no more fumbling) stores in the case. Clips directly to TV antenna terminals (fast & sure!). The EICO 385 is powered by six long-life "C" cells or the AC adaptor accessory. The economical package contains all you need to enable you to do a fast yet reliable job.

Easy-to-assemble Kit: **\$79.95**
Wired: \$109.95



EICO's complete Color TV Lab for the pro

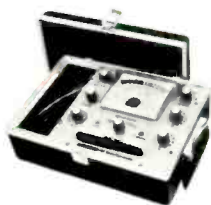
Praised by the pros for laboratory precision at lowest cost



Model 369 Sweep/Marker Generator. For easiest, fastest visual alignment of color or b/w TV and FM RF and IF circuits. Five sweep ranges from 3-220 MHz. Four marker ranges from 2-225 MHz. Crystal marker oscillator. Post injection of markers. \$99.95 Kit, \$149.95 wired.

Model 435 Direct-Coupled Wideband Scope. Top-quality DC-4.5 MHz scope with 3" flat-face. CRT Zener calibrator: Outperforms 5" scopes, facilitates on-location color TV and other servicing. \$119.95 Kit, \$169.95 wired.

New Model 235 Professional VTVM. Designed especially for solid-state servicing. Accurate to as little as 0.01 volts on its 1/2-volt scale. RMS/p-p/DS/ohms in 7 overlapping ranges. Big six-inch meter, 200 ua movement. \$49.95 Kit, \$69.95 wired.



NEW EICO 633 Portable All-Solid-State CRT Tester and Rejuvenator. Rapidly tests and rejuvenates color as well as black and white picture tubes. Line adjustment control, 12 different filament voltages, individual voltages applied to two of the grids, accurate meter — all insure precise measurements. Continuity and leakage checked through transistorized VOM, read directly on meter. **\$69.95 Kit, \$99.95 wired.**



NEW EICO 635 Deluxe All-Purpose Portable Tube Tester. Thoroughly professional, full-range modern versatility. Tests all standard tubes and even the new decals, magnovals, 7-pin nuvistors, and popular TV picture tubes. "Take-it-anywhere" design expressed in a modern, rugged, scuff-proof, luggage case. Compact (4"H, 12 1/2"W, 9"D) and lightweight, 4 1/2 lbs. Quick, accurate, dependable and the price is modest. **\$44.95 Kit, \$69.95 wired.**



NEW EICO PSI-1 Solid-State Signal Injector Probe. Perfect for on-the-spot signal tracing in the field. Pen-size, self-powered, self-contained signal generator from 1,000 Hz with harmonics to 30 MHz. Ideal for trouble-shooting audio, IF & RF circuitry in any electronic equipment, transistorized or vacuum tube. Use it once — you'll never want to be without it! **\$5.95 Kit, \$9.95 wired.**



FREE 1969 CATALOG

EICO Electronic Instrument Co., Inc.
283 Malta Street, Brooklyn, N.Y. 11207

Send me **FREE** catalog describing the full EICO line of 200 best buys, and name of nearest dealer.

Name _____

Address _____

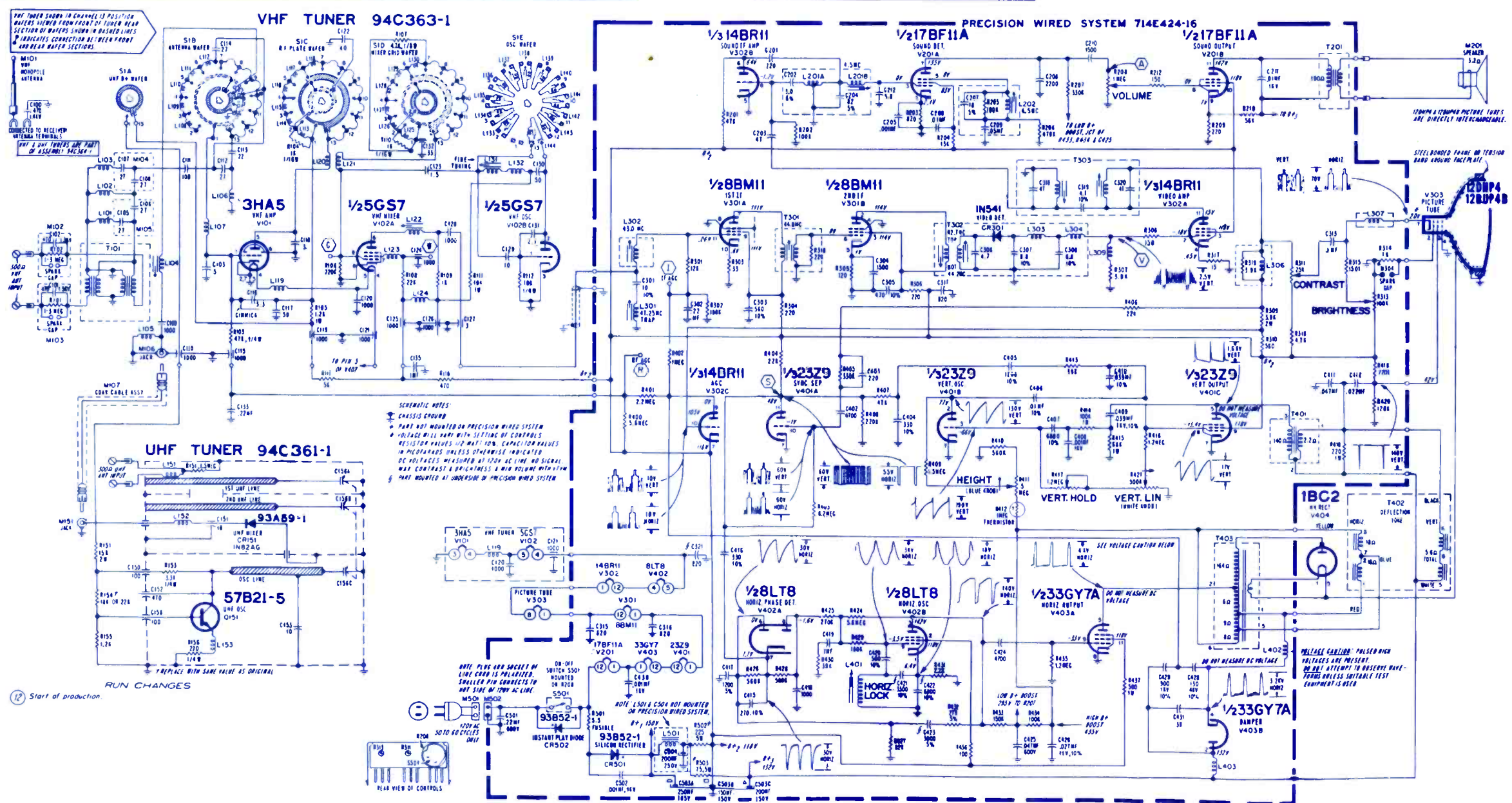
City _____

State _____ Zip _____

GROUP
200

	SCHEMATIC NO.	SCHEMATIC NO.
ADMIRAL TV Chassis T10H1-1AX	1217	OLYMPIC Color TV Chassis CT-1940 1218
AIRLINE TV Model GEN-11769B	1220	RCA VICTOR Color TV Chassis CTC40 1219
EMERSON TV Chassis 120914A,B	1221	TRUETONE TV Model 2DC3916 1222

ELECTRONIC TECHNICIAN/DEALER is published monthly by Harbrace Publications, Inc., Harbrace Building, Duluth, Minnesota 55802, a subsidiary of Harcourt, Brace & World, Inc. Subscription rates: One year \$5, two years \$8, three years \$10, in the United States and Canada. Other countries: One year \$9, two years \$14, three years \$18. Single copies 60¢. Second class postage paid at Dansville, New York and at additional mailing offices. Copyright 1969 by Harbrace Publications, Inc.
POSTMASTER: Send Form 3579 to ELECTRONIC TECHNICIAN/DEALER, Harbrace Building, Duluth, Minnesota 55802.

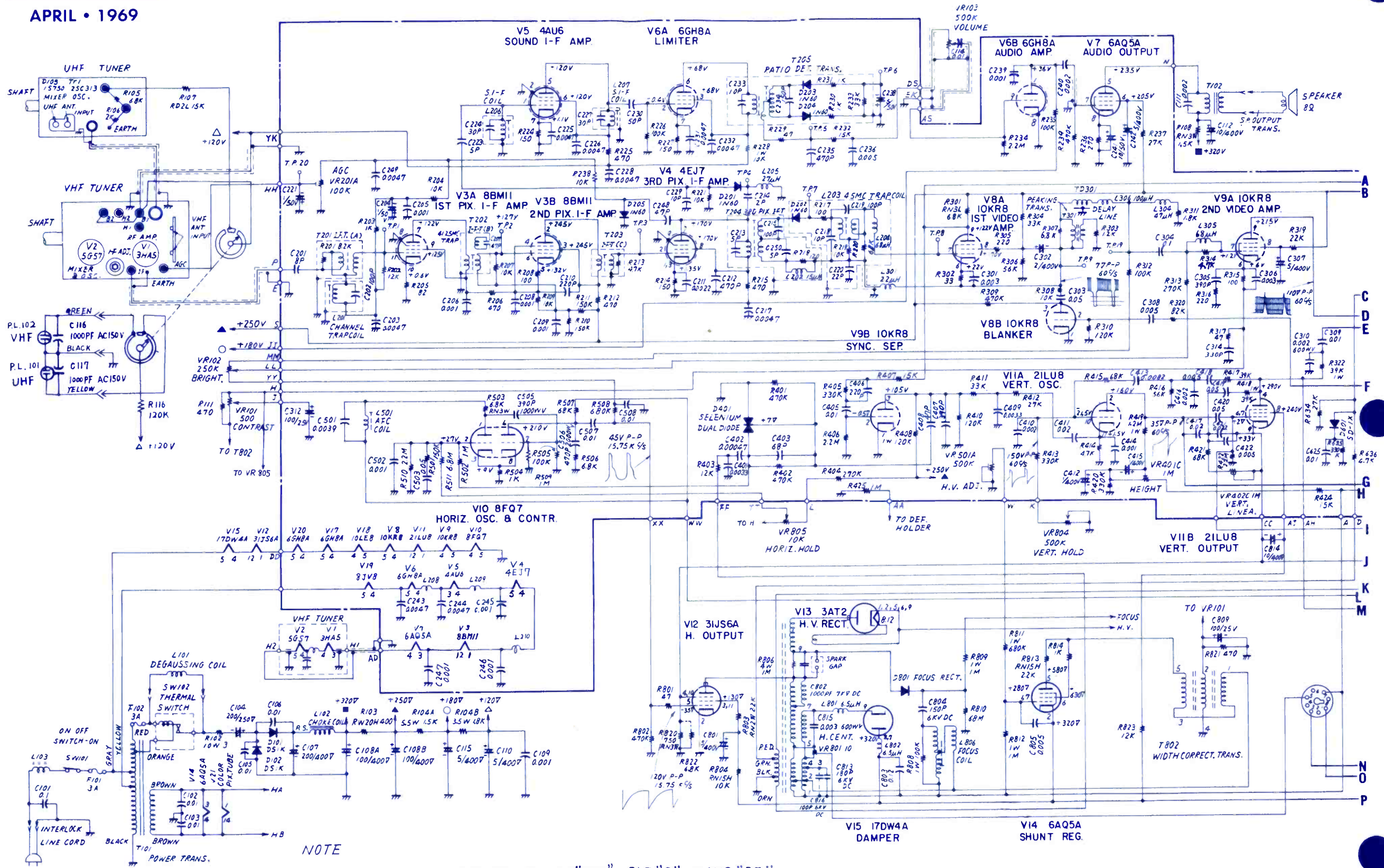


SYMBOL	DESCRIPTION	OLYMPIC PART NO.
CLJ61543	coil assy AFC	TD 469
CKJ61456	coil choke	TDT 464
CKJ61455	coil choke	TRT 766
CKJ61542	coil choke	TRT 767
CLJ61534	coil inductor	TRT 565-5
CLJ61451	coil inductor	TRT 565-7

CLJ61536	coil color phase	TRT 700 H
CLJ61537	coil color phase	TRT 750 H
INJ61435	diode dual selenium	EP 2798
REJ61541	resistor	EP 3572
SWJ60222	switch ther	EP 4246
CLJ61538	spark gap	EP 3798 J
SAJ61533	xformer assy width coil	EP 2835
		TDT 458 H

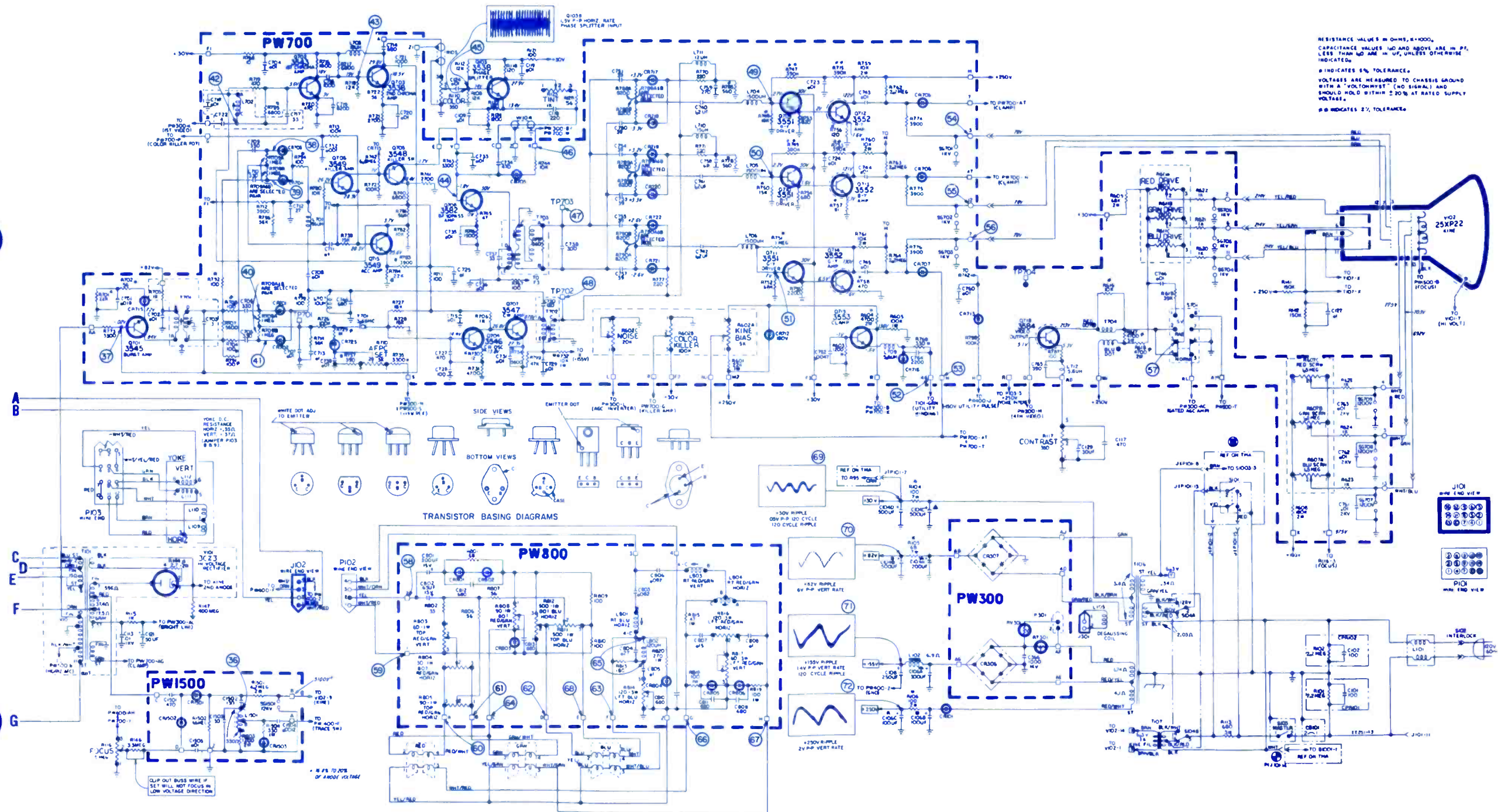
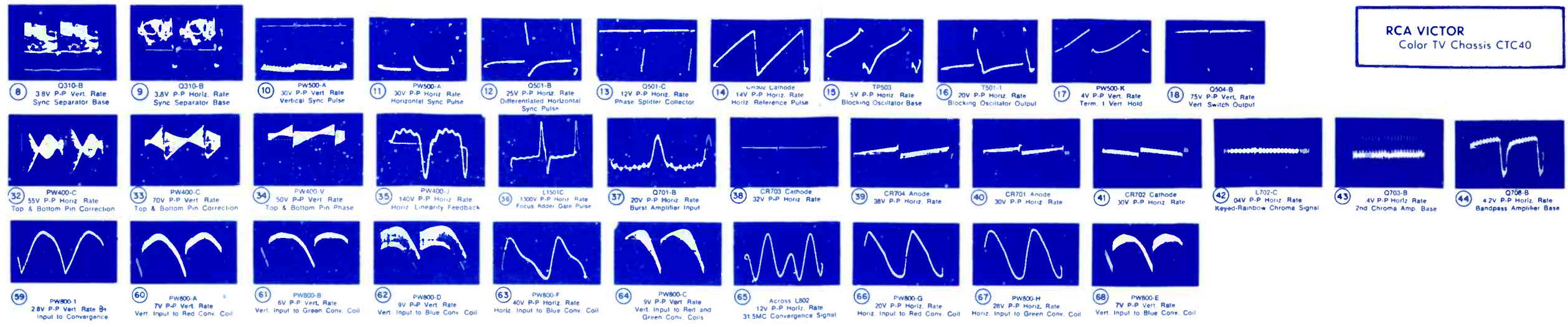
TRJ61531	xformer assy HV	TDT 484 K
CLJ61446	xformer assy burst phase	TRT 747
CLJ61453	xformer assy peaking	TRT 745 H
CLJ61535	xformer assy peaking	TRT 739 I
TRJ61532	xformer power	ETLT 211H
TRJ61530	xformer vert output	TDT 405 J
TRJ61529	xformer 1st band pass	TRT 675
TNJ61433	trans	IS 1621
CLJ61521	yoke def	TDT 483-1

APRIL • 1969



NOTE

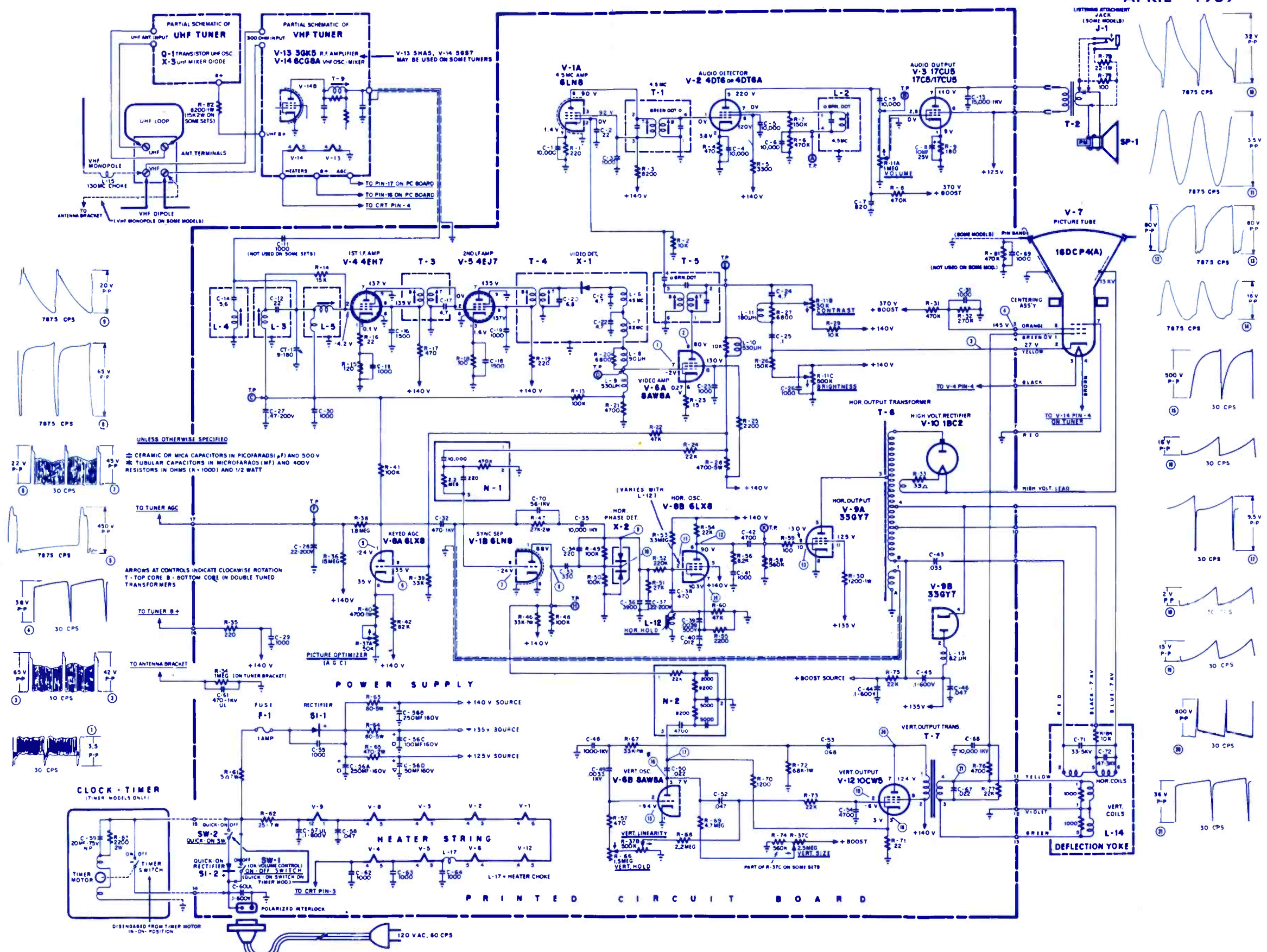
1. ALL CAPACITANCE VALUES ARE IN "MF", BUT "P" MEANS "PF"
2. ALL RESISTANCE VALUES ARE IN OHMS. K = 1,000, M = 1,000,000.
3. VOLTAGES ARE MEASURED TO CHASSIS GROUND WITH AN "ELECTRONIC VOLTMETER" & WITH NO SIGNAL INPUT & SHOULD HOLD WITHIN ± 20% WITH 120V. AC SUPPLY.



SYMBOL	DESCRIPTION	EMERSON PART NO.
R-11A	Vol cont-1M	391004
R-11B	Contrast cont-30K	391004
R-11C	bright cont-500K	391004
R-37A	picture optimizer cont-50K	391003
R-37B	vert lin cont-500K	391003
R-37C	vert size cont-2.5M	391003
R-66	vert hold cont-1.5M	391005
CT-1	cap-var trimmer-9 to 180pf	900227

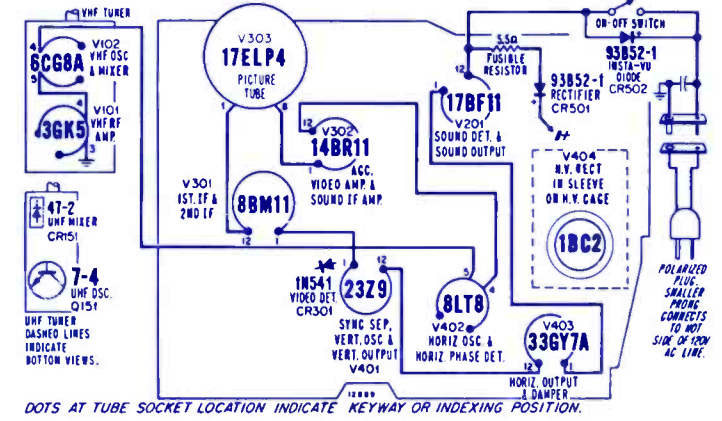
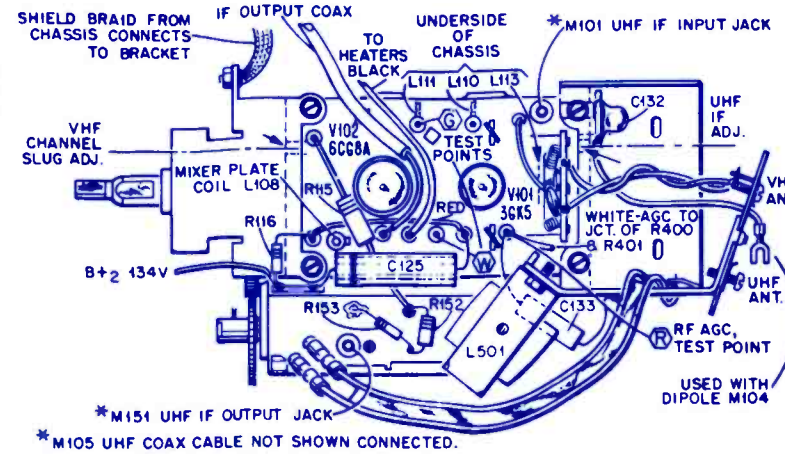
C-56A	cap-elec-250μf @160v	925700
C-56B	cap-elec-250μf @160v	925700
C-56C	cap-elec-100μf @160v	925700
C-56D	cap-elec-50μf @160v	925700
L-2	sound quad coil-4.5MHZ	720404
L-12	horiz osc coil	716165
L-14	defl yoke assy	708534
L-16,17	filament choke	705031
T-1	sound interstage 4.5MHZ	720513

T-2	audio output xfmr (part of sp-1)	720454
T-3	if xfmr interstage	720455
T-4	if xfmr video det	720512
T-5	sound take-off xfmr 4.5MHZ	738227
T-6	horiz output xfmr	738226
T-7	vert output xfmr	808256
F-1	fuse 1a	923059
N-1	couplate-sync separator	923159
N-2	couplate vert integrator	817077
X-1	diode video det type IN295	



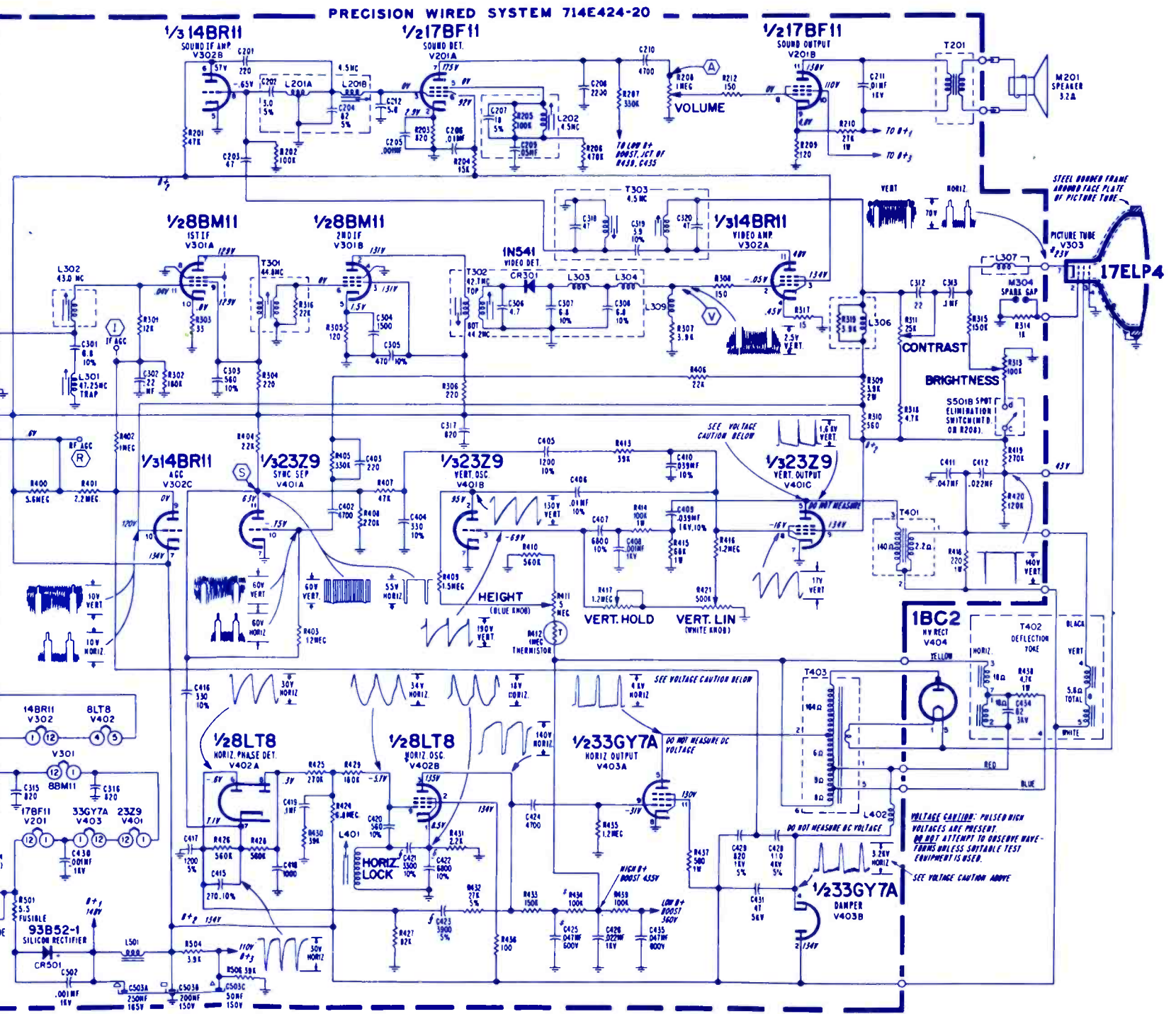
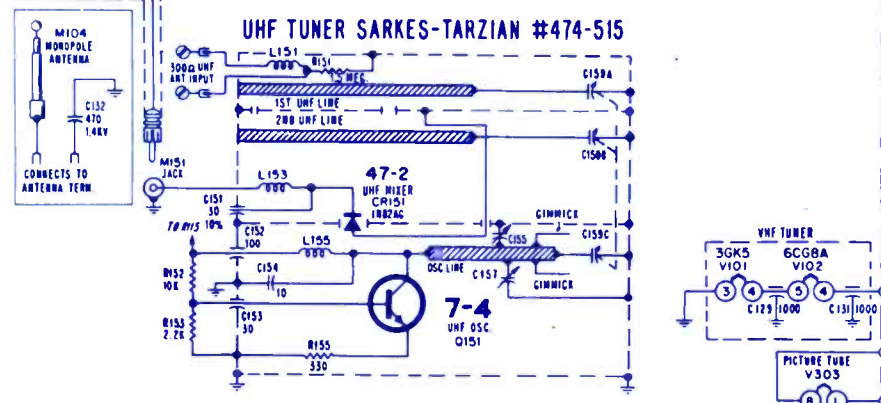
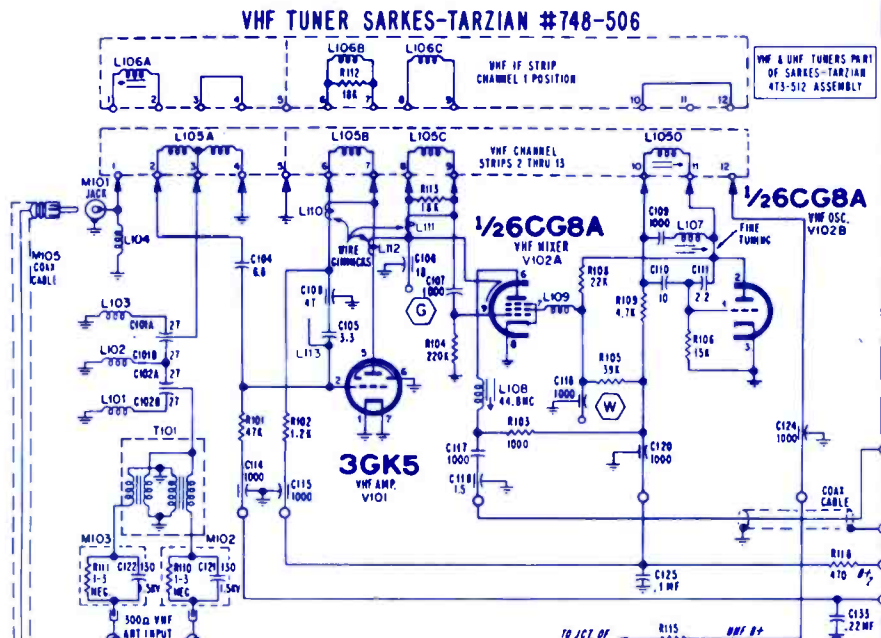
COMPLETE MANUFACTURERS' CIRCUIT DIAGRAMS AND TECHNICAL INFORMATION FOR 6 NEW SETS

VHF-UHF Tuner Assembly, Showing Connections, Alignment and Test Point Locations.



SYMBOL	DESCRIPTION	TRUETONE PART NO.
R208	1M vol cont on-off switch S501 inc. R311 and R313	75C126-2
R311	cont cont 25K	part of R208
R313	bright cont 100K	part of R208
R411	5M height cont	74C101-16
R412	1M therm	61C41-2
R417	1.2M vert hold cont	75C100-8
R421	500K vert line cont	75C101-17
R501	5.5A fusible	61B48-1
C204	82pf 500v 5% NPO cer disc	65D10-98
C207	18pf 500v 5% N220 cer disc	65D10-140
C212	5.6pf 500v 5% NPO cer disc	65D10-356
C503A	250µf 165v elec	67D30-12
C503B	200µf 150v elec	67D30-12

C503C	50µf 150v elec	67D30-12
L201A&B	sound if phase shift coil inc C212	72C301-4
L202	quad coil inc C207 & R205	72C132-82
L304	RF choke	73C31-3
L306	video peak wound on R319	73C5-46
L307	video peak	73C5-40
L401	horiz lock coil	94D17-19
L501	filter choke	74D18-60
T201	audio output xlfomer	79D124-1
T301	1st IF xlfomer	72C308-2
T302	2nd IF xlfomer	72C310-1
T303	3rd IF & sound trap	72C185-7
T401	vert output xlfomer	79C123-1
T402	def yoke assy	700D814-5
T403	horiz output	79D117-5



NOTE: PLUG AND SOCKET OF LINE CORD IS POLARIZED. SMALLER PIN CONNECTS TO HOT SIDE OF 120V AC LINE.

SCHEMATIC NOTES:

- CHASSIS GROUND. → PUSH-ON CONNECTOR.
- PART NOT MOUNTED ON PRECISION WIRED SYSTEM.
- VOLTAGE WILL VARY WITH SETTING OF CONTROLS.
- RESISTOR VALUES IN Ω WATT Ω W. CAPACITOR VALUES IN MICROFARADS, UNLESS OTHERWISE INDICATED.
- DC VOLTAGES MEASURED AT 120V AC LINE, NO SIGNAL.
- MAX. CONTRAST & BRIGHTNESS A MIN VOLUME WITH VFM.
- COMPONENT MOUNTED AT UNDERSIDE OF PRECISION WIRED SYSTEM.



OVERHAUL

\$9.75

GUARANTEED for 1 Year

OVERHAUL \$9.75 • REPLACEMENT TUNERS... \$10.45

Nine-seventy-five buys you a complete tuner overhaul—including parts (except tubes or transistors)—and absolutely no hidden charges. All makes, color or black and white. UV combos only \$15.

Guaranteed means a full 12-month warranty against defective workmanship and parts failure due to normal usage. That's 9 months to a year better than others. And it's backed up by the only tuner repair service authorized and supervised by the world's largest tuner manufacturer—Sarkes Tarzian, Inc.

Four conveniently located service centers assure speedy in-and-out service. All tuners thoroughly cleaned, inside and out... needed repairs made... all channels aligned to factory specs, then rushed back to you. They look—and perform—like new.

SEND ORDERS FOR UNIVERSAL AND CUSTOMIZED REPLACEMENT TUNERS TO OUR OFFICE IN INDIANAPOLIS.

Prefer a universal replacement? Sarkes Tarzian will give you a universal replacement for only \$10.45. This price is the same for all models. The tuner is a new tuner designed and built specifically by Sarkes Tarzian for this purpose. It has memory fine tuning—UHF plug-in for 82 channel sets—universal mounting—hi-gain—lo-noise.

ORDER TUNERS BY PART NUMBER, AS FOLLOWS:

Part #	Intermediate Frequency	AF Amp Tube	Osc. Mixer Tube	Heater
MFT-1	41.25 mc Sound 45.75 mc Video	6GK5	6LJ8	Parallel 6.3V
MFT-2	41.25 mc Sound 45.75 mc Video	3GK5	5LJ8	Series 450 MA
MFT-3	41.25 mc Sound 45.75 mc Video	2GK5	5CG8	Series 600 MA

Prefer a customized replacement tuner? The price will be \$18.25. Send us the original tuner for comparison purposes, also TV make, chassis and model numbers.

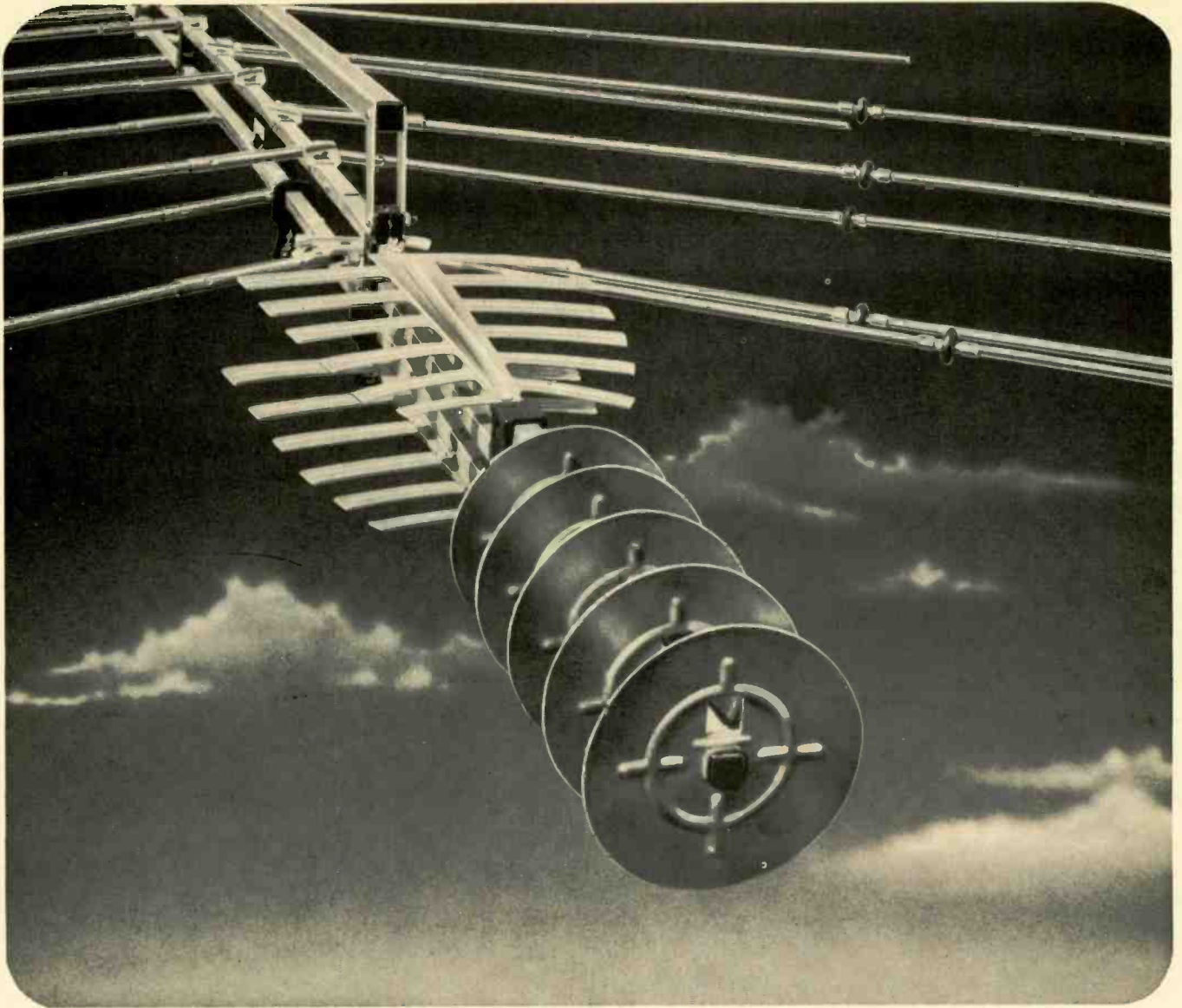


TUNER SERVICE CORPORATION FACTORY-SUPERVISED TUNER SERVICE

- MIDWEST..... 817 N. PENNSYLVANIA ST., Indianapolis, Indiana TEL: 317-632-3493
(Home Office)
- EAST..... 547-49 TONNELE AVE., Jersey City, New Jersey TEL: 201-792-3730
- SOUTH-EAST..... 938 GORDON ST., S. W., Atlanta, Georgia TEL: 404-758-2232
- WEST..... SARKES TARZIAN, Inc. TUNER SERVICE DIVISION
10654 MAGNOLIA BLVD., North Hollywood, California TEL: 213-769-2720

WATCH FOR NEW CENTERS UNDER DEVELOPMENT

... for more details circle 138 on postcard



There is a difference.

When our engineers designed our LPV Log Periodic antennas, they added something that made our antennas really different:

1. **Patented capacitor-coupled log periodic-V dipoles** that operate on both the fundamental *and harmonic* modes for higher gain and front-to-back ratios than other VHF antennas with more elements.

2. **Log Periodic trapezoid drivers** for amazingly high (but uniform) frequency response on all UHF channels.

3. **Radar-type disc-on-rod director system** that vastly increases signal capture across entire UHF band. Rejects multi-path reflections.

Is it any wonder JFD Color Laser and LPV Log Periodic TV antennas outperform antennas larger in size and number of elements?

Is it any wonder why professional installers who count on antenna gain (not the element numbers game) prefer JFD — the *scientifically* designed antenna with the college education?

Call your JFD distributor and see the difference in spectacular color and black-and-white.

And while you're at it, ask him about our versatile new solid state Program Center amplifier-distribution systems.

JFD[®]

LICENSED UNDER ONE OR MORE OF U.S. PATENTS 2,959,081, 2,985,879, 3,011,154, 3,108,260, 3,150,376, 3,210,767, RE. 25,740 AND ADDITIONAL PATENTS PENDING IN U.S.A. AND CANADA. PRODUCED BY JFD ELECTRONICS CO. UNDER LICENSE FROM THE UNIVERSITY OF ILLINOIS FOUNDATION.
LICENSED UNDER ONE OR MORE OF U.S. PATENTS 2,955,287 AND 3,015,821 AND ADDITIONAL PATENTS PENDING.

JFD ELECTRONICS CORP.

15th Avenue at 62nd Street, Brooklyn, N. Y. 11219

JFD International, 64-14 Woodside Ave., Woodside, N. Y. 11377 JFD Canada, Ltd., Toronto, Ontario, Canada
JFD de Venezuela, S.A., Avenida Los Haticos 125-97, Maracaibo, Venezuela

... for more details circle 119 on postcard

ELECTRONIC TECHNICIAN/DEALER

ELECTRONIC TECHNICIAN / DEALER

WORLDS LARGEST ELECTRONIC TRADE CIRCULATION

APRIL 1969 • VOL. 89 No. 4

**HUGH "SCOTTY"
WALLACE**
Publisher

PAUL DORWEILER
Editor

JOSEPH ZAUHAR
Technical Editor

MARTIN PADLEY
Field Editor

DONNA BUTLER
Production Editor

BOB ANDRESEN
Art Editor

RUTH GELINEAU
Circulation Manager

JOHN KESSLER
Manager, Reader Services

JUDI LeMAY
Advertising Production

OFFICES

71 Vanderbilt Ave.
New York, N.Y. 10017
Phone: (212) 686-2200
Telex: 01-26286

43 East Ohio St.
Chicago, Ill. 60611
Phone: (312) 467-0670
Telex: 02-53549

Harbrace Building
Duluth, Minn. 55802
Phone: (218) 727-8511
Telex: 02-94417

MARKETING REPRESENTATIVES

HUGH "SCOTTY" WALLACE
Chicago: (312) 467-0670

ALFRED A. MENEGUS
New York: (212) 686-2200

DONALD D. HOUSTON
Los Angeles: (213) 872-1572

ROBERT UPTON
Tokyo, Japan
I.P.O., Box 5056

HARBRACE PUBLICATIONS, INC.

JAMES MILHOLLAND, JR.
President

DEAN MYHRAN
Executive Vice President

RICHARD MOELLER
Treasurer

JOE WOLKING
Senior Vice President

LARS FLADMARK
Senior Vice President

HARRY RAMALEY
Vice President

BEN MARSH
Vice President

JAMES GHERNA
Art Director

WILLIAM SWAIN
Sales Promotion Manager

WARREN BODIN
Ad Production Manager

39 TEKLAB REPORT

The new RCA CTC40 chassis review is continued this month as our Electronic Technician/Dealer lab technicians explain the operation and service of the horizontal, focus and high voltage circuits

45 UP-DATING THE EICO 368

Technicians will find this feature of interest as it outlines the procedure for installing a marker adder stage in this and similar sweep generators

48 INSTALLING HOME MATV SYSTEMS

A review of what goes into a home MATV system and how it is installed should be of special interest to dealers who want to expand their market capabilities to meet the increased consumer use of TV and FM receivers

52 TWO-WAY RADIO ON THE GO

Part two of this series gets into practical transmitter troubleshooting and service of citizen's band equipment including the latest in SSB, synthesized, single and dual conversion AM units

57 TV SERVICE IN CATV AREAS

This timely feature explains why areas covered by CATV can bring you added service business and some of the practical service procedures necessary to optimum set operation

60 TESTLAB REPORT

The all new Sencore MU 150 tube tester and the Lectrotech SCA-300 Sweep Circuit Analyzer are the subjects of this month's lab report

22 EDITOR'S MEMO

24 LETTERS TO THE EDITOR

28 BOOK REVIEWS

30 TECHNICAL DIGEST

64 DEALER SHOWCASE

68 COLORFAX

74 NEW PRODUCTS

76 NEWS OF THE INDUSTRY

82 CATALOGS AND BULLETINS

86 AD INDEX

COVER

The two-way radio service business is a sophisticated enterprise as evidenced by the impressive array of modern instruments on this month's cover.

TEKFAX • 16 PAGES OF THE LATEST SCHEMATICS • GROUP 200

ADMIRAL: TV Chassis T10H1-1AX

AIRLINE: TV Model GEN-11769B

EMERSON: TV Chassis 120914A,B

OLYMPIC: Color TV Chassis CT-1940

RCA VICTOR: Color TV Chassis CTC40

TRUETONE: TV Model 2DC3916

ELECTRONIC TECHNICIAN/DEALER is published monthly by Harbrace Publications, Inc., Harbrace Building, Duluth, Minnesota 55802, a subsidiary of Harcourt, Brace & World, Inc. Subscription rates: One year \$5, two years \$8, three years \$10, in the United States and Canada. Other countries: One year \$9, two years \$14, three years \$18. Single copies 75¢ in the United States and Canada; all other countries: \$2.00. Second class postage paid at Dansville, New York, and at additional mailing offices. Copyright 1969 by Harbrace Publications, Inc.

POSTMASTER: Send Form 3579 to ELECTRONIC TECHNICIAN/DEALER, Harbrace Building, Duluth, Minnesota 55802.



1N1040

95298

2SA374

40110

3N37

121-151

2SD130

40253

121-451

40310

48-134478

2N1772

2SC488

2N1479

A2E

Only one cross reference guide lists replacements for these semiconductor numbers (and 18,000 others). Ours!

Most of these are manufacturers' "house" numbers used in such consumer products as TV, stereo and radio. And the Motorola HEP Cross Reference Guide is the only one that lists them all . . . replacements for over 18,000 semiconductor part numbers. Even Japanese and other foreign makes are covered in depth.

Yes, we've got your number. In one convenient Guide. And the specified Motorola HEP replacement probably does the job better than the original.

See your Motorola HEP distributor for a copy of the latest Motorola HEP Cross Reference Guide (HMA07). It's free!

Get HEP and get HAPPY!



MOTOROLA HEP SEMICONDUCTORS

P. O. BOX 20924 / PHOENIX, ARIZONA 85034

... for more details circle 126 on postcard

Quality Lacks Control

A recent survey by the National Federation of Independent Business, Inc., contains some interesting comments about the problems of quality control in manufacturing and why it appears to be sliding.

The survey, taken by the federation's research staff, indicates little doubt that imperfect goods are being sold. This was based on comments from more than 100,000 respondents.

They cite a typical example from a Wisconsin TV and radio dealer with five employees, who says, "I am particularly concerned about the poor quality control on TV and radio receivers we get to sell. I would estimate that 50 percent have to be fixed in one way or another before they can be sold. I hired a full-time man at five dollars per hour and he worked for me for four and a half weeks fixing new merchandise before I could sell it. Seems ridiculous, but it is a vicious cycle."

The federation's report goes on to say that the problem of quality plagues the independent retailer and wholesaler because they don't want to jeopardize their customer relations by knowingly selling them shoddy merchandise.

One report came from a writer for the WALL STREET JOURNAL who worked as a clerk in a New York discount house during the Christmas season. The report indicated that clerks sold merchandise they knew was defective in the hopes that only a certain percentage would be returned.

The federation's report was summarized by saying "It seems that government, instead of attacking corporation managements on the matter of quality control, would serve the consumer better by attacking unions and government bureaus which make the disciplining of sloppy or inefficient production workers a major project for management."



Paul A. Horvath

FAST

COMPLETE SERVICE ON ALL MAKES OF TV TUNERS

Maximum Time In Shop 24 Hrs.

(WE SHIP C.D.D.)
YOU PAY SHIPPING
\$9.95



Black &
White
or Color

VHF or
UHF

UV Combo's \$16.50

Price includes all labor and parts except Tubes, Diodes & Transistors. If combo tuner needs only one unit repaired, disassemble and ship only defective unit. Otherwise there will be a charge for a combo tuner. When sending tuners for repair, remove mounting brackets, knobs, indicator dials, remote fine tuning arrangements and remote control drive units.

EFFECTIVE AUGUST 1, 1969

All tuners must have remote control units and/or mounting brackets removed before tuner can be cleaned and repaired. If these accessories are left on tuner, there will be a \$2.00 charge for disassembly and reassembly.



All tuners are serviced by **FACTORY TRAINED TECHNICIANS** with years of experience in this specialized field. All tuners are **ALIGNED TO MANUFACTURER'S SPECIFICATION** on crystal controlled equipment and air checked on monitor before shipping to assure that tuner is operating properly.

GEM CITY TUNER REPAIR SERVICE

Box 6D Dabel Station
2631 Mardon Drive
Dayton, Ohio 45420

... for more details circle 113 on postcard

ET/D

LETTERS TO THE EDITOR

Manufacturers Don't Reply

I am writing this letter to voice a gripe about the U.S. manufacturers who feel that they are too big to answer letters from technicians requesting parts or assistance in the form of schematics. Here in Iceland the exchange gets all kinds of new products and since my shop is the only one available to the Armed Forces personnel stationed here, I get a little bit of everything. It is not uncommon for me to have a piece of gear awaiting parts for 8 to 10 months. I can't even get some of these people to answer some of my letters. If they do, they come back with some kind of nonsense like "We have forwarded your letter to our office in San Francisco to expedite delivery to you." This just doesn't make sense as all our mail comes through FPO, New York.

This shop is a joint effort. My wife works during the days when I am at my Air Force job and I work nights. I currently employ six technicians and a part-time clerk.

Several thousand dollars worth of foreign equipment goes through our shop every month and we don't have as much trouble getting parts for these as we do for American-made gear. If other technicians have similar problems, only in reverse, have them contact me.

RICHARD W. GUYER

Base TV Repair Shop
Keflavik, Iceland
HQ. SQ. SEC., AFI, BOX 617
FPO N.Y. 09571

TV Interference

Many TV service organizations assume no responsibility for outside interference and they are not giving their customers the service they are entitled to. Many interference problems are readily solved by the use of various filters and traps.

Many TV servicemen and dealers are not aware of the fact that TV manufacturers furnish high-pass filters for the elimination or reduction of interference problems from sources below 52MHz.

FM band stop filters are available for the solution of interference problems from strong, local FM stations. Various companies manufacture special filters and traps for the alleviation of interference problems.

How many TV servicemen and dealers are aware of the Anti-Noise

Bill, HR14910, which has been passed and which permits the Federal Communications Commission to regulate the manufacture, import, shipment, sale or use of incidental radiation devices capable of causing interference to radio communications?

This means that the manufacturers of appliances that have caused considerable interference problems to TV and other radio services in the past, must now design and filter their products to eliminate the interference problem. Appliances are only one area that the bill covers.

We believe that you could render your readers a great service by featuring an article on interference problems and solutions to the problem.

We know that many TV technicians and dealers are in the dark when confronted with an interference problem.

D. C. RASMUSSEN

BTARC Interference Committee
Belvidere, Ill. 61008

Business for Sale

I have an excellent business here in southeast Florida in the fastest-growing county in the country, but the time has come for me to step down and seek retirement.

It would be an excellent opportunity for one or two younger men to take over a fully equipped and going business that is well established. If you can pass this along to your readers, I would be glad to furnish particulars.

I have enjoyed your publication for many years and am unable to recall ever having been disappointed with the contents. There is something for everyone interested in electronics. I shall miss it when I no longer subscribe.

FRED W. VON TSCHAMMER
2476 N. Federal Highway
Lighthouse Point, Fla. 33064

Lost Confidence

As a member of a company which manufactures "Japanese Junk" selling for \$1000 and up, I wish to take issue with Mr. Neuman's letter printed in your February Letters column.

We have tried using independent service stations to maintain our equipment with the result that we no longer trust our gear in the hands of you nit-wits.

Only Japanese are able to repair Japanese equipment. They have a pride in their work and the capacity to keep abreast of advances in technology which seem totally lacking in the American servicemen who, if they were really any good, would be working for a manufacturer. What is left for the service stations are those who

I'm glad you asked that question...

Who offers the most profit in tuner service? They tested us and learned:

Would you believe PRECISION TUNER SERVICE does?

If you're one of our thousands of long-time customers, you've already had it proven to you DAY AFTER DAY.

But, if you're not, you'll want to know how we got all those happy customers—(steady, satisfied customers, that is)

- PRECISION TUNER SERVICE is dependable . . . quality work . . . no complaints . . . just conscientious service!
- PRECISION TUNER SERVICE uses only ORIGINAL PARTS . . . no home-made or make-do inferior merchandise! (This is why we charge extra for major parts!) You get your tuner back in ORIGINAL EQUIPMENT condition.
- PRECISION TUNER SERVICE is fastest! Speedy 8-hour service . . . every time. No phone calls. No wondering.
- PRECISION TUNER SERVICE is more profitable! The cost is less . . . up to \$5.50 less than other tuner service! Major parts, tubes, transistors charged at net price. UV Combos—\$14.95

**AND NOW FOR EVEN FASTER SERVICE—
A BRANCH PLANT IN TEXAS AND CALIFORNIA, TOO!**

Why don't you test us and find out?
Don't make it easy on us . . .

***don't give us a break!
you get...***

***Fast 8 hr. Service!
\$8⁹⁵***

1 Yr. Guarantee

For finer, faster PRECISION TUNER SERVICE,
send faulty tuner with tubes, shields and all
broken parts to:



PRECISION TUNER SERVICE

one of the OLDEST and LARGEST tuner service companies in the country

WEST: 2325 WALDORF
TURLOCK, CALIF. 95380
TEL. 209, 632-2928

HOME OFFICE: 1210 S. WALNUT
BLOOMINGTON, IND. 47401
TEL. 812, 339-9653

SOUTH: 332 W. TYLER
LONGVIEW, TEX. 75601
TEL. 214, 753-4334

Use Aerovox capacitors available from your local AEROVOX DISTRIBUTOR

He's your best "one-stop" source for virtually every replacement capacitor you require. He carries the complete Aerovox line which includes: ceramics, micas, electrolytics, papers, film and interference filters. So no matter what your replacement requirement, you're sure to find it at an Aerovox Distributor.

service it
FAST
with
components
that
LAST!



AERVOX
Hi-Q
AERVOX
CORPORATION

DISTRIBUTOR SALES, New Bedford, Mass. 02741

... for more details circle 101 on postcard

ET/D

**LETTERS
TO THE EDITOR**

just manage to squeeze through tech school with a D- average.

The manufacturer is forced into the position of either doing the service himself or designing products which can be thrown away after their useful life.

The manufacturer of precision equipment employs his own field-service force and in addition designs his units smaller and smaller so that they can be cheaply shipped to and from his service centers.

The American service station has lost the confidence of both the customer and the manufacturer. There is a long, uphill road ahead if you want to get that confidence back.

JOSEPH MANN

Woodside, N.Y. 11377

Readers' Aid

I have been in the radio selling and repairing business since I was 11 years old when radio began in 1921. I am in the process of building a radio history museum showing radio models built by various firms dating back to 1921. I would like to hear from readers who may have old radios of 1921 to 1931 vintage willing to donate or sell to me. They need not be in working order. Also would like to hear from any one having tube types WD-11 and WD-12, either new or old, or even burnt out. As a subscriber, your publication is tops.

JOHN SPORNA

Sporna TV & Appliance Co.
Vinegar Bend, Ala. 36584

Could one of your readers help me obtain copies of the ELECTRONIC TECHNICIAN/DEALER TEKFAK editions.

PAUL G. YOUNG

Young's
58 Billing Rd.
North Quincy, Mass. 02171

I have an RCA 35w. ship-to-shore radio, Model ET-8056, which is in need of repair. I have been unable to obtain a schematic or service information as the manufacturer claims it is too old (20 years). I would appreciate any help you or your readers can give me. Keep up the fine work on an excellent trade magazine.

JOSEPH NIESSEN

Metropolitan TV Sales
3322 Kensington Ave.
Philadelphia, Pa. 19134

**MAKE
YOUR
OWN
TUNER TEST!**

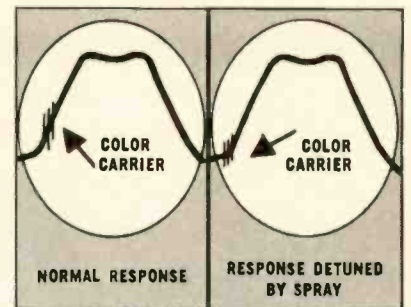
If you're like most professional TV technicians, you clean the tuner of every chassis you service.

But how careful are you in choosing your tuner spray? The wrong spray can cost you a lot in aggravation and callbacks.

That's why we ask you to

MAKE THIS TEST YOURSELF

1. Tune in a good color picture on any color set.
2. Spray the tuner with anything but a Chemtronics Spray.
3. You will see the color fade and disappear almost immediately, due to the changes of capacitance in tuned circuits caused by the spray.



4. Wait about 10 minutes for the spray to dry. Unfortunately, the color will not come back.
5. Spray the tuner with Chemtronics TUN-O-WASH.
6. Wait about two minutes and color will be restored.

WHAT THIS TEST MEANS TO YOU

Most tuner sprays leave a residue of slow drying, petroleum base lubricant. This saturates the coils and other components causing a shift in response as shown in illustration.

To compensate for this shift, you often adjust oscillator slugs. Then, when the set has played in your customer's house for a week or two, the residue dries out, shifting the oscillator back toward its original frequency. If the customer can't compensate for this drift with the fine tuner, you have a callback on your hands. Even if the drift is not too severe, the remaining residue picks up dirt and eventually "gunks up" the tuner.

TUN-O-WASH IS LIKE NO OTHER SPRAY ON THE MARKET

TUN-O-WASH is a powerful, high pressure spray designed to do just one job superlatively well. It melts away grease, oil, dirt and corrosion quickly and completely. It leaves absolutely no residue behind. Tests show that TUN-O-WASH is at least 10 times as effective as any other tuner spray in degreasing gunked up tuners.

Use TUN-O-WASH as your first step in repairing any tuner. It gives you a clean start in much the same way as the ultrasonic bath used by tuner specialists — but without harmful vibration. You'll be surprised at how many tuners you can repair the TUN-O-WASH way.

Then, once the tuner is restored to good working condition, you can lubricate it with a light spray of Chemtronics famous COLOR-LUBE, guaranteed not to detune, attack plastic parts or "gunk up." COLOR LUBE uses a unique synthetic lubricating formula developed specifically for color TV tuners.



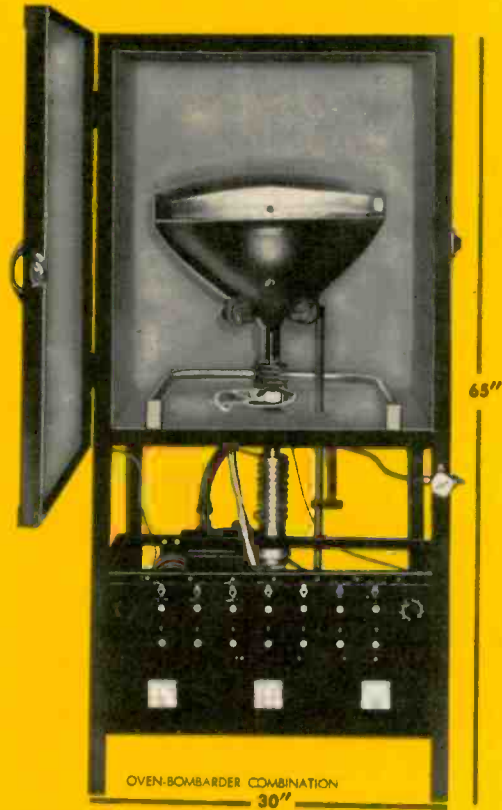
CHEMTRONICS

Giant 24 oz. can
only \$3.25 dealer net.

1260 RALPH AVENUE • BROOKLYN, N.Y. 11236

... for more details circle 106 on postcard
ELECTRONIC TECHNICIAN/DEALER

THE PROFIT-MAKER!



- REBUILDS ANY SIZE ROUND OR RECTANGULAR COLOR PICTURE TUBES . . . AVERAGE COST PER TUBE \$7.80
- REBUILDS ANY SIZE BLACK AND WHITE PICTURE TUBE . . . AVERAGE COST PER TUBE \$1.80
- FREE INSTALLATION AND TRAINING ANYWHERE IN THE CONTINENTAL U.S.A.
- FREE SUPPLIES FOR REBUILDING YOUR FIRST 50 PICTURE TUBES
- EXTREMELY EASY TO OPERATE
- INCLUDES LAMINATING AND DELAMINATING EQUIPMENT FOR REBUILDING BLACK AND WHITE AND COLOR BONDED-FACE PICTURE TUBES.
- INCLUDES ALL TOOLS FOR REBUILDING ROUND AND RECTANGULAR COLOR PICTURE TUBES
- INCLUDES ALL TOOLS FOR REBUILDING BLACK AND WHITE PICTURE TUBES

CRT COLOR CHAMPION

CRT COLOR CHAMPION . . . \$2,875.00

Mail Coupon Today for FREE CATALOG

C.R.T. Equipment Company, Inc.
2740 Old Lebanon Road
Nashville, Tennessee 37214

Telephone (615) 883-0215

(Please Print)

Name _____

Firm Name _____

Address _____

City _____

State _____ Zip _____

. . . for more details circle 110 on postcard

TRANSISTOR COLOR-TV SERVICING GUIDE. By Robert G. Middleton, published by Howard W. Sams, 112 pages, 8½ x 11. \$4.50.

This color service guide is well written and illustrated and will find use in any TV service shop. Color photos and diagrams showing current path, screen patterns and waveforms for various color circuits will be useful. Explanations are backed up by illustrations to allow easy troubleshooting procedures. Each section of a color receiver is explained in separate chapters which outline test points in each respective stage and describe what is normal and what is not. There are ten chapters in the book; the first two explain the differences between B/W and color receivers and some of the problems common only to B/W sets. Television technicians, new or old, will find this book a worthwhile guide for solid-state color servicing.

SOURCEBOOK OF ELECTRONIC CIRCUITS. By John Markus.

Published by McGraw-Hill Book Co. 864 pages plus index, over 3000 illustrations; 8½x11. \$18.50.

Regardless of your position in electronics, this book has circuits which you should find helpful. It is made up of a collection of circuits from numerous electronic publications and is one of the most complete circuit reference books we have seen in some time. The 100 circuit chapters include alarm, audio, demodulator, counters, medical, automotive, noise, photo electric, power supply, receiver, sawtooth, stereo, TV cameras, B/W and color TV, video and welding circuits, just to name a few. Each listing includes many variations of these circuits with an explanation of operation and a source of reference for the original.

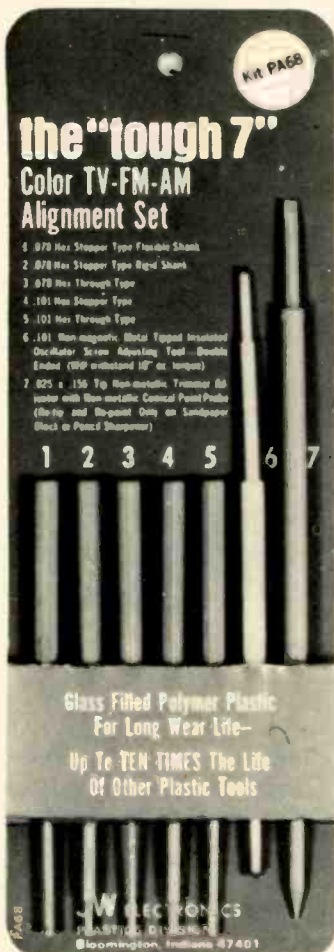
HOW TO SELECT AND INSTALL ANTENNAS. By Lon Cantor. Published by Hayden Book Co., 112 pages, 5¾ x 8¼. \$3.95.

The average technician and dealer who does only limited TV antenna

work will find this book useful, especially for its coverage of multiple antenna systems. Much of the material in the eight chapters deals with actual installation examples and explains the type and purpose of various antennas for particular applications. The book also discusses procedures for stacking antennas to reduce ghosts, fading and co-channel interference. The chapter on MATV, we feel, adds the most prestige to this work. It includes not only useful information on MATV, but also on more complex installations for 82 channel systems. The book is well written and does not waste much time in its presentation. It should be a handy reference for the professional as well as a practical guide for the beginner.

ON THE COLOR TV SERVICE BENCH. By Jay F. Shane. Published by TAB Books, Inc., 192 pages. \$4.95 paperbound, \$6.95 hardbound.

This book is written for the service technician and is definitely not a textbook. Its 14 chapters of case history problems deal with most of the circuits found in B/W and color TVs. Since the book is written by a practicing technician, most of the information is on a practical level and much of the jargon will be familiar to the service man. As case histories of service problems make up the bulk of this guidebook, it should be a handy reference source for troubleshooting. The information deals directly with causes and cures which can be applied to similar circuits in other sets. The book is well illustrated and presented so a particular service problem can be referenced without going through a number of unrelated procedures.



... WOULD YOU LIKE TO BE FIRST with a Revolutionary New Alignment Tool that will outlast, outperform anything now available?

- The "TOUGH 7" TV and FM Alignment Tool Set was engineered to overcome excessive wear and the problem of high torque and breakage of cores.
- Developed for use in factories where tools are in constant use, the "TOUGH 7" are ideal for long wear life in the field.
- Handy for the caddy and also for the work bench.
- Competitively price (Kit suggested net—\$2.95).
- Individual tools available. (When ordering tools in bulk, order by kit PA68 and tool size).
- Shipped from stock.

For full details, see your distributor or write

JW Electronics Plastics Division
Highway 48 AT OARD ROAD
BLOOMINGTON, INDIANA 47401
AC 812 - 332 - 0665

LEN FINKLER, LTD.
2 Tycos Drive
Toronto, Canada
AC 416 - 781 - 5231



Replacement quality you can depend on...

Zenith engineered and produced Color Picture Tubes!

Europium activated rare earth phosphor for redder reds, brighter greens, more brilliant blues.

Zenith's aluminization process adds to color brightness.

Cinelens® picture glass transmits more light. And its dust-tight seal ends the need to clean interior glass surfaces.

Tube funnel assembly.

Zenith precision 3-gun assembly.

3-point mounting system for perfect alignment of face plate, frame and shadow mask. Prevents shifting of color after tube warm-up.

Every Zenith replacement picture tube is made with the same care and engineering skill that go into the color TV picture tubes which Zenith produces as original equipment.

Zenith's uncompromising quality standards—which include tube testing at elevated line voltages for long periods—assure your customers of tubes with greater dependability and longer life.

Be sure. Order genuine Zenith picture tubes—for color or B&W TV—from your Zenith Distributor.

EXCITING SURPRISES FOR YOU—and Your Family! Fun for all!
Get the details at your Zenith Distributor's Parts Department.

Why not sell the best

ZENITH

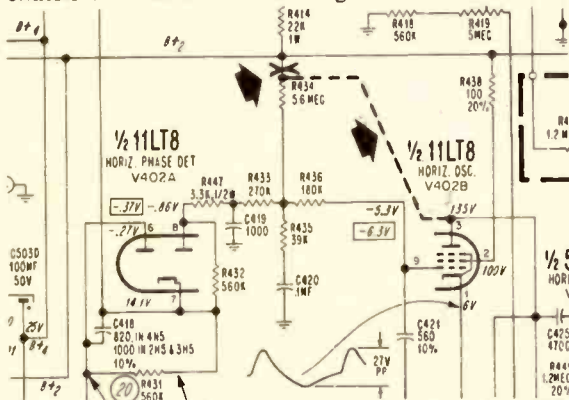
The quality goes in before the name goes on

Zenith B&W replacement picture tubes are made only from new parts and materials except for the glass envelope which, prior to reuse, is inspected and tested to the same high standard as a new envelope. Zenith color picture tubes may contain used material which, prior to reuse, is carefully inspected, to meet Zenith's high quality standards.

ADMIRAL

TV Chassis H1/H2/H3/H4—Slow Starting

In the January Technical Digest, a change was made in the horizontal oscillator circuit of the H1, H2, H3 and H4 chassis to correct slow starting or intermittent oscilla-



tors. This same condition has been noted in the H5 and MH5 series chassis and is corrected in the same manner.

Disconnect R434 from B+2 and connect it to the plate of V402B as shown in the diagram. Please note this change

in your S1070, S1078 and S1090 series service manuals.

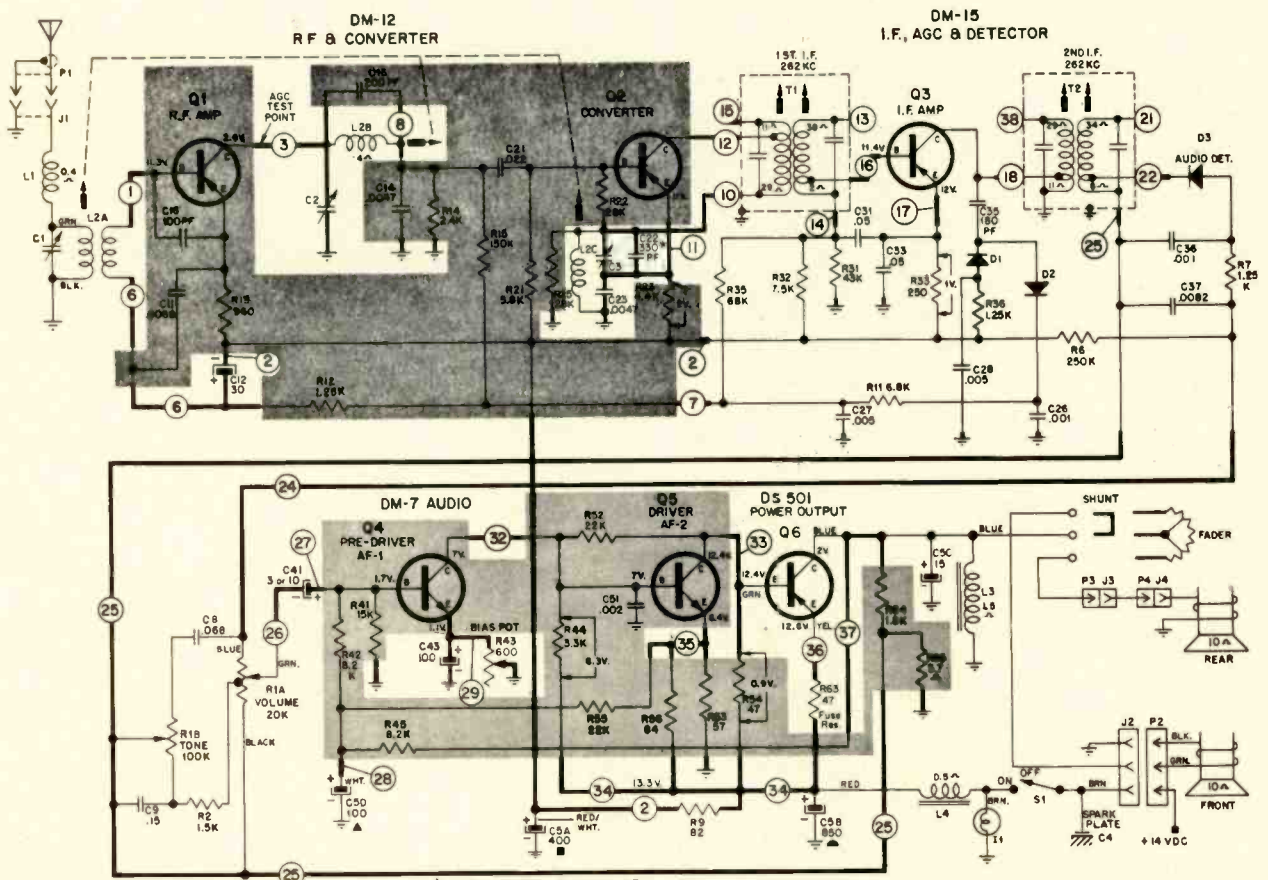
Instant Play Feature

The "instant play" feature on current ac-dc portable television receivers can be added to older ac-dc television receivers by adding a diode, 93B52-1, across the ac switch. This feature cannot be added to ac-dc sets that use a filament transformer, a full-wave power supply or that have the remote control feature. The added diode must be connected so that it is of the opposite polarity to the one in the power supply. Our current portable B/W schematics show how the diode is connected. This feature will allow the tube filaments to operate at half their normal drain while everything else is shut off. The slight added cost of operation is usually offset by fewer service calls.

DELCO RADIO

Radio Model 94BPB3/94EPB3—Troubleshooting Procedures

The 1969 Riviera, model 94EPB3, will have the first three-module radio. Buick, model 94BPB3, will also use the three-module circuit. The three-module radio requires an entirely new concept in troubleshooting. Whole circuits are encapsulated in modules.



UNLESS OTHERWISE NOTED:
ALL RESISTORS ARE ± 10%, 1/4 WATT.
ALL CAPACITORS ARE SHOWN IN MFD AND ARE 75 VOLT OR HIGHER EXCEPT ELECTROLYTICS AND THOSE NOTED BY AN *

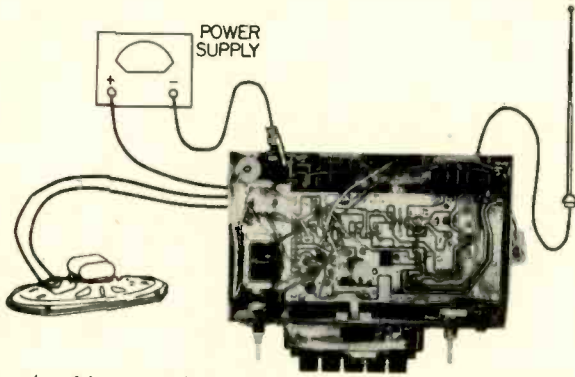
* SPECIAL CAPACITOR. SEE PARTS LIST
SHADED AREA INDICATES COMPONENTS IN MODULES
(THREE MODULE)

VOLTAGES MEASURED WITH A VTVM
NO SIGNAL AND 14 VOLTS APPLIED TO RADIO.

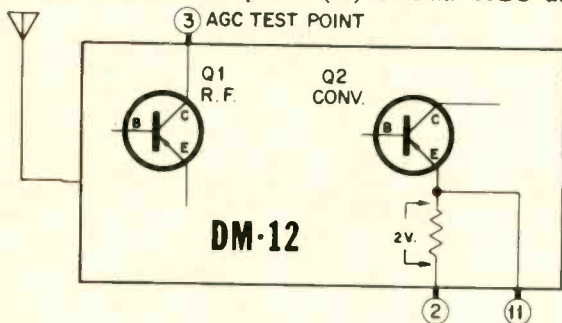
The radio consists of the audio module, DM-7, which has been in production for a year, an IF-AGC-detector module, DM-15, and an RF converter module, DM-12.

Troubleshooting Procedure

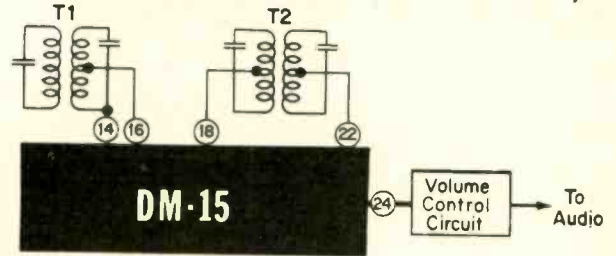
(1) Check for 2.0v at DS-501 collector. (2) If incorrect, the problem is most likely in the audio. Use standard



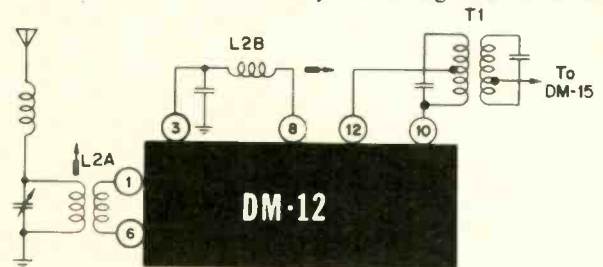
conduction bias troubleshooting procedures. (3) Check for AGC action at the test point. (A) Normal AGC action



indicates that all circuits from antenna to the primary of the 2nd IF transformer are normal. (B) Low voltage that does not vary when tuning through stations usually in-



icates trouble in the RF and converter module (DM-12) or associated components. (C) High voltage that does not vary when tuning through stations could indicate a leaky Q1 or an open AGC diode (D1 or D2) in DM-15. (4) Check for oscillator action by observing converter con-



duction when tuning radio from high to low end of band. About 0.2v increase should occur. If conduction is normal, but improper change occurs, then the problem is most likely in the tank circuit. Bridge the 330pf and .0047μf capacitors in oscillator circuit. (5) Using a noise generator, inject signal into volume control circuit. (6) Inject signal at both the input and output of T2—a weak signal should

Who needs a tuner wash? Save your money and use **QUIETROLE**

The product that cleans while it lubricates. Zero effect on capacity and resistance. Harmless to plastics and metals. Keeps color and black and white on the beam. Non-flammable.



manufactured by **QUIETROLE CO.**
Spartanburg, South Carolina

... for more details circle 127 on postcard

LOOK! A NEW **ELECTRONICS SLIDE RULE** with complete instruction program



Here's a great *new* way to solve electronic problems accurately, easily... a useful tool for technicians, engineers, students, radio-TV servicemen and hobbyists. The Cleveland Institute Electronics Slide Rule is the only rule designed *specifically* for the exacting requirements of electronics computation. It comes complete with an illustrated Instruction Course. You get four **AUTO-PROGRAMMED** lessons... each with a short quiz you can send in for grading and consultation by CIE's expert instructors.

See for yourself. Learn how to whip through

all kinds of reactance, resonance, inductance, AC and DC circuitry problems in seconds... become a whiz at conventional computations too!

This all-metal 10" rule is made to our rigid specs by Pickett, Inc... comes complete with top grain leather carrying case *and* Instruction Course. A \$50 value for less than \$25. Send coupon for **FREE** illustrated booklet *and* **FREE** Pocket Electronics Data Guide, without obligation. Cleveland Institute of Electronics, 1776 E. 17th St., Dept. ET-129, Cleveland, Ohio 44114. *TRADEMARK

GET BOTH FREE!



Send coupon today →

Cleveland Institute of Electronics

1776 E. 17th St., Dept. ET-129, Cleveland, Ohio 44114

Send **FREE** Electronics Slide Rule Booklet. Special Bonus: Mail promptly and get **FREE** Pocket Electronics Data Guide too!

NAME _____ (Please Print)

ADDRESS _____ COUNTY _____

CITY _____ STATE _____ ZIP _____

A leader in Electronics Training... since 1934

... for more details circle 108 on postcard

To service Color TV you need:

1. vectorscope
2. color bar generator
and you can't
use one without
the other!



portable



for home
or shop

only the V7 gives you both

- The only complete one unit color vectorscope/color-bar generator available anywhere!
- Completely portable for servicing color TV in the home . . . no need to bring set to the shop!
- The only one with detailed instructions on color circuit alignment and color adjustment. And, additional instructions are available as new sets are introduced!
- Recommended by leading TV manufacturers!
- Proven performance . . . over 4 years of use in field and shop by thousands of technicians . . . no other vectorscope manufacturer can make this claim!

V7 • Checks and aligns demodulators to any angle.
• Checks and aligns bandpass-amplifier circuit.
• Pinpoints troubles to a specific color circuit.

Exclusive Features: Self-Calibrating—adjust timing circuit without external test equipment, Dial-A-Line—adjust horizontal line to any width from 1 to 4. Plus: All Crosshatch, Dots, and Color Patterns; Voltage Regulated; Fully Enclosed Cable Compartment. Free copy of Wayne Lemon's Book, "Color TV Servicing Simplified with Vectorscope" Net **18950**

Remember . . . V7—the complete one

See your distributor or write Dept. ET-4
LECTROTECH, INC.
4529 North Kedzie Ave., Chicago, Ill. 60625

. . . for more details circle 123 on postcard

ET/D TECHNICAL DIGEST

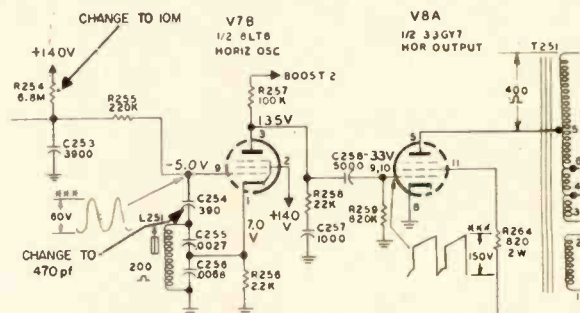
be present. (7) Inject signal at T1. A strong signal should be present at the input and a weak signal at the output. (8) Inject signal at the output of RF coil L2B. (9) Inject signal at input of RF coil L2B. (10) Inject signal at input of DM-12. (11) Inject signal at antenna socket.

GENERAL ELECTRIC

TV Chassis S/V—Intermittent Horizontal Oscillator Startup

Occasional field reports indicate horizontal oscillator startup problems on monochrome "S" and "V" chassis receivers. These chassis both employ an 8LT8 tube in the same basic oscillator circuit.

The problem appears as a "no raster" symptom when the receiver is switched on. Sometimes switching the set off and on will cause the oscillator to start. Then the receiver



may operate normally for some period of time, only to have the problem occur again a few days or weeks later. Because the problem is random and intermittent in nature, it is very difficult to pin down. Normal troubleshooting procedures do not seem to provide any answers.

First, the receiver should be checked thoroughly. Change the 8LT8 (horiz osc) tube and check all associated circuitry to determine that components are the proper value and not defective. Reduce the ac line voltage by means of a variac to 100v and check for oscillator operation. Sometimes a borderline no-start will show up under reduced line voltage.

If a chronic startup problem exists, resistor R254 should be increased in value to 10M. Original values found in "S" and "V" chassis receivers will be 4.7, 5.6 and 6.8M.

Increasing R254 resistance will reduce grid current under startup conditions raising the grid input impedance. With the circuit noise working into the higher impedance, lower energy noise is sufficient to start the oscillator.

An increase in the value of capacitor, C254, from 390pf to 470pf will also aid oscillator startup. However, changing this capacitor value can be extremely critical because C254 controls part of the temperature compensation of the horizontal oscillator. The replacement part used must be a ceramic 470pf, N750, 5%, 500v unit (G.E. Catalog No. EU18X542 or equivalent).

After changing capacitors, check the receiver for horizontal drift and hold-in range. Using a strong channel signal (preferably Channel 6) set the fine tuning for best picture and all other controls in their normal operating position.

Turn the horizontal hold control two full turns counter-clockwise. Switch to the next highest channel and then return to the original channel. Slowly turn the horizontal hold control clockwise until the picture just barely "hangs on" out of sync. You should count three or four bars just before the picture snaps into sync. Repeat this same pro-

Continued on page 80

ELECTRONIC TECHNICIAN/DEALER



No More Room at the Top?

There's always room... for improvement! And, because RCA understands this, the SK Series solid-state replacement line is constantly updated to meet your growing needs.

Backed by production excellence and premium specifications, RCA's "Top-of-the-Line" series—transistors, rectifiers, integrated circuits—is precisely engineered, manufactured, and tested for use specifically as replacements.

If you're building a name for yourself in solid-state servicing, your solid-state replacements should be RCA SK "Top-of-the-Line" devices. They are top-quality units—no cast-offs, no factory seconds, no unbranded culls.

The line is comprehensive—39 devices that can do the work of almost 13,000 others. Each unit has electrical characteristics comparable to or better than originally designed-in devices. RCA's SK series can be your answer for any needs from small signal to the newest in silicon audio output applications.

RCA SK Series and the types they replace are cross-referenced in the RCA Solid-State Replacement Guide—SPG-202G. Get your copy at your RCA Distributor. Today.

And, if you want an inexpensive way to extend your integrated circuit skill, try RCA's KD2117 Linear IC Variety Pack... includes 5 integrated circuits:



two KD2114 transistor arrays
one KD2115 audio amplifier
two KD2116 transistor arrays
plus
instructions for 12 useful
circuits, schematics,
parts lists, etc.

RCA | Electronic
Components | Harrison,
N. J. 07029



An Extraordinary Offer

to introduce you to the benefits of Membership in
ELECTRONIC TECHNICIAN'S BOOK CLUB

for a limited time only you can obtain

ALL 3
OF
THESE
UNIQUE
BOOKS

... yours for only \$199
...with Trial
Club Membership

\$199

May we send you these three unique servicing handbooks as part of an unusual offer of a Trial Membership in Electronic Technician's Book Club?

Electronic Circuit Design Handbook

A new second edition containing over 500 proven circuits, for all types of functions, selected from thousands on the basis of originality and practical application. This ever-popular circuit designer's "cookbook," with over 500 award-winning designs, is a handy compendium of design ideas. Now you can have, at your fingertips, this carefully-planned reference source of over 500 different tried and tested circuits. Selected from thousands submitted by distinguished engineers, these "thought-starters" are a collection of original 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 . . . that can be adapted or modified to suit your own specific needs. This practical information will help you solve your daily problems . . . will save you hours of time and effort. These accurate and clear circuit descriptions are supplemented by over 600 easy-to-follow diagrams, waveforms, and illustrations which contain all component values and other needed data.

Electronic Circuit Design Handbook is a GIANT of a book—an 8½" x 11" hardbound volume of 320 pages, with 19 BIG sections. To supplement its over 500 circuit designs, it contains over 600 schematic diagrams and illustrations. These tried and tested circuits constitute a vital source of ideas and techniques, and serve as "imagination triggers" for anyone who has an interest in electronic circuit design and construction. 320 pps., 19 BIG sections, over 600 illustrations, 8½" x 11". Bound in long life, flexible leatherette binding for ease of use.

Modern TV Circuit & Waveform Analysis

Here's a new book for professional TV service technicians, emphasizing the use of a triggered-sweep oscilloscope to diagnose TV circuit troubles efficiently. Written by 20-year veteran Stan Prentiss, the text explores the newest

transistorized, integrated circuit, and tube-type receivers—both color and monochrome—while not completely ignoring the tried-and-true "reliables" of the past. The author explains how individual circuits work and shows you the waveforms that should appear at strategic points, using as examples the circuitry encountered in most TV sets manufactured today.

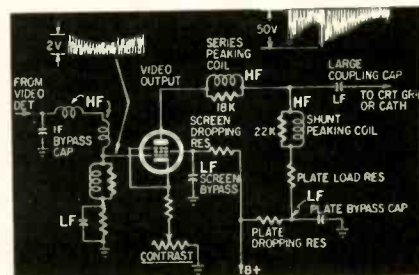
By simply referring to the more than 100 waveforms, complete with peak-to-peak and time base designations, you can quickly locate a circuit malfunction, and with the text analysis and waveform comparison you can put your finger on the defective component in short order. For those technicians who are interested in further developing their ability, the author has included a wealth of data on how to troubleshoot semiconductor circuits.

The content begins with an analysis of basic waveforms and typical waveforms found in the average TV set. Succeeding chapters deal with RF-IF circuits, second detector and video amplifier circuits, sync and AGC, vertical and horizontal deflection systems, audio circuits, and chroma circuits. Each chapter includes functional descriptions of various circuit types, the troubles you may encounter, and the waveforms you should observe when such troubles occur. The final chapter discusses techniques for troubleshooting solid-state circuits by explaining, in an easy-to-understand manner, what happens when certain defects develop in specific circuits. Also included are 15 solid-state troubleshooting charts.

Here is the information you must have if you are to keep up with the ever-increasing pace of new developments. If you plan on staying in the business of electronics servicing, you need this book!

Pinpoint Transistor Troubles in 12 Minutes

A virtual library of practical data of value to everyone who works with transistor circuits. Here is a unique servicing text you can put to immediate use, whether your interests are oriented toward home-entertainment or industrial type equipment. Experienced technicians will find it one of the most valuable references ever published on servicing all types of transistor circuits. If you service entertainment equipment, here is everything you need on all types of home and auto radios . . . PLUS transistorized TV receivers! If you service



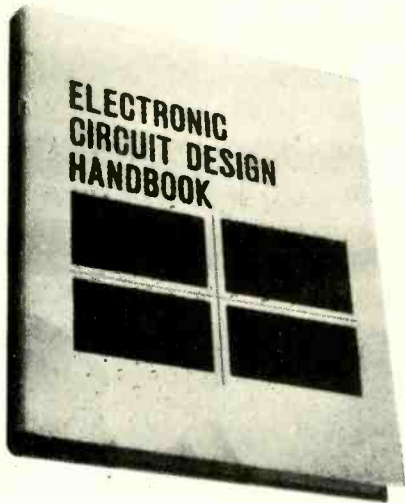
Literally scores of easy-to-use schematic diagrams are contained in all these new books. (Example shown greatly reduced in size)

commercial sound equipment, electronic organs, servo systems, transmitters, control and alarm equipment . . . EVEN computers . . . here is the troubleshooting data you need.

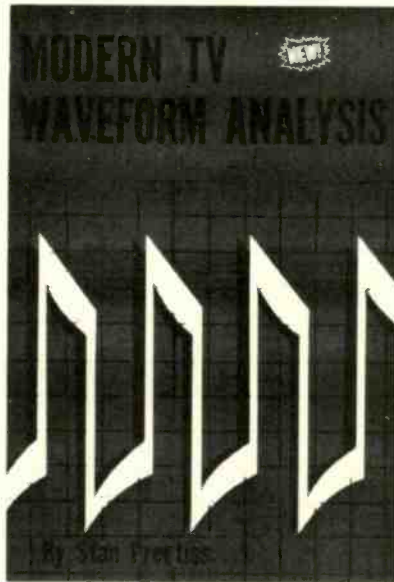
Organized so that needed information can be located quickly and easily. A quick-reference table tells you exactly where to find appropriate trouble-shooting charts and service procedures for practically every type of transistorized device. For example, under the general heading of amplifiers, specific page numbers and trouble charts are listed for these types: audio, booster, control, hearing aid, high fidelity, instrument, intercom, laboratory, megaphone, meter, microphone, mixer, phonograph, power, preamps, public address, recorder, relay, servo, stereo and stethoscope. In all, nearly 100 different types of equipment are categorized under general headings such as amplifiers, radio receivers, radio transmitters, power supplies, test instruments, and special equipment.

In the event you are unfamiliar with the operation of any circuit in question, the text gives complete information on circuit operation. Moreover, numerous commercial units, used as examples of transistor circuit design, are described in detail. Troubleshooting information and alignment data is also included. Other sections provide information on transistor and component specifications, professional test techniques, repair procedures, and servicing tips.

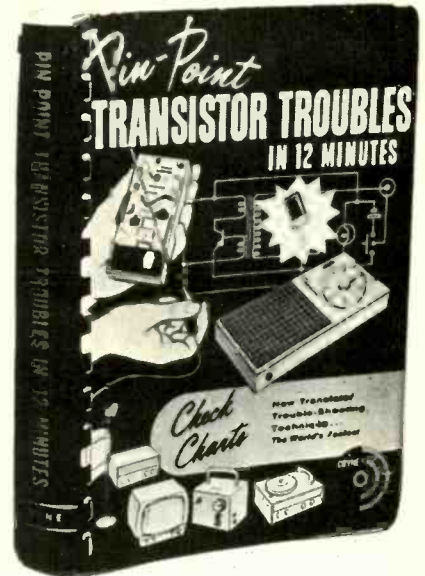
Electronic Circuit Design Handbook, *Modern TV Circuit & Waveform Analysis*, and *Pinpoint Transistor Troubles in 12 Minutes* are handsome, hardbound books, indicative of the many other fine offerings made to Members . . . important books to read and keep . . . volumes with your specialized interests in mind.



- 320 pages • **BIG** 8½" x 11" size
- Over 600 Illustrations
- 19 **BIG** Sections
- Over 500 **TRIED & TESTED** CIRCUITS



- 192 pages • 101 *illus.*
- **BRAND-NEW & Original**
- Over 200 Waveform photos
- Unique step-by-step guide



- 495 pages • 243 *illus.*
- Permanent hardbound volume
- 10 Fact-Filled Sections
- 78 Tables • Practical Data!

How You Profit From Club Membership

This 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 interest to you as an electronic technician (no hobby or "fringe" books are offered). Membership in the Club offers you several advantages:

1. Charter Bonus. *Electronic Circuit Design Handbook, Modern TV Circuit & Waveform Analysis, and Pinpoint Transistor Troubles in 12 Minutes* carry a publisher's retail price of \$30.85. But they can be yours for only \$1.99 with your Trial Membership.

2. Continuous Savings: The Club guarantees to save you 15% to 75% on the books you need.

3. Editorial Advisory Services: The Club's Editorial Advisory Board selects *only* the important books of direct interest to you.

4. Wide Selection: Members are annually offered over 50 of the authoritative books on all phases of electronic servicing. The Club makes it a point to offer new books, along with standard classics . . . lists books from *all* publishers—not just one or two.

5. 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 professional 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 professional litera-

ture published in your specific area of interest . . . and to save substantially while so doing.

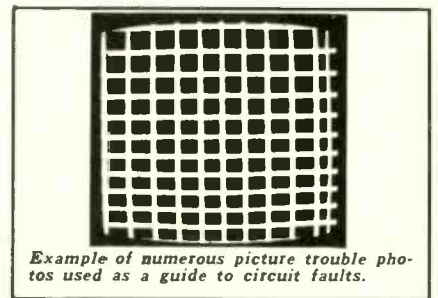
How the Club Works

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 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 the only Book Club devoted *exclusively* to electronic servicing. We urge you, if this unique offer is appealing, to act promptly, for we've reserved only a limited number of Handbooks 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 *Electronic Circuit Design Handbook, Modern TV Circuit & Waveform Analysis, and Pinpoint Transistor Troubles in 12 Minutes* for **FREE** 10-day inspection. **SEND NO MONEY!** If you are not delighted with these quality hardbound books, return them within 10 days and your Trial Membership will be cancelled without cost or obligation. Electronic Technician's Book Club, Blue Ridge Summit, Pa. 17214.



Example of numerous picture trouble photos used as a guide to circuit faults.

Typical Savings Offered Club Members on Recent Selections	
How To Test Almost Everything Electronic	List Price \$5.65; Club Price \$3.95
How to Use Your VOM, VTVM & Scope	List Price \$6.95; Club Price \$4.95
Modern Electronic Troubleshooting	List Price \$7.95; Club Price \$4.95
Installing Hi-Fi Systems	List Price \$7.95; Club Price \$4.95
Electronic Circuit Design Handbook	List Price \$14.95; Club Price \$7.95
Repairing Home Audio Systems	List Price \$7.95; Club Price \$6.50
FET Applications Handbook	List Price \$12.95; Club Price \$7.95
Handbook of Semiconductor Circuits	List Price \$7.95; Club Price \$4.95
Pinpoint TV Troubles in 10 Minutes	List Price \$6.95; Club Price \$4.95
Easy Way To Service Radios	List Price \$6.95; Club Price \$3.95
Practical Color TV Servicing Techniques	List Price \$7.95; Club Price \$4.95
Popular Tube & Transistor Substitution Guide	List Price \$4.95; Club Price \$2.50
Semiconductors From A To Z	List Price \$7.95; Club Price \$4.95
On the Color TV Service Bench	List Price \$6.95; Club Price \$4.95
TV Servicing Guidebook: Problems & Solutions	List Price \$6.95; Club Price \$4.95
Transistor Circuit Guidebook	List Price \$6.95; Club Price \$4.95
Mathematics for Electronics	List Price \$10.95; Club Price \$7.95
Transistor Projects	List Price \$5.95; Club Price \$2.95
Radio Operating Questions & Answers	List Price \$9.25; Club Price \$7.95
Electronic Musical Instruments	List Price \$10.00; Club Price \$7.95

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

It's your fault if she's 13-38-12.



And you have to go back and fix your repair job one week after you've fixed the set. It's your fault, and your money.

Replacement parts ought to last longer than that.

Like capacitors. They should be able to meet the requirements of high-reliability computer and missile systems, hold their rating at 125° C continuous operation.

Like Elmenco dipped Mylar® paper capacitors do.

Yet you can buy them at regular TV set prices. In any value you need from .001 mfd. to 1.0 mfd. In TV rated voltages from 400V through 1600V. Or in 100V values for

transistorized circuitry.

Elmenco distributors can sell you the other Elmenco capacitors: padders and trimmers, high voltage dipped micas. And Arcolytic capacitors, also.

So you'll only have to do your repair jobs once. Then if the lady in the set looks the same once you've finished, it's her mother's fault.

Loral Distributor Products

A DIVISION OF LORAL CORPORATION
Pond Hill Industrial Park, Great Neck, New York 11022

... for more details circle 124 on postcard

ELECTRONIC TECHNICIAN/DEALER

RCA Victor's CTC40 Color Chassis

Circuit study can eliminate the cob webs of doubt when servicing new solid-state equipment

■ The Teklab report in the March issue covered the VHF tuner, video amplifier, brightness limiter, video peaking and the sound circuit of this RCA Victor CTC40 color chassis.

In this concluding article we will explain circuit functions of the color AFPC detector, vertical convergence, high voltage generation, high voltage regulation, horizontal deflection protection circuitry and the dc power supply.

Probably one of the most interesting circuits is the horizontal output stage employing two silicon controlled rectifiers (SCRs) in a new type horizontal deflection system. The SCR is capable of handling substantially higher current and voltage than can be obtained using economically feasible transistors. The SCR is similar in operation to the Thyatron tube in that it is non-conductive until switched on by a control electrode.

The following comprehensive circuit explanation will help the technician in his servicing to keep the chassis operating properly with the minimum of service time.

AFPC Detector

The purpose of the AFPC (Automatic Frequency and Phase Control) detector is to provide a dc voltage proportional to the frequency which in turn is proportional to the frequency (and phase) difference between the applied color synchronization signal (burst) and the 3.58MHz color oscillator. Tight control over the phase of this oscillator is imperative for proper color demodulation because the oscillator acts as the reference against which demodulation occurs.

The AFPC detector employs a phase sensitive discriminator circuit in the basic operational configuration shown in Fig. 1. Referring to this figure, the basic operation of the AFPC detector may be explained as follows: The burst signal is applied at equal amplitude but opposite phase through

capacitors C1 and C2, to diodes D1 and D2 respectively. A sample of the 3.58MHz oscillator output is applied to point C, the junction of diodes D1 and D2. If the oscillator is in sync with the applied burst signal as illustrated, the diodes will conduct equally. This can be verified by observing the three wave-shapes applied at time T1. The 3.58MHz oscillator waveshape is at 0, thus, adding--or opposing--voltage is placed in series with the diode conduction through R3. Therefore, the resulting current flow through each diode is equal and opposite in direction. This places equal but opposite charges on capacitors C1 and C2. The discharging of these capacitors through resistors R1 and R2 then creates equal but opposite voltages across these resistors. The voltage at the junction of the resistors (Point A) will, therefore, be 0. This voltage is the AFPC correction voltage. Capacitor C3 completes the

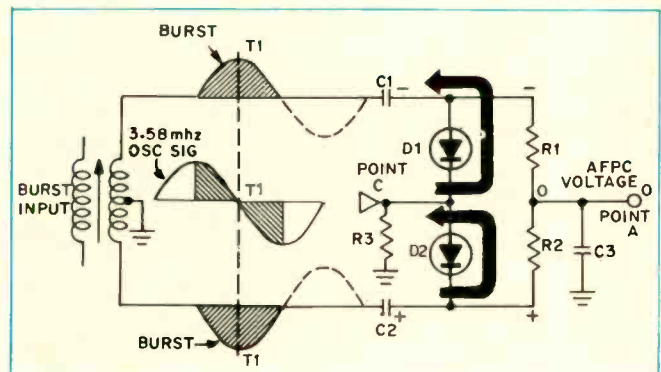


Fig. 1--Color sync AFPC detector circuit with oscillator on frequency.

discharging path and acts as a filter for the AFPC voltage.

Fig. 2. illustrates the detector action when the oscillator output is lagging the applied burst signal. At time T1, the oscillator waveform, because of its lower frequency, is somewhat delayed re-

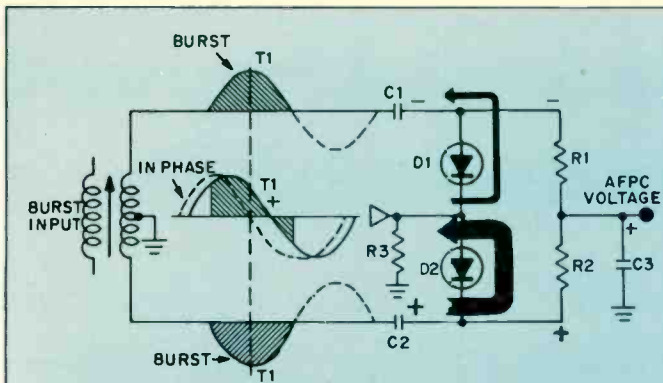


Fig. 2--Color sync AFPC detector circuit with oscillator frequency low.

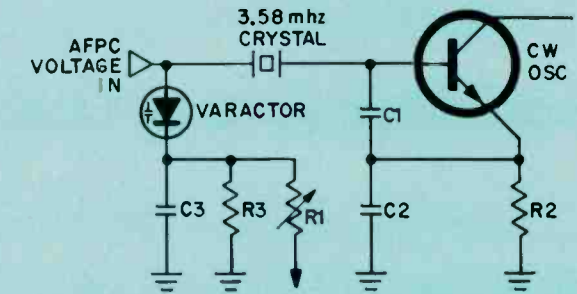


Fig. 4--The basic 3.58MHz oscillator circuit.

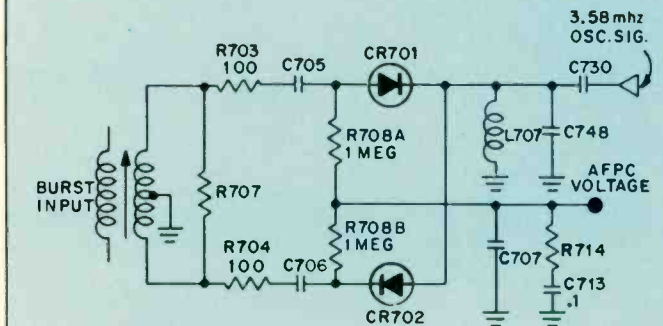


Fig. 3--Color sync AFPC detector employed in the CTC-40 color chassis.

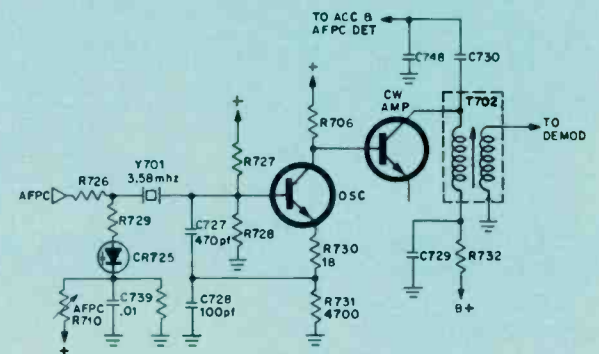


Fig. 5--The 3.58MHz and amplifier circuit.

relative to the in-phase signal (dotted line). This results in the positive portion of the waveform being effectively placed in series with the diode conduction path through R3. Diode D2 conducts heavier than D1, causing the value of the positive charge on C2 to become greater than the value of the negative charge on C1. The resulting unbalance in current flow through R1 and R2 (when the capacitors discharge) causes the potential at Point "A" to become positive.

A similar but opposite action occurs when the oscillator frequency is leading that of the applied burst signal.

The actual schematic of the color sync AFPC detector used is shown in Fig. 3. Inductor L707 acts as the diode return impedance (R3 in the previous figure). Capacitors C730 and C748 form a capacitor voltage divider network to supply the desired level of 3.58MHz signal to the detector circuit. Resistors R703 and R704 act to minimize the possibility of diode radiation. The complete AFPC filter network consists of C707, R714 and C713.

3.58MHz Oscillator

A basic schematic of the 3.58MHz oscillator employed is shown in Fig. 4. This oscillator is a modified Clapp circuit. Feedback energy necessary to sustain oscillation is coupled from the emitter impedance, consisting of R2 and C2, to the base through capacitor C1. Operating frequency is determined by the 3.58 crystal and the capacity

represented by summation of C1, C2 and the varactor diode. The varactor incorporates a specially constructed junction which enhances the normal voltage-dependent capacity characteristics of a diode. The frequency of the oscillator can be varied (over a limited range) by changing the voltage across the varactor diode. In this manner, the AFPC voltage--and the voltage determined by the voltage divider network represented by R1 and R3--will change oscillator frequency. Capacitor C3 acts as a low impedance ground return for the varactor and has no effect on the oscillator frequency.

A more complete schematic of the 3.58 oscillator is shown in Fig. 5. Resistors R727 and R728 provide oscillator base bias. Resistor R730 acts as an emitter stabilization resistor while R706 provides the proper collector load.

Also shown is the 3.58MHz CW amplifier. This amplifier operates into a high-Q, single-tuned transformer (T102), which develops a sine wave from the output current pulses. Capacitors C748 and C730 act as a voltage divider network to provide the desired 3.58MHz reference signal level to the AFPC detector circuit. The secondary of the oscillator couples 3.58MHz energy to the color demodulators.

Vertical Convergence

The vertical convergence circuitry used in the CTC40 chassis employs operating principles somewhat different from those previous sets. Opera-

tion of the horizontal convergence circuitry, however, remains basically the same as in previous RCA color chassis.

The vertical convergence circuitry generates the required parabolic current waveshape by shaping a partially integrated vertical sawtooth voltage. A simplified schematic is shown in Fig. 6.

The vertical sawtooth voltage is developed across R126, a 39 Ω resistor connected in series with the vertical output transformer primary and B+. The vertical convergence circuit directs current from this sawtooth voltage source through two paths:

The path used to converge the upper half of the picture exists through C802, differential resistors R804 and R805, the red and green vertical convergence coils, diode CR803, to B+. Capacitor C802 and resistors R802 and R803 form a shaping circuit in which the values are chosen for optimum convergence. The other path is used to converge the lower half of the picture. During this time, diode CR803 is no longer conducting and the current path exists through R803, the differential resistor R805, the convergence coils, amplitude resistor R808, the shaping network CR801, CR802, R801 and capacitor C801. The amplitude controls, R803 and R808, provide control over the amount of correction of vertical lines, while the differential controls, R804 and

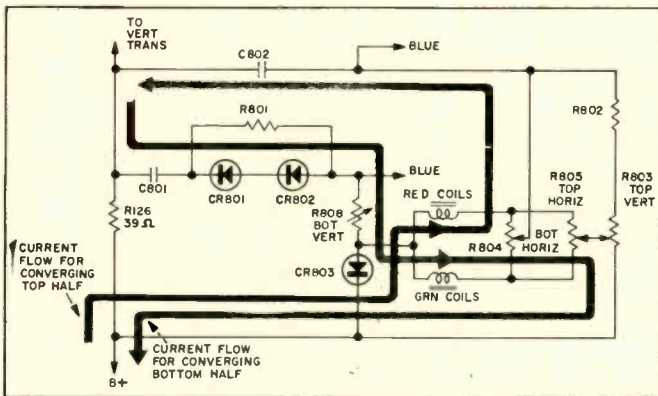


Fig. 6--Simplified vertical convergence circuitry.

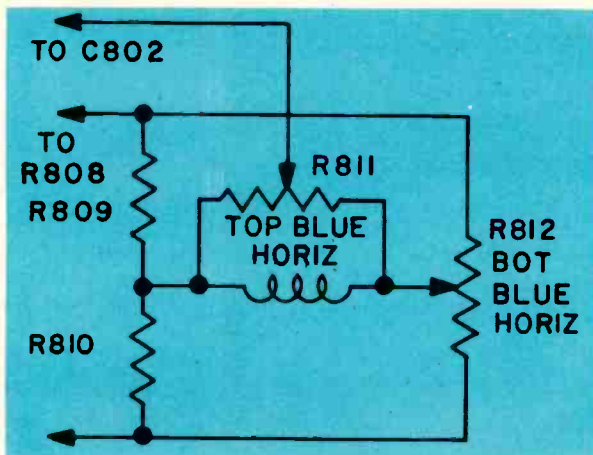


Fig. 7--Simplified blue vertical convergence circuitry.

R805, correct the error in horizontal lines at the top and bottom of the scan.

The blue vertical convergence circuitry, simplified in Fig. 7, provides for vertical convergence of blue horizontal lines as the vertical scan progresses. The correction current required is provided by the same voltage source used to converge the upper and lower halves of the picture in the case of red-green. The blue circuitry provides correction of either polarity as well as of variable magnitude.

High Voltage Generation

The manner in which high voltage is developed in the RCA CTC40 chassis is identical to the system used for many years--the transformation of the horizontal deflection retrace pulse (flyback) to a high voltage by a transformer and the subsequent rectification of this stepped-up voltage. The high voltage rectifier employed is a vacuum tube. The resulting high voltage has nominal value of 26.5kv, dropping approximately 2kv over the normal range of CRT beam currents. Fig. 8 illustrates the relationship of the various elements associated with the high voltage circuitry.

The focus and picture tube screen supply consists of rectifier CR405 and resistor R406, together with a capacitive filter which comprises a positive 1kv CRT screen grid and focus supply. This circuit generates the required dc voltage by rectifying and filtering horizontal pulses obtained from the secondary of the horizontal output transformer.

The negative voltage supply consists of diode CR713, capacitor C760 and associated resistors providing approximately -60v to operate the color killer switch.

High Voltage Regulation

High voltage is regulated by controlling the amount of energy made available to the horizontal output circuitry. The output circuitry is supplied by the energy which is stored during trace time primarily on the commutating capacitors (CR and the auxiliary capacitor CH). These capacitors are charged during trace time through inductance

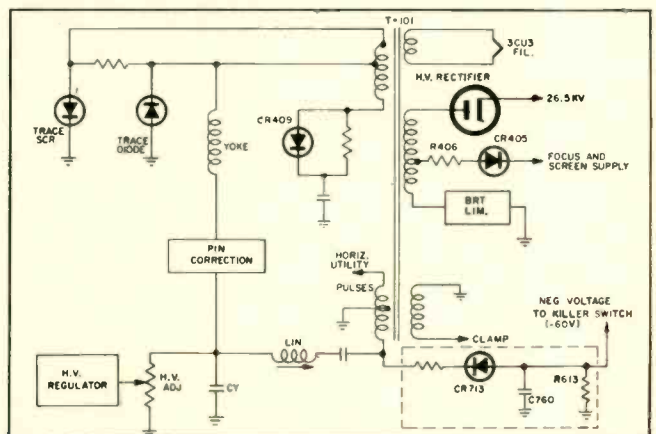


Fig. 8--High voltage generation circuitry.

LG, which is part of transformer T102. To provide a means to control the energy on the commutating capacitors, inductance LG is designed to resonate with these capacitors at a frequency whose period approaches twice the horizontal scanning interval. The exact resonant frequency is made variable by the high voltage regulator circuitry. Fig. 9 illustrates the effect of this resonant action on the commutating capacitor charge. It can be seen that the waveshape resulting from the resonant action will determine the amount of charge that will be on the capacitors when their energy is released into the output circuitry.

A block diagram illustrating the relationships of the elements that comprise the high voltage regulating system is shown in Fig. 10. The resonance of LG and the capacitors, CR and CH, is made variable by controlling the inductance of LG with a saturable reactor, T103. The saturable reactor load winding is placed in parallel with LG; by changing the current in the reactor control windings, the total inductance represented by LG and the reactor load winding is made variable. The control current for the reactor is determined by the conduction of high voltage regulator transistor. The collector current of this transistor is controlled in turn by the voltage across the yoke return capacitor CY. This voltage, which reflects high voltage changes, is sampled by the high voltage adjustment control and compared to a reference voltage determined by a zener diode. The resulting difference voltage, representing changes in high voltage, controls the conduction of the high voltage regulator transistor.

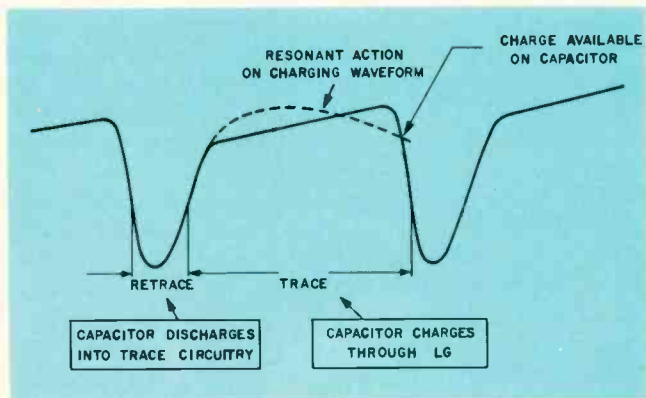
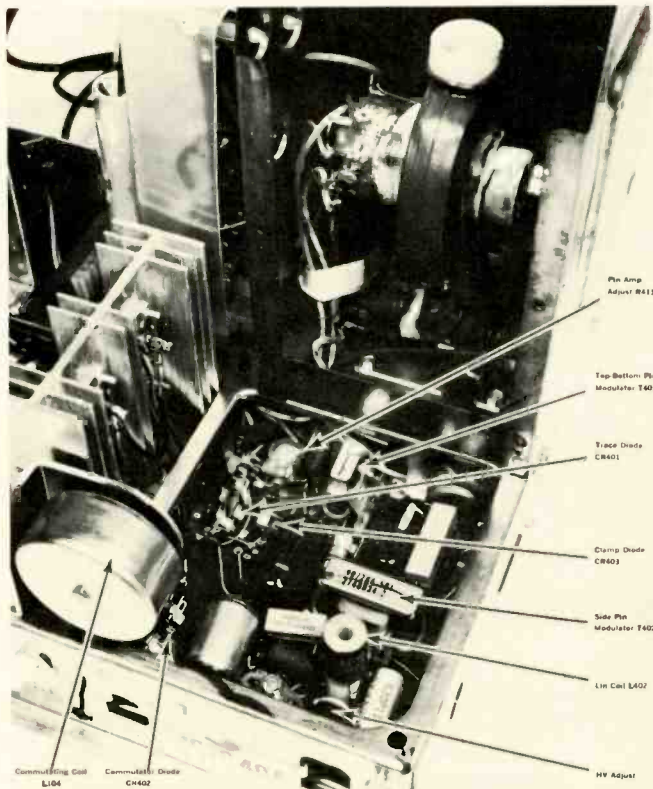
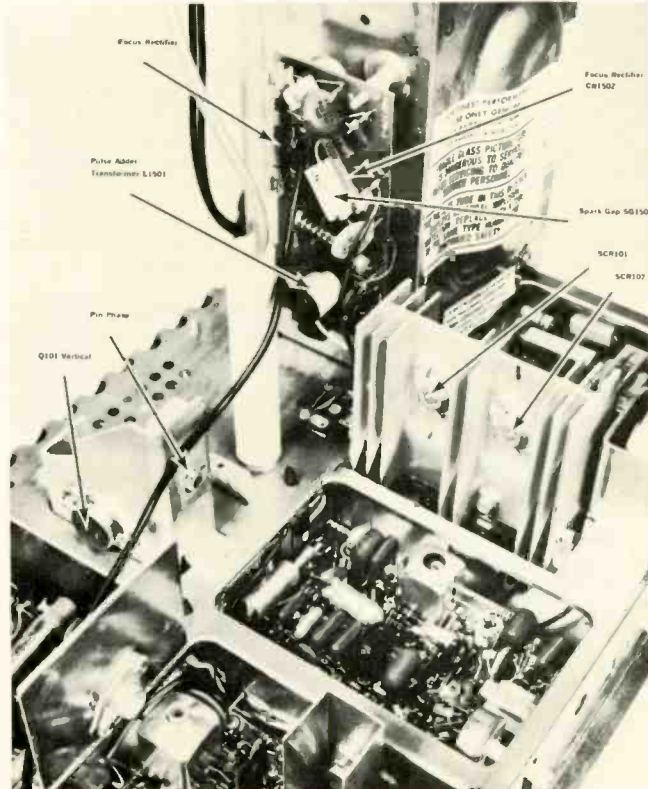


Fig. 9--Voltage on commutating capacitor.



High voltage generation portion of the CTC-40 chassis.



Vertical deflection, horizontal oscillator and focus board.

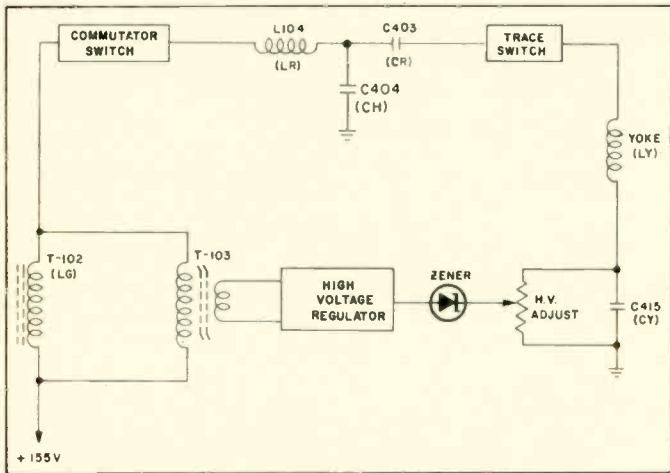


Fig. 10--A block diagram of the high voltage regulator.

The action of the high voltage regulator system under a condition of decreasing beam current is shown in Fig. 11. As the high voltage load (beam current) decreases, the high voltage tends to increase, causing the voltage across the yoke return capacitor to increase. This results in an instantaneously higher current pulse through the regulator transistor base-emitter junction. The reactor control current therefore tends to increase proportionally, reducing the total inductance of LG. The resulting change in resonance of LG and CR causes the voltage on CR to reduce, in turn reducing the energy made available to the output circuit, therefore stabilizing the high voltage. The reverse action would occur if the high voltage tended to decrease.

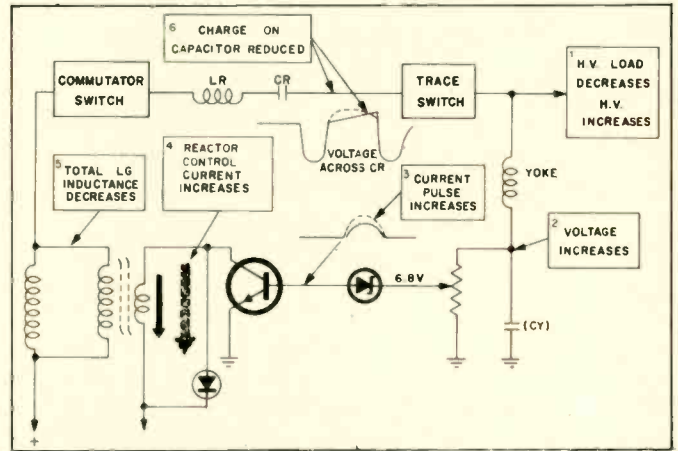


Fig. 11--The action of the HV regulator system under a condition of decreasing beam current.

Fig. 12 illustrates additional components in the regulator circuit. Diode CR406 acts as an energy recovery diode to improve the efficiency of the control circuit. The regulator transistor actually conducts for only a very short time, leaving the majority of the control current to be supplied by diode conduction. Diode CR407 maintains a dc component in the load winding of the saturable reactor.

This high voltage regulating system is designed to maintain high voltage substantially constant for line voltage variations ranging from 105vac to 130vac.

The high voltage will drop only 2.5kv from a nominal 26.5kv with a picture tube beam current increase from 0 to 1.5ma.

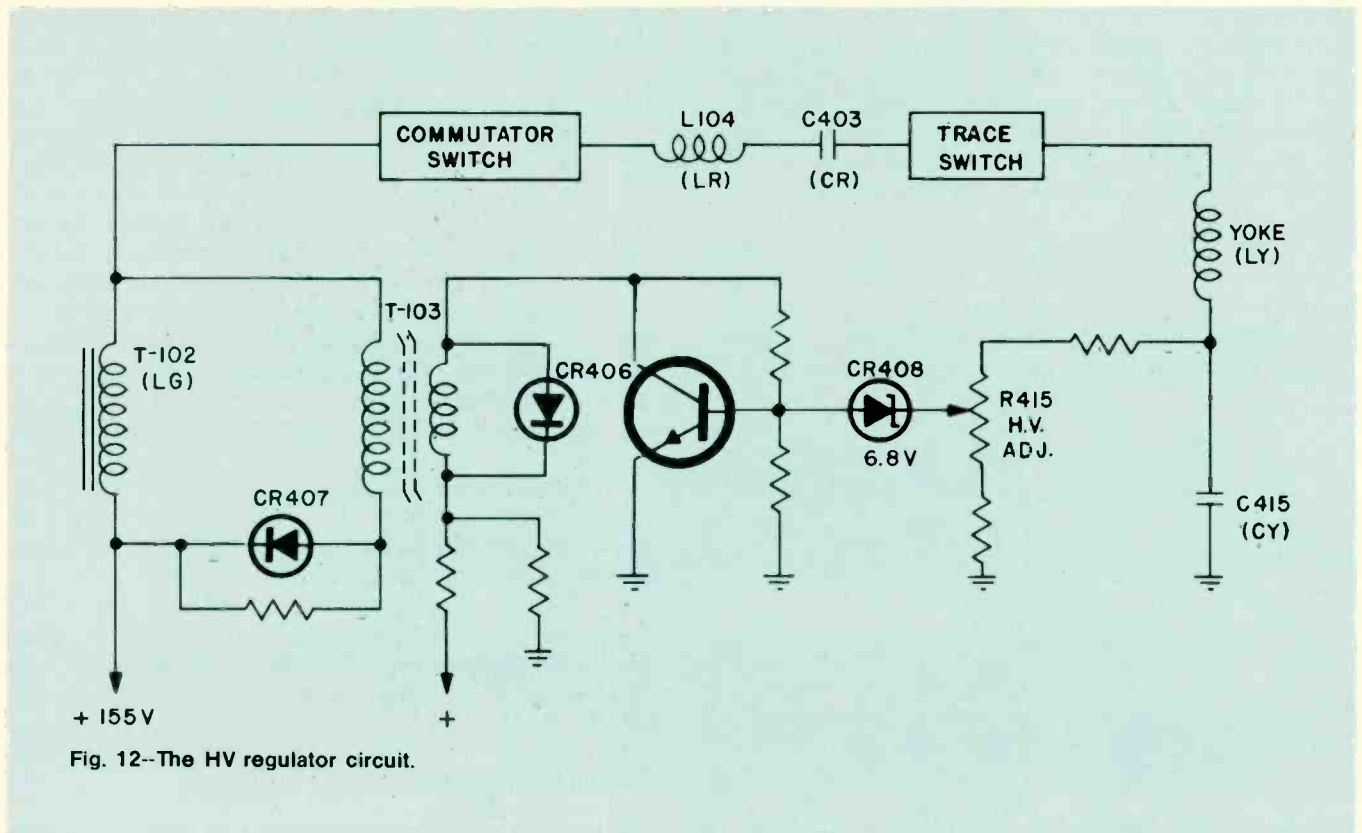


Fig. 12--The HV regulator circuit.

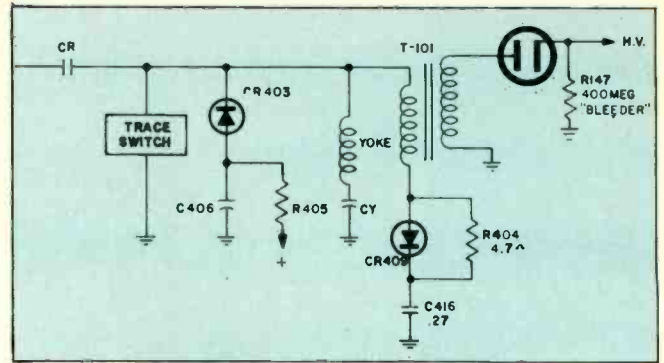


Fig. 13--Horizontal deflection protection circuitry.

Horizontal Deflection Protection Circuitry

Referring to Fig. 13, two circuits are employed which protect the trace switch (diode and SCR) from high currents and voltages which can result from high voltage rectifier arcing.

One protection circuit consists of resistor R404 and diode CR409 placed in series with the primary of the high voltage transformer. These components dampen the high ringing current which can occur under arcing conditions. This current is mainly dissipated in the resistor; the principal purpose of the diode being to allow normal initial flyback current to flow unimpeded, thereby preventing a reduction in high voltage.

The other protection circuit consists of diode CR403, capacitor C406 and resistor R405. Diode CR403 conducts during the peak voltage of the retrace pulse, charging capacitor C406 to that voltage. Resistor R405 provides a high resistance discharge path for the capacitor, providing a means to reduce the voltage on the capacitor sufficiently to keep the diode reverse biased during trace time. When a sharp voltage pulse occurs under high voltage arcing conditions, CR403 conducts, clamping the trace switch to the voltage on C406, thus preventing the arc pulse voltage from exceeding the breakdown voltage of the trace switch components.

A 400M high voltage bleeder resistor, R147, is coupled from the cathode of the high voltage rectifier (ultor of CRT picture tube) to ground, to provide a means to safely discharge the high voltage after the instrument is turned off.

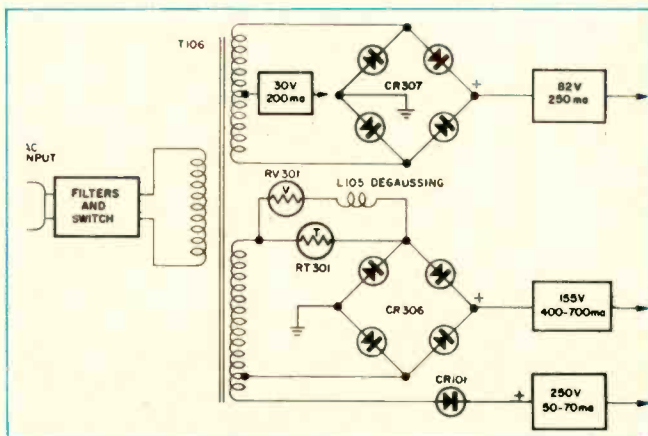


Fig. 14--The dc power supply employed in the CTC-40 chassis.

DC Supply

The dc power supply provides four separate sources, generated from three separate rectifier circuits. As illustrated in Fig. 14, rectifier group CR307 supplies both the 30v source and the 82v source. The 82v source is supplied from the full wave bridge configuration of CR307, while the transformer secondary supplying this rectifier group is tapped at the half-voltage point to supply two rectifiers in that group in a full wave, center tapped configuration; this latter configuration provides the 30v source.

A second rectifier group CR306, in a full wave bridge configuration, provides the 155v source from a tapped T109 secondary winding.

The automatic degaussing circuit is coupled to the transformer secondary supplying CR306. The automatic degaussing circuitry consists of thermistor RT301, voltage dependent resistor RV301 and the degaussing coil L105. This circuit operates in the same manner as on previous instruments. When cold, the thermistor has a relatively high resistance, permitting most of the ac current to flow through the voltage dependent resistor and the degaussing coil. This action creates a magnetic field about the coil which degausses the CRT. As the thermistor warms because of some small initial current flow through it, its resistance decreases and it passes on an increasingly larger share of current. As less current flows through the voltage dependent resistor, its resistance increases. Further restricting current flows through the degaussing coil. Approximately five seconds after instrument turn-on, the current through L105 has decreased to zero, completing the degaussing action.

A 250vdc source is supplied by a half-wave rectifier circuit consisting of CR101 and its filtering network. This source employs the full winding of the secondary which supplies CR306.

Under average operating conditions, the CTC-40 draws approximately 1.8a of ac current at 120ac input. As illustrated in Fig. 14, the average dc current supplied by each separate dc source is as follows:

- 30v source--200ma
- 82v source--250ma
- 155v source--400-700ma (varies with beam current)
- 250v source--50-70ma (varies with beam current). ■

Updating the Eico 368 Sweep Generator

Don't throw away that old sweep generator.

Convert the unit into an up-to-date test instrument

■ If your service shop is one with an EICO 368 on the shelf collecting dust, then you have probably considered the difference between the old generator and the new Model 369. For a couple of dollars and a few hours of work you can update your Model 368 to have essentially the same features as the Model 369 sweep generator for current servicing.

Sweep Generator Comparison

The EICO Model 368 and almost all of the other inexpensive sweep generator kits are designed basically as shown in Fig. 1. The frequency of the RF oscillator is continuously varied at a 60Hz rate with a controllable inductor. The marker generator usually consists of two oscillators. One is crystal-controlled at a fixed frequency; the other is tuned manually. The sweep and marker signals are mixed and applied to the TV or FM receiver being aligned. The receiver output is then connected to the vertical input of a scope. A filtered 60Hz voltage from the power transformer is applied to the horizontal input of the scope. The resultant trace shows the relative amplitude response of the circuit being tested, with respect to frequency. At the appropriate spot there is a ragged little spike to indicate the marker frequency.

So far so good, but why should I update the unit? The test setup described lacks two important features. First, if the circuit you are testing is a band-rejection filter, or even if you are looking at the skirt of a band-pass filter, the marker may be so greatly attenuated that you can't see it on the scope. Secondly, suppose that you are aligning a FM tuner and have the scope connected

to the ratio detector at point B, shown in Fig. 2. You have adjusted the scope showing the characteristic "S" curve of the detector. Now if you change the amplitude or frequency of the marker signal, the dc level on capacitor C changes and the trace on the scope jumps around. It is very annoying to have to wait for the trace to settle down every time the marker is adjusted, especially when you are trying to measure the bandwidth of a circuit.

Marker-Adder Circuit

The solution is to redesign the sweep generator so that the marker is added after the swept RF voltage has passed through the receiver being aligned. One method of doing this is shown in Fig. 3. Now the marker amplitude can be changed whenever desired and its frequency moved throughout the passband of the receiver without affecting the dc level of the scope display.

Updating your old sweep generator involves nothing more than adding one vacuum tube and a handful of other parts. The circuit for the marker adder used in the EICO Model 369 is shown in Fig. 4. The portion enclosed within the dotted lines shows the new components. The reference numbers were chosen to continue the sequence from the Model 368. This circuit may also be added to almost all of the other popular sweep generators now on the market. Check your own schematic to locate the corresponding points to connect the sweep and marker generators.

Circuit Description and Operation

RF signals from marker oscillator V1 and a sample of the swept RF voltage from V2, are mixed in V7B,

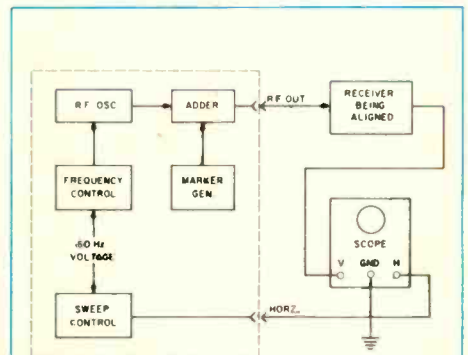


Fig. 1—Many sweep generators combine the marker signals with the swept RF before applying them to the receiver.

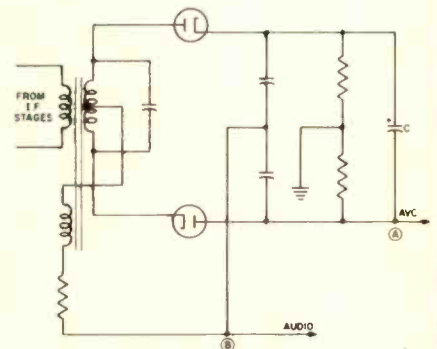


Fig. 2—A typical ratio detector circuit. The dc voltage at points A and B changes when the marker frequency or amplitude is varied.

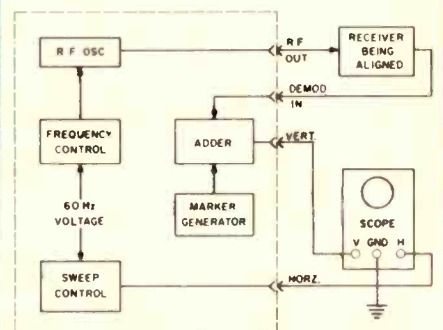
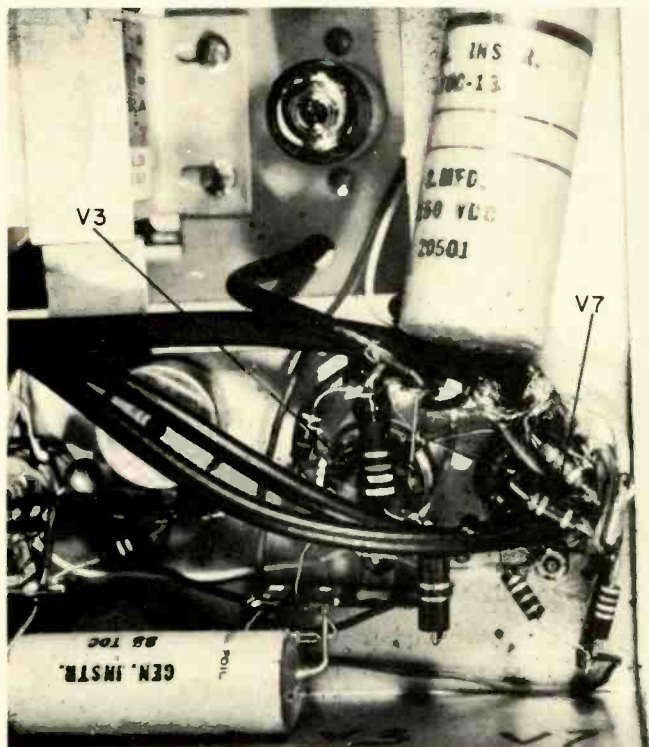


Fig. 3—The EICO 369 adds the marker signal after the swept RF signal has passed through the receiver being aligned.

SWEEP GENERATOR...



The photo shows the chassis wiring and the socket for the new tube V7 installed next to the V3 tube socket.

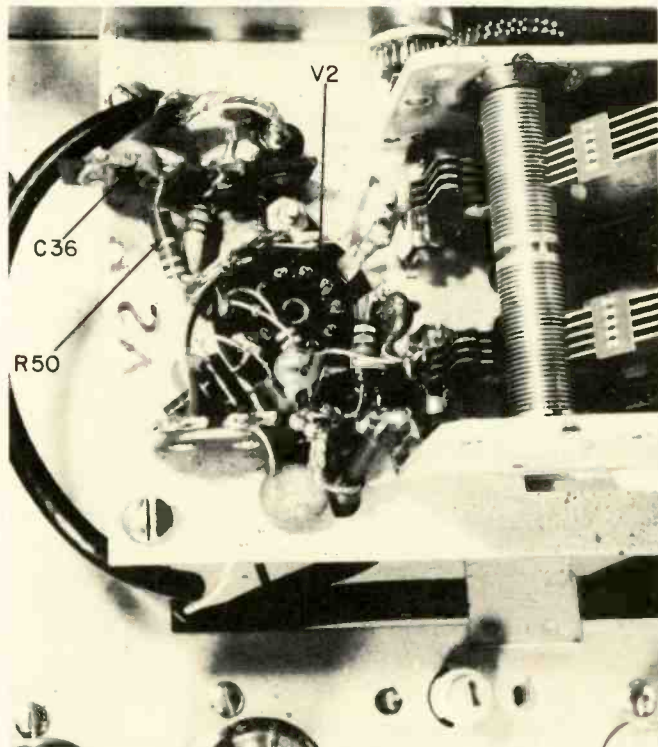


Photo showing sweep oscillator wiring. Replace TP3 near V2 with a longer terminal strip to hold R50 and C36.

which is one-half of a dual-triode 12AU7 tube. The resultant beat frequency, which is the marker signal, is passed through Marker Size control R42 and applied to the V7A grid, the other half of the 12AU7. The amplified marker is then added in resistor R44 to the demodulated signal from the receiver being aligned. Finally, the combined demodulated/marker signal is applied to the vertical input of the oscilloscope. Note that separate pots are provided to control the size of the markers and the demodulated signal, so that adjustment of one does not affect the display of the other. In addition, the size of the amplified marker pip on the scope leaves no doubt as to location.

Construction

Begin by adding new connectors for the demodulated signal input and for the scope vertical output. Also add the 2M pot for trace size control. Suggested locations for these three new parts are shown in the photograph. Use a small metal panel to cover the original oscillo-

scope binding post holes, because the new connectors are in slightly different locations. This could also be done by leaving the two scope terminals where they are, and mounting the new scope vertical connector directly below the MARKER-RANGE control, and putting the TRACE SIZE control directly above the COARSE RF control at the right-hand side of the panel.

Punch a $\frac{3}{4}$ in. diameter hole in the chassis next to V3. Install a nine-pin tube socket and label at V7. Mount terminal strips as shown in the photos for the other components. Remove and discard R42, the original MARKER SIZE control, and the two shielded wires connected to it. Install a new 100K pot in its place.

Connect the filament leads for socket V7 to V3, the nearest tube. Then install and wire the rest of the components, following the schematic diagram. Be sure to use high-quality coax cable, not ordinary shielded microphone wire, for the lines connecting the marker oscillator V1 and to RF sweep oscillator V2. If you use shielded cables for the new

connectors and for R42, they need not be such high quality because the frequencies involved are much lower. Finish the conversion by identifying the new front-panel controls and connectors with black decals or dry-transfer lettering.

While you have the instrument apart, play it safe and add a 2a fuse on the rear apron of the chassis. This will avoid having to replace the power transformer because of a shorted tube or filter capacitor.

Finally, remove the 68K resistor from the original scope probe and replace it with 47K. Remove the spade lugs from the other end of the cable and install an Amphenol type 75MC1F cable plug. Connect this probe to the new demodulator input terminal of the sweep generator. No changes are required to the RF output cable or probe.

Operation

The modified sweep generator is now ready to go to work. Connect your test cables as shown in Fig. 3. Attach the RF output probe to the receiver being aligned, usually at the

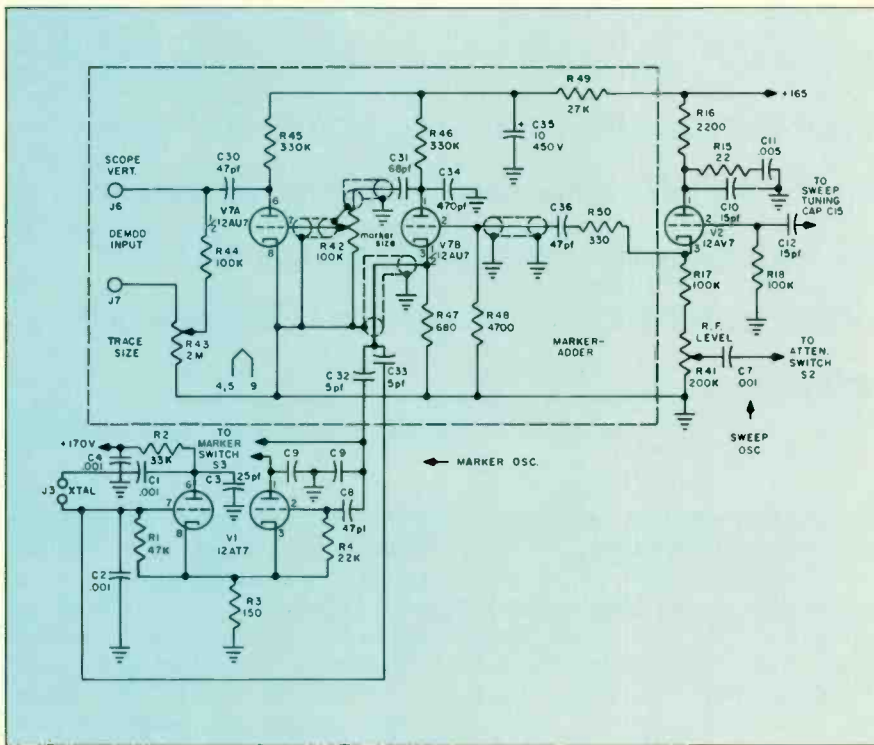


Fig. 4—The dotted lines enclose the new circuit added to update the sweep generator.

grid of the first IF tube. Put the demodulator input probe at the output of the receiver ratio detector or discriminator. Connect the scope vertical and horizontal leads to the corresponding terminals on the sweep generator. Set the scope vertical input to dc and adjust the controls for a convenient display.

The first thing you will notice when using your modified sweep generator is the dc level of the trace stays put when you vary the marker amplitude or frequency. This makes it easy to check the bandwidth of a tuned circuit by simply moving the marker from one skirt to the other of the resonance curve, and noting the marker frequency in each case. The second difference is the marker size may be increased until it practically fills the screen, if desired, making it easy to find on the scope display.

A few minutes spent incorporating these changes into your old EICO Model 368, or any similar sweep generator for that matter, will be well worth the effort the next time you align a receiver. ■

PARTS LIST

R42	pot 100K (marker size) see text
R43	pot 2M (trace size)
R44	res 100K
R45, R46	res 330K
R47	res 680 Ω
R48	res 4.7K
R49	res 27K
R50	res 350 Ω
C30, C36	cap disc 47pf
C31	cap disc 68pf
C32, C33	cap disc 5pf
C34	cap disc 470pf
C35	cap elec 10 μ f/450v
V7	tube 12AU7
J6, J7	receptacle Amphenol 75PC1M



Shown in photo are the suggested locations of the demodulated signal input jack, scope vertical output jack and the trace size control.

Selling Home MATV Systems

Television today is a vital part of the American home and with this emphasis on TV, the home with only one TV outlet is almost as inefficient as a home with only one ac outlet, which all adds up to a brand new market potential for the service—dealer who wants to expand his business.

■ Most people like the idea of connecting two or more sets to one antenna. It gives them a feeling of getting something for nothing. Many people like the idea of a TV outlet in every room, once they know that such a thing is possible. Thus, you can sell a good percentage of your customers up from a simple home antenna installation to a complete home MATV system.

Let's see what this means to you in dollars and cents. Suppose that you install about eight antennas a week at an average price of \$60 per installation. Your gross sales are then $8 \times \$60 = \480 per week.

Now, suppose that you try to sell all of these customers on home MATV systems and only one out of four buy. This means that you will sell two MATV systems per week. Since a home MATV system generally costs the customer at least \$100, you will have increased your sales by \$200—more than 40 percent—without so much as adding a single new customer.

Direct Sales

Chances are that you will sell direct to customers on a quotation basis. Someone calls you on the phone or walks into your store to inquire about antennas. You give them a brief sales talk, quote a price and make

the sale contact at a later date.

To sell up to a home TV system, you don't do a thing different. You make the antenna sale exactly as you have been doing. You can't afford to let any distraction jeopardize that sale.

But, once the sale is made, it's time to start selling up. When you visit your customers' home to make the antenna installation, be sure you have everything you need for a complete system. Install the antenna on the roof and then ask your customer this innocent question: "Where do you want me to put the TV outlet?"

If your customer owns two or more sets, as almost all of your customers do, this question will naturally lead into a discussion of how you can handle all of his sets from the one antenna.

Now, you're ready to start selling a home MATV system.

You'll have to develop your own sales pitch, of course, and each situation is different, but you could say something like this:

"You know, Mrs. Jones, one antenna outlet isn't going to be enough for your home. You need an outlet for your new color set, one for the old black and white console, one for your FM stereo and at least one for your portable TV.

"What I would recommend

is a complete home TV system. I can hook it right up to the antenna I've already put on your roof. That way, you'll have an outlet in every room in the house. Wouldn't it be nice to move your portable into the kitchen while you're doing the dishes or out on the patio in nice weather or into your child's bedroom when he's sick?

"And this way, your husband can watch his ball games while you watch your programs and somebody else is listening to the FM—all at the same time from the one antenna.

"Since you're investing in a new antenna, why not go all the way—let me give you an outlet in every room. This is the ideal time. If you let me do the job now, I can install the whole system for only \$150, plus the cost of the antenna.

"Remember, a system like this will almost last forever. Even if the antenna itself eventually has to be replaced, you can just have your new antenna plugged right into this system.

"A modern system like this definitely increases the resale value of your home. That's why so many builders are now putting TV systems into new housing developments.

"As I said before, Mrs. Jones, I can install this system for you now for only \$150. That's less than \$20 per outlet. But if you

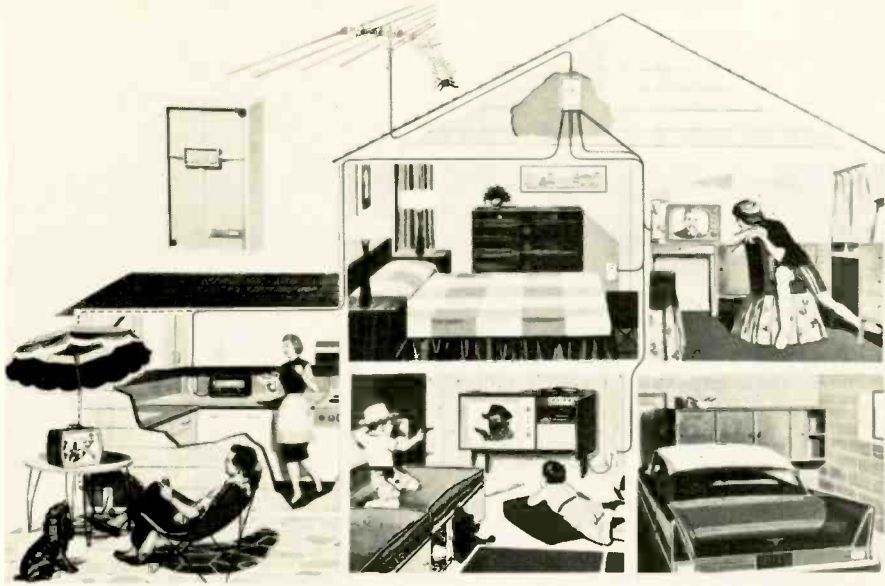


Figure 1

decide to do it later, after the antenna installation is complete, I'll have to charge you my regular price, which is \$25 per outlet."

It takes only a few minutes to try to sell up to a home master TV system and the effort cannot possibly kill your antenna sale. The increased profit makes the relatively small extra effort very worthwhile.

Sell Through Appliance Stores

Many technicians install antennas sold by department, discount and appliance stores. You can sell complete home master TV antenna systems to these customers in one of two ways:

(1) By arranging for the floor salesman to sell systems along with the antennas. Unfortunately, floor salesmen are seldom eager to make the effort unless the customer actually asks about more than one TV outlet. But you should be sure to work with the buyer to establish prices and guidelines that the floor salesmen can use to sell home systems. Then you should spend a few minutes explaining just what a home system is and how it can be sold.

(2) At the time of installation, you can sell the appliance store salesman in exactly the same way you sell your own customers on multiple outlet systems. Before you can do this, you'll have to establish a number of

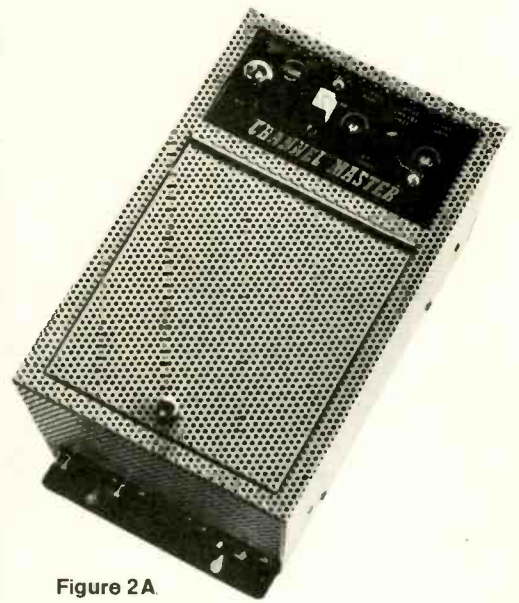


Figure 2A

Fig. 2A, 2B, 2C, 2D, 2E

Distribution amplifiers such as these provide the necessary gain for an effective multiple outlet home MATV system.



Figure 2B

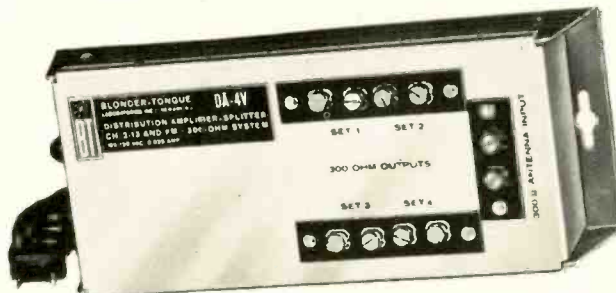


Figure 2C

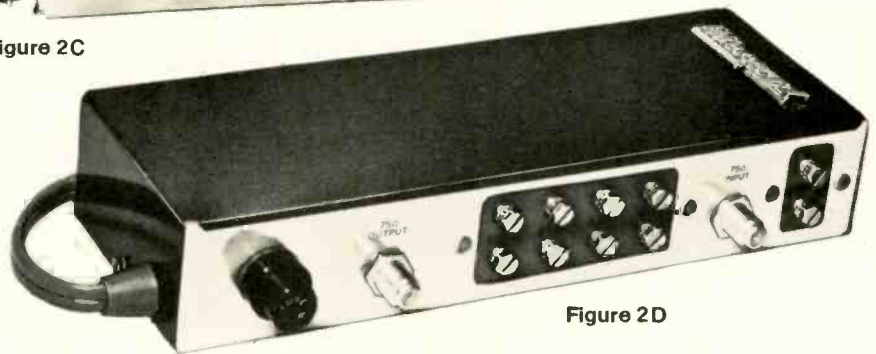
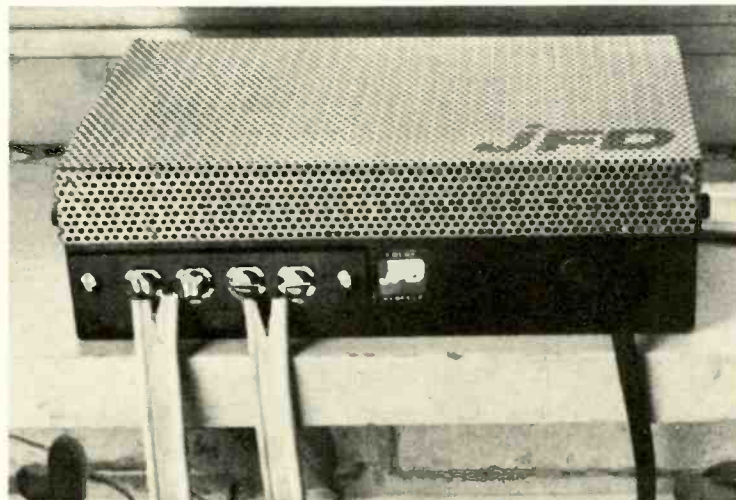


Figure 2D

Figure 2E



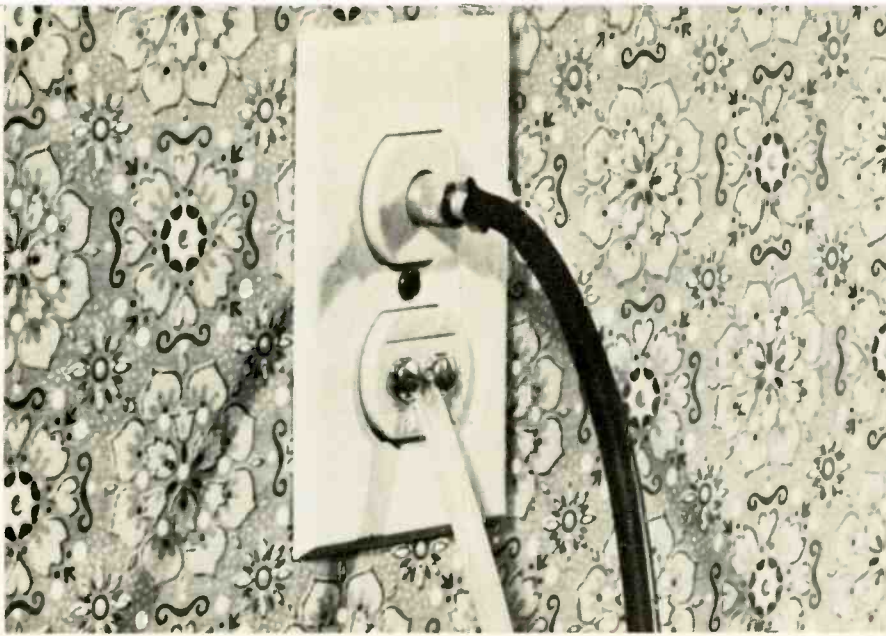


Figure 3A

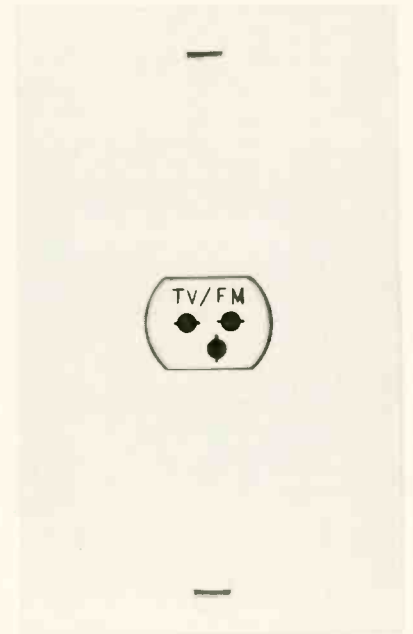


Figure 3B

Wallplates for easy connection to a TV or FM receiver may be of the flush-mounted type shown in Fig. 3A, 3B, 3C or the surface-mounted type in Fig. 3D and 3E.

Selling MATV. . . .

policies with your buyers. Each store may be different. You'll have to discuss the markup profit for the store; billing through the store; and adding the cost of the system to the customer's charge account.

Typical Systems

Fig. 1 shows how easy it is to convert a single antenna installation into a four-outlet system. All you need is a four-outlet amplifier such as those shown in Fig. 3, plus four wallplates.

The wall plates can be either flush or surface mounted. (See Fig. 3.) Flush-mounted wallplates are used for new homes just being built, while surface wallplates are generally used in existing construction.

Wire from the amplifier to the four wallplates can be hidden behind the walls in new construction, but in existing construction you have to hide them as best you can. Run them outdoors, through closets, along basements, under rugs and—as a last resort—along baseboards. Crawl spaces and attics over rooms are ideal for hiding wires. But don't try to be too fancy about snaking wires through beams, etc., or the labor involved can eat up your profits.

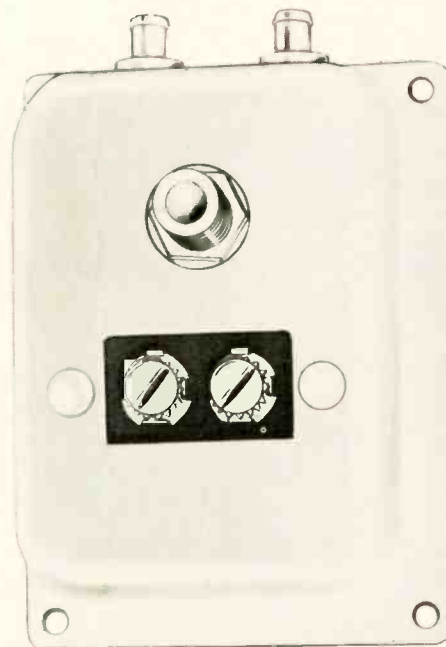


Figure 3D

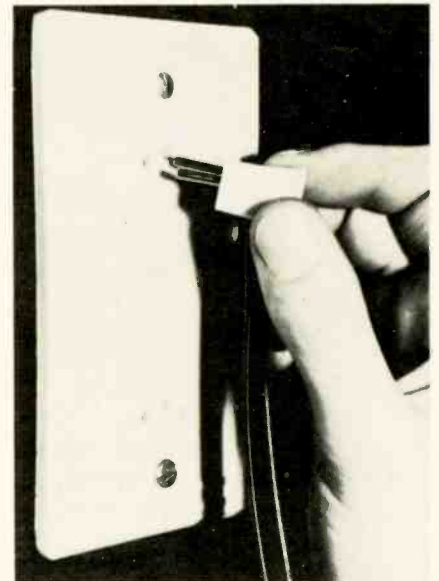


Figure 3C

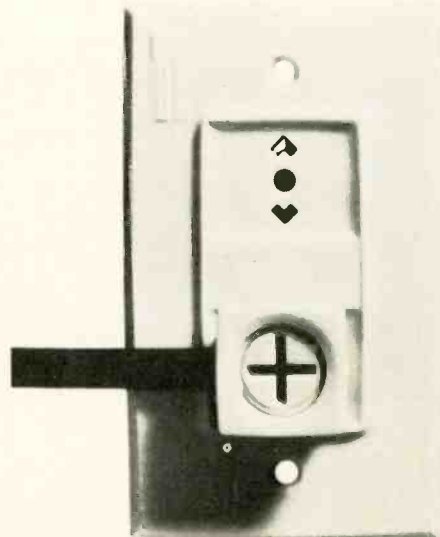
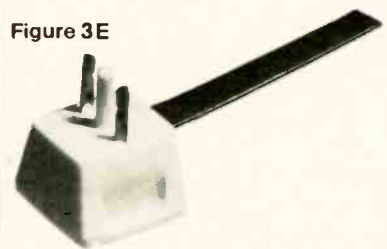


Figure 3E



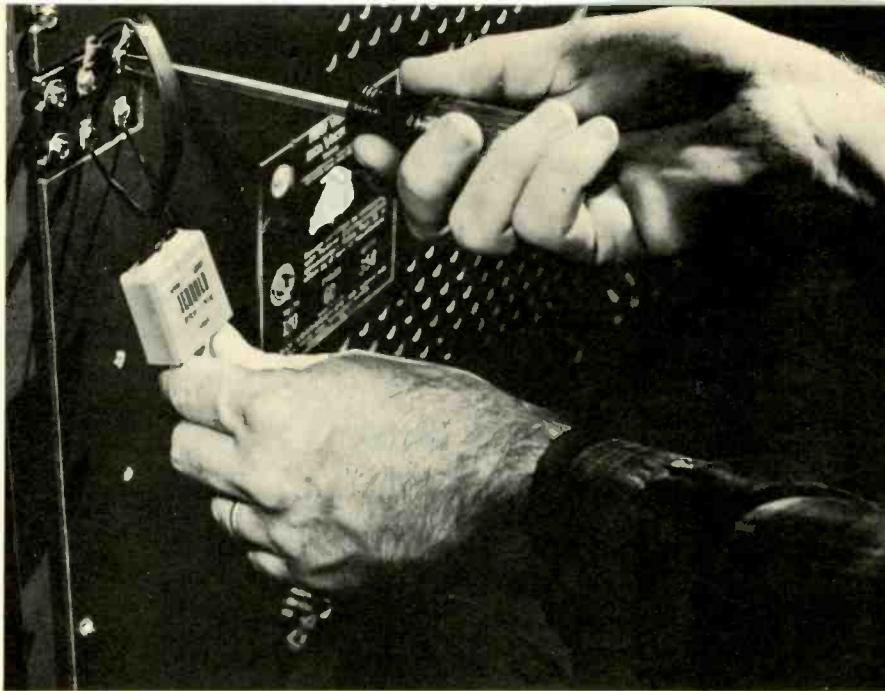


Figure 4A

Fig. 4A, 4B, 4C, 4D, 4E, 4F

Typical matching transformers used with coaxial cable to provide the correct coupling between the 75 Ω cable and the 300 Ω input to the TV receiver.

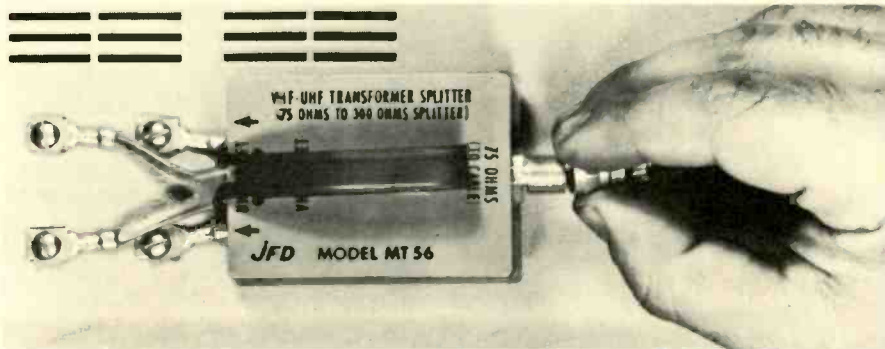


Figure 4B

Fig. 1 shows a 300 Ω twin-lead system. Coaxial systems are a little more expensive, but they are easier to install and usually work a little better. In a coaxial system you have to use matching transformers as shown in Fig. 4.

Sell 82 Channel Systems

With UHF still spreading throughout the country, it is foolish to install anything but an 82 channel (UHF/VHF/FM) system. Even if there's no UHF at all in your area now, a new station might come on the air at any time. A home master TV system should be permanent and obsolescence-proof. Besides, the difference in costs between VHF-only equipment and today's modern 82 channel equipment is negligible.

Of course in 82 channel systems—even 300 Ω systems—you have to include a signal splitter to provide separate UHF and VHF inputs to all channel receivers.

Home master TV systems are the wave of the future. You can prepare for that future and enjoy an immediate increase in profits by selling up to complete MATV systems right now.

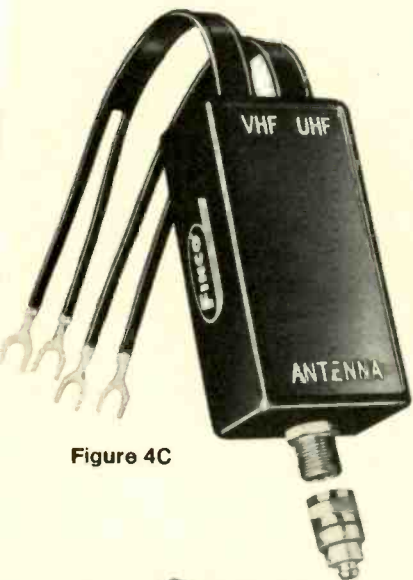


Figure 4C

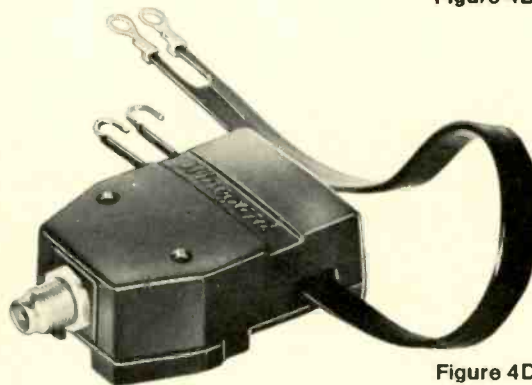


Figure 4D

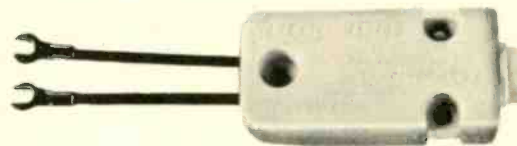


Figure 4E

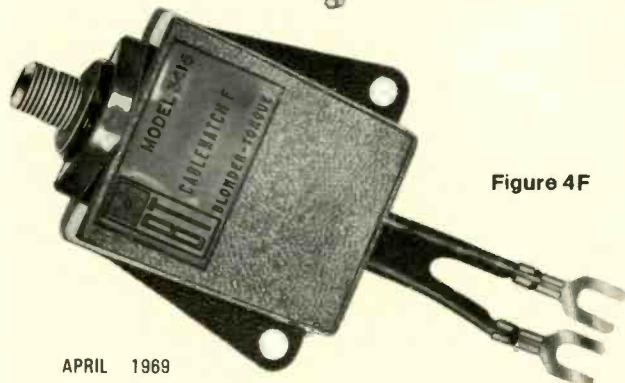


Figure 4F

TWO-WAY RADIO ON THE GO

PART 2

Two-way radio transceivers for use in citizens band frequencies fall into several circuit types. A basic understanding of these will make the servicing job easier and faster.

■ Part one of this series (ET/D, January 1969) was an introduction to CB servicing, technical requirements, test instruments and receiver troubleshooting. This article continues with transmitter troubleshooting circuit descriptions and alignment.

Transmitter Troubleshooting

Transmitter problems normally fall into two categories: dead-no output; or no modulation. Along with this might be lack of transmitting range, distortion or intermittent operation.

The transmitter in transceivers other than synthesized units normally has its own oscillator, but uses the same receiver audio circuit for modulation, the same antenna through a relay (or diode switching network) and the same power supply. As in receiver troubleshooting, the circuits common to both receiver and transmitter will likely be easier to isolate.

Weak or distorted modulation with normal audio during receive could be caused by a defective microphone, dirty relay contacts, a defective modulation winding in the audio transformer, defective components in the speech compressor and misalignment or defective transistors in the transmitter.

A weak transmitter is often caused by a broken or shorted

antenna. It can also be caused by a defective power transistor which may allow the transmitter to be heard only a few blocks away. A loose antenna or connection can cause intermittent operation, especially in mobile units. Microphone elements are often susceptible to damage from being dropped or slammed around and a damaged element can cause weak audio.

Troubleshooting transmitters in SSB transceivers is somewhat different in that there is no transmitter output without modulation. When the transmitter is keyed, there should be no power output until audio is fed into the audio amplifiers either from the microphone or an audio signal generator. The SSB transceiver in Fig. 1 utilizes many common circuits including the bandpass filter, diode switching for antenna, local oscillator ring modulator, audio amplifiers and the power supply.

A synthesized receiver-transmitter is shown in Fig. 2. In addition to the common audio, power supply and antenna circuits, there is a synthesizer network which consists of high and low frequency oscillators and a mixer stage.

Problems in the synthesizer will affect both receiver and transmitter. A general coverage communications receiver

can be used to check oscillation of the high and low frequency oscillators. If the receiver is inoperative but the transmitter is normal, check the receiver oscillator, RF and IF stages. A reversed situation might mean a defective buffer, driver or final amplifier in the transmitter.

AM Transceiver Alignment-Single Conversion

Citizens band receivers normally have an input impedance of 50Ω and a frequency range of 26.965 to 27.255MHz designated by channels 1 through 23.

There are various alignment procedures recommended by manufacturers for their particular receivers. Some suggest alignment of the receiver from the RF stage through the IFs on the operating frequency. Others recommend alignment of the low IF first, then the high IF and finally the R section. In all cases, follow the procedure the manufacturer suggests for his particular unit.

In a single conversion receiver, Fig. 3, alignment is usually done by applying a modulated signal at the antenna input and peaking the RF and IF coils with an AC-meter or scope across the speaker or on the AGC line. In this unit, the manufacturer suggests that signal generator at 30 percent modulation on channel 9 be used with $1\mu V$ output. Connect an

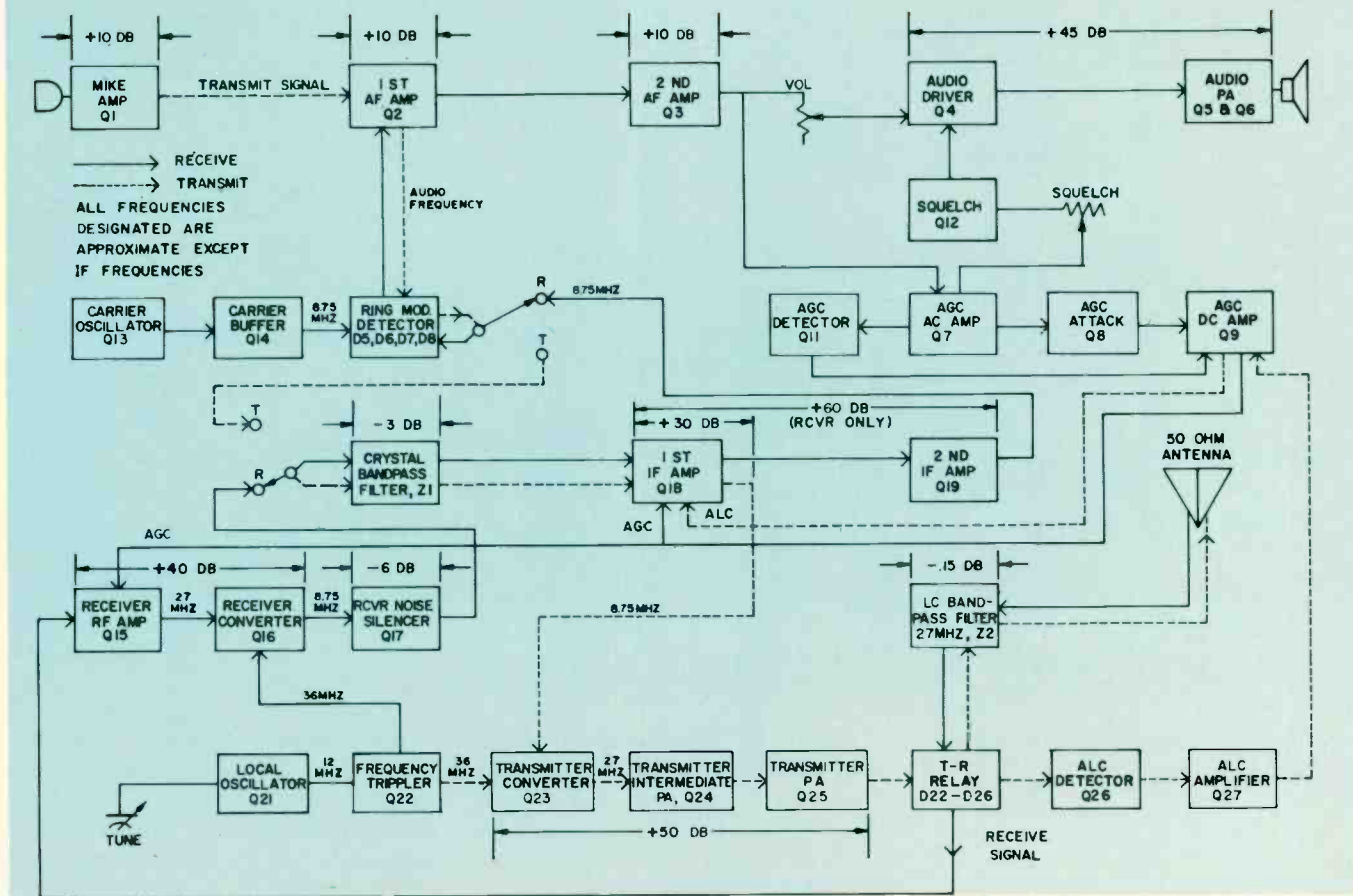


Fig. 1—Johnson Messenger 350, single-sideband transceiver, block diagram.

ac meter or scope to the cathode end of the detector D2 and tune the RF and IF coils in succession for maximum output. According to specifications, the AGC line should measure 1.1v with no signal and 1.0v with signal ($3\mu\text{v}$ RF signal input to antenna, 1000Hz at 30 percent modulation).

In case of poor sensitivity, the manufacturer suggests to check the oscillator injection voltage at the base of Q2 as well as RF and IF gain through the transistors. A dead receiver may be caused by a lack of B +open or shorted detector (D2), dead crystal, oscillator or defective channel selector switch.

No audio or low audio in this unit could be caused by Q10, Q11, Q12 or Q13.

The transmitter RF section is tuned on channel 9 by connecting an RF wattmeter and 50Ω load to the transmitter output.

A choke, ML-3, is connected

between the collector of Q9 and the modulation transformer, AFT-2. Unsolder the choke lead "cold end" from the circuit board where it connects to the lead from AFT-2. Then connect a 0 to 500ma dc meter between the choke lead and AFT-2. The plus (+) side goes to the choke and the negative (-) lead to AFT-2. Key the transmitter and adjust L-D, L-E, L-F, L-G and L-H for maximum on the RF wattmeter. The final amplifier current should be 400ma maximum for 5w input with 12.5vdc on the collector of Q9.

AM Transceiver — Dual Conversion

Alignment of dual conversion receivers is slightly more complex than single conversion in that there are two oscillators and two mixers. A block diagram of a dual conversion receiver is shown in Fig. 4.

It might help to briefly ex-

plain how a dual conversion receiver operates to produce the 455kHz IF frequency. Two oscillators and two mixers provide the 455kHz IF frequency. The receiver crystals and 1st oscillator are 5.010MHz higher than the incoming signal. This means that the output of the 1st mixer will always be 5.010MHz to the 2nd mixer. The 2nd crystal oscillator provides a 5.465MHz signal to the 2nd mixer. The difference between these two signals at the output of the 2nd mixer then is the IF frequency of 5.465-5.010MHz or 455kHz.

When aligning a dual conversion receiver, the 455kHz IF is normally adjusted first. An IF signal is injected at the input to the 1st IF stage and an ac meter connected across the speaker. The IF transformers are peaked for maximum output on the meter. The signal is then fed to the input of the 2nd mixer and that stage

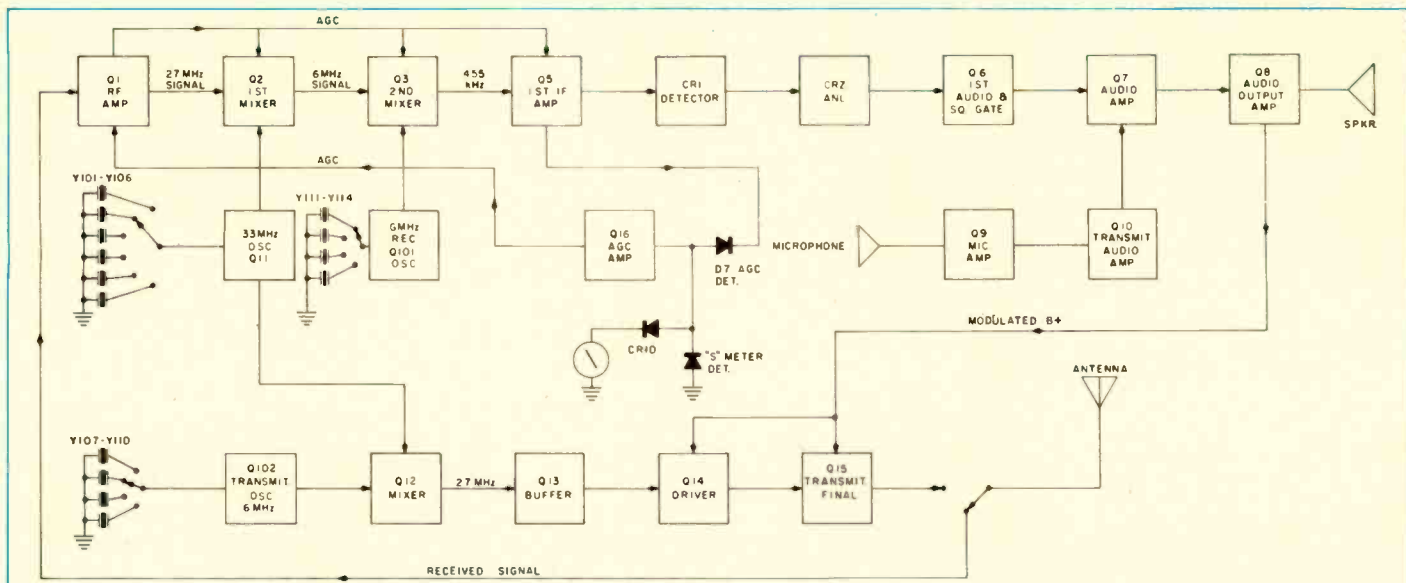


Fig. 2--Pearce-Simpson director 23 synthesized transceiver, block diagram.

is tuned to proper frequency.

Following this is alignment of the high IF, 1st mixer and RF stages. Here again, some variations occur in manufacturer-recommended procedures. Alignment in these stages is often somewhat critical. Follow the manufacturer's procedure. Misalignment in the front end of the receiver can cause audio distortion, weak sensitivity and intermittent operation on some channels.

Synthesized Transceiver Alignment

Receiver alignment in a synthesized unit should be no more difficult than alignment of a standard dual conversion model except for an understanding of how 23 channel operation is obtained with only a few crystals.

Referring to the schematic diagram in Fig. 5, an incoming signal on channel 9 (27.065MHz) is amplified and coupled to the 1st mixer. Here it is "mixed" with the 33.100MHz signal from the 33MHz oscillator to provide a difference output frequency of 6.035MHz to the 2nd mixer. The 6.490MHz output of the 2nd oscillator combines with the 6.035MHz signal to produce the IF frequency of 455kHz.

Alignment of the receiver is similar to the standard dual channel units except for the master oscillator, Q11, stage. There is a variable capacitor in the circuit, C32, which affects both the receive and transmit frequency. When alignment is necessary in a circuit of this type due to critical parts replacement or misalignment, it must be done carefully. Use a frequency counter and an RF pickup loop. Each crystal frequency is measured and selected for proper operating frequency. Also, as a master oscillator, any change in C32 will affect the other crystal frequencies in the circuit.

The transmitter is adjusted as in a standard circuit after correct alignment of the master oscillator.

SSB Transceivers

Single-sideband (SSB) transceivers will probably be new in theory to many technicians charged with the job of repair and alignment. Chances are we will see more of them in use than we do at present. And ultimately, the units will need service.

An SSB transceiver has only a few of the basics found in the previously described units.

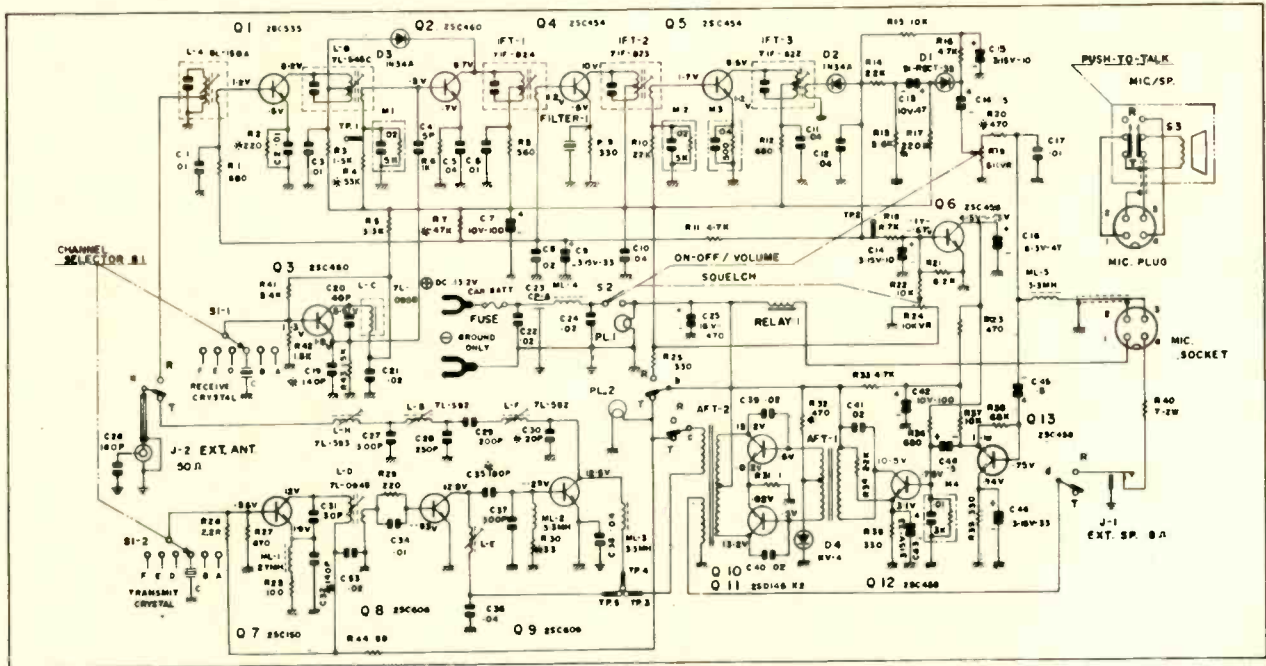


Fig. 3—Amphenol model 750 single-conversion transceiver, block diagram.

These are the antenna, receiver audio and power supply.

As shown in the block diagram, Fig. 1, the SSB transceiver input circuit in this unit functions as a bandpass filter for receive and transmit. As such, it provides low insertion loss and sufficient rejection of receiver and transmitter images and harmonics. Diode switching is used in place of a relay so there are no moving contacts. The diodes are biased to disconnect the transmitter from the antenna during receive and biased in the opposite direction during transmit.

The incoming signal is amplified by the RF amp and coupled to the receiver converter, Q16. The converter also receives a 36 MHz signal from the high frequency oscillator Q22. The adjustments of the local oscillator, Q21, and frequency tripler, Q22, are critical for proper channel operation as they affect both the receiver and transmitter frequencies.

The receiver converter passes the difference frequency of the incoming signal and the high frequency oscillator signal to the noise silencer. The output frequency of the converter and noise silencer is 8.75MHz. The noise silencer uses diode switch-

ing to disconnect the 8.75MHz signal from the crystal filter, Z1, each time a noise pulse is received.

The crystal filter, Z1, selects the designated channel and sideband frequency to pass on to the IF amplifiers. Undesirable signals are filtered out. From the IF stages the signal goes to the ring modulator-detector, where it is mixed with an 8.75MHz ± 1.5 kHz signal from the carrier oscillator. The output signal from the ring modulator-detector is the audio signal fed to the Q2.

The ring modulator-detector acts as a detector during receive and as a modulator during transmit.

The transmitter, as mention-

ed, also uses the ring modulator. The carrier oscillator, Q13, couples the 8.75MHz signal to the ring modulator where it is mixed with audio from the microphone. At the output of the ring modulator then, is a combination of these signals containing both upper and lower sideband frequencies as well as the carrier oscillator frequency which has been nulled down by the ring modulator. The signal goes to the crystal filter and the desired sideband is passed to the 1st IF amp. The SSB signal is amplified to a level of +30db above the previous level and still has a frequency of approximately 8.75MHz.

The 8.75MHz SSB signal is

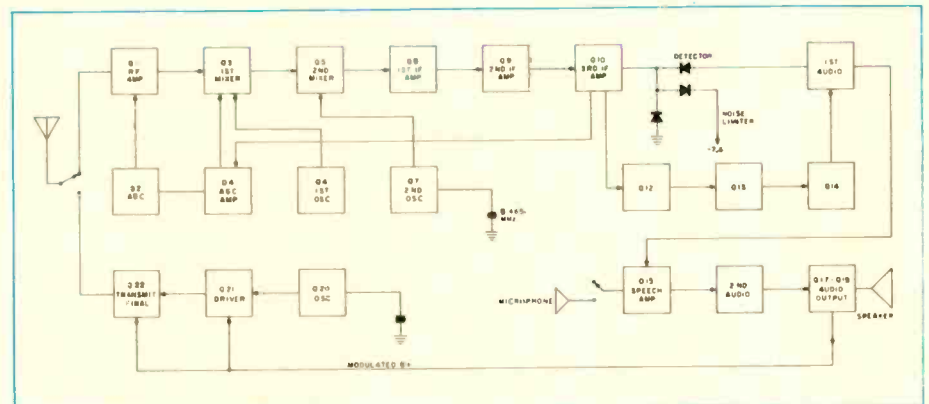


Fig. 4—KARR model TR-336, dual-conversion transceiver, block diagram.

Cable antennas TV (CATV) demands optimum TV set operation. It will bring out problems, mostly due to misalignment, that otherwise do not show up because the channels are separated. CATV can bring added service and sales that mean money in your cash drawer if you are geared to do the job

■ One normally thinks of CATV as something beyond the ultra-fringe area. This attitude is changing as CATV comes to cities already covered by one or two local TV stations.

There is sufficient public demand for CATV in such areas that it soon becomes a factor in the TV shop's sales and service pattern.

Typical of CATV systems under the towers of existing TV stations are those in Pittsburg, Kansas, not yet in complete operation, and in Carthage and Joplin, Missouri, in operation less than a year.

All three cities are within the primary coverage areas of three TV stations.

The three cable companies translate the local TV signals to other VHF channels to avoid off-the-air pickup on the cable subscriber's TV set at a level of about 1000 μ v.

They also pick up one TV channel from Tulsa, Okla., and two more from Springfield, Mo., all normally available only to the owners of expensive antenna

TV Service in CATV Areas

systems. These signals are cleaned up in elaborate receiving systems, and put into the subscriber's set on-channel, also at about 1000 μ v.

In addition, the cable company originates its own programs, feeding them into the cable on an empty channel.

In Joplin and Pittsburg, the cable companies limit themselves to weather-scan on their own channel. This consists of a camera that pans slowly across a series of meters showing wind direction and velocity, temperature, etc.

In Carthage, Carthage Cablevision alternates between weather-scan and its own programs such as a fashion show, news, a talk-show, and other local-interest programs, sometimes feeding simultaneous audio to a local radio station in Carthage.

FM Broadcasts

Carthage and Pittsburg also pick up FM from a radius of about 125 miles and feed it into the cable on-frequency.

Joplin plans on sending only selected FM signals into its cable at a later date.

Thus, a new CATV subscriber formerly receiving two or three local TV channels, suddenly finds himself with nine channels of TV, plus a wide choice of FM.

This increase in available programs can cause a drastic change in sales and service patterns if the TV service shop does not adapt quickly.

Antenna Sales

Carthage is different from Joplin and Pittsburg, in that outside antennas are fairly common. Shop owners there report a sudden drop in antenna sales, even among people who are not on cable. Many refuse to buy a new antenna or repair an old one, preferring to wait until cable comes to their neighborhood.

Some shops report that the drop in antenna sales can be more than compensated for by increased FM sales and service-provided the salesman takes time to demonstrate to the customer the dramatic increase in FM signals available on cable.

However, both CATV personnel and service technicians warn against two traps for the unwary salesman.

First, some of the currently available FM equipment is designed to work in areas with no more than a half a dozen, widely spaced signals. On cable, these sets may have too poor selectivity for the many closely spaced signals.

Secondly, some FM stations have discontinued stereo transmission altogether and others have reduced it to a part-time level.

Store managers should pay special attention to the selectivity characteristics--particularly skirt selectivity--of the merchandise they offer, and salesmen should be cautioned against over-emphasizing the availability of FM stereo reception.

TV Service in CATV Areas

The indicated changes in sales patterns appear to be minor compared to the changes in service patterns. CATV within the coverage of existing local stations is producing service calls of types that do not exist in either ultra-fringe CATV or antenna systems.

Adjacent Channel Tuner Problems

At first, many customers complain that their sets work just fine on the antenna, but won't work on cable. And they are uncertain as to whether the trouble is in their set or on the cable. Many older sets—and some not so old—have trouble of such a nature that the sets appear to work properly on two or three strong, widely spaced signals, but fall short of normal operation when faced with several medium-strength signals on adjacent channels. However, if properly adjusted for adjacent channel reception, there should be little difficulty, providing the signal levels of the various channels are approximately equal.

When CATV was new to an area, both the TV technicians and CATV technicians tried to decide how to separate defective or misadjusted cable troubles. They soon adopted a universal tactic for such calls—they carry a portable TV.

If the portable works, but the customer's set won't, it leaves absolutely no doubt in anybody's mind where the trouble is.

This simple method does much to hold down friction between the cable company and local TV technicians. It is enthusiastically endorsed by CATV per-

sonnel. If the problem is caused by the cable company, it should be called.

Customers were quick to learn that the cable company makes such service calls free—but technicians do not. Consequently, within a short time, the technician finds himself receiving calls from customers who already know that the trouble is in their set.

The more obvious troubles of this type originate in individual channels in the tuner which have probably never been used.

Aside from turret strips and switch contacts, complaints often involve sets which give poor reception on translated local channels, but good reception on the original channel using the antenna.

Cable companies do not allow signals to deteriorate in translation—they've got too much at stake to goof on things like that.

More than likely, the long-unused channels in the tuner are detuned to the point of smearing or snowing up the picture. Check individual channel tuning on such service calls.

Sound on Adjacent Channels

There is one tuner problem that turns up on this type of CATV with distressing regularity.

CATV operators in a licensed area covered by a local TV station are required by the FCC to "protect" the local station by ceasing transmission of distant station coverage whenever their programming duplicates that of the local station. To maintain signal continuity, most CATV operators do not actually stop these transmissions altogether. Instead, they may substitute

weather-scan for the undesired program. In these cases, it may be possible to obtain identical pictures and sound on two, three or even four adjacent channels.

It's easy to set up a tuner "one step off." And the customer will call up asking how come channel 2 is on position 3, channel 3 on position 4, etc. It is also possible, especially with turrets, to have one channel come up twice and the adjacent channel come up missing.

These mistakes are particularly easy to make on the new TVs, with their wide-range fine tuners.

Wide-range fine tuners are also causing another special type of nuisance call, characteristic of CATV. The customer will complain that he's trying to get channel 3, but all he can get is channel 4 where 3 belongs. When the service man gets there, he finds the fine tuner all the way to the end of its range, with the adjacent-channel program on the set. All he has to do is move the fine tuner back where it belongs.

Like most nuisance calls, these calls tend to go to the cable company after the first few weeks as customers learn about the free service calls.

Tuner problems are in the minority of the group of CATV-triggered calls which can be lumped together under the alignment category.

Another common complaint among new CATV users in overlapping areas are sync buzz and herringbone patterns that can't be tuned out. Herringbone patterns could be present if the program were picked up directly off-the-air on the same chan-

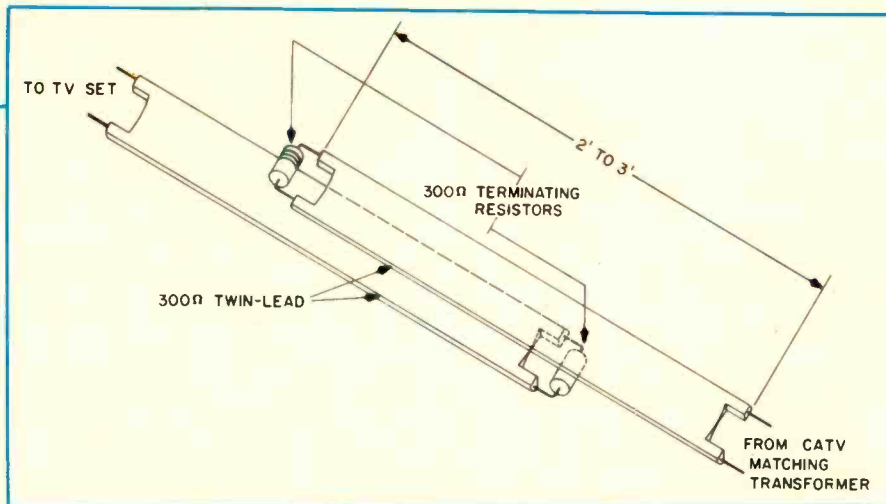


Figure 1

Variable attenuator that can be easily put together from a piece of 300ohm twin lead and a couple of terminating resistors. The attenuator is tuned by sliding the two pieces together until the desired amount of attenuation is reached. Then tape the lead to hold it in position.

nel carried by the cable company to translate the local station to another channel, this problem is normally eliminated. Sync buzz is usually caused by transmitter overmodulation, not normally a cable system problem except in cases where a CATV operator originates a channel with his own modulating equipment.

Trap Alignment

Since CATV comes into an area already covered by local TV, many of the TV sets used in CATV areas are older units. As components age and tubes are changed, their IF systems tend to drift out of alignment. With only two or three widely spaced signals, this is of little consequence and local TV service technicians are in the habit of ignoring alignment. This is particularly true of adjacent-channel trap alignment.

When these sets are connected to CATV, any misalignment shows up instantly.

Technicians with experience in CATV areas say that the only sure answer is to take the set back to the shop for a complete realignment, paying special attention to adjacent-channel traps.

It is worth noting that alignment is often the source of the grumbling about CATV.

Overloading

Although alignment problems constitute the major source of calls peculiar to CATV, the

sudden drop in signal levels also creates a scattering of other types of calls where the customer complains that the set works on the antenna, but not the cable.

Many technicians report that some old sets can handle high levels when there is no adjacent-channel signal, but can't handle low level signals when there is something on the adjacent channel. Since cable TV delivers medium-strength signals, one will sometimes encounter a very old set with either herringbone or sync buzz that no amount of alignment or AGC work will cure. Such sets can sometimes be cleaned up by inserting an attenuator between the cable and the set.

One enterprising service-dealer devised a variable attenuator for such sets, which can be made in the customer's home with a pair of pliers and a soldering iron. See Fig. 1.

Faded Colors

Every technician gets an occasional complaint of faded color on cable, but normal color on the antenna. This is usually a level problem. Normally, it is AGC or color killer trouble, but some of the cheaper inexpensive color sets do fade out slightly during a drop in signal level. On fading problems, re-adjust the color controls including AGC and color killer.

Once in a while you may encounter a set with noisy sound,

snow or both on cable, but good reception on the antenna. This is because a higher antenna signal level is forcing its way through a weak tube. Check tubes starting with the tuner.

When working on these sets, the technician should keep in mind that there is one safety problem peculiar to CATV.

The transformers that convert the 75Ω from the cable to 300Ω for the TV set have a bare coax fitting on one end that is thoroughly grounded. It is possible to get a nasty shock if you let the bare fitting brush across your hands while working on hot-chassis type units.

The cable companies indicate that there are no objections to the technician covering that fitting with electrical tape. The cable itself is insulated and the two sides of the transformer are insulated from each other so taping the fitting should provide adequate protection.

Sales people eventually learn that CATV can open up a wider FM field and often make the difference between selling a color set or a color TV-FM stereo combination. Service people soon learn that CATV, with its multiplicity of signals, forces the customer to buy newer equipment and maintain it better. More business is waiting for the shop that can offer this increase in quality and adapt to the service demands that CATV generates. ■

Sencore Model MU150 Tube Tester



Sencore model MU-150 tube tester.

Carry a tube tester capable of checking mutual conductance of all new tube types

■ As the business of servicing electronic equipment becomes larger, the need for a better tube tester becomes apparent. The instrument needs greater flexibility and individual connections for different tube elements as well as some sort of qualitative measure of a tube's performance. Meeting these qualifications is the Sencore Model MU150, one of the units we are evaluating in this month's Testlab report. This particular unit makes it possible to check the tube for emission and mutual conductance. In this type of tester we often find more controls required for setup, but Sencore has reduced the number of controls to make tube testing faster.

With an increasing number of new tubes such as the Novar, Compactron, Magnoval and the new 10-pin Decal, the substitution method of checking is a thing of the past. We must rely on a fast, accurate tube tester to make all the necessary checks.

The Continental has been designed to detect problems in a tube. It will make four independent tests: dynamic mutual conductance test; full load cathode current test; a high sensitivity grid leakage test; and the Sencore Mightly Mite "Stethoscopic Shorts Test," which has become very popular.

The tester will check tube types that include the standard seven and nine pins, octal, loctal, compactron, novar, magnoval nuvistor and the new 10-pin Decal.

Tube charts are kept current and new charts are sent when available for a nominal charge. If you do find an unlisted tube, the tester is easily set up from published tube data.

In addition to the three popular tests, the unit will test for true dynamic mutual conductance (Gm), an important test when working with critical circuits. As the tube ages, the tube elements can relax and change position slightly, affecting the operation of the tube. A mutual conductance test will show if this condition exists in a tube; the control grid will not have normal control of the plate current as with a good tube and this is also detected.

The mutual conductance or Gm circuit of the Continental employs a unique circuit called "ABC" (Automatic Biasing Control). This circuit selects the proper bias to hold the plate voltage at a constant level to obtain a true Gm reading on the tube under test. Resistors R2 and R6 form a voltage divider between the plate of the tube under test and the negative power supply line. The plate connects to the top of R2. The control grid connects to the junction of R2 and R6. As the plate current in the tube under test rises, it causes the positive voltage at the plate to drop. This in turn increases the negative bias on the control grid of the tube which brings the plate current back to the original level. This arrangement regulates the plate current and sets the bias on any tube that is being checked for Gm. The current ranges selected by

... for more details circle 900 on postcard

the B LOAD switch are 2, 7 and 25ma. The ABC system adjusts the plate voltage at these current levels to approximately 100vdc. The screen voltage for pentodes is regulated to 115vdc by the voltage regulator OB2 V1, and the zener diode CR11. The zener diode also regulates the collector supply voltage to the signal multivibrator (TR2 and TR3). The signal multivibrator generates a 5kHz square wave that is used as the Gm signal. The F SIGNAL control, R20, controls the amount of the 5kHz square wave that is fed to the control grid of the tube under test. R21 and R24 are used to set the 100 to 1 ratio and the maximum voltage available from R20.

When the Gm TEST switch is pushed, the plate and screen voltages are applied to the corresponding elements of the tube. The signal to the control grid is amplified by the tube being tested at the desired plate current selected by the B LOAD switch and the amplified signal is taken off the load resistor, R7. This signal is then coupled to the transistor amplifier TR1 and its output is rectified by the voltage doubler CR6, CR7, C4 and C13. This dc voltage is applied through the function switch to the meter circuit. The meter indicates in proportion to the dc voltage applied. When the tube has a Gm of its indicated value taken from the tube manual, the meter will read at 100. Any deviation from this indicates the amount the Gm varies from

the listed value and reflects the tube's quality.

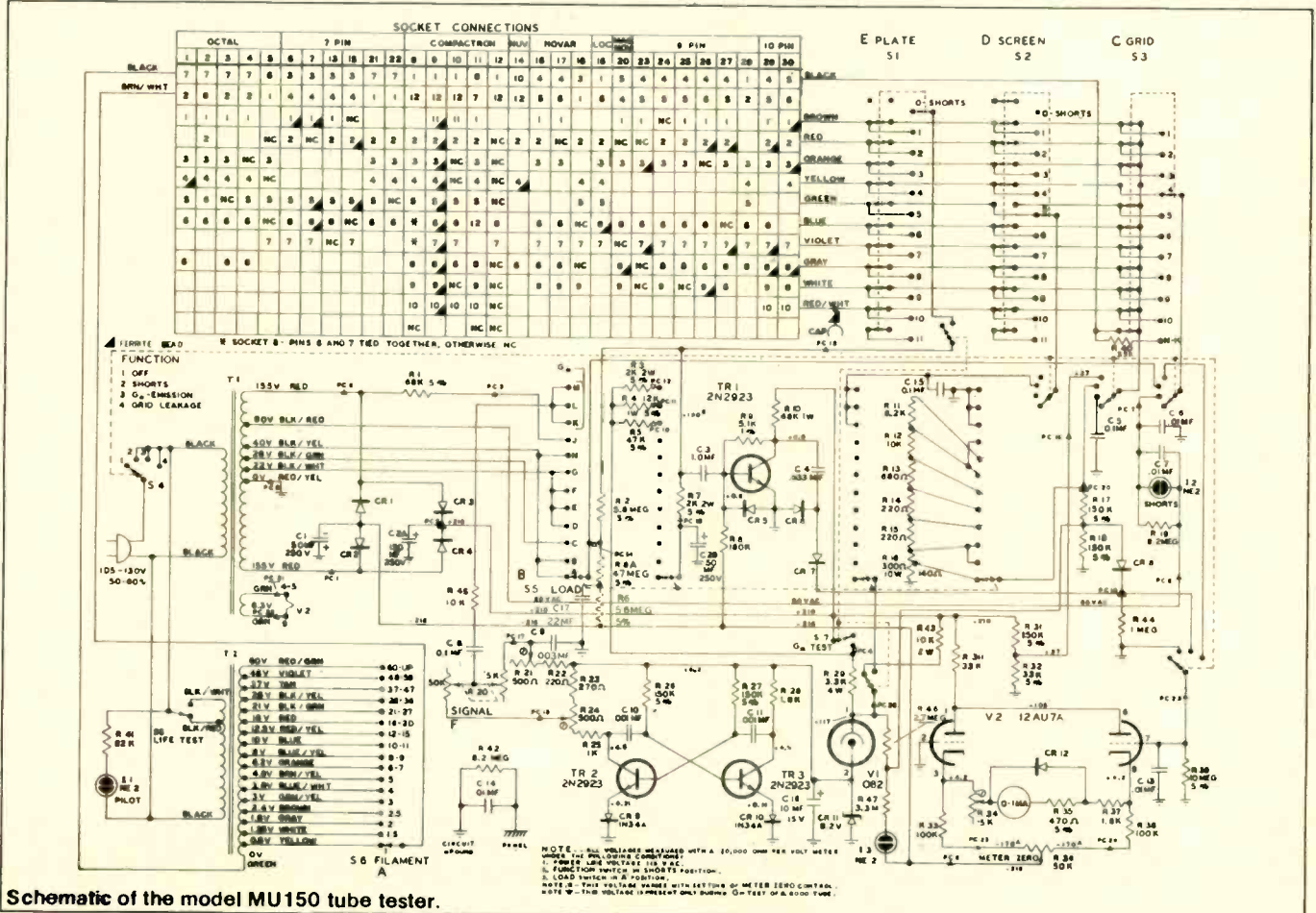
Shorts between elements of 180K or less are indicated by a simple neon bulb. A capacitive voltage divider consisting of C6 and C7 allow less than 40v to reach the elements of the tube under test. This is important in the newer grid tubes where breakdown can occur with higher voltage applied between elements.

When checking control grid leakage, the control grid of the tube is tied to ground through the 10M resistor R39. All other elements are supplied with about 37v positive through the FUNCTION switch S4.

In use, the control grid of a tube that has leakage will cause a positive potential to appear across the 10M resistor. This voltage will cause the meter circuit to indicate. The more leakage that is present, the higher the meter will read until a dead short will cause the meter to read just about full scale. Leakage of 100M, or a grid emission of about 0.35µa, would produce a leakage indication just into the BAD area.

This tube tester can be modified for new tubes as they are needed. Simply remove a cover plate on the front panel exposing four 3/8-in. guide holes. These holes are pre-numbered to correspond with setup information supplied by the manufacturer.

The instrument is styled resembling an attache' case with a pop-open lid. The setup book is fastened to the lid for easy reference. Price is \$219.50. ■



Lectrotech Model SCA-300

Transistor TV Sweep Circuit Analyzer

Use the timesaving signal injection method to troubleshoot transistor TV deflection circuits

■ If you used the signal injection method of troubleshooting the tube type TV deflection circuits and the method became obsolete with the introduction of solid-state, this unit will put you back in business. You can go back to the timesaving isolation method using this new transistor TV sweep circuit analyzer.

Conventional vacuum tube analyzers will destroy transistors because of their high voltage level. Sufficient power is available to drive the base circuit of any horizontal output stage to full sweep and high voltage. All tests are dynamic and the results are displayed directly on the CRT.

The analyzer determines whether the stage being driven employs a PNP or NPN transistor and the correct drive is automatically provided. The pulses produced will drive the base and collectors of all stages.

The analyzer is very easy to use with only two operating controls: (1) VERTICAL/HORIZONTAL selector, (2) output LEVEL control. There are two leads on the unit, the ground and the injection test probe.

How the Sweep Analyzer Works

Transistor Q1 and Q2 form a simple cross-coupled multivibrator that oscillates at 15,750 cycles. Control P1 is adjusted for the correct operating frequency and P2 is used to adjust the duty cycle for a symmetrical square wave. Control P2 is factory adjusted and will not require resetting over the life of the instrument. P2 is a hidden control not

accessible from the outside of the instrument. P1 is available through a hole on the front panel.

Transistor Q3 is direct coupled to the base of Q2. Q3 provides isolation between the oscillator (Q1, Q2) and the output transistor Q4. Its purpose is to isolate the load from the oscillator so that the oscillator frequency will not change with loading.

Transistor Q4 is also direct coupled to the base of Q3. Q4 acts as a switch. The collector of Q4 is alternately either at ground potential when it is saturated or at +11v when it is cut off. Current limiting is provided for by the 10 Ω , 10w collector load. This circuit can deliver approximately 1a of drive at 15,750 cycles. The collector of Q4 connects to the frequency selector switch, which in turn feeds P3, the signal level control. The arm of the signal level control connects to two electrolytic capacitors back-to-back (to provide non polarized action) and the signal appears at the signal test probe.

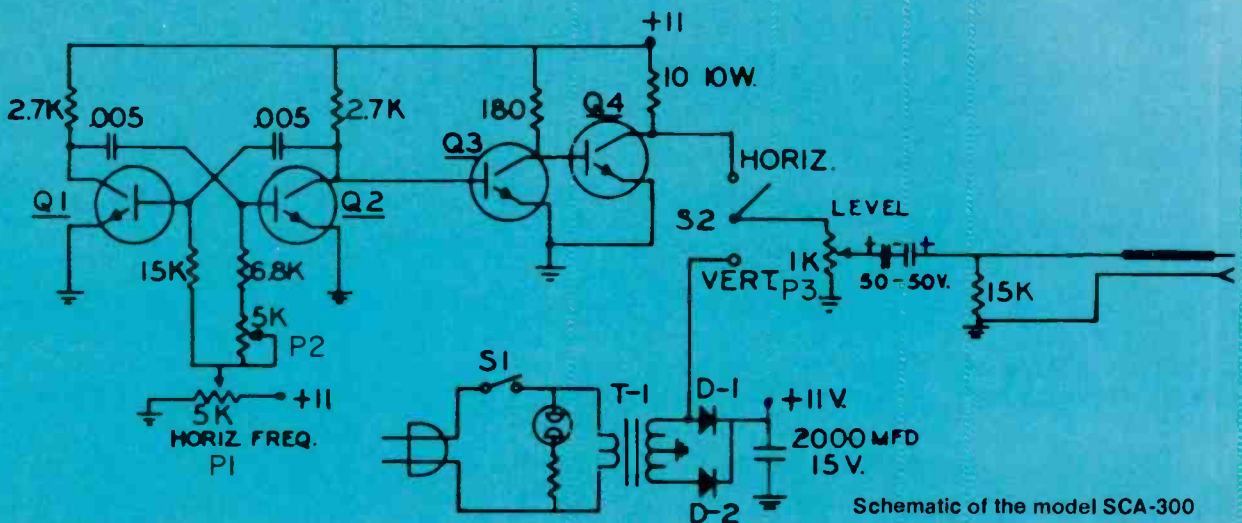
The vertical signal is a sine wave derived from the secondary of transformer T1. When the frequency selector switch is in the vertical position this sine wave appears across the SIGNAL LEVEL control and then to the output. The circuit delivers approximately 1a of signal current to a load.

The 15K resistor across the output circuit provides a discharge path for the 50 μ f, 50v capacitors.

The power supply is a conventional full wave rectifier circuit feeding a 2000 μ f filter capacitor. The dc output voltage is +11v. The unit is portable, measuring 6 3/4 X 5 1/4in. and weighs 3 lb. Net price is \$39.50.■



Lectrotech model SCA-300 transistor TV sweep circuit analyzer.



Schematic of the model SCA-300 transistor TV sweep circuit analyzer.

... for more details circle 901 on postcard



DEALER SHOWCASE

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

Garage Door Opener 700

New solid-state radio controls for automatic garage door opener systems are introduced. Designated the "Genie



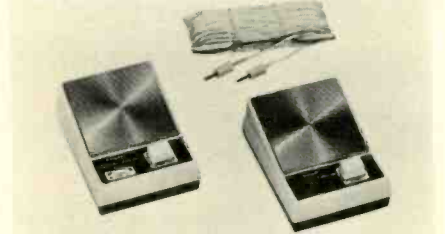
AC-24" radio control, both transmitter and receiver feature transistorized circuits. The radio receiver operates

on 24vdc. The miniature transmitter is a palm-sized push-button control which may be carried in car, purse or pocket. Power for its circuitry is supplied by a standard 9v battery. Signals from the transmitter are picked up by the receiver which automatically activates the door opener. A press of the button on the transmitter opens the garage door and turns on the inside light, or closes and turns off the light. Normal operating range is within 100ft. Alliance.

Two-Station Intercom 701

Announced is an all-transistor, two-station intercom kit in the low-priced range. No special skills or tools are required for assembly and it is simple to operate—a button is pressed to talk and released to listen. Volume control is on the master-station. The circuit permits signal to be sent even if switch is in "off" position on the

remote-station. The units are enclosed in plastic cases with gold-color grills



measuring 3 x 1 1/4 x 4in. Kit includes battery, 66ft interconnecting wire, plugs and step-by-step instructions. Price \$7.95. Allied.

Portable TV 702

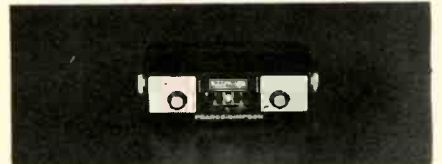
Announced is a 19in. B/W portable television receiver employing solid-state signal circuits which provide greater reliability by operating



with less heat. It has 184sq.in. of viewing area, 20kv chassis, instant play, polarized line cord and dipole telescopic antenna. The Aristocrat Model 19P51C in a brown cabinet has an open list price. Admiral.

CB Radio 703

Introduced is the Panther, a five-channel, all-solid-state Citizen's Band



radio capable of producing up to 4w output. The 12v mobile unit comes

Continued on page 67

Solve Color Register Problems



Use Miller 7604 Blue Lateral & Purity Assembly

Now register blue, red and green beams simultaneously on any size rectangular color picture tube with the Miller 7604 blue lateral and purity assembly.

A single wheel rotates two magnetic rings in opposite directions to provide blue lateral convergence. Purity correction is accomplished by individual adjustment of the two purity rings. The magnets compensate for mis-registration up to .005" in any direction.

Dealer Net Each: \$3.96: Available from distributors' stocks. Write for your copy of Cross Reference Bulletin 1069

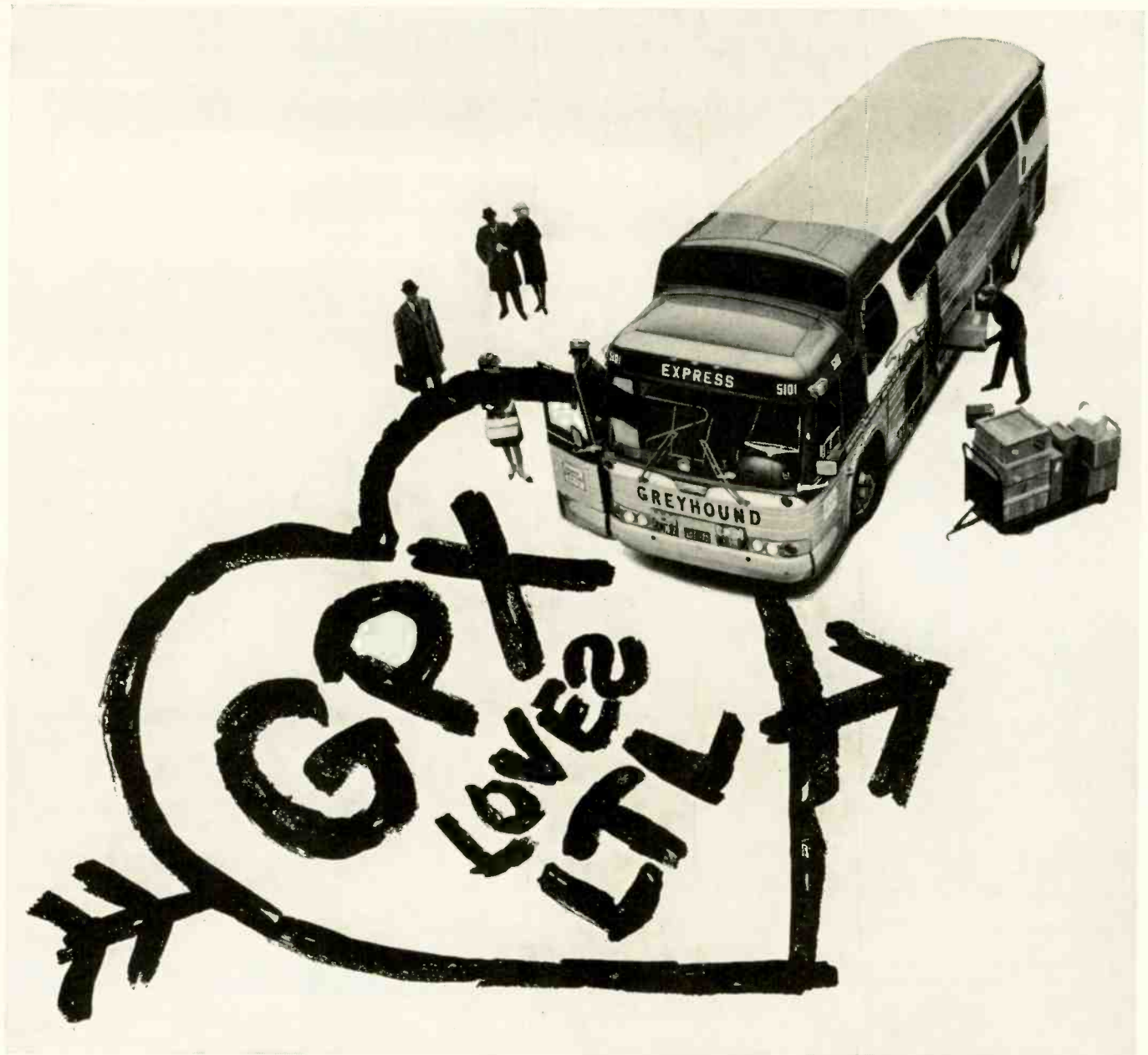


J.W. MILLER COMPANY

5917 SO. MAIN STREET ■ LOS ANGELES, CALIFORNIA 90003

See your local distributor for the full line of RF and IF coils, chokes and transformers

... for more details circle 125 on postcard



Small shipments are the heart of our business.

We've got more going for you, with service to over 25,000 cities and towns every day.
Can we drop something off for you?

It's there in hours and costs you less when you ship by GPX.

For Example	Buses Daily	Running Time	10 lbs.	30 lbs.	50 lbs.
Memphis—Nashville	9	3 hrs. 45 min.	\$1.85	\$2.35	\$2.95
Pittsburgh—Cleveland	13	2 hrs. 20 min.	1.95	2.45	3.15
Los Angeles—Oakland	9	8 hrs. 50 min.	1.80	2.45	3.20

Other low rates up to 100 pounds. Lot shipments, too. For complete information call Greyhound, or write Greyhound Package Express, Dept. 53-D, 10 South Riverside Plaza, Chicago, Illinois 60606.

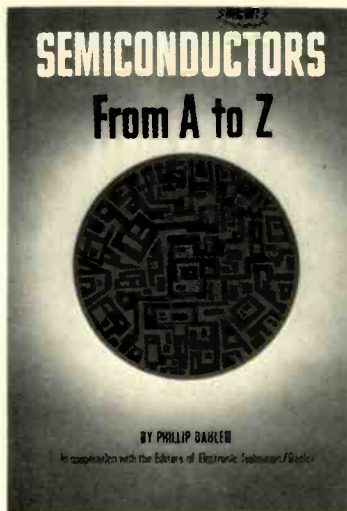


... for more details circle 115 on postcard

Here it is . . . THE BOOK ET/D READERS HAVE DEMANDED!

SAVE \$2⁰⁰

on this special
Prepublication Offer!



- BRAND NEW and Complete
- 26 BIG Chapters
- 256 Fact-Filled Pages
- Over 300 Illustrations
- Attractively Hardbound

PARTIAL LIST OF CONTENTS

What Is a Semiconductor?
Semiconductor Characteristics
Determining Semiconductor Characteristics
Frequency Limitations
Field-Effect Transistors
MOS FETs
The Tunnel Diode
Tunnel Diode Applications
Integrated Circuits
IC Balanced Differential Amplifier
IC Applications in FM Circuits
IC Applications in TV
IC TV Sound Circuits
IC Time Constants & Cascade Amplifiers
The Varicap
Varicap Applications
Review of Capacitor & Coil Impedances
Photo Sensitive and Photo-Emissive Devices
FET Light-Sensitive Devices
Principles of Optics
Optic-Electronic Couplers
Semiconductors for Power Supplies
Constant-Voltage Transformer
Power Conversion
Filter & Regulators
Index

SEMICONDUCTORS From A to Z

By Phillip Dahlen, in cooperation with the Editors of ET/D

All You Need to Know About the Entire Range of Transistors and Semiconductors Used Today.

Here it is — everything you need to know about semiconductors — from basic diodes and transistors to FETs, MOS FETs, tunnel diodes, integrated circuits, varicaps, photoFETs, light-sensitive and light-missive devices, incandescent and luminescent optic-electronic circuits, unijunction transistors, field-effect diodes, SCR and zener diodes, etc. Based on the series of articles appearing in ET/D, "Semiconductors From A to Z" is written in language anyone can understand. It explains how these various devices work and how they are used, with complete descriptions of all the common and unique circuits used in modern semiconductor technology. With the wealth of knowledge incorporated in this book you'll be eminently qualified to service any type of solid-state equipment.

The content begins with a review of how basic semiconductors work, including types and functions, how a transistor conveys a signal, transistor biasing and self-biasing techniques, effects of temperature on operation, factors limiting transistor frequency response, etc. Succeeding chapters delve into the mystical area of field-effect transistors by explaining the differences between FETs and regular transistors. You'll understand junction FET applications, frequency response, temperature effects, and the treatment given depletion-type and enhancement-type MOS FETs is the most down-to-earth explanation you'll ever find.

Considerable attention is given to integrated circuit applications — variable-current and constant-current sources, unbalanced differential amplifiers, IC applications in FM and TV receivers, TV sound circuits, discriminator circuits, and cascade amplifier networks. The use of varicaps is also covered, as well as unijunction transistors, field-effect diodes, zener diodes, SCR diodes, 4-layer diodes, diacs, and triacs. Several chapters are devoted to the new field of optic-electronic circuits, including uses for photo-voltaic and photoconductive cells, photodiodes, phototransistors (FETs and MOS FETs), light-emitting diodes, optic lenses, fiber optics, incandescent couplers, luminescent couplers, and a "needle-less" phone pickup that plays standard records. The final chapters deal with constant current and voltage regulating systems.

Here's your chance — before technology passes you by — to acquire a thorough understanding of all semiconductors. Don't be left in the dark as these devices begin to dominate the field of electronics. 256 pp., over 300 illus., 26 Chapters. Hardbound.

FREE 10 — DAY EXAMINATION! For a limited time, you may order at the Special Price of only \$5.95 (regular price \$7.95) . . . at our risk . . . for 10 - day FREE examination. NO NEED TO SEND MONEY NOW. Simply fill in and mail NO-RISK Coupon below for this indispensable volume!

OTHER HELPFUL BOOKS FOR ELECTRONICS ENGINEERS

SERVICING TV RECEIVER CIRCUITS — With Special Color Section
By Electronic Technician Editorial Staff. Here's a volume every TV service technician will want for his reference library. It contains just the kind of practical, down-to-earth information you can use in your everyday service work expert troubleshooting techniques and solutions to the most complex circuit problems. Written by nearly a dozen leading experts in the field, the content is arranged to provide a quick and easy reference. Contains the service data most needed for troubleshooting both monochrome and color receivers — all in one handy volume. Also included are 3 chapters on transistor TV circuits and troubleshooting techniques. Emphasis is on practical information you can use in the home or at the service bench. Numerous actual example troubles are cited to help you solve "tough dog" problems. Includes complete analysis of TV circuit troubles and solutions for sweep and sync problems, AGC malfunctions, RF and IF faults, sound and audio troubles, power supply defects, etc. More than half the content is devoted to color, including the practical background theory needed to troubleshoot and repair today's complex color TV receivers, complete with test procedures, waveform photos, and trouble-correction techniques. 224 pgs., 38 Chapters, 5 1/2" x 8 1/2" Hardbound.
No. 414 - Regular Price \$6.95
Limited Time Offer, only \$4.95

TV TROUBLESHOOTER'S HANDBOOK
By Editorial Staff, Electronic Technician magazine. A carefully-planned reference source of over 350 different, tried and tested solutions to "Tough-dog" TV servicing problems. Here is a digest of TV receiver troubles and cures, unusual circuits and descriptions of how they work, field and factory changes, recurring defects, etc., that will help you locate and correct the most elusive TV circuit faults. For ease of use, all troubles have been logically organized by manufacturer and model number. A special Section on color TV describes

recurring defects and cures, and includes service hints for troubleshooting chroma circuits, short-cuts for making convergence adjustments, descriptions of new circuits, etc. 192 pgs., 125 illus., Hardbound.
No. 401 - Regular Price \$6.95
Limited Time Offer, only \$4.95

MODERN ELECTRONIC TROUBLESHOOTING
Using Up-to-Date Instruments and Advanced Servicing Techniques.
By the Editors, Electronic Technician/Dealer. A down-to-earth handbook that deals with today's electronic servicing problems on a practical level, using modern test instruments and advanced troubleshooting procedures to cope with the special problems created by printed boards and solid-state circuitry. It is hard to conceive of a book that encompasses monochrome and color TV, multiband radio receivers, hi-fi equipment, tape recorders, two-way communications equipment, and test instruments for servicing all this equipment. Yet this book does! By getting right to the subject of how to service the equipment without the usual wordy theoretical discussions of how the circuits work. This is a book for professional service technicians, dealing with the problems which are currently causing them the biggest headaches. The content is divided into five Sections. The first four deal with troubleshooting techniques and test instruments for servicing solid-state circuitry (radio, TV, hi-fi, and communications gear), color-TV circuits, hi-fi and stereo equipment and two-way communications transceivers. The final section gives social information such as how to add a triggered sweep to your old scope, how to use an R/C bridge effectively, how to service your own test equipment. 256 pgs., over 100 illus., 24 Chapters. Hardbound.
No. 474 - Regular Price \$7.95
Limited Time Offer, only \$5.95

PUBLISHER'S GUARANTEE

Put the information in these books to work for you for 10 days. If they don't prove to be worth several times their cost, return them and we'll cancel invoice.

NO RISK COUPON — MAIL TODAY

TAB BOOKS Blue Ridge Summit, Pa. 17214
Please send me _____ copies of "Semiconductors from A to Z" at the Special Prepublication Price of only \$5.95.

Also send me: 401 414 474

I enclose \$.....
 Please invoice on 10 day FREE trial

Name.....

Company.....

Address.....

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

SAVE POSTAGE BY REMITTING WITH ORDER! ET469

ET/D DEALER SHOWCASE

complete with channel 9 crystals, power cord, mounting cradle and palm mike. Constructed of Cyclocac with illuminated channel selector and power-on indicator light, the radio features low current drain (0.3a receive), L-C filter, superhet receiver, Class B push-pull audio, electronic switching, preset automatic noise limiter and squelch control. The noise limiting circuit is claimed to virtually eliminate ignition and alternator noise. Easy to install with a locking, adjustable bracket, the unit measures 7 $\frac{3}{4}$ x 2 $\frac{1}{4}$ x 6in., weighs 3lb. and is priced at \$99.90. Pearce-Simpson.

Stereo Tape Player 704

Introduced is a family of five mobile stereo tape cartridge players. Two of the units are equipped with built-in FM/stereo radios with recessed function controls and die-cast front housings in a black satin chrome "camera finish." The new models offer a choice of 4-track and 8-track com-



patible tape play, or 4-track or 8-track play exclusively. Models 3117 and 3119 feature built-in FM/stereo radios and automated cartridge and radio/play features. Model 3117, with six head positions for precise track alignment, selects 4- or 8-track play automatically. It also features automatic switching for all 8-track cartridges or 4-track tapes with a sensing foil strip at the program change point. Model 3119, a straight 8 tape player, features automatic program switching of 8-track cartridges. When an FM broadcast changes from monaural to stereo in either model, the radio's switching circuit automatically provides stereo sound, says the maker. Automatic Frequency Control (AFC) is used to make station tuning easier. Change-over from tuner to cartridge play is also automatic whenever a cartridge is inserted. Each unit incorporates a multi-function program/FM bar for selection of tape play or FM/stereo radio broadcast. A manual defeat switch locks the radio in a monaural condition when the received signal is not strong enough for noise-free stereo. It is claimed that installation

Continued on page 72

NOW - CHECK ALL TRANSISTORS IN OR OUT OF CIRCUIT ...



all regular transistors plus the new field effect transistors.

You won't be stopped when you run into the new FETs that are wired into the latest hi-fi, newest TV receivers and nearly every other new device coming on the market. For the very first time, you can check them all, in or out of circuit. The TF151 works every time using tried and proven signal injection techniques. New, improved tests on special RF transistors and the latest high power transistors, mean that the TF151 is the only up-to-date transistor tester on the market. A new, exclusive setup book in rear compartment guides you to every test for over 12,000 transistors and FETs. The book is not needed for general service troubleshooting. Regular transistors are checked for beta gain and I_{gss} leakage. FETs are checked for transconductance and I_{gss} leakage. **only \$129⁵⁰**

Your distributor just got this new tester in stock. See him, it obsoletes all others.



SENCORE
NO. 1 MANUFACTURER OF ELECTRONIC MAINTENANCE EQUIPMENT
426 SOUTH WESTGATE DRIVE. ADDISON, ILLINOIS 60101



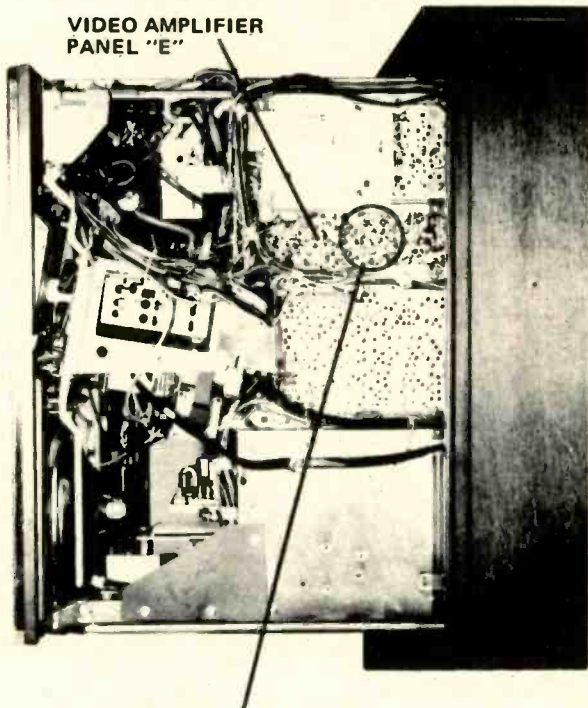
COLORFAX

MOTOROLA

Color TV Chassis TS915—Service Information
Video Ringing

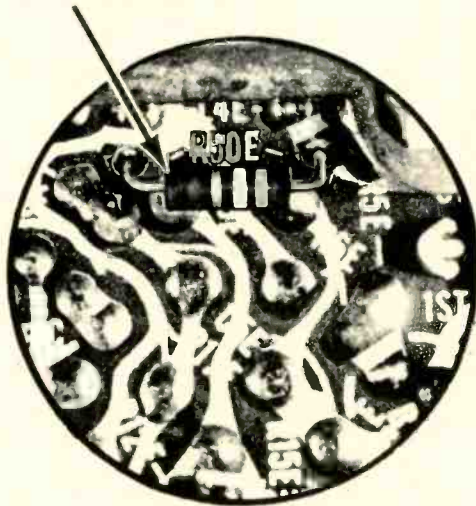
Several changes have been made in recent editions of video amplifier (E) panels to provide optimum response and picture detail.

Symptom: Under certain operating conditions, sets with E-14 or E-15 panels may tend to "ring" in the second



VIDEO AMPLIFIER
PANEL "E"

ADD 2.7K ½ W RESISTOR R50E.
INSERT INTO EXISTING HOLES
IN PANEL AND SOLDER.



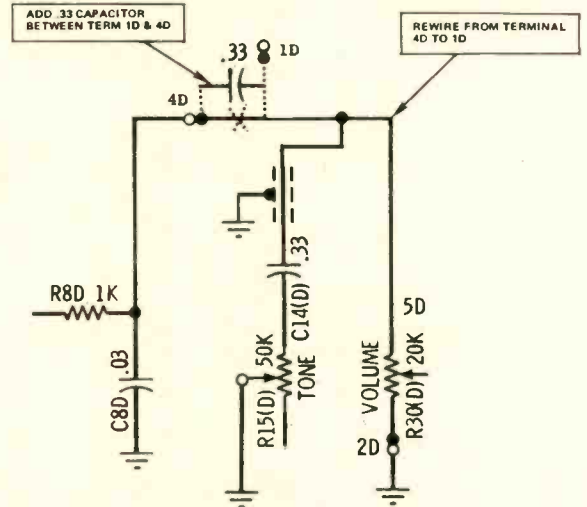
video stage and cause either (1) a multiple ghost effect with each ghost spaced about ¼ in. to the right, or (2) a slightly "busy" background.

Solution: For sets using either E-14 or E-15 panels, install a 2.7K ½ w resistor in the space provided for resistor

R50E (see details in the photos). This places the resistor in parallel with the video peaking coil and prevents ringing. This modification will not be needed for subsequent E panels.

TS-915 Remote Chassis Only

Symptom: Audio popping during channel change function in TS-915 remote chassis only. Solution: Add a .33μf

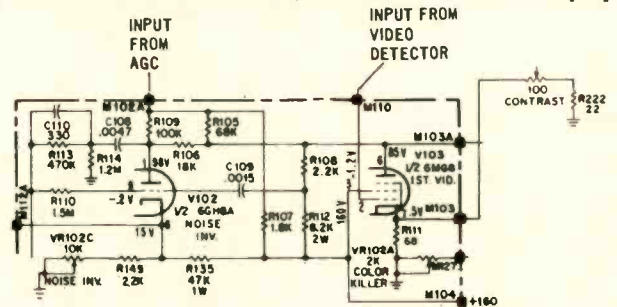


capacitor in series with volume control. Remove all leads from terminal 4D on chassis and connect to terminal 1D. Add .33μf capacitor between terminals 1D and 4D. Capacitor part is No. 8S10191A69. (See partial schematic diagram.)

PHILCO-FORD

Color TV Chassis 17MT80A/18QT86—Video Amplifier Servicing

Defects in this section usually affect the picture and sync while the sound remains normal. Some of the symp-



The new Kaar "Series 80"* mobile radios

We believe this equipment to be technically superior to any other 2-way radios available, and to set new standards for reliability and ease of installation, operation and maintenance.

here's why 

BUSINESS REPLY CARD
No postage necessary
if mailed in the United States

FIRST CLASS
Permit No. 311
Rahway, N.J.

Postage will be paid by

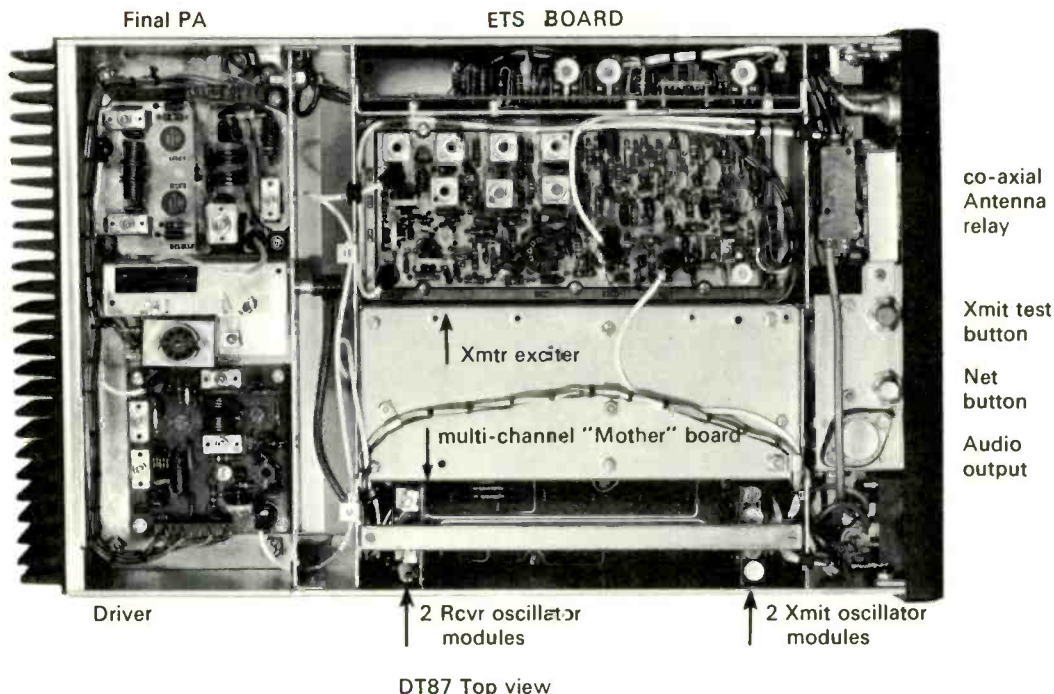
**KAAR ELECTRONICS
CORPORATION**
232 Westcott Drive,
Rahway, New Jersey 07065

*Trademark



The new Kaar "Series 80"

2-way radios ... the most up-to-date, all solid-state mobile equipment on the market today.



ENGINEERING DESIGN

The use of latest design concepts, including silicon and field-effect transistors (FET), an integrated circuit (IC) and optional all solid-state electronic tone squelch (ETS), provides a degree of reliability previously unattainable. Modular style construction, using plug-in glass epoxy circuit boards, vastly simplifies maintenance and reduces the need for stand-by sets. Multi-channel sets are pre-wired at time of assembly. Simple, in-field modification using plug-in modules permits multi-channeling at any time.

CONSTRUCTION

Rugged, dust-proof cases of heavy gauge metal are designed to withstand the hard use to which mobile sets are bound to be subjected.

COMPONENTS

To achieve the desired superior performance and reliability, many important "Series 80" components were designed and manufactured to our own specifications. One example is the microphone—a sealed, shock-mounted unit with trouble-free leaf type switch contacts and numerous other features that make it undoubtedly the finest available for commercial communications.

APPEARANCE

At last, here is a marriage of electronics engineering and industrial design... with the result that the best performing 2-way mobile radios are also the best looking.

COMPACTNESS

The "Series 80" takes second place to none for compactness and ease of instal-

lation in tight quarters. The trunk-mount receiver/transmitter units are only 3 1/4" high... easily fit under seats, on side walls and in many places not previously useable.

ADAPTABILITY

A number of optional features and accessories make the "Series 80" readily adaptable to a wide range of applications... as add-on equipment or for new systems, large and small.

POWER DRAIN

"Series 80" units draw far less power for the same RF output. There are no power supplies* or crystal ovens. The sets operate directly from the vehicle battery, protected from voltage fluctuations by a built-in, solid-state regulation circuit.

*Exceptions: DT84 and AC model of DT83.

MAIL THE CARD FOR FULL INFORMATION ON THIS GREAT NEW EQUIPMENT

To: Kaar Electronics Corporation,
232 Wescott Drive,
Rahway, N.J. 07065

Please send me technical specifications and full information on "Series 80" mobile radio.

NAME _____

COMPANY _____

ADDRESS _____

STATE _____ ZIP _____

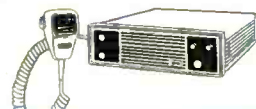
I am a User of electronic equipment.

Dealer

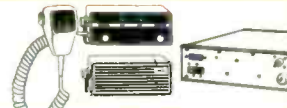
DT82, UHF, 10 watts RF output. 12VDC. Trunk mount. 1 to 8 channels 406-420 MHz and 450-470 MHz.



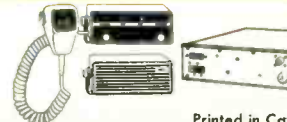
DT83, UHF, 10 watts RF output. 12VDC under-dash mobile. Also available as 117VAC desk-top control station. 1 or 2 channels 406-420 MHz and 450-470 MHz.



DT84, UHF, 70 watts RF output, 12VDC. Trunk mount. 1 to 8 channels. 406-420 MHz and 450-470 MHz.



DT87, VHF, low band, 50 watts RF output. 12VDC. Trunk mount. 1 to 8 channels. 25-35 MHz and 35-50 MHz.



are reading voltages across open components. In this way erroneous indications can be obtained, leading to false conclusions. To avoid errors of this kind, it is better to use an oscilloscope and follow the waveform through the circuit, noting where it disappears. The trouble exists between the points where the signal last appears and where it disappears. If other parts in the suspected circuit check properly, substitute a transistor known to be good to determine if the transistor is at fault.

By close analysis of the symptoms on the screen, along with a knowledge of the circuits involved, you can usually localize the trouble to one or two stages. For example, in the 17MT80A color chassis, the signal used for sync and AGC is taken from the output of the 1st video amplifier stage. Therefore, if the sync and AGC operation are unaffected, the problem is probably in the video driver or video output stages.

Another example is a lack of, or misfitting, detail in the color picture. This usually means that the luminance signal from the video amplifiers is not being delayed properly. This function is performed by the delay line which couples the video driver to the output. It delays the video (or luminance) signal long enough to allow the chroma signal to pass through the various stages in the chroma section. In this way, both signals arrive simultaneously at the CRT.

If the delay line is open, of course there will be no detail in the color picture and no black and white reception. However, if the delay line is shorted, the missing time lag will cause a misfit of detail information in the color pic-

Continued on page 84

Weller®
makes first class
soldering the easiest
part of any job



The original Dual Heat Soldering Guns

Preferred by technicians for their fast heating copper tips, exclusive trigger-controlled dual heat, and high soldering efficiency. Available in 3 watt-age sizes, each with spotlight.

100/140-watt Model 8200, 145/210-watt Model D-440, and 240/325-watt Model D-550. Also in complete kits:

Dependable MARKSMAN Irons
in a size for every job



Ideal for deep chassis work and continuous-duty soldering, Marksman irons outperform others of comparable size and weight. All five feature long-reach stainless steel barrels and replaceable tips.

- 25-watt, 1¾-oz. Model SP-23 with 1/8" tip (In kit with extra tips, soldering aid, solder—Model SP-23K)
- 40-watt, 2-oz. Model SP-40 with 1/4" tip
- 80-watt, 4-oz. Model SP-80 with 3/8" tip
- 120-watt, 10-oz. Model SP-120 with 1/2" tip
- 175-watt, 16-oz. Model SP-175 with 5/8" tip

25-watt Technician's Iron
for intricate circuit work



Industrial rated pencil iron weighs only 1¾ ounces, yet delivers tip temperatures to 860°F. Cool, impact-resistant handle. All parts readily replaceable. Model W-PS with 1/8-inch tapered tip.

Also available: A new Battery Operated Iron for use with 12 volt battery or 12-24 volt AC/DC source. Complete with 12 ft. cord and battery clips. Model TCP-12.

Complete Weller Line at your Electronic Parts Distributor.

WELLER ELECTRIC CORPORATION, Easton, Pa.
 WORLD LEADER IN SOLDERING TOOLS

10 Watt Power
INTERCOM
& Paging System

Designed to offer the latest in solid state and more operational features. Master and remote originate calls by making use of "tone" calling. Indicators continue to display calls until contact is completed. Simplified 2-wire installation. 8-transistor, 5-station master. 115 VAC.

MASTER \$69.95

AE DIVISION
 ALCO ELECTRONIC PRODUCTS, INC., NO. ANDOVER, MASS. 01845

NEW — AUDIO
CONTROL CENTER
FOR SWITCHING SYSTEM'S INPUT OR OUTPUT

Control up to 4-6 complete stereo speaker systems, located in every room in your house. Or . . . use it to switch in or out various inputs such as tuners, tape recorders, phonos, etc. No impedance worries. Attractive black leatherette finish; employs easy-to-use push-push switches. Size: 5 5/8" x 2 1/8" x 3 1/4". See your dealer today.

4-CHANNEL RCA JACK 19.95
6-CHANNEL (Shown) 26.95

AE DIVISION
 ALCO ELECTRONIC PRODUCTS, INC., NO. ANDOVER, MASS. 01845

. . . for more details circle 102 on postcard

. . . for more details circle 139 on postcard



**Put this E-V
needle/cartridge
display next to
your cash register
...it insures
good fortune!**

Put this handsome merchandiser with its stock of E-V literature on your counter. You've just taken the first step toward bigger phono needle & cartridge sales.

Now, take the second step. Let your E-V distributor help you fill it with the best-selling needles & cartridges in town.



Best-selling because the Electro-Voice computer prepares accurate, up-to-date popularity lists for your guidance. Easy-selling because all E-V needles and cartridges meet or exceed original equipment specifications for quality.

Your Electro-Voice distributor has the broadest line of exact-replacement phono parts in the business. Needles, cartridges, wheels and belts. Plus a merchandiser deal that helps you sell them. Start your good fortune today at your nearby E-V distributor's!

ELECTRO-VOICE, INC., Dept. 497T
663 Cecil St., Buchanan, Michigan 49107

Electro-Voice®

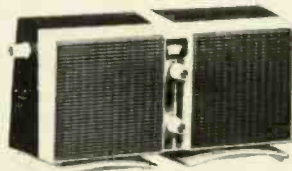
A SUBSIDIARY OF GULTON INDUSTRIES, INC.

ET/D DEALER SHOWCASE

Continued from page 67
of these units will not disable present AM radios and the same car antenna will serve both. Model 3117 lists at \$169.95; model 3119 for \$139.95. Craig.

FM Monitor Receiver 705

Introduced is the Model TR100H police/fire call monitor receiver. The unit is a solid-state, crystal-controlled, ac, double-conversion superheterodyne receiver designed for use in the narrow band FM channels of the public safety communication bands. These channels cover all of the police, fire,



civil defense, utility and industrial service frequencies. The unit can be ordered with from one to six different frequencies. Specifications: Frequency range—Model TR100H—High Band—150.175MHz. Sensitivity—10db S+N/N high band—.5µv or better. Selectivity—narrow band, 60db at ±30kHz. Stability—crystal controlled. Tuning—delta fine tuning to reduce distortion. Squelch—high band adjustable. Audio output—approximately 1.5w. Power—110-120vac 60Hz-10w. Complete with antenna. Antenna impedance—50-75Ω. Dimensions—10¼ x 5½ x 3½in. Warranty—one year on parts and labor. Trojan.

FM Paging/Receiver 706

An FM selective-calling paging-receiver, that is said to be compatible and interchangeable with other sys-



tems, is announced. This solid-state, crystal-controlled double superheterodyne receiver, Model PR-150/2, operates on either low band (30-50MHz) or the recently assigned 150MHz band. It offers either beep-

only or beep-plus-voice and is available for operation from rechargeable batteries or dry cells. The unit measures 2½ x 5 x ¾in. and weighs 7oz. Price under \$200. Minilec Devices.

Tape Splicer 707

Announced is an in-store Tape Splicing Center. The display pro-



vides a mounted splicer and a supply of EDITABS. Instructions and illustrations are part of the display. Prices start at \$3.50. Elpa.

Cassette Counter Display 708

A new cassette center counter display is offered for Aiwa cassette tape recorders. The display holds four units and features copy for



items displayed. Over-all dimensions of the pilfer-resistant merchandiser are 27x30x14in. It can be obtained on a merchandise plan. Selectron International.

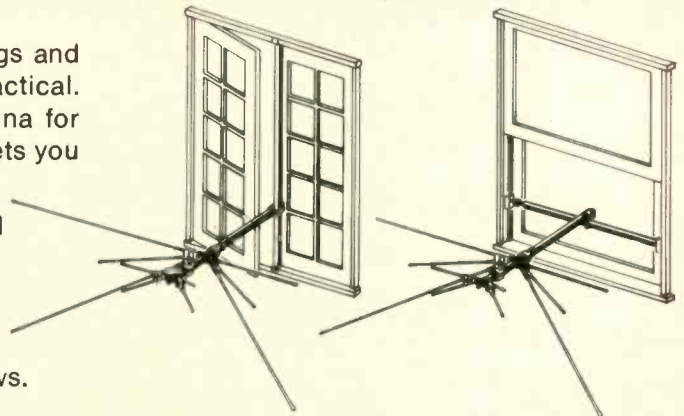
**For more information,
see Readers Service
page 87.**

NOW! An outdoor antenna you don't have to mount on the roof

All channel color TV WINDOW ANTENNA outperforms any indoor antenna!

Here's the ideal antenna for apartment buildings and homes . . . where rooftop mounting is impractical. Window mounting gives you an outdoor antenna for improved TV reception. Unique swivel design lets you aim for VHF and UHF stations independently.

- All aluminum construction with gold corodized corrosion-proof finish.
- Mounting bar fits horizontally or vertically in any type window up to 42" wide or high.
- Extension bars available for larger size windows.

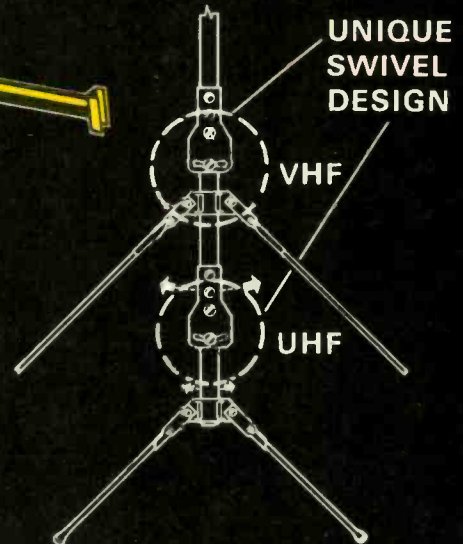


FINCO®



- 10 element VHF/UHF
List Price \$14.95
- 6 element VHF only
List Price \$11.95

All Prices Subject to Change.



By the makers of the famous FINCO Color Spectrum Antennas "signal customized" for better color reception.
T.M.



THE FINNEY COMPANY

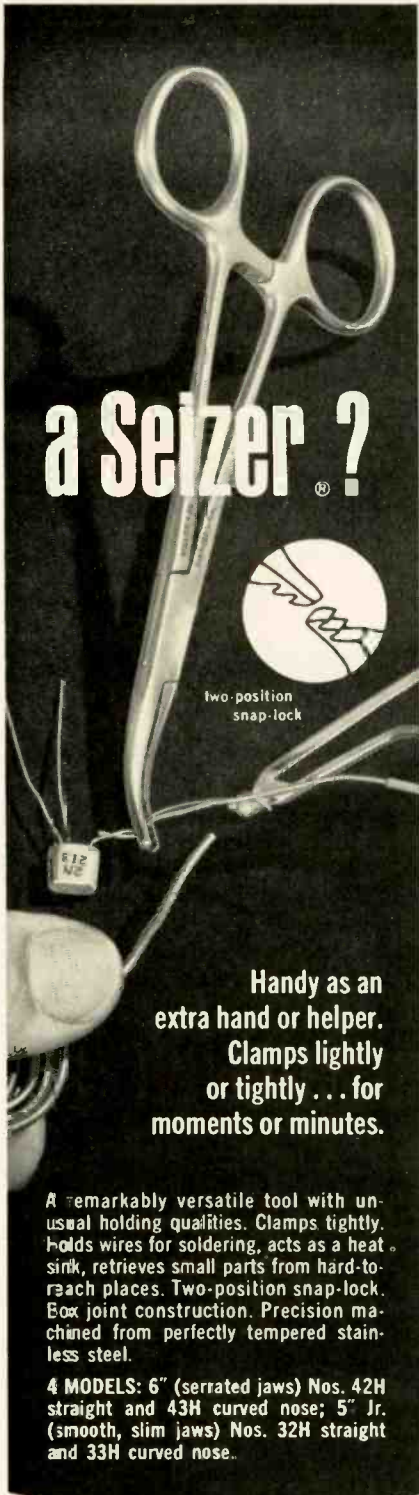
34 West Interstate Street, Dept. 110-4
Bedford, Ohio 44146

Mail coupon for free brochure.

Name _____
Address _____
City _____ State _____ Zip _____

... for more details circle 112 on postcard

how often
could you
have used...



a Seizer?

two-position
snap-lock

Handy as an
extra hand or helper.
Clamps lightly
or tightly... for
moments or minutes.

A remarkably versatile tool with unusual holding qualities. Clamps tightly, holds wires for soldering, acts as a heat sink, retrieves small parts from hard-to-reach places. Two-position snap-lock. Box joint construction. Precision machined from perfectly tempered stainless steel.

4 MODELS: 6" (serrated jaws) Nos. 42H straight and 43H curved nose; 5" Jr. (smooth, slim jaws) Nos. 32H straight and 33H curved nose.

XCELITE

XCELITE, INC., 130 Bank St., Orchard Park, N. Y. 14127
In Canada contact Charles W. Pointon, Ltd.

... for more details circle 141 on postcard

ET/D

NEW PRODUCTS

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

Alignment Tool

709

Introduced is the Tough 7 TV and FM alignment tool set which was developed for long wear use in factories

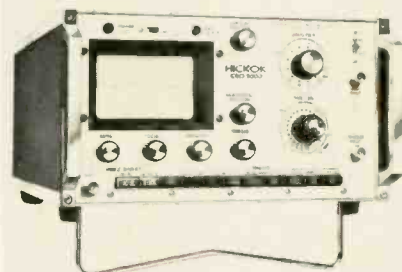


and in the field. The tool is engineered to overcome excessive wear and the problem of high torque and breakage of cores. Suggested net price is \$2.95. JW Electronics.

Solid-State Oscilloscope

710

Introduced is a medium-priced 25MHz oscilloscope. The unit reportedly features an all-solid-state design and a bandwidth from dc to 25MHz at 3db down. The unit has a response above 25MHz and usable to 50MHz. Sweep speeds and trigger response are



consistent with this requirement, reportedly assuring stable 50MHz displays with adequate horizontal expansion. A built-in vertical delay line permits viewing the leading edge of pulse displays when triggered internally, providing nearly 50ns of baseline prior to start of the pulse display. A vertical sensitivity of 10mv per division with 12 calibrated sensitivity steps from

10mv per division to 50v per division accommodate a broad range of input signal levels. Input circuitry is overload protected. To facilitate critical viewing or measurement of waveforms, the vertical amplitude of a waveform may be increased to five times screen height with essentially zero distortion. Vertical positioning range permits shifting of the display vertically to view any portion of this display. "Sweep Delay" is provided by the CRO 5000. The displayed waveform may be continuously delayed up to 40 divisions by means of the multi-turn horizontal position control, allowing the operator to obtain full screen presentation of small portions of the input waveform. Sweep linearity is unaffected by this positioning over a wide range. Twenty-four calibrated sweep ranges are provided from 50ns per division to 2s per division with continuously variable sweep speeds between ranges. Accuracy is reportedly 3.0 percent. A 4in. flat-faced CRT with 3.8kv accelerating voltage provides a bright trace. The graticule scales a display area of 6 x 10 major divisions, each 0.8cm. Horizontal amplifier response is unusually broad—dc to over 5MHz, extending its utility in X-Y display applications. The instrument is small (11½in. W, 6¾in. H, 19in. D) and weighs 24 lb. Price \$650. Hickok.

TV-Radio Remote Control

711

Introduced is a remote control center in a low-priced kit. The unit has a



built-in 60min. timer and speaker. It operates from a distance of up to 15ft. to control a TV set, radio or phonograph. The unit can be used to turn sets on or off, adjust the volume of any set, control the volume of its own built-in speaker or to turn a set off automatically after a preset delay of 60min. A switch is provided for the main speaker or extension speaker and there is an earphone jack for private listening. Price is \$7.95, complete with all parts, instructions, earphone and 15ft remote control cord. Allied.

Tuner Cleaner

712

An improved version of tuner restorer has been developed. The formula is claimed to eliminate the freezing effect found to be undesirable in the original formula. The cleaner is an



aerosol designed to remove grease, oil and other lubricants, thus restoring tuner alignment without removing it from the chassis. Tun-O-Wash contains no lubricants and in addition to TV tuners, it is said to be suitable for use in tape recorders, phonographs, motors and fan blowers. Price dealer net \$3.25. Chemtronics.

VHF-TV/FM Amplifier

713

A fully transistorized four-outlet VHF-TV/FM amplifier (Model M-101) is introduced to meet the



growing demand for multiple television outlets in the home. The amplifier
Continued on page 81

FAR SUPERIOR TO ANY VTVM OR VOM

--and for less money only \$69.95



NEW FIELD EFFECT MULTIMETER

Here is the revolutionary new approach to circuit testing, the solid state Sencore FIELD EFFECT METER. This FE14 combines the advantages of a VTVM and the portability and versatility of a VOM into a single low-cost instrument. This is all made possible by the use of the new space age field effect transistor that is instant in action but operates like a vacuum tube in loading characteristics. Compare the features of the FIELD EFFECT METER to your VTVM or VOM.

Minimum circuit loading — 15 megohm input impedance on DC is better than a VTVM and up to 750 times better than a 20,000 ohm per volt VOM — 10 megohm input impedance on AC is 20 times better than a standard VTVM. The FIELD EFFECT METER is constant on all ranges, not like a VOM that changes loading with each range.

Seven AC peak-to-peak ranges with frequency response to 10MHz. Seven zero center scales down to 0.5 volt. Five ohmmeter ranges to 1000 megohms. DC current measurements to 1 ampere. Full meter and circuit protection. Mirrored scale. Low current drain on batteries — less than 2 milliamps. Built-in battery check. Unbreakable all-steel vinyl clad case. Optional Hi-Voltage probe adds 3KV, 10KV and 30KV ranges with minimum circuit loading for greatest accuracy in the industry... \$9.95.

FE16 HI-ACCURACY FIELD EFFECT METER.

All of above features, plus unmatched accuracy — 1.5% on DC, 3% on AC. High-style meter, knobs, and special meter-tilting handle. \$84.50.



SENCORE

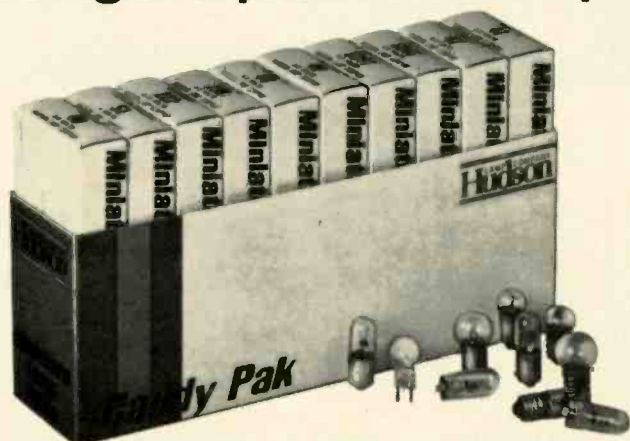
NO. 1 MANUFACTURER OF ELECTRONIC MAINTENANCE EQUIPMENT

426 SOUTH WESTGATE DRIVE, ADDISON, ILLINOIS 60101

... for more details circle 135 on postcard



**Bugged about never having
the right replacement lamp?**



**Hudson's New "Caddy-Pak"
puts them right at your fingertips.**

Now there's a replacement kit of miniature lamps packed just like replacement tubes. Hudson's "Caddy-Pak" — available in four assorted packages of eight to ten types — a total of 100 miniature lamps of those types proven in day-to-day experience to be the most needed in servicing all makes of television and radio sets.

The "Caddy-Pak" is convenient and handy for in-shop repairs — and is especially useful for house calls. Makes it easy for your jobber to keep you well supplied, too.

So take in a supply of first-quality, made in U.S.A., miniature lamps in a Hudson "Caddy-Pak". Save yourself time, frustration — and money. Ask your jobber about the "Caddy-Pak" today.

LAMP COMPANY
Hudson

Hudson Lamp Company, 528 Elm Street,
Kearny, New Jersey 07032. Telephone: (201) 997-1850

... for more details circle 117 on postcard

Menegus Named Harbrace Marketing Representative

Alfred A. Menegus has been appointed marketing representative for Harbrace Publications, Inc., it was announced by Joseph A. Wolking, senior vice president. Menegus will represent ELECTRONIC TECHNICIAN/DEALER.

For the past two years, Menegus was Eastern marketing representative for PF REPORTER. Prior to that, he was advertising manager for VISUAL ELECTRONICS.

Menegus will be headquartered in the Harbrace office at 71 Vanderbilt Ave., New York, N.Y.

EIA Calls Increase 'Grossly Inadequate'

The Tube Div. Imports Committee of the Electronics Industries Assn. (EIA) stated today that the recent \$1 to \$4 price increase by Japanese television set manufacturers on goods being sent to the United States is grossly inadequate. The EIA group said that the token \$1 to \$4 increase did little or nothing to bridge the gap between domestic and export prices and does not alter the fact that the "dumping" of goods in this country is prevalent with certain Japanese manufacturers.

In 1968, the committee filed a claim with the U.S. Commissioner of Customs charging that various Japanese television set manufacturers were "dumping" their products on the American market. The basis of this claim is a discrepancy between the high prices charged by manufacturers to Japanese distributors and the substantially lower prices on the same goods exported to the United States.

The committee also pointed out that in 1968, Japanese television imports rose 54.7 percent with 11 months' actual shipments of 1,604,000 B/W and 660,000 color television sets. During the same period of time, U.S. production increased by only 3 percent.

Receiving Tube Sales Off 6.7 Percent in 1968

U.S. factory sales of receiving tubes totaled 302 million units during 1968. This was a decrease of 6.7 percent from sales of 323 million during 1967, according to the Electronic Industries Assn.'s marketing services department. The largest percentage decline occurred in direct sales of receiving tubes to government agencies. At 11.1 million during 1968, sales to this market dropped 34.9 percent from sales of 17.1 million units during the previous year, EIA said. Receiving tube sales to equipment manufacturers decreased 8.9 percent at 163.7 million units, while sales to foreign countries fell 10.7 percent, reaching 13.7 million. In contrast to other market channels, receiving tube sales for renewal purposes showed a 1.2 percent increase to reach 113.1 million units during 1968, according to EIA.

Dual Prices Go Up

The prices of Dual automatic turntables and United Audio's line of bases and dust covers have gone up as of Feb. 1. The three top Dual models (1019, 1009F and 1015F) go up \$10 each, to sell at \$139.95, \$119.50 and \$99.50, respectively. The Dual 1212 goes up \$5 from

\$74.50 to \$79.50. Accessories for the turntables are unchanged in price. Bases and dust covers, manufactured by United Audio, go up \$1 each at resale, and the combination base and cover goes up from \$29.50 to \$39.95.

According to Robert Stang, general manager of United Audio, the final straw in a series of increases in the cost of the turntables was the 4 percent export tax imposed by the German government without notice and effective immediately.

Labor and material costs in United Audio's woodworking plant have gone up four different times, according to the company. Previous increases in the factory's prices and United Audio's own increased costs have all been absorbed until now, Stang stated. He also pointed out that for the past few months United Audio has been flying units in and filling orders directly from these shipments as United Audio's inventory was insufficient to meet the current demand.

Astatic Purchases Sonotone Products Line

Clevite Corp. and the Astatic Corp. of Conneaut, Ohio, announced jointly that Astatic has purchased the audio products line of Sonotone Corp., a Clevite subsidiary. The line consists of Sonotone's phonograph cartridge, needle and microphone products, and includes all production tools, dies and inventory of finished and semi-finished materials as well as domestic patent rights.

All physical assets involved will be transferred from Sonotone's Elmsford, N.Y., plant to Conneaut.

James Ross, Astatic's chairman of the board, said appropriate Sonotone products will continue to be available to the trade while at the same time enlarging the extensive Astatic line. He noted that the new acquisition is in line with Astatic's expansion plans.

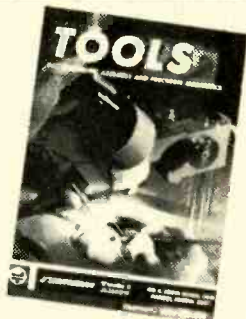
Similar acquisitions have been completed by Astatic in recent years including the cartridge manufacturing facilities of Euphonics Corp. in San Juan, Puerto Rico, a year ago.

MOVING?

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

FREE CATALOG

Lists over 1700 hard-to-find tools used by electronic technicians, instrument mechanics, engineers, and scientists. Included are many types of pliers, tweezers, wrenches, soldering irons, wire strippers, relay tools, watchmakers tools, drills, precision grinders, files, optical equipment, lighting, vacuum systems, tool cases, and tool kits. Included also are a solder section and four pages of useful "Tool Tips" with valuable data on fasteners, color coding, drill and metal gauges, insulation facts, and tool selection.



JENSEN TOOLS and ALLOYS
3630 E. Indian School Road, Phoenix, Arizona 85018

... for more details circle 118 on postcard

NEW Heathkit® Solid-State Color Bar - Dot Generator



Kit IG-28
Only \$79.95*

Advanced Integrated Circuitry Delivers 12 Patterns Plus Clear Raster ... No Divider Chain Adjustment ... No Flicker, Bounce or Jitter

- All solid-state construction using Integrated Circuitry
- No divider chain adjustments
- Stable pattern display — no flicker, bounce or jitter
- Produces 12 patterns plus clear raster
- Instant switch selection of all functions
- Exclusive 3x3 display plus standard 9x9 display of all patterns
- Horizontal lines only one raster thick for added accuracy
- Variable front panel tuning for channels 2 through 6
- Variable front panel positive and negative video output
- Front panel negative going sync output
- Two handy AC outlets on front panel
- Built-in gun shorting circuit with lead piercing connectors
- Front panel switchable crystal controlled sound carrier
- Copper-banded transformer to reduce stray fields
- Safe three-wire line cord
- Fast, easy construction with two circuit boards and two wiring harnesses

Advanced Design. The new Heathkit IG-28 is one of the most stable, versatile Color and B&W TV service instruments available. In addition to the exclusive Heath "3 x 3" display of patterns illustrated, it also produces the familiar 9 x 9 displays ... plus a clear raster for adjusting purity without upsetting the AGC. Fifteen J-K Flip-Flops count down from a crystal controlled oscillator to eliminate divider chain instability and adjustment.

Time-Saving Versatility ... gives you front panel tuning for channels 2 thru 6 ... front panel variable plus and minus video output ... front panel sync output ... two convenient AC outlets ... built-in gun shorting circuits and grid jacks ... vectorscope capability ... crystal controlled sound carrier ... banded transformer to eliminate stray fields ... zener-regulated power supply ... safe three-wire line cord ... fast circuit board-wiring harness assembly. For the versatility you couldn't get before ... put the new IG-28 on your bench now.

Kit IG-28, 8 lbs. \$79.95*

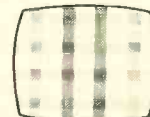
Standard 9x9 Displays plus Exclusive Heath "3 x 3" Display



3x3 Dot



3x3 Cross Hatch



3x3 Shading



3x3 Color Bars

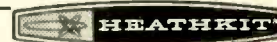


3x3 Vertical



3x3 Horizontal

HEATH COMPANY, Dept. 24-4
Benton Harbor, Michigan 49022



Please send my FREE 1969 Heathkit Catalog.

Enclosed is \$ _____ plus shipping.

Please send model (s) _____

Name _____

Address _____

City _____

State _____

Zip _____

Prices & specifications subject to change without notice.

*Mail order prices; F.O.B. factory.

Dept. 24-4

Winegard introduces COLOR

...dramatically different in design, in performance and in construction!



Shown here: Model CW-96
VHF-UHF-FM

When we introduced the *original* wedge design antenna (the SC-1000) in June of 1967, we told you there would be plenty more to come.

And now it's here. Now we've refined and expanded our original wedge into an entire line of *super high gain* antennas . . . the phenomenal Color Wedge series! Phenomenal because Color Wedge is much more than a new antenna or a new shape. It's a dramatically different antenna. Dramatically different in design! Dramatically different in performance! And dramatically different in construction.

Look for yourself! Both high and low band elements are connected directly to the booms—so that the booms are actually used as phasing lines. Element insulators and harmonic parasitics are completely eliminated, making the Color Wedge much more mechanically rugged. All elements operate at their fundamental mode, assuring complete freedom of minor lobes on all channels, so pick-up of unwanted, interfering signals is reduced almost to zero.

And, of vital importance, Color Wedge has a built-in ferrite impedance stabilizer that enables us to tune the antenna driven elements longer than is possible in other antenna designs, resulting in 10% more gain and an automatic match at 300 ohms. And, incidentally, all that and more is achieved in an antenna that is up to 50% shorter and more compact than other antennas would have to be.

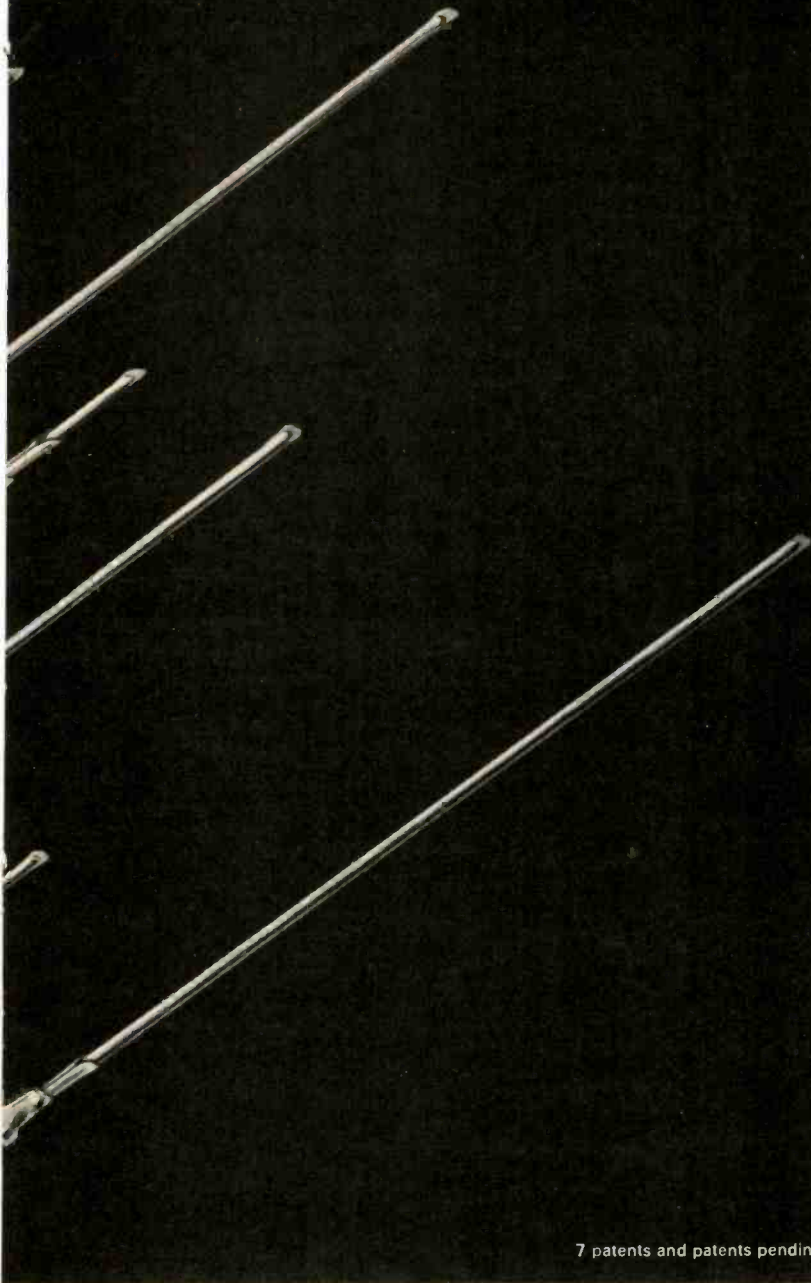
Other unique Color Wedge features? We've listed most of them here. When you see them, you'll know why Color Wedge is truly the most dramatically different antenna ever designed.

... for more details circle 140 on postcard

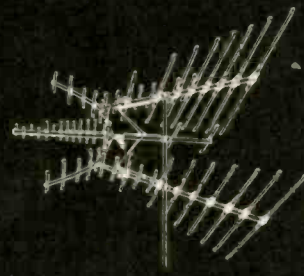
SPECIAL COLOR WEDGE FEATURES

- Unique Wedge design provides greatly increased vertical capture area (36°) . . . prevents pick-up of interfering signals from above and below . . . and enables antenna to work at peak performance because booms act as phasing lines.
- Patented UHF driven element assembly on 82-channel models and patented parabolic reflector screen provide unprecedented gain in an all band antenna.
- Special lightning protection circuit prevents static electricity build-up and arching.
- Ferrite impedance stabilizer enables antenna elements to be slightly longer for greater capture area and an increase in gain of 10% . . . assures perfect impedance match to download.

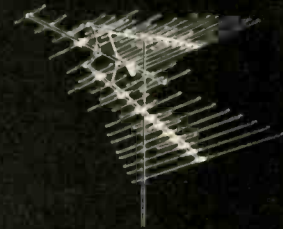
WEDGE



7 patents and patents pending



CW-1000 VHF-UHF-FM



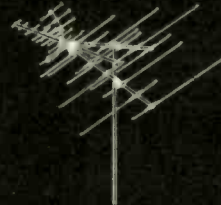
CW-2000 VHF-FM



CW-98 VHF-UHF-FM



CW-48 VHF-FM



CW-96 VHF-UHF-FM



CW-46 VHF-FM



CW-94 VHF-UHF-FM



CW-44 VHF-FM

- Built-in transparent cartridge housing accepts solid state preamplifiers, and provides permanent weather protection for downlead terminals right at feed point of antenna, resulting in maximum signal transfer.
- FM control elements allow attenuation of strong FM signals where they interfere with TV reception.
- 82-channel models have special UHF control elements permitting antenna to be peaked for channels 70 to 83 in translator areas.
- New truss construction, with three mast clamps, makes this the most rugged, strongest antenna made. Two special Cylolac tuned mast clamps have built-in anti-resonant circuit to prevent signal leakage to antenna mast.
- Boom cone, made of unbreakable Cylolac, automatically positions upper and lower booms at 36° for maximum efficiency and rigidity.
- Super strong ellipsoidal booms and attached elements are of a special aluminum alloy for greater strength and resistance to bend and distortion.

- High tensile aluminum elements are made of alloy with PSI rating of 38,000 compared to 27,000 PSI for alloys used in other antennas. More than 49% stronger and 29% more resistant to bend and wind distortion.
- All aluminum parts are permanently weather and corrosion proofed with attractive, genuine gold and blue anodized finish.
- One-year factory guarantee of performance satisfaction and two-year unconditional replacement warranty.
- Beautiful new display-type shipping carton features wedge motif in color . . . attractive full-color wrap-around label on each antenna.
- Nationally advertised in Life, Sports Illustrated and Popular Mechanics.

 **Winegard**
ANTENNA SYSTEMS

© Copyright 1969, Winegard Company

WINEGARD CO. • 3019-2 KIRKWOOD ST. • BURLINGTON, IOWA 52601

Continued from page 32

cedure in the opposite direction.

After completing this test, the control has to be returned to its proper setting. This can be approximated by fine tuning into audio and adjusting the horizontal hold for a floating picture. Exact horizontal frequency adjustment procedure can be found in the specific chassis service manual.

These field fixes are applicable only to individual chronic horizontal oscillator startup problems which will not respond to normal troubleshooting and repair procedures and should not be indiscriminately applied.

The change in R254 value is very much preferred over the capacitance change when dealing with this "no start" condition.

MAGNAVOX

Conversion of Magnavox Record Players for 50Hz Supply Operation

The recent increase in movement of military personnel and others to and from overseas locations has resulted in an increase in questions concerning proper operation of their Magnavox instruments. In most cases they complain that the record player will not run at proper turntable speed. If they are moving back to the United States their record player most likely had been converted to 50Hz operation and now must be reconverted to 60Hz operation. In view of these inquiries we have gathered together in this bulletin all the information you may need to properly handle these record player conversions.

Most recent Magnavox record players can be converted to provide proper turntable speed when used on a 50Hz supply. The conversion from 50 to 60Hz operation requires an increase in motor pulley diameter. Those record players which use an overwind or underwind motor (to provide amplifier power) cannot be converted.


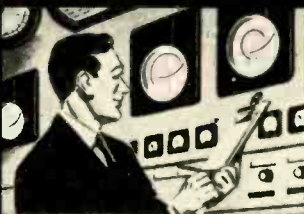
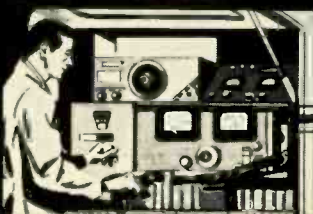
Certain earlier record players may be converted to 50Hz use by replacing the original motor (or pulley) with a 50Hz motor (or pulley). In other instances the conversion is accomplished by installing a sleeve or set of sleeves over the motor pulley. A 50Hz adaptor kit consisting of the sleeve(s) and installation instructions is available from Magna-Par.

A record player which has been converted to 50Hz operation will exhibit excessive turntable speed when used on a 60Hz supply. It should be reconverted to 60Hz operation by restoring its original 60Hz configuration. Accordingly, reconverted certain earlier record players requires replacement of the 50Hz motor (or pulley) with the original type 60Hz motor (or pulley). Those models converted with the sleeve-type adaptor kit should be reconverted by removing the adaptor sleeve(s). Sleeves that are cemented in place may be heated (with a soldering iron) to soften the cement. Any remaining cement should be removed from the motor pulley with nail polish remover or a similar solvent.

**FOR MORE INFORMATION
ON ADS AND NEW PRODUCTS,
SEE READERS' SERVICE, PAGE 87.**

4 ways to increase your income

RCA Institutes, Inc. offers these four comprehensive home study courses especially designed to help build your income immediately!

 <p>COLOR TV Add profitable color TV to your skills with this home training course, newly revised to include information on the latest techniques, receiver circuitry and equipment. Train under the direction of RCA Institutes... experts in Color TV home study training.</p>	 <p>TRANSISTORS You get the necessary background for semiconductor technology including characteristics of tunnel diodes, rectifiers and other solid state devices. Transistor trainer also available.</p>
 <p>AUTOMATION ELECTRONICS Trains you for the many applications of automation electronics in industry and government including Photoelectronics, Digital Computer Techniques, Synchros and Servomechanisms, Automatic Control Systems, and many more!</p>	 <p>MOBILE COMMUNICATIONS Trains you to service and maintain 2-way radio communications on land, sea, and air! Gives you the technical foundation for space communications!</p>

Take advantage of RCA's Liberal Tuition Plan. You only pay for lessons you order, and have no long-term obligations. Licensed by New York State Education Department. Approved for Veterans.



SEND THIS COUPON NOW FOR COMPLETE FREE INFORMATION

RCA INSTITUTES, INC. Home Study School, Dept. ET-49
320 West 31st Street, New York, N.Y. 10001

Without obligation, rush me free information on the following RCA Home Training Course: COLOR TV TRANSISTORS MOBILE COMMUNICATIONS AUTOMATION ELECTRONICS

Name _____ Age _____

Address _____

City _____ Zone _____ State _____

... for more details circle 132 on postcard

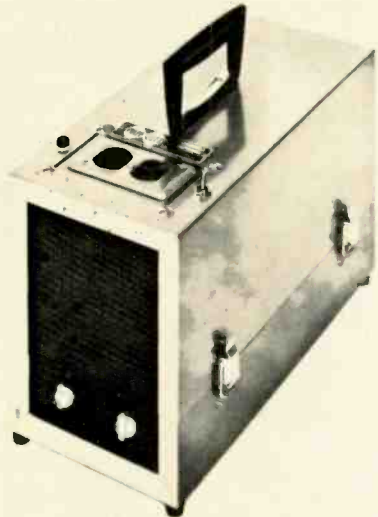
ET/D NEW PRODUCTS

Continued from page 75

fier reportedly can be placed in any convenient location—attic or roof space, garage wall or screwed to a joist in the basement at a point where the antenna lead usually enters. From the four pairs of marked terminals, suitable lengths of 300Ω lead can be routed to any desired area. With a reported gain of 6db for each of the four outputs, the amplifier will supply a signal approximately 50 percent greater than the antenna to each outlet. Individual receivers may be tuned to any channel normally received in the area. In addition, the fourth outlet can be used to feed an FM receiver. Finco.

Solid-State Inverter 714

Introduced is a unit which converts 12vdc engine or battery current into 115vac to operate tools, equipment, and small appliances. The inverter delivers high power output from such engine sources as: mobile labs, service vehicles, maintenance trucks, lift trucks, trailers, cars, boats and planes to provide power where another ac



current is not available. It is claimed to have an operating efficiency of ±1Hz from 11 to 12v and from 25 to 1000w. Features include: solid-state design, compact portability, convenient built-in handle and corrosion-resistant case. The unit delivers 800w continuously, 900w intermittently and surges to 1000w. A neon pilot light is used to indicate an overload or low battery. Polarity protection against incorrect hook-up is also provided. The inverter has 18 power switching transistors, two oscillator transistors and one Zener diode for frequency control. Tripp-Lite.

Imagine a doctor without a stethoscope



Imagine an engineer without a slide rule



Imagine a professional service technician without a Sencore Mighty Mite V.



STANDARD OF A PROFESSION!

The Mighty Mite has become the standard of the industry with over 50,000 used daily by competent professional servicemen from coast to coast. The Mighty Mite checks them all; tubes large and small . . . and it checks them critically too. 100 megohm grid leakage sensitivity, individual tube element shorts test and cathode emission test at full rated current make the Mighty Mite really tough. It's tough on tube tests, tough in appearance with vinyl case and cover, and mighty tough on competition. But, it's not tough on your pocketbook at only

See your Sencore distributor today.
He has the TC142 Mighty Mite in stock. **\$84.50**



SENCORE

NO. 1 MANUFACTURER OF ELECTRONIC MAINTENANCE EQUIPMENT
426 SOUTH WESTGATE DRIVE, ADDISON, ILLINOIS 60101

... for more details circle 136 on postcard

from Technician to ENGINEER

Advance beyond technician level
Become an electronics engineer

The Grantham educational program in Electronics Engineering is designed to upgrade technicians to engineers, mostly by home study. In this program you can acquire an extensive knowledge of engineering and earn your BSEE Degree—for greater prestige, better pay, and more security.

Grantham School of Engineering is accredited by the Accrediting Commission of the National Home Study Council, is approved under the G.I. Bill, and is authorized under the laws of the State of California to grant academic degrees.

Grantham School of Engineering

Specializing in Electronics since 1951
1505 N. Western Ave.
Hollywood, Calif. 90027
Telephone:
(213) 469-7878

Grantham School of Engineering BT-4-69
1505 N. Western Ave., Hollywood, Calif. 90027

Please mail your free Bulletin, which explains how the Grantham educational program can prepare me for my Bachelor of Science Degree in Electronics Engineering.

Name _____ Age _____
Address _____
City _____ State _____ Zip _____

... for more details circle 114 on postcard

ET/D

CATALOGS & BULLETINS

Headphones 400

An eight-page brochure covering over 30 general communication and dictation headphones, other private listening devices and accessories is available. The two-color brochure contains photographic illustrations of every product and information on application, specifications, new catalog numbers and prices. Telex Communications.

Car and Truck Fuse 401

The 1969 edition of the Buss car and truck fuse list is now available. The 16-page booklet shows what the fuse protects, the proper fuse to use and where the fuse is located on all 1969 cars and trucks. It also covers older models for the past 12 years. Information on which Buss fuse to use in servicing foreign vehicles is also given. Bussman.

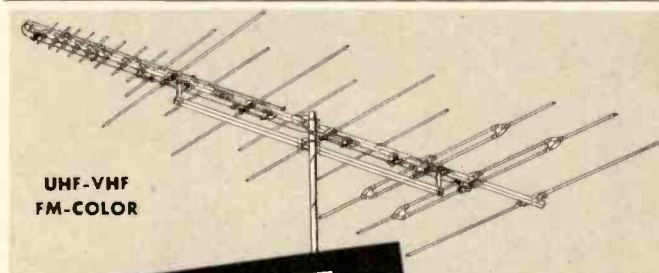
Transistors 402

A 74-page catalog describing nearly 400 types of high reliability silicon transistors is offered. The new edition contains tabulated specifications for

transistors used as general purpose medium- and high-speed amplifiers, low level amplifiers, ultra-high-speed logic switches, core drivers, choppers, differential and dual amplifiers, and Darlington amplifiers. Also included are new listings and specifications of the special poly chip devices, NPN/PNP complimentary duals, UHF high power amplifiers and NASA-approved types. Maximum ratings and electrical characteristics are given for each of these units with geometric drawings and characterization graphs. Raytheon.

Video Transmission 403

A 51-page book called "Video Transmission Techniques" is available free of charge to anyone interested in the technicalities of video distribution. The illustrated publication describes in detail the problems encountered in routing video through cable. Pictorial diagrams, supported by text and numerous photographs, charts and tables, make system design easier. This book includes design information for a multitude of systems, both unbalanced and balanced. It covers everything from cable types to complex electronic terminations. The problems involved in selecting the equipment for a particular application are also discussed with the equipment detailed for many systems. Dynair.



UHF-VHF
FM-COLOR

**FREE SPACE
STANDING WAVE
MAGNETIC
ANTENNA**

**BETTER TV
DEMANDS
BETTER
RECEPTION**

*The FSM Antenna Discriminates Between
Desired Signal and Unwanted Noise*

outstanding electrical qualities, combined with the simplified mechanical construction of this system yields a total performance package unparalleled in today's market. 4 models, 60-inch to 180-inch boom, all modestly priced.

S&A Electronics Inc.

Phone (419) 693-0528

204 West Florence St.

Toledo, Ohio 43605

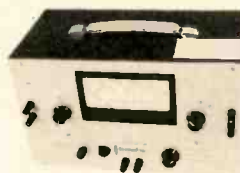
... for more details circle 133 on postcard



- SCALE RANGES: 1.0%, 0.3% to 0.1% full scale. RMS calibration of sine wave flutter according to NAB standard
- BAND WIDTH SELECTION:
 - (a) 0.5 to 6 Hz Wow
 - (b) 0.5 to 200 Hz weighted to NAB standard
 - (c) 0.5 to 200 Hz Un-weighted to NAB standard



The Model FL-5 Flutter and Wow Meter has been designed for use where greater sensitivity and lower instrument noise is required.



FL-3D-1 MODEL
Vacuum tube circuitry
Shorter range capability for
production testing

WRITE FOR FREE BROCHURE...



Sentinel inc.

P.O. BOX 336 • GARLAND, TEXAS 75040

... for more details circle 137 on postcard

VIEW

The **RCA WO-33A** Super-Portable 3-Inch Oscilloscope helps solve virtually any electronics servicing problem, inside or outside the shop. Its combination of exceptionally low cost and high performance have already made it popular as a monitoring and trouble shooting 'scope in black and white and color TV broadcasting studios, and in professional service. And why not? Here's a 3-inch 'scope that meets your requirements for gain, bandwidth, transient response, accuracy, versatility, and portability. AND IT'S ONLY \$139.00.* Also available in an easy to assemble kit, WO-33A (K).



The **RCA WO-91C** 5-inch Dual Band Oscilloscope is a reliable, heavy-duty, precision 'scope in use in thousands of installations from classrooms to TV distribution systems...from service benches to broadcast stations. You probably can't find a better value. Applications include waveform analysis, peak-to-peak voltage measurement, square-wave testing, and observation of circuit characteristics. A front-panel switch gives you an easy choice of wide-band or narrow-band (high sensitivity) operation. It's easily portable, AND IT'S ONLY \$269.00.* The WO-91C-V1 is available for 240V operation, no increase in price.



*Optional Distributor resale price. Prices may be slightly higher in Alaska, Hawaii, and the West.

Write for a catalog with complete descriptions and specifications for all RCA test equipment: RCA Electronic Components, Commercial Engineering, Department No. D-46W Harrison, N. J. 07029
LOOK TO RCA FOR INSTRUMENTS TO TEST/MEASURE/VIEW/MONITOR/GENERATE

RCA

... for more details circle 130 on postcard

The brand for all reasons



BSR McDONALD 600

Every BSR McDonald automatic turntable is precision made in Great Britain to the most exacting specifications. Upon their arrival in the U.S., every model is unpacked and re-tested under actual playing conditions. That's why BSR service calls are the lowest in the industry—and perhaps that also explains why BSR sells more turntables than anyone else in the world.



McDONALD

"S"
BSR (USA) LTD.
BLAUVELT, N.Y. 10913
Please send FREE detailed literature
on all BSR McDonald automatic turntables.

Name _____

Address _____

City _____

State _____

Zip _____

... for more details circle 105 on postcard

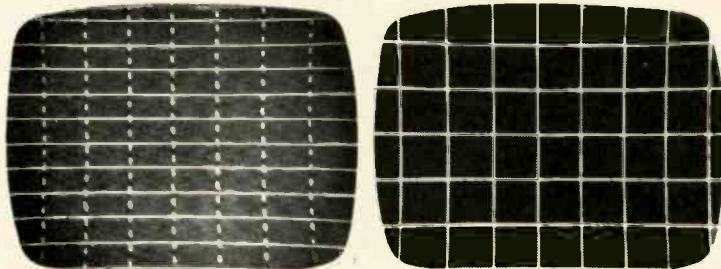
COLORFAX

Continued from page 71

ture, making it appear misconverged. Simply shunting across the delay line with a clip lead while in operation should enable you to determine if it needs replacement. It is impractical to repair a delay line; instead, it should be replaced with a duplicate.

It should be noted here that in some newer color televisions, such as the Philco 18QT86 color chassis, the video driver transistor has been replaced by an IC or "Integrated Circuit." The IC offers several advantages over its transistor counterpart, such as increased high frequency response due to proper impedance matching over a wider band of frequencies. Also, since the IC has a higher reliability record, it will seldom give any trouble. Troubleshooting methods should center around signal tracing the input and output signals with an oscilloscope (the inner-stage connections of the IC are all encased and not accessible) and checking supply voltages. Close inspection of the area is recommended because you are more apt to find a bad connection or trouble in the printed board than in the component itself. If the IC unit is found to be defective, it is not repairable and must be replaced as a unit.

Make the wiggly test.



On the left, a pattern* produced by an ordinary color bar generator. On the right, the equivalent pattern* produced by Leader's LCG-388. Perfectly stable, the instant you turn the power on.

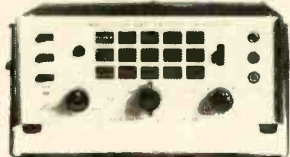
Flip the switch, and you can select from 15 patterns. Including the single dot, single cross, single horizontal and single vertical.

The magic is in Leader's binary counters and gates. Nobody else has them, and what a difference they make.

\$149.00, and you can make the wiggly test at your distributor's. For the one nearest you, just drop a line or call.

*As photographed.

Seeing is believing.



LEADER INSTRUMENTS CORP.

24-20 Jackson Avenue, Long Island City, N. Y. 11101/(212) 729-7411

... for more details circle 122 on postcard

TWO-WAY RADIO

Continued from page 56

is set during adjustment of the local oscillator at the time crystals are installed. The only other alignment necessary to the SSB transmitter is peaking the power output and setting the modulation. Remember, the SSB transmitter should have no power output with modulation. Therefore, during transmitter adjustment, an audio signal generator is applied to the microphone input to simulate modulation. Citizens band transceiver alignment can be relatively easy with proper equipment and circuit knowledge and we have attempted to provide some helpful information along those lines in this feature. Business-industrial two-way radio is more complex and requires additional test procedures. Future articles will cover the test instruments, circuit description and procedures for alignment and troubleshooting various transceivers used in the business-industrial two-way radio services. ■

ELECTRONIC TECHNICIAN/DEALER

... for more details circle 143 on postcard →

"QT" keeps you ahead with the fastest moving RCA parts.

"QT" is a Quick Turnover Inventory system that brings you a steady supply of the fastest-moving RCA Home Instrument replacement parts. It practically guarantees you'll have the parts you need for most of your servicing jobs.

This means you get the jobs done, without backlogging and last-minute dashes to your distributor for essential "QT" parts.

A "QT" inventory helps you cut down on those stacks of dusty boxes and trays of unused parts—and the dollars you have tied up in them.

The entire system is incredibly handy and efficient

... lets you find parts quickly while you're working ... reminds you to reorder when your supply is low ... makes inventorying and reordering so fast that it's almost automatic.

Suddenly you'll find yourself with a lot more time to devote to additional servicing jobs.

Check it out with your FCA "QT" Parts Distributor. He'll discuss the different "QT" inventory plans with you and help you select one tailored to your operation.

After that, things go very smoothly.

Parts and Accessories, Deptford, New Jersey.

RCA



Special to readers of ELECTRONIC TECHNICIAN

TRY THIS

**WILL NOT
DETUNE
TUNERS**

**SAFE
FOR ALL
PLASTICS**

**CLEANS AND
LUBRICATES WITH
ONE QUICK SPRAY**



**AND GET THIS
FREE!**

**NO ARC
HIGH VOLTAGE
INSULATOR**

**POSITIVELY STOPS
ARCING & CORONA
SHORTS IN HIGH
VOLTAGE CIRCUITS—
(up to 30,000 volts)**



Why are we willing to give you a FREE 98¢ bottle of Chemtronics NO ARC just to try Color Lube? The reason is simple. Once you try it you'll be hooked. You won't be willing to settle for any other tuner spray, even if it's cheaper.

We claim that Color Lube is the best tuner cleaner-lubricant on the market. And we're willing to put our money where our claims are.

Buy a can of Color Lube from your favorite distributor. Then, send us the label along with this coupon and we'll send you a FREE 98¢ bottle of NO ARC. It's as simple as that.

FOR YOUR FREE NO ARC, mail this coupon and a Color Lube label to:
CHEMTRONICS, 1260 Ralph Ave., Bklyn, N.Y. 11236

Expires May 30, 1969

NAME _____

COMPANY _____

ADDRESS _____

CITY _____

STATE _____

CHEMTRONICS

... for more details circle 107 on postcard

ET/D AD INDEX

Aerovox Corporation	26
Alco Electronics	71
Associated Industries (Div. Lakeside)	86
B & K Div., Dynascan	23
BSR (USA) LTD	84
Chemtronics, Inc.	26, 86
Cleveland Institute of Electronics	31
Cornell Dubilier	3rd Cover
C.R.T. Equipment Company	27
EICO Electronic Instruments Co.	2nd Cover
Electro-Voice, Inc.	72
Finney Company	73
Gem City Tuner Service	24
Grantham School	82
Greyhound Lines, Inc.	65
Heath Company	77
Hudson Lamp Company	76
Jensen Tools & Alloys	77
JFD Electronics Corp.	20
J. W. Electronics	28
Kaar Electronics	69, 70
Lampkin Laboratories	86
Leader Instruments	84
Lectrotech, Inc.	32
Loral Distributor Products	38
J. W. Miller Co.	64
Motorola HEP Corp.	22
Quietrole Company	31
Precision Tuner Service	25
Radio Corporation of America	4th Cover
RCA Test Equipment	83
RCA Semiconductor	33
RCA Institutes, Inc.	80
RCA Parts and Accessories	85
S & A Electronics Corp.	82
Sencore	67, 75, 81
Sentinel, Inc.	82
Tuner Service Corporation	19
Weller Electric Corp.	71
Winegard Company	78, 79
Xcelite, Inc.	74
Zenith Sales Corporation	29

WAVE FORM ANALYSIS & PEAK FM MODULATION



all for LESS MONEY!

The Lampkin 205A FM Modulation Meter accurately indicates PEAK modulation on mobile transmitters. To shoot trouble visually, use your own general-purpose oscilloscope at the 205A rear jack output. This makes a low-cost, highly effective test combo — and a well-rounded shop — all for less money.

Lampkin pioneered the PEAK voltmeter for FM modulation indication.

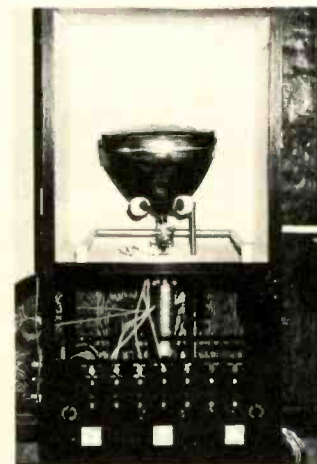
Like to see the complete specs? Mail coupon today!

Use this coupon for FREE booklet "How To Make Money in Mobile-Radio Maintenance" and information on Lampkin meters.

Name _____
Address _____
City _____ State _____ Zip _____

LAMPKIN LABORATORIES, INC.
Div. II, Bradenton, Fla. 33505

CRT Rebuilder



Rebuild your own CRT's. Average cost B/W \$1.50—Color \$8.50. Easy to operate. Requires only 4x8 feet of space.

Supplies for your first 50 picture tubes free!

Color — black and white. Rebuilt white you are here. See the results for yourself.
Terms Available

Associated Industries—Div. Lakeside Ind.
5234 N. Clark St.
Chicago, Ill. 60640
Phone: 312-271-3399

Free demonstration appointment
 Send me more information

Name _____
Address _____
City _____ State _____

... for more details circle 103 on postcard

ELECTRONIC TECHNICIAN/DEALER

... for more details circle 109 on postcard →

A black and white photograph of a wide-brimmed cowboy hat on the left and a thick book on the right. The book's cover is visible, showing the title 'CORNELL-DUBILIER ELECTROLYTIC REPLACEMENT GUIDE' and several pages with technical diagrams and tables. The background is dark.

The Wide Ranger Rides Again.

And you sure need the Ranger back.

You see the guys who design the circuits and components want to keep costs at a minimum. So they specify electrolytics with the minimum capacity and voltage to do the job.

And that's the trouble. That's why there are thousands of different sizes and ratings for twist prong capacitors.

Then there's the label problem. The manufacturers meet the broad standard tolerances laid down by E. I. A. But it's not possible to build these capacitors to very close tolerances. So most capacitors are made to exceed the capacity shown on the label.

For example, a capacitor marked 100 mfd. at 300 volts could in fact measure from 90 mfd. to 200 mfd. and still be within tolerance.

So we decided to make things a little simpler. We examined over 20,000 capacitors and put together a new line of 248 Wide Range Twist Prongs that can replace 97% of all electrolytics you're ever going to come across.

And they're all listed in the new Cornell-Dubilier Electrolytic Replacement Guide. Plus a complete listing of the line by voltage and capacities; a complete reference to major competitors' products; 100% reference to all color TV chassis original manufacturers' part numbers and a cross reference to major black and white TV chassis. Write today for your free copy.

CDE **CORNELL-DUBILIER**

Why do service technicians specify RCA color picture tubes more often than any other brand?



Back in the early days of color, you had no choice. Now that you have a choice, it's still RCA by a wide preference. Why? Primarily because of experience.

And hand-in-glove with experience goes performance. Outstanding overall performance...

down through the years...with a wide variety of tube sizes.

Put them together and they add up to confidence...for the service technician who installs the tube...for the set owner who has to pay the bill.

RCA puts its reputation on the line with every picture tube it makes. Whether it's the RCA HI-LITE built to OEM specs all the way...or a quality rebuilt RCA Colorama...you can rely on RCA picture tubes to protect your hard earned service reputation. They're designed to protect the biggest reputation in the COLOR TV industry.

RCA Electronic Components, Harrison, N.J.

RCA