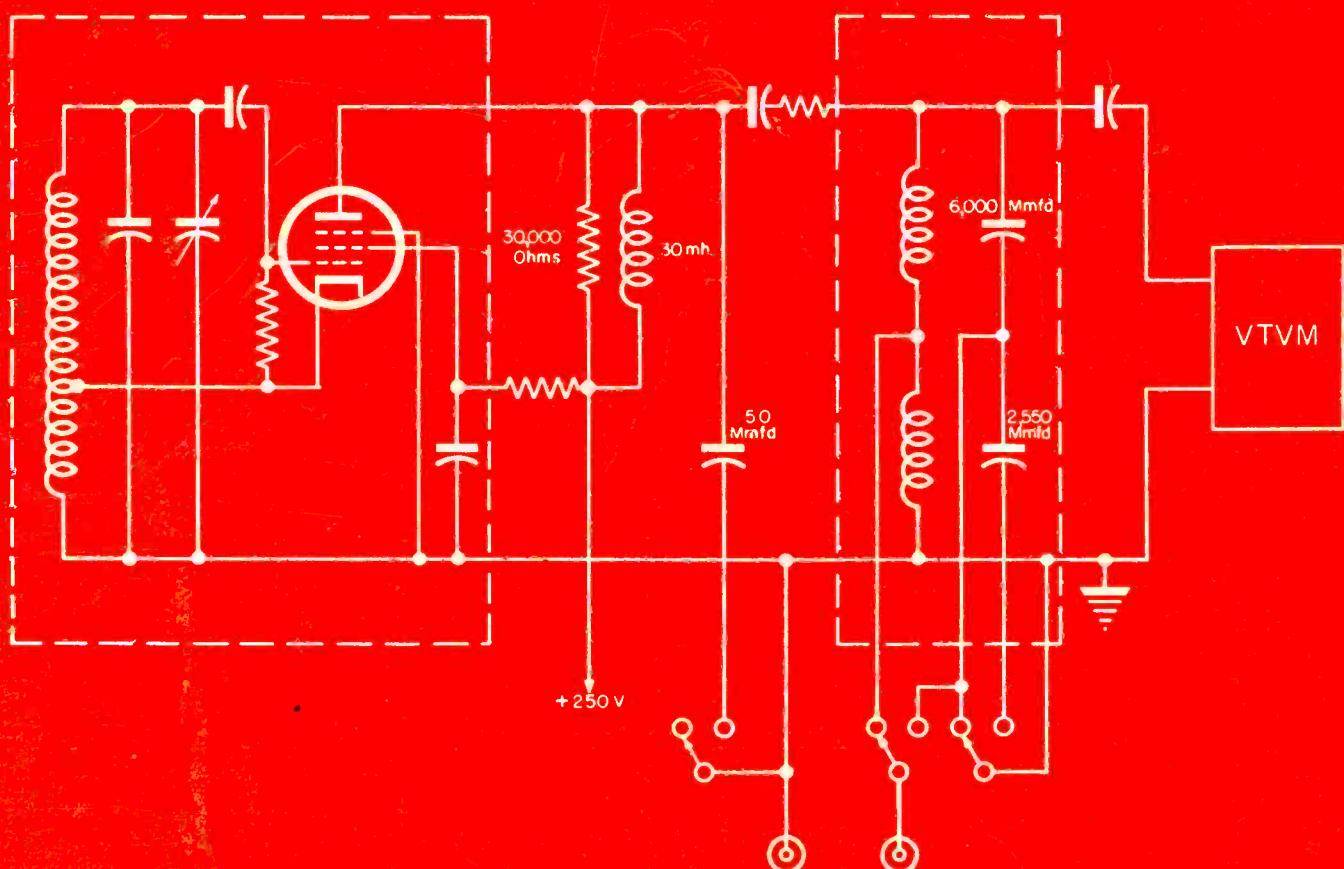


RADIO • TELEVISION • ELECTRONIC

# SERVICE

6SK7

DECEMBER  
1950



Pin Jacks for Test Leads

Circuit of rf test instrument which features one inductance and two capacitance test ranges.

[See page 2]

THE TECHNICAL JOURNAL OF THE RADIO TRADE

# 10 reasons why C-D type UP electrolytics are superior

For TV and auto radio  
applications; and wherever extremes  
of heat and cold are encountered

See your Classified Phone Book for nearest jobber.

Catalog No. 200B  
on request.

**CORNELL-DUBILIER**  
ELECTRIC CORPORATION,  
Dept. 120 South  
Plainfield, New Jersey.

Other plants in New  
Bedford, Brookline  
and Worcester, Mass.;  
Providence, R. I.;  
Indianapolis, Ind.,  
and subsidiary,  
The Radiart Corp.,  
Cleveland, Ohio.

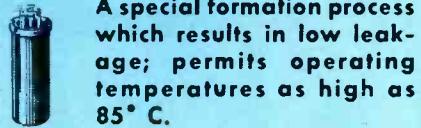


For better servicing results insist on superior  
**C-D Electrolytics—Best by Field Test!**

CONSISTENTLY DEPENDABLE

**CORNELL-DUBILIER**

CAPACITORS • VIBRATORS • ANTENNAS • CONVERTERS



A special formation process  
which results in low leakage;  
permits operating  
temperatures as high as  
85° C.



Special separator — exclusive  
with C-D electrolytics —  
prevents breakdowns  
under the worst field conditions.



Special construction results  
in lowest intercoupling be-  
tween sections.



Special winding results in  
good RF impedance.



Etched cathode construction  
(Type UPE) where high rip-  
ple currents require it for  
permanence of capacity.



Rubber diaphragm type of  
construction results in a  
positively operated vent.



Spot welded anode risers to  
lugs.

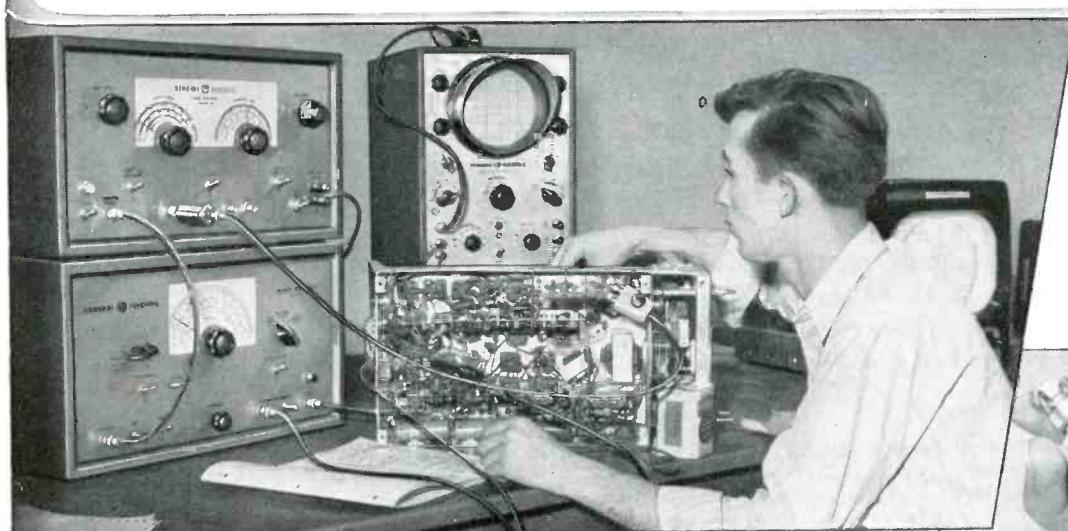


Spot welded cathode tabs  
to mounting rings.

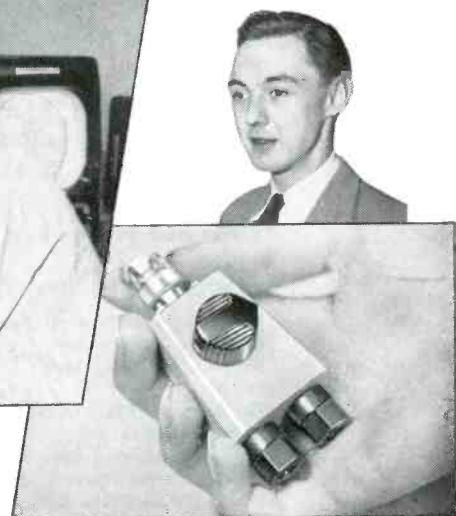


Saddle lug permitting easy  
wiring of the lugs.

# "Complete, Accurate TV SET ALIGNMENT IN 15 MINUTES!"



Says **JIM OTTMAN**  
**TV Service Supervisor**  
General Electric Supply Corp.  
Buffalo, New York



New! Balanced output adaptor (Type ST-8A) permits accurate alignment of balanced input receivers. Now G.E. offers you both single-ended and balanced output.

"**C**OMPLETE alignments used to take us half a day when we used a conventional sweep. Now we do them in 15 minutes with our G-E Test Equipment Package!

"We align 60% of the sets that come into the shop—as an extra service to our customers. Result—we've been getting letters from pleased patrons who say their receivers work better than ever! *This has built our service business faster than anything we've done before.*

"We now repair most head ends right in the service shop because the G-E Variable Permeability Sweep has enough output to do the job alone. This G-E Package is the only equipment

we've found that will align an inter-carrier circuit receiver quickly and accurately. With it, we get accurate marking of frequency by crystal controlled markers, plus clear visual presentation from the wide-range Cathode Ray Oscilloscope.

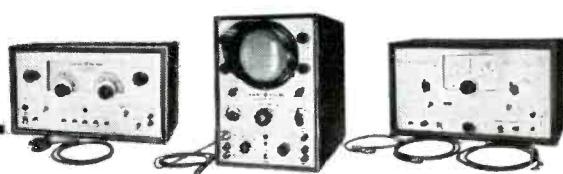
"It does more things *better* than any equipment we've ever used. Without it we could never service so many receivers so fast, so accurately!"

That's the opinion of TV Service Manager Jim Ottman, of Buffalo. What this G-E equipment has done for his operation, it will do for yours. It's easy to buy—simple to use—and what a difference in results!

**ASK ABOUT THE G-E EASY BUDGET PLAN!  
LET THE EQUIPMENT PAY FOR ITSELF!**

*You can put your confidence in—*

**GENERAL**  **ELECTRIC**



General Electric Company — Section 3120  
Electronics Park  
Syracuse, New York

Send me complete information on the G-E Television Test Package and new Balanced Adaptor — plus TERMS OF THE EASY BUDGET PLAN.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

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

**LEWIS WINNER**  
Editor



F. WALEN  
Assistant Editor

ALFRED A. GHIRARDI  
Advisory Editor

Including *Radio Merchandising* and *Television Merchandising*.  
Registered U. S. Patent Office

	Page
Annual Index, SERVICE, 1950 .....	41
Association News .....	40
Finding Your Way Around a TV Chassis. By Cyrus Glickstein .....	12
RF Reactance Measurement Tests (Cover). By Philip H. Greeley .....	20
Phono Installation and Service. By Kenneth Stewart .....	26
Ser-Cuits (TV-FM Booster) .....	34
Servicing FM Detectors (Part II). By Allan Lytel .....	32
Servicing Helps. By M. A. Marwell .....	16
Tube News (16GP4 Centering Adjustments). By L. M. Allen .....	18
Views and News. By Lewis Winner .....	11

#### CIRCUITS

Discriminator Alignment Setup (Using AM Signal Generator and VTVM) .....	32
Flyback Circuitry .....	18
Greeley RF Test Circuit (Cover) .....	24
Philco 51-PT1207 Sound System .....	28
Raytheon 14AY28, 17AY21, 16AY211, 17AY24 TV Chassis .....	38
Ratio Detectors .....	32
RF Test Measuring System Using Wavemeter Technique .....	21
Triad Hi-Fi Amplifiers .....	26
Westinghouse Phase Detector Circuit (H-627K16, H-628K16, H-629K16) .....	16
Westinghouse Phase Detector Circuit (H-633C13, H-634C17, H-635T17, H-636T17, H-638K20) .....	16

#### COVER

RF Test System .....	20
----------------------	----

#### PHONO INSTALLATION AND SERVICE

HF-LF Speaker System .....	28
Lab Type Amplifier .....	29
Needle Replacement Data .....	30
Philco Sound System in 51-PT1207 Chassis .....	28
10 Watt Hi-Fi Amplifier .....	28
Triad Hi-Fi Amplifier Kit .....	26
Tweeters .....	28

#### SERVICING HELPS

Stromberg-Carlson Notes:	
Eliminating Vertical White Streaks on Right Side of Picture Tube; Model TC19 .....	47
IF Tube Substitution; Model 17 .....	47
Improving Picture Focusing; Model 119 .....	46
Removing Audio Buzz; Model 17RPM .....	47
Securing Ganged Cores in Tuner Carriage; Models 116, 117 and 119 .....	47

Index to Advertisers .....	56
Manufacturers	
Jots and Flashes .....	56
News .....	51
New Parts . . . Tools . . . Instruments .....	52
TV Parts . . . Antennas . . . Accessories .....	54

Entire contents Copyright 1950, Bryan Davis Publishing Co., Inc.



**Published monthly by Bryan Davis Publishing Co., Inc.**  
**52 Vanderbilt Avenue, New York 17, N. Y. Telephone MURRAY Hill 4-0170**

Bryan S. Davis, President

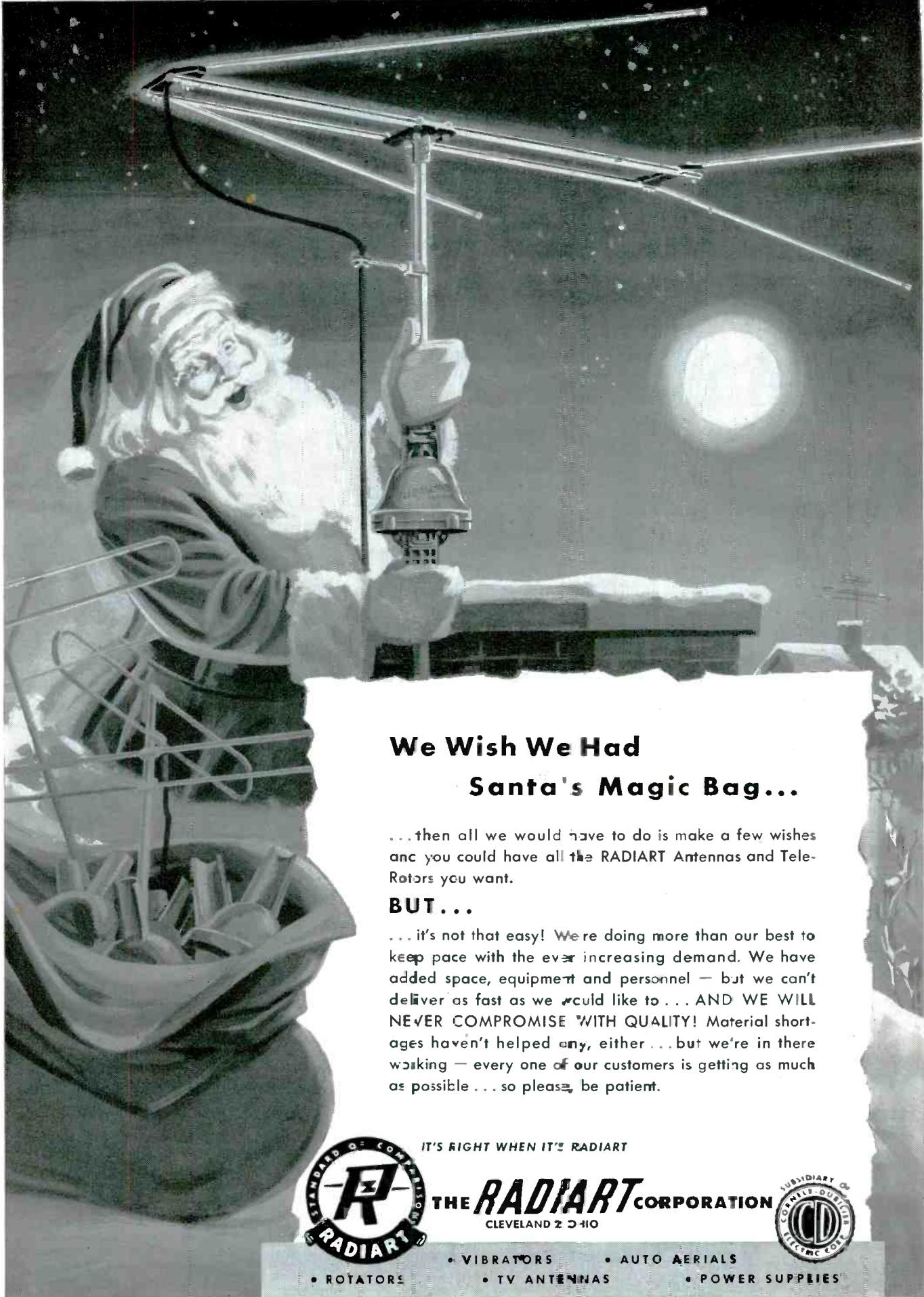
Paul S. Weil, Vice-Pres., Gen. Mgr.

F. Walen, Secretary

A. Goebel, Circulation Manager

Mid-West Representative: Stuart J. Osten, 333 N. Michigan Ave., Chicago 1, Ill. Telephone: Dearborn 2-3507  
East-Central Representative: James C. Munn, 2253 Delaware Dr., Cleveland 6, Ohio. Telephone: ERIeville 1-1726  
Pacific Coast Representative: Brand & Brand, 1052 W. Sixth St., Los Angeles 14, Calif. Telephone: Michigan 1732  
Suite 1204, Russ Building, San Francisco 4, Calif. Telephone: SUtter 1-2251

Entered as second-class matter June 14, 1932, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Subscription price: \$2.00 per year in the United States of America and Canada; 25 cents per copy. \$3.00 per year in foreign countries; 35 cents per copy.



## We Wish We Had Santa's Magic Bag...

...then all we would have to do is make a few wishes and you could have all the RADIART Antennas and Tele-Rotors you want.

### BUT...

...it's not that easy! We're doing more than our best to keep pace with the ever increasing demand. We have added space, equipment and personnel — but we can't deliver as fast as we would like to . . . AND WE WILL NEVER COMPROMISE WITH QUALITY! Material shortages haven't helped any, either . . . but we're in there working — every one of our customers is getting as much as possible . . . so please, be patient.



IT'S RIGHT WHEN IT'S RADIART

THE RADIART CORPORATION  
CLEVELAND 2 OHIO



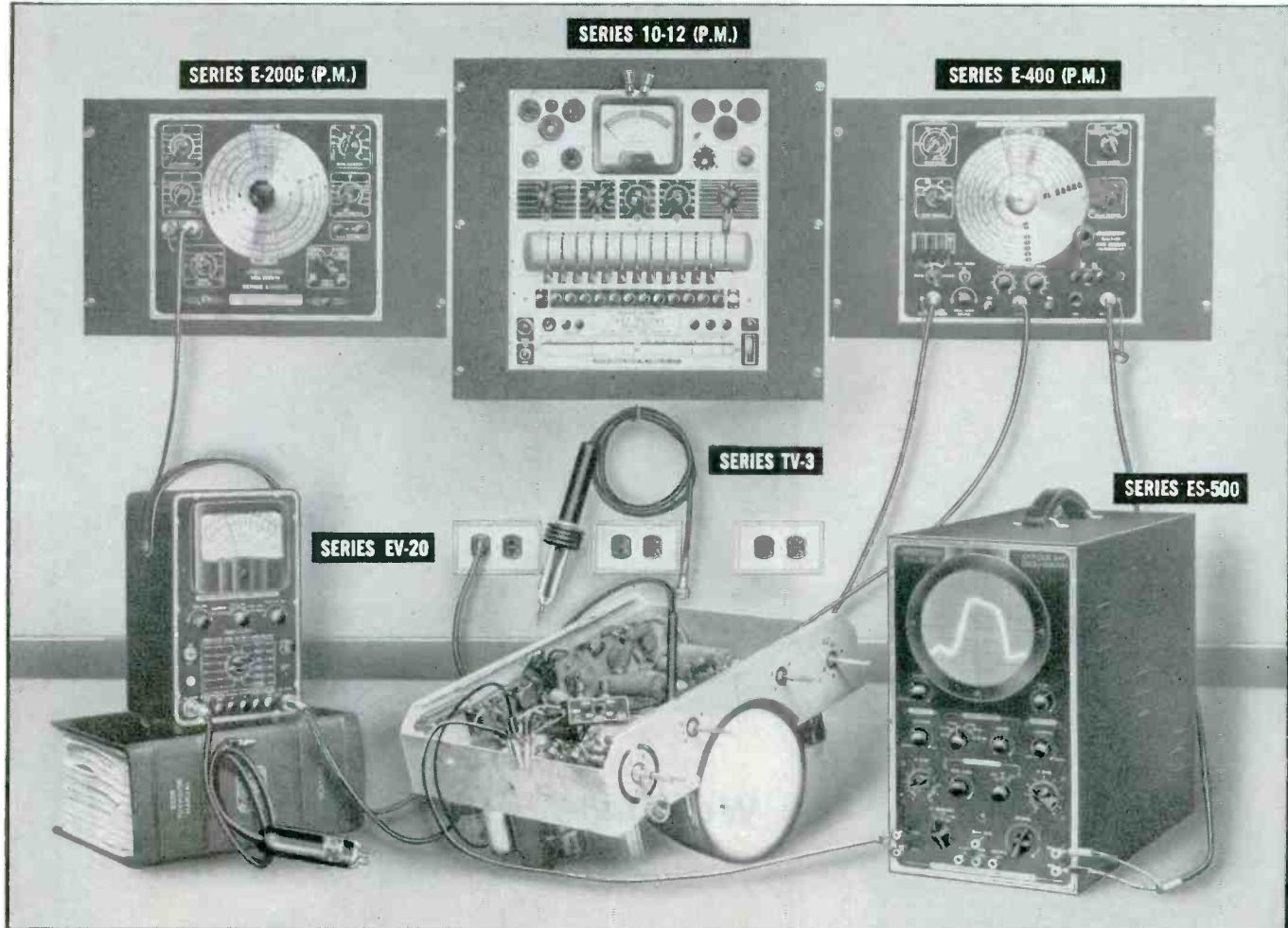
- VIBRATORS
- AUTO AERIALS
- ROTATORS
- TV ANTENNAS
- POWER SUPPLIES

**★ Build Your Service-Sales Future on a Firm Foundation With.....**

**PRECISION**  
TEST EQUIPMENT  
*Standard of Accuracy.*

**These 5 "Precision" Instruments Provide a Complete, Modern Service Lab...for TV-FM-AM ...at only moderate cost.**

NO. 2 OF A SERIES OF MATCHED COMBINATIONS



**SERIES E-200C (P.M.)**

**SIGNAL AND MARKER GENERATOR**

Exceptional Accuracy and Stability • Direct reading • 88 KC to 120 MC. • 1000 pt. vernier calibrating scale • 0-100% Modulation • A.V.C.-A.G.C. Substitution network • Complete with output cable and technical manual. In standard panel 19" x 12 1/4".

**Net Price:** \$76.75

**SERIES E-400 (P.M.)**

**SWEEP SIGNAL GENERATOR**

Narrow and Wide Band Sweep for F.M. and TV • Direct Freq. reading 2 to 480 MC. • Multiple Crystal Marker • 8 tubes including V.R. and rectifiers • RG/E2U Coaxial Terminated Output • Complete with 2 crystals • In standard panel 19" x 12 1/4".

**Net Price:** \$140.00

**SERIES ES-500**

**5" OSCILLOSCOPE**  
Wide Range  
High Sensitivity

V. Amp. Response to 1 MC. • Low C, High R input Step Attenuator • Z axis modulation terminals • 9 tubes incl. V.R. and 2 rectifiers • Complete with light shield and mask • Heavy gauge steel case. 8 1/4" x 14 1/2" x 18".

**Net Price:** \$159.50

**SERIES EV-20**

**True Zero Center VTVM & Multi-range Test Set**

48 ranges to 1200 V., 2000 mgs., 63 DB, 12 amps. • Voltage Regulated Bridge Type Circuit • 13 1/3 Megs. D.C. Input resistance • Direct reading high freq. scales • Optional RF-10-A High Freq. Probe • Heavy gauge steel case 6 1/4" x 5" x 10 1/2".

**Net Price:** \$68.25

**SERIES 10-12 (P.M.)**

**Electronamic\* TUBE MASTER**

Employs famous "PRECISION" Electronamic tube performance testing circuit plus dynamic Battery Tester • 12 element, anti-obsolete-free-point lever system • Roller-chart • Dual short-check • Noise tests • In standard panel 19" x 17 1/2".

**Net Price:** \$106.50

**SERIES TV-3 SUPER HIGH VOLTAGE SAFETY TEST PROBE.** Extends range of Series EV-20 to 30 KV direct reading. Series TV probes available to match most VTVM's and 20,000 ohms per volt test sets. (NOTE: For deluxe Series EV-10 VTVM, with extra-large 7" meter, order Series TV-1 probe.)

**Net Price:** \$14.75

\*Reg. U.S. Pat. Off.

**BUY PERFORMANCE—NOT SPECIFICATIONS!—BUY "PRECISION"**

"PRECISION" PERFORMANCE, ACCURACY, WORKMANSHIP and VALUE have been setting a standard of comparison for over 15 years. DO NOT BE MISLED... It is not "PRECISION" test equipment unless it is manufactured by Precision Apparatus Co., Inc., Elmhurst, L.I., N.Y.

"Precision" Instruments are on display at leading radio equipment distributors.

• TV • FM • AM



**PRECISION APPARATUS CO., INC.**

92-27 Horace Harding Boulevard, Elmhurst 6, New York

Export Division: 458 Broadway, New York, U.S.A. • Cables—Morhanex  
In Canada: Atlas Radio Corp., Ltd., Toronto, Ontario

Convenient Purchase Terms can be arranged with your favorite Precision Distributor.

AM • FM • TV

**OTHER MATCHED COMBINATIONS**

The instruments shown above illustrate one of many possible MATCHED COMBINATIONS of diversified "PRECISION" Test Equipment for TV-FM-AM. Each combination provides a selected and basic, modern, efficient Laboratory at moderate cost.



# Announcing—

**A new advance in popularly priced  
high-fidelity speaker design—The RCA-515S2**

✓ Requires no cross-over network   ✓ Has uniform directivity pattern   ✓ Minimum cross-over interference   ✓ Designed for either rim or flange mounting   ✓ Wide-angle radiation over entire frequency range   ✓ Low non-linear distortion   ✓ Sound pressure radiates from one plane.

A NEW SPEAKER . . . embracing a new approach to audio quality standards . . . the RCA-515S2 employs the "duo-cone" principle originated by Dr. H. F. Olson, world renowned acoustical authority of RCA Laboratories.

Featuring high sensitivity over a useful response range of 40 to 12000 cycles per second, the 515S2 has a power-handling capability of 25 watts of audio power.

The unique vibrating system and magnet structure utilized in the 515S2 consist of a duo-cone, and two voice coils operating in two separate air gaps excited by a single, 2-pound Alnico V magnet. The duo-cone is constructed with large "woofer" cone and small "tweeter" cone each so mounted in its

individual housing that the large cone is effectively a continuation of the small cone. The large cone is driven by a 2-inch voice coil to produce the low frequencies, and the small cone is driven by a  $\frac{3}{4}$ -inch voice coil to produce the high frequencies.

RCA has a complete line of quality speakers designed to RTMA rim-mount standards. From the miniature 2" x 3" to the superb new 15" duo-cone—each RCA speaker is skillfully designed, fabricated from the finest materials, and produced under rigid quality-control methods. For complete details on the RCA-515S2 duo-cone speaker, see your RCA Distributor, or write RCA, Commercial Engineering, Section 156V, Harrison, N. J.



**RADIO CORPORATION of AMERICA**  
**ELECTRONIC COMPONENTS**



# A Masterpiece

**COMPLEX, EFFICIENT... KESTER SOLDER MAKES IT POSSIBLE**

Good fast work can only be done with the best materials. Kester Plastic Rosin-Core Solder and the more active Kester "Resin-Five" Core Solder, made only from newly mined grade A Tin and Virgin Lead, are formulated especially for TV, radio, and electrical work. Kester Solders flow better... handle easier... faster to use.

**Free Technical Manual**—Send for your copy of "SOLDER and Soldering Technique."

## **KESTER SOLDER COMPANY**

4248 Wrightwood Ave., Chicago 39, Ill.  
Newark, N. J. • Brantford, Canada

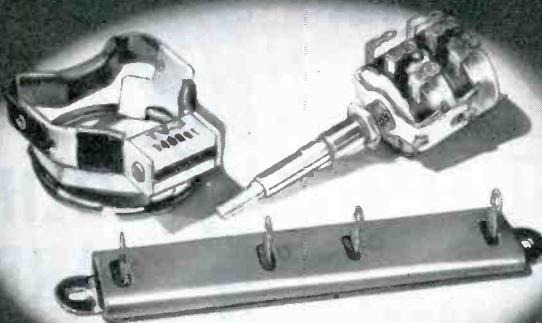


the  
best  
picture  
in  
**Television**  
is...

# CLAROSTAT



**FOR CONTROLS,  
RESISTORS, BEAM-BENDERS**



As "Big Business," television came suddenly. Just as suddenly, Clarostat was ready. Three decades of pioneering and specialization, backed by a plant second to none, assured TV designers and manufacturers of an outstanding selection of resistors, controls and resistance devices.

And when ion spot blemishes became a major problem, again Clarostat was ready with simpler and cheaper beam-benders.

Thus Clarostat products are already represented in over 5,000,000 sets and in countless radios in daily use. All because, for quality, uniformity, dependability, economy, it's CLAROSTAT.

**WRITE FOR**

For profitable TV and radio service, too, it's CLAROSTAT for replacement controls and resistors. Ask your Clarostat jobber for latest TV Replacement Data sheets—or write us.

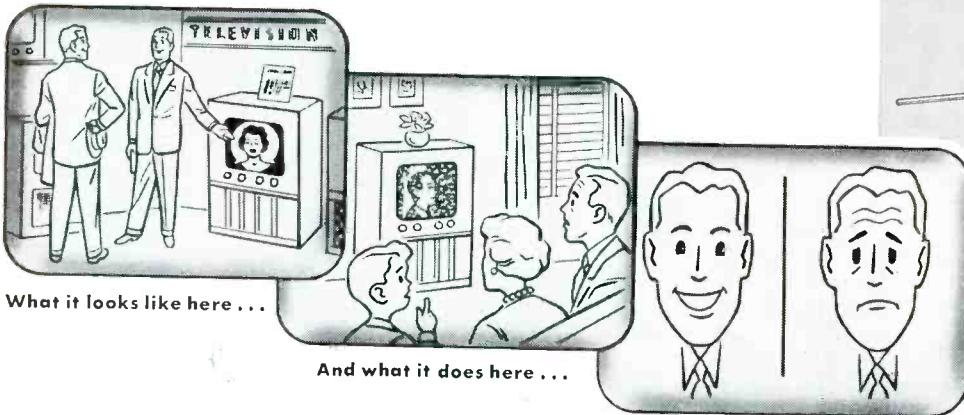
## Controls and Resistors

CLAROSTAT MFG. CO., INC. • DOVER, NEW HAMPSHIRE  
IN CANADA: CANADIAN MARCONI CO. LTD., MONTREAL, P. Q., AND BRANCHES



# Satisfaction

**the BIG WORD in TV reception**



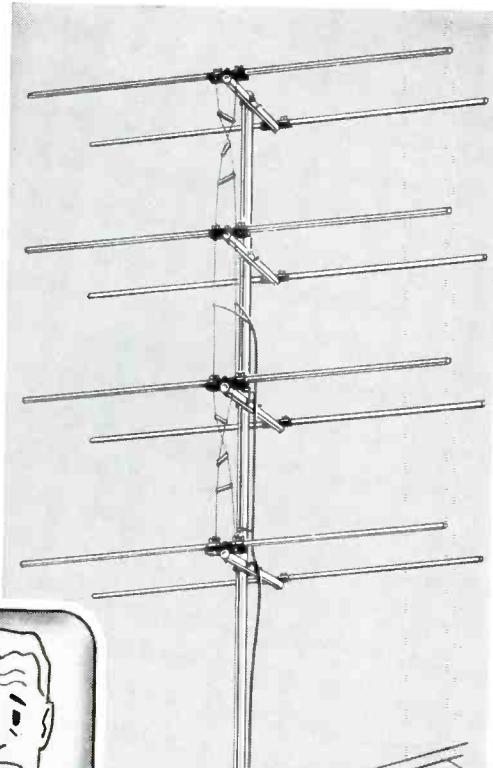
*depends on what's up here . . .*

Don't sell your customers short on complete TV satisfaction. Give them the brilliant performance they have a right to expect by insisting on a genuine VEE-D-X antenna installation. Whatever your area — primary, fringe, or remote — there is a VEE-D-X antenna to more than satisfy your customer requirements. The tremendous surge of preference for VEE-D-X (far ahead of the industry) is due to the fact that every VEE-D-X antenna is stronger structurally and is the most powerful in its price class. It is also an established fact that even the lowest priced VEE-D-X arrays are producing powerful, long distance reception never thought possible. Why gamble with customer satisfaction when you can be sure with VEE-D-X.

**WRITE** for new catalog showing the complete VEE-D-X Single Source Line.  
THE LaPOINTE-PLASCOMOLD CORPORATION, UNIONVILLE, CONN.

# VEE-D-X

BUILDERS OF THE WORLD'S MOST POWERFUL ANTENNAS



Assure Customer  
Satisfaction With the  
**COLINEAR  
ARRAY**

Powerful, high gain, all channel performance. Completely pre-assembled for immediate installation. Compact in size. Light in weight . . . only 4 1/4 lbs. Equipped with attached phasing harness. The lowest price 4 bay array ever manufactured.

**ONLY 23<sup>75</sup>  
LIST**

Less Mast

# Jensen Replacement Needle Chart...

**TEAR OUT THIS PAGE AND HANG UP FOR QUICK, READY REFERENCE!**



CARTRIDGE MFG.	CARTRIDGE MIC.	POINT SIZE	POINT MATERIAL	CARTRIDGE NEEDLE NO.	JENSEN NEEDLE NO.	ILLUSTRATION (Actual Size)	ILLUSTRATION (Actual Size)	CARTRIDGE NUMBERS		CARTRIDGE NUMBERS	
								CART. NO.	POINT SIZE	CART. NO.	POINT SIZE
Astatic	Q1(M)	A .80	Omium	W.02	M.1			W.03	W.05	F14.4	F14.4
Astatic	Q.33(M)	A-.80(LP)	Omium	W.03	W.14			W.15	W.15	A1.4	A1.4
Astatic	Q.AG(M)	A-.802	Omium	W.04	W.15			W.16	W.16	A1.4	A1.4
Astatic	Q.J	A-.81(LP)	Sapphire	W.05	W.17			W.18	W.18	A1.M	A1.M
Astatic	Q.33(J)	A-.81(LP)	Sapphire	W.06	W.19			W.20	W.20	A1.M	A1.M
Astatic	D(M)	A-.83(LP)	Omium	W.07	W.20			W.21	W.21	Q1	Q1
Astatic	D-.23(M)	A-.83(LP)	Omium	W.08	W.21			W.22	W.22	G1M	G1M
Astatic	C.78(M)	A-.84(LP)	Omium	W.09	W.23			W.24	W.24	G1M	G1M
Astatic	A-.84(LP)	A-.84(LP)	Omium	W.10	W.25			W.26	W.26	W.S	W.S
Astatic	GAG(M)	A-.84(LP)	Omium	W.11	W.27			W.28	W.28	A14	A14
Astatic	T(M)	A-.85(LP)	Omium	W.12	W.29			W.30	W.30	A9H	A9H
Astatic	T.33(M)	A-.86(LP)	Omium	W.13	W.41			W.42	W.42	Q3	Q3
Astatic	C.3(M)	A-.87(LP)	Omium	W.14	W.43			W.44	W.44	C9	C9
Astatic	C.1(M)	A-.87(LP)	Omium	W.15	W.45			W.46	W.46	Q2	Q2
Astatic	U(M)	A-.88(LP)	Omium	W.16	W.47			W.48	W.48	F16	F16
Astatic	C.3(L)	A-.89(LP)	Omium	W.17	W.49			W.50	W.50	F16	F16
Astatic	C.1(L)	A-.89(LP)	Omium	W.18	W.51			W.52	W.52	F15.1	F15.1
Astatic	A-.78(M)	A-.80(LP)	Omium	W.19	W.53			W.54	W.54	F7	F7
Astatic	A-.78(M)	A-.81(LP)	Omium	W.20	W.55			W.56	W.56	F11	F11
Astatic	A-.80(M)	A-.82(LP)	Nylon	W.21	W.57			W.58	W.58	RPX 040	RPX 040
Shure	A62A	JF-.30	Admiral 409111	P.73	P.74AD			P.74	P.74	GE-10	GE-10
Shure	A62A	JF-.30	Admiral 409111	P.71	P.71			P.75	P.75	GE-10	GE-10
Shure	A62U	JF-.31	Admiral 409111	P.71	P.71			P.76	P.76	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.77	P.77	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.78	P.78	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.79	P.79	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.80	P.80	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.81	P.81	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.82	P.82	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.83	P.83	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.84	P.84	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.85	P.85	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.86	P.86	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.87	P.87	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.88	P.88	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.89	P.89	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.90	P.90	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.91	P.91	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.92	P.92	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.93	P.93	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.94	P.94	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.95	P.95	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.96	P.96	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.97	P.97	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.98	P.98	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.99	P.99	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.100	P.100	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.101	P.101	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.102	P.102	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.103	P.103	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.104	P.104	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.105	P.105	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.106	P.106	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.107	P.107	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.108	P.108	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.109	P.109	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.110	P.110	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.111	P.111	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.112	P.112	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.113	P.113	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.114	P.114	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.115	P.115	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.116	P.116	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.117	P.117	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.118	P.118	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.119	P.119	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.120	P.120	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.121	P.121	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.122	P.122	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.123	P.123	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.124	P.124	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.125	P.125	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.126	P.126	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.127	P.127	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.128	P.128	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71			P.129	P.129	GE-10	GE-10
Shure	A67U	JF-.31	Admiral 409111	P.71	P.71	<img alt="Illustration					

- 1 These needles are handled by all Radio Parts distributors.
  - 2 A set of installation instructions is packaged with each needle.
  - 3 Ask for them by the Jensen number indicated.

*Jensen* INDUSTRIES, INC.  
331 SOUTH WOOD ST., CHICAGO 12, ILL.

# Sell an **ANCHOR** BOOSTER

*for fast profits*

and complete customer satisfaction...

## **ON EVERY FRINGE INSTALLATION**

Why High Towers,



Hazardous Installations



for your men as well as your customers? WHY spend so many hours on one installation when you CAN make 3 or 4 calls and more profits per installation in one afternoon?

You, the Service Dealers, are recognized as experts in your community. Your advice is often asked and usually followed. Your men are the *one group* in the electronics field who actually get into the home . . . right at the point of sale. It stands to reason then that an installation of one of the many fine simple-to-install antennas, plus an ANCHOR Single or Two-Stage Booster would make a faster and more profitable installation for YOU as well as a completely satisfied customer. REMEMBER, returned calls due to dis-satisfaction are costly.

The New **ANCHOR BOOSTERS** Are Available. Order from your jobber Now.



ANCHOR'S NEW SINGLE-STAGE BOOSTER, ARC-101-75, especially recommended for low signal areas in or near cities where there may be any number of interference problems. Assures consistently good reception up to 75 miles.



\$1980 PROFIT ON  
NEW TWO-STAGE  
BOOSTER

\$1500 PROFIT ON  
NEW SINGLE-STAGE  
BOOSTER

BE SURE YOU KNOW  
ALL THESE FACTS

Only **ANCHOR** can provide your customers with ALL of the most Ultra-Modern advantages for consistent, top-notch, long-range TV reception. Here's why!

- **ANCHOR** has the highest gain of any TWO-STAGE BOOSTER.
- **ANCHOR** has the highest Signal to Noise Ratio.
- **ANCHOR** is the only non-regenerative unit available. The unit that is not returned.
- **ANCHOR'S** Single Knob Construction is so convenient for Booster is turned on and can be switched and tuned off on the same knob.
- **ANCHOR'S** New and Revolutionary method of construction of the RF Stage (Pat. Pend.) is the only real engineering advance in Boosters in recent years.
- **ANCHOR'S** TWO-STAGE BOOSTER is modernly styled with streamlined plastic escutcheon, soft mahogany leatherette finish.
- **IMPORTANT** **ANCHOR'S** TWO-STAGE BOOSTER is often the answer to installation difficulties well within the normal TV areas where their New Single Stage Model fails to give complete satisfaction.

ANCHOR'S NEW TWO-STAGE BOOSTER, ARC-101-100, increases original TV signal strength more than 5 times and assures consistently good reception over 100 miles.

# ANCHOR

ANCHOR ENGINEERING ALWAYS A YEAR AHEAD  
2215 SOUTH ST. LOUIS AVENUE

CHICAGO 23, ILLINOIS



#### **Successful Management in the Shop**

PROBABLY NO PHASE OF SERVICING is overlooked so blandly as the business end. For some reason or other Service Men just seem to dread that word *business* and its implications. Yet, without a sound business program, a successful shop just can't exist.

What does the business regimen involve? Some think it is just accounting. Actually, accounting is but one of many of the facets which must be considered. There are the problems of skillful buying, effective stock controls, sound merchandising, proper pricing, adequate financing, helpful records, good housekeeping, service to customers and particularly, a friendly pleasing personality. Every item cited is important and soundly related. Good housekeeping, for instance, can contribute substantially to the successful shop, by providing adequate light, good ventilation, orderly arrangements on the bench, the shelves and in the window with attractive and sensible displays. Service to customers is extremely vital and closely allied with that friendly pleasing personality requirement. To be successful, the Service Man must recognize that basic fact that his customers are in reality his employers and that they will employ him and his shop only as long as he serves them well. Interest in the community is an integral part of any service program. Commenting on this point in a recent business aid report, Goodreau Soper, of the Department of Commerce small business division, said that the successful Service Shop owner usually has a personal interest in the community in which his store is located, the attractions it has for persons from the surrounding areas, and the social, recreational and educational facilities it provides for its citizens. In addition, such an operator takes an active part in the civic and charitable activities of the community, supporting those which will strengthen the town and make it a healthier and happier place in which to live and earn a living.

There are other items on the successful business agenda which demand urgent recognition. Diagnosis is one of them. A quick and positive diagnosis can provide quite a handsome return. Oldtimer Charles Golenpaul, of Aerovox, in a striking commentary on this and other business aspects during a recent address before the PRSMA group in Philadelphia said that nothing is more vital in profitable servicing than a rapid assured diagnosis, a step which incidentally can be guaranteed by the use of the very best test equipment.

#### **Parts Replacement**

Discussing the step which follows diagnosis, parts replacement, Golenpaul accented the importance of the use of reputable components . . . "those carrying the names of recognized manufacturers, packed in original cartons, coded to indicate recent production runs." He pointed out that the Service Man just can't . . . "afford to take a chance on uncertain components which are apt to fail in short order and compel you to call back to make good. Sloppy material, quite as much as sloppy workmanship, can prove to be the easiest way to commit business suicide."

"Salaries and charges, we were told, represent another business problem on most calendars. Unfortunately, there are too many Service Men who operate by the week. That can be disastrous, for the variable take-home pay never seems to keep pace with the expenses. "A salary is the best arrangement. "Pay yourself a fixed salary," said Golenpaul, "based on what the business averages by the month, or better still by the quarter. . . . See that the salary is available after you've accounted for those other items of business cost. And live on that weekly salary. Then, at the end of every quarter or half year, or year, see how much money is left over and above your salary." "That is profit," he emphasized, "and it's profit you are in business for, not just salary!" Following this pattern,

declared Golenpaul, will assure that you're . . . "going to stay in business, going to grow and will be somebody some day."

Reviewing the delicate situation of material charges, Golenpaul stressed the need for list price charges. He stated that the trade discount given to the Service Man should not be discarded, for that discount is part of the Shop's profit.

Transportation charges, another key source of income or loss, were also analyzed at the meeting. It's important to charge for transportation, which can be placed on a mileage basis. "Make it clear to your customers and prospects," declared Golenpaul, "that you charge for your time from the moment you leave your shop and return, for transportation, for actual labor and again for material."

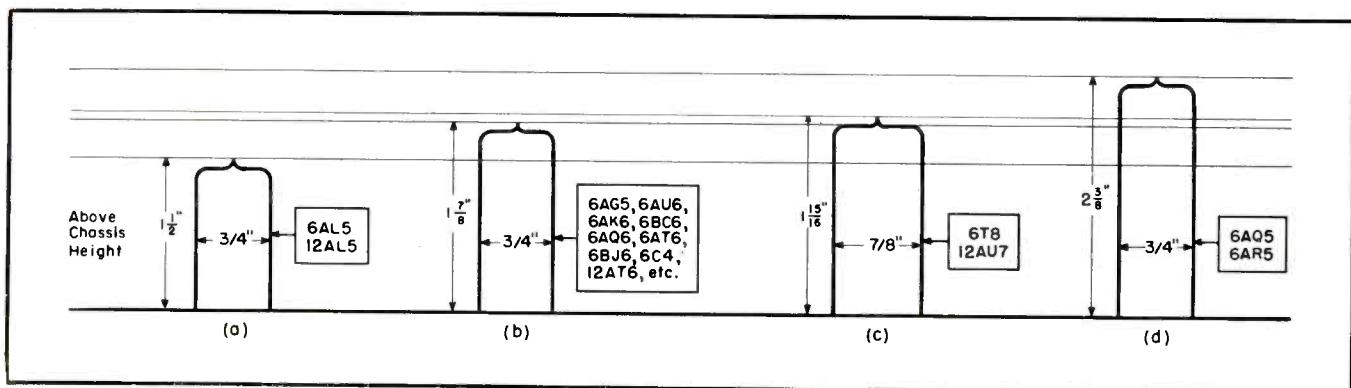
#### **Business Building**

Summarizing the means available to build business today, Golenpaul said: "To keep your charges fair and square, be mighty efficient. Make every hour count during the working day. Organize your jobs so as to minimize waste motion. Plan your calls so as to reduce travel mileage and time. Use the most efficient test equipment to arrive at the correct diagnosis promptly and dependably. Carry a reasonable stock of essential parts and materials so that you won't lose time chasing down to the jobbers for every job you handle. Use dependable parts and materials that won't let you down. Remember, labor is your greatest item of cost. Time is money. . . . You're in a good business. It's a business that can be as good as you make it. . . . Play it square. It's satisfied customers that can build up your business. By the same token, dissatisfied customers can chop off your head in short order. It's for you to decide, by your ethics and practices, whether you wish to remain in this game or not."

Here truly are words of wisdom which every Service Man should limelight in his resolutions for the New Year!—L.W.

(Below)  
Fig. 1. Variations in miniature tube sizes.  
All types shown are seven-pin models,  
except the two listed in c, which have  
nine pins.

# Finding Your Way



## Application of Stage-by-Stage Check Procedures, Noting Specific Tubes, Components and Layouts Used, Disclosed as an Ideal Means of Locating Defects When Schematic or Chassis Data Are Not Available: Typical Analysis Cited for Single Chassis Models.

AT THE SHOP or in the field, the Service Man is often confronted with TV models for which he has no chassis layouts and with which he may not be too familiar, circuitwise. There is no denying that such occasions should not exist, but they do, particularly during those sudden emergency calls. However, it has been found possible to solve this awkward problem with the aid of a check plan which provides for the location of a defective stage without a schematic to guide the way.

Briefly the plan provides for the location of various stages when the chassis is in the cabinet and when it is out of the cabinet.

The in and out approaches were found to be most logical in view of the fact that a certain proportion of troubles may be caused by defective tubes. In such cases, it evidently would be a waste of time to yank the chassis out of the cabinet. On the other hand, when the chassis is already out, there are additional ways which can be applied to find a given stage a little faster and perhaps make identification more definite.

Before looking for a defective stage, it is necessary to check the type of receiver since this will often influence which stages to probe. Most receivers fall into one of four categories:

- (1) Electrostatic or electromagnetic deflection. It is essential to know which system is used be-

cause this generally provides information on the type of deflection circuits and their output connections.

- (2) Transformer low-voltage supply or transformerless. If the last is used, the filaments are in series-parallel, and if one filament opens, there generally will be a string of tubes unlit or possibly even all of them.
- (3) Kickback or rf high voltage supply. This information is handy in determining how to analyze a dark screen with satisfactory sound or in deciding what type of horizontal deflection circuits to expect.
- (4) Intercarrier system or separate video and audio if stages. This is useful in determining where to look for troubles common to both sound and picture or to either one.

In looking over a new chassis, prior to trouble-shooting, it is surprising how much useful servicing information can be obtained at almost a glance.

If a set has a 7-inch screen, it almost definitely has electrostatic deflection. If the screen is 10-inch or larger, the tube is certainly an electromagnetic type. There have been only a few exceptions to this rule. For instance, in '46 RCA introduced a model (621) which used a 7DP4, hav-

ing magnetic deflection and static focusing. An early Belmont model also used a 10-inch electrostatic tube, the 10HP4. An additional check, where one may be necessary, involves a study of the neck of the picture tube. Electrostatic tubes have bare necks. Magnetic types are well surrounded with such items as a deflection yoke, focusing coil, and usually an ion trap magnet near the socket.

The transformer low-voltage supply or transformerless chassis can be identified by using the system applied in checking a broadcast model. A look at the chassis will reveal if there is a power transformer sitting on it. In TV, the transformer can't be missed. They are larger, of course, than in radio because of the greater load they must handle, and may have 3" or 4" of laminations or even more. If there is no transformer on the chassis, the conclusion is obvious.

Incidentally, transformerless sets usually have one or more tubes, such as 25L6 and 19BG6, that obviously can't get filament voltage from a transformer.

(There are only a small number of models with minor variations; some with filament transformer for heaters and transformerless B+ supply and others with transformer B+ and series-parallel filaments.)

It is important in servicing to know the type of low-voltage supply. For

# Around a TV Chassis

by CYRUS GLICKSTEIN

American Radio Institute

example, if all the tube filaments are unlit in a transformer set, there may be no current at the outlet, or a blown fuse in the receiver, a line cord out or defective, or a bad transformer, etc. In transformerless sets, it may be any of the foregoing, except the last or it may be an open picture-tube filament. In many of these types of sets, there are two strings of filaments in series with the picture-tube filament. If the last is open (or if the picture-tube socket is off) no tubes will light. If one of the other filaments open, several tubes will be unlit and each must be checked with an ohmmeter to find the defective one. The kickback or *rf* high-voltage supply constitutes the two most important types of high-voltage power supplies in use at present.

Most seven-inch sets use the *rf* type of power supply, with a power amplifier tube such as a 6V6, 6Y6, 25L6, etc., used as an *rf* oscillator and the 1B3 as the high-voltage rectifier. The air-core coil, wound on a hollow bakelite form, looks like an overgrown radio *rf* choke with 4 or 5 pies or sections. This coil acts as the high voltage stepup transformer.

In addition, some 10 and 12-inch magnetic sets are now using the *rf* power supply. Most of the magnetic sets, however, use the kickback system. The tube lineup in this system is a definite clue. In older sets, we find the 6BG6 as the horizontal output tube, a 1B3 as a high voltage rectifier, and the 5V4 as a damping tube. In newer sets, the horizontal output has a 6BQ6, the rectifier a 1X2, and the damper a 6W4. Some more recent sets have some combination of the two; Table I; p. 14.

These tubes are generally found inside the high voltage cage. An additional clue to the kickback type of high voltage system is the kickback transformer; a combination high-voltage transformer and output transformer for the horizontal circuit. It has a unique construction and doesn't resemble any other type of coil or transformer in the set. It also has seven or eight leads coming off it, and is found in the high-voltage cage. Since there are generally perforations in the cage, it is easy to look in to see what is there without opening it, unless this becomes necessary.

The intercarrier or separate audio and video *if* sections are the most difficult to spot by inspection. In some intercarrier models, when the contrast control is turned all the way up while listening to a station, there is an *intercarrier buzz* (a rasping 60-cycle buzz) in the audio.

In the main, the 7-inch sets use intercarrier and many of the late model larger receivers, use the system, too. Since one of the basic purposes of intercarrier sets is to cut down the number of stages, when it is found that less than 20 tubes are used, it is more likely, though not absolutely definite, that it is an intercarrier model.

There are other checks which can be tried. For instance, if both the sound and picture are lost when the video detector tube is taken out, while the set is in operation, the set is an in-

tercarrier model. If only the video is lost, it is not an intercarrier type. This check can be made only on transformer sets. In transformerless sets, with series-parallel filaments, it would be necessary to short out the video detector output to make the same type of check.

If there is only one audio *if* stage, intercarrier operation is also indicated.

Once the general characteristics of the set are observed, the individual stages can be identified. Before outlining the procedure, let us review the functions of the various stages.

There are 7 general sections in all TV receivers and each can be broken down into a number of stages as shown below.

(In intercarrier sets there are three to four common video and audio *if* stages up to the video detector. There

Section	Function	Usual Number of Stages (Tubes)
(1) Front end or tuner.	Receives two signals, video and audio. Provides local oscillator signal which beats with incoming ones to produce two <i>if</i> frequencies.	3 ( <i>rf</i> , oscillator, mixer) or 2 ( <i>rf</i> with combination oscillator and mixer).
(2) Video strip.	Amplifies video <i>if</i> signal, detects it and amplifies video frequencies.	3 (4 video <i>if</i> amplifier). 1 video detector. 1 (2 video amplifiers). 2 (3 audio <i>if</i> stages). 1 discriminator or ratio detector. 2 audio amplifiers.
(3) Audio strip.	Amplifies audio <i>if</i> signal, detects and amplifies audio frequencies.	2 (3 sync separators and clippers). 1 horizontal <i>afc</i> .
(4) Sync section.	Clips off sync pulses from video signal, amplifies them and feeds pulses to vertical and horizontal oscillator to trigger them at correct time to synchronize sweeps with incoming information.	1 (2 vertical oscillator and amplifiers). 2 (3 horizontal oscillator, horizontal output, and damper, if magnetic deflection).
(5) Sweep.	Provides horizontal and vertical deflection.	1 (2 low voltage rectifiers; none, if selenium rectifiers are used.) 2 for <i>rf</i> system; oscillator and rectifier. 1 for kickback-rectifier.
(6) Low voltage.	Provides plate voltage for all stages except picture tube.	
(7) High voltage.	Provides high voltage for picture tube.	

is usually one audio *if* stage after the 4.5-mc audio *if* signal is taken off. However, some non-intercarrier sets have one or two common *if* stages following the tuner, before the two *if* signals are separated.)

Above-the-chassis inspection to identify each stage involves four points:

- (1) Type of tube.
- (2) Shape of tube.
- (3) Location of tube with respect to other tubes and above-chassis components.
- (4) Tube withdrawals to check identification.

When the chassis is out of the cabinet, there is a fifth factor to consider, too: Location of the tube with respect to below-chassis components and controls.

**Type of tube:** A variety of tubes are used in present-day receivers. However, a random selection of a number of TV receiver models over the past few years, including some '50 types has revealed that in many stages the tubes are similar. This information has been summarized in Table I.

**Shape of tube:** There are significant differences in the shapes of the various miniature tubes used in different sections of the receiver, and they can be immediately identified on inspection.

The most popular tubes for video and audio *if* stages, 6AG5, 6AU6, etc., are medium width and height. The exact tube size appears in Fig. 1b. The 6AL5, used as video detector, and less often as audio discriminator and in horizontal *afc* circuits, is a medium width type and smallest in height; Fig. 1a. The 6AQ5, used as audio power amplifier and sometimes as the last video amplifier, is medium width and tallest of the miniatures; Fig. 1d. The 6T8, used as a combination discriminator and first audio and the 12AU7 are medium height, but widest of the miniatures and have a 9 pin base; Fig. 1c. The 6T8 is also recognizable by the unique triple rectangular structure inside the bulb.

In standard size tubes, the 6SN7GT, which is a double triode, has part of the filament inside each triode section. As a result, a top view of a lit tube doesn't show a glow in the center but two glowing spots, one on each side. The 5U4G rectifier is one of the largest tubes in the receiver, with the old-fashioned shape. The 5V4G damping tube also has that shape but is somewhat smaller. The 6BG6, horizontal output tube, is in between the two. It

(Continued on page 31)

Table I  
Tube types used in various stages of TV receivers.

Manufacturer and Chassis Model	Front End	Video IFs	Video Detector	Video Amplifiers	Sound Amplifiers and Limiter	Sound First Audio	Vertical Oscillator and AFC Amplifier	Sync Amplifiers and Clippers	Horizontal AFC Oscillator	Horizontal Output	Horizontal Damper	High-Voltage Rectifier	Low-Voltage Rectifier	Picture Tube	
Air King† 206(7) R	6AG5	3-6AU6*	6AL5*	6AC7	6AU6	6T8	6V6	12AU7	12AU7	6AL5	6BG6	6W4	IB3	5U4	
Bendix† 2000, 3000	6AG5	3-6AU6*	1N60	6AU6	6AU6	6T8	6AQ5	6AU6	6SN7	6SN7	6BQ6	.....	IB3	6X5	
Crosley 9-404M	6T8	2-6AL5	6AL5*	12AU7	2-6AU6*	6T8	6V6	6SN7	6SN7	1/2 6SN7	6BG6	5V4	IBP4	5V4	
Emerson 637	6AK5	6AU6*	6AL5*	6AU6	2-6AU6*	6T8	6V6	1/2 12AU7	6SN7	6SN7	6BG6	5V4	IB3	2-5Y3s	
Gared 10TZL-3, 4	6J6	2-6AG5s	6AL5*	1/2 12AU7	6AU6	6T8	6K6	2-6AU6*	6SN7	6AL5	6BG6	5V4	IB3	5U4	
12TZL, 3, 6	3-6J6s	4-6BA6s	6AL5*	6AC7	2-6AU6*	6BBA6	6T8	6K6	2-6SN7	6AR5	6BG6	5V4	IB3	10BP4	
15TZL	2-6AU6s	2-6AU6s	6AL5*	12AU7	6AU6	6AL5	25L6	12SN7	1/2 12SN7	1/2 12SN7	19BG6	25Z6	IB3	12J-L-QP4	
G. E. 805-6-7	12AT7	3-6AU6*	6AL5*	12AU7	6AU6	6AL5	6SO7	6AQ7	6SN7	1/2 6SN7	6BG6	5V4	IB3	5U4	
6AU6	3-6AU6	6AL5*	12AU7	2-6AU6*	6SH7	6AU6	6K6	12AU7	6SN7	6SN7	6BG6	5V4	IB3	5Y3	
Hallicrafters 509	2-6AK5	4-6AU6s*	6AL5	6AU6	6AU6	6AL5	6AU6	6AU6	6SN7	6AL5	6BG6	5V4	IB3	5U4	
910	6C4	6AQ5(G76)	6AO6	12AU7	3-6AU6s	6T8	6V6	2-12AU7s	6SN7	6AL5	6SN7	6BG6	5V4	IB3	10BP4
Motorola TS9D	6AG5	3-6BA6s	6AL5*	12AU7	6AU6	6AU6	6AU6	12SN7	1/2 12SN7	1/2 12SN7	1/2 12SN7	.....	IB3	2-5U4s	
Motorola TS-16	6J6	3-6AU6*	1N34	6AU6	6AU6	6AU6	6AL5	25L6	12SN7	1/2 12SN7	1/2 12SN7	.....	IB3	10BP4	
Philco 50-T1400	6AG5	4-6AG5s*	1/2 12AU7	1/2 12AU7	6BA6	6AU6	6V6	6SN7	1/2 12AU7	6SN7	6BG6	6W4	IB3	7JP4	
Raytheon 12AN22	7FB	4-6AU6s*	6AL5*	12AU7	6AU6	6AU6	6T8	6K6	1/2 6SL7*	6SN7	6AL5	6SN7	IB2	5U4	
RCA 630	6J6	4-6AG5s	6AL5*	6AU6	2-6BA6s	6AL5	6K6	6AT6	6AT6	6K6	6BG6	5V4	IB3	2-5U4s	
RCA 8T241	2-6AG5	4-6AG5s	6AL5*	12AU7	2-6AU6s	6AL5	6V6	2-6SN7	6SN7	1/2 6SN7	6BG6	5V4	IB3	10BP4	
Stewart-Warner AVT-1	6BH6	4-12AU6s*	12AU6	12AU6	12AU6	19T8	6K6	12AU6	12SN7	6K6	6BG6	5V4	IB3	10BP4	
Telephone TV-249	6J6	3-6AG5s*	1N34	12AU7	6AU6	6AL5	6AT6	6AT6	6SN7	1/2 6AL5*	12SN7	3-50BSs	1B3††	(A)	
Westinghouse V-2150-111	2-6AG5	3-6BH6s*	6AL5*	6AH6	2-6BH6s	6AL5	6AV6	12AU7	12AU7	1/2 6SN7	6BG6	5V4	IB3††	5U4	
Zenith† 23G22/23	6CA4	6B16	6AU6s*	IN54	12AU7	1/2 12AT7	6BN6	6BN6	6AL5	6SN7	19BG6	25W4	(rf osc. 6Y6)	2-5U4s	
	6J6	6B16	6AU6s*	6AG5	1N54	12AU7	6AG5	6BN6	6BN6	6AO5	6BG6	25W4	(rf osc. 6Y6)	5U4	
													Series Fil.	25/6	

\*1950 models.  
†Intercarrier (common *if*s)

‡RF detector combined with *ac* diode<sup>a</sup>.

dc restore<sup>b</sup>; clamping diode<sup>c</sup>; noise limiter<sup>d</sup>.

<sup>a</sup>Combined with *ac* diode or amplifier.

<sup>b</sup>Combined with *ac* diode or amplifier.

<sup>c</sup>Combined with *ac* diode or amplifier.

<sup>d</sup>Combined with *ac* diode or amplifier.

<sup>e</sup>Combined with *ac* diode or amplifier.

<sup>f</sup>Combined with *ac* diode or amplifier.

<sup>g</sup>Combined with *ac* diode or amplifier.

<sup>h</sup>Combined with *ac* diode or amplifier.

<sup>i</sup>Combined with *ac* diode or amplifier.

<sup>j</sup>Combined with *ac* diode or amplifier.

<sup>k</sup>Combined with *ac* diode or amplifier.

<sup>l</sup>Combined with *ac* diode or amplifier.

<sup>m</sup>Combined with *ac* diode or amplifier.

<sup>n</sup>Combined with *ac* diode or amplifier.

<sup>o</sup>Combined with *ac* diode or amplifier.

<sup>p</sup>Combined with *ac* diode or amplifier.

<sup>q</sup>Combined with *ac* diode or amplifier.

<sup>r</sup>Combined with *ac* diode or amplifier.

<sup>s</sup>Combined with *ac* diode or amplifier.

<sup>t</sup>Combined with *ac* diode or amplifier.

<sup>u</sup>Combined with *ac* diode or amplifier.

<sup>v</sup>Combined with *ac* diode or amplifier.

<sup>w</sup>Combined with *ac* diode or amplifier.

<sup>x</sup>Combined with *ac* diode or amplifier.

<sup>y</sup>Combined with *ac* diode or amplifier.

<sup>z</sup>Combined with *ac* diode or amplifier.

<sup>aa</sup>RF detector combined with *ac* diode<sup>a</sup>.

<sup>bb</sup>Selenium rectifier; series filament.

<sup>cc</sup>Combined with *ac* diode or restorer.

all we can say to you is

# A MERRY CHRISTMAS



**SNYDER MFG. CO.**

# Servicing Helps

**Installation of 6C4 Phase Detector in Place of 6C4 Phase Inverter and 6AL5 Horizontal AFC in Westinghouse Chassis . . . Stromberg-Carlson Service Notes: Improving Picture Focus; Removing Audio Buzz and Vertical White Streaks on Right Side of Picture; IF Tube Substitutions; Securing Ganged Cores to Tuner Carriage.**

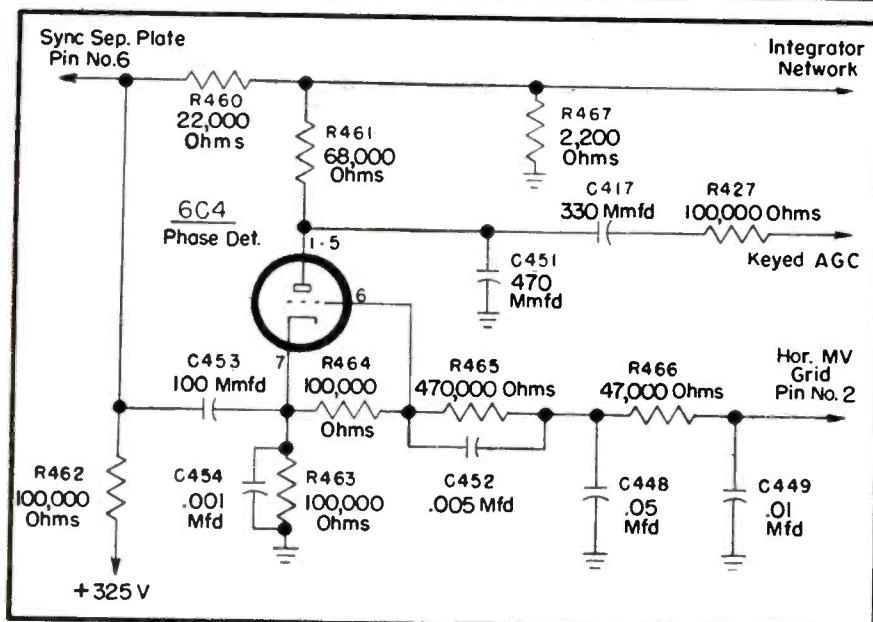
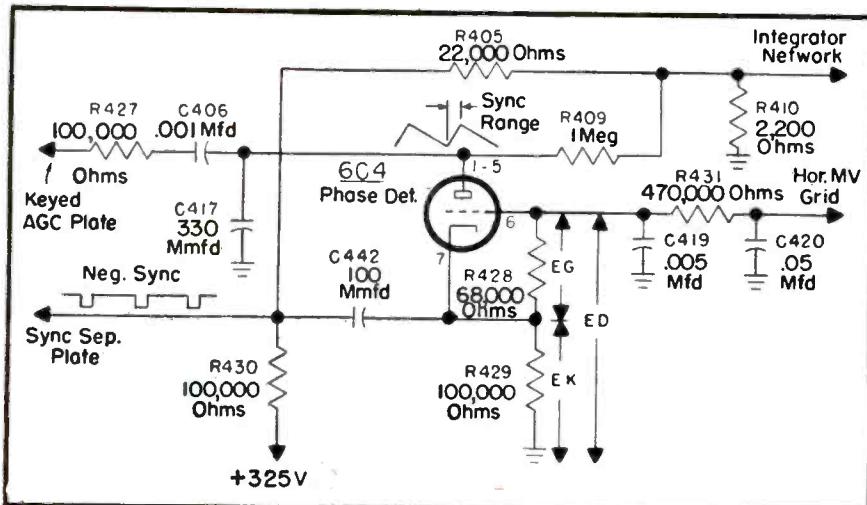


Fig. 1. Phase detector circuit now being used in Westinghouse H-627K16, H-628K16 and H-629K16 models.



by M. A. MARWELL

To DEVELOP CORRECTION voltage, that can be applied to the horizontal multivibrator in a TV chassis to control the frequency, there has been developed a 6C4 phase detector circuit, which can now be found in several runs of receivers. The system has been found so effective that Westinghouse has installed it in place of the 6C4 phase inverter and 6AL5 horizontal *afc* circuit. The corrected circuit appears in the H-627K16, H-628K16 and H-629K16 models; Fig. 1.

In Fig. 2 appears a basic circuit of the system as used in the Westinghouse B-2170 series of chassis.

The *dc* correction voltage, that will control the frequency of the horizontal multivibrator, must be a measure of the phase difference between the incoming horizontal sync pulses and the horizontal sweep voltage developed in the receiver.

As shown in the Fig. 2 circuit, no *dc* potentials are applied to the 6C4 phase detector elements with the exception of a small positive bias of approximately 3 volts which is applied to the plate to stabilize the operation. Instead, the operation of the circuit depends upon the application of *ac* voltages. A portion of the saw-tooth voltage from the horizontal output stage is applied to the plate of the phase detector. The peak-to-peak amplitude of the saw-tooth voltage at the plate is 20 volts or more. Sync pulses with a peak-to-peak amplitude of approximately 10 volts are applied to the cathode, and these sync pulses extend in a negative direction.

An important point in the consideration of the circuit is that when a vacuum tube is operated in such a manner that grid current flows, the magnitude of the grid current is greatly affected by the amount of voltage applied to the plate. When the plate voltage is zero or negative, maximum grid current will flow, and the grid current will decrease as the plate voltage increases in a positive direction.

The .005-mfd capacitor ( $C_{419}$ ) which is connected between the control grid

(Continued on page 46)

Fig. 2. Another version of the phase detector circuit used in Westinghouse models H-633C17, H-634C17, H-635T17, H-636T17 and H-638K20.

*Announcing*

## RCA WV-97A

### Senior VoltOhmyst\*

*reading peak-to-peak voltages*

**ONLY \$62.50** Suggested User Price

Includes direct probe and cable, dc probe, ohms lead, and ground lead

#### TEN WAYS BETTER!

1. Directly measures complex waves from 0.2 volt to 1400 volts, peak-to-peak.
2. Has an over-all accuracy for dc measurements of  $\pm 3\%$  of full scale.
3. Measures dc voltages from 0.02 volt to 1500 volts.
4. Measures rms values of sine-wave voltages from 0.1 volt to 1200 volts.
5. Has 7 non-skip ranges for both resistance and voltage.
6. All full-scale voltage points increase in a uniform "3-to-1" ratio.
7. Frequency response flat from 30 cps to approximately 3 Mc.
8. Negative-feedback circuit provides better over-all stability.
9. Fully enclosed metal case shields sensitive electronic-bridge from rf fields.
10. More convenient to use because of smaller size and new slip-on probes.

The WV-97A has a range of usefulness extending beyond that of any other instrument in the field. Its quality, dependability, and accuracy make it a true laboratory instrument; it is exactly what is needed for television in the design laboratory, factory, and service shop.

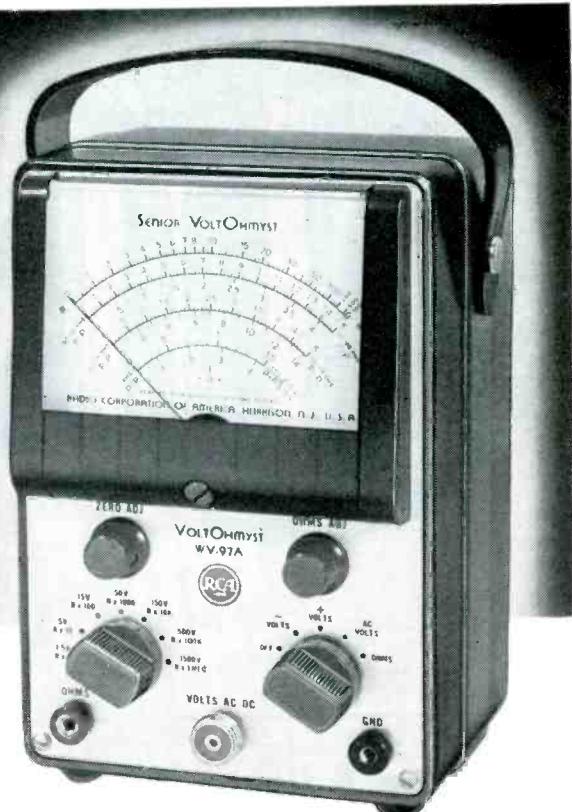
The new Senior VoltOhmyst measures dc voltages in high-impedance circuits, even with ac present. It reads the rms values of sine waves and the peak-to-peak values of complex waves or recurrent pulses, even in the presence of dc. Its electronic ohmmeter has a range of ten billion to one.

Like all RCA VoltOhmysts, it features high input resistance, electronic protection from meter burn-out, zero-center scale for discriminator alignment, molded-plastic meter case, a 1-megohm isolating resistor in the dc probe, and sturdy metal case for good rf shielding.

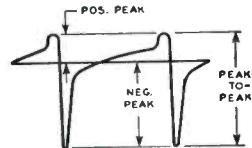
An outstanding feature is its usefulness as a television signal tracer . . . made possible by its high input resistance, wide frequency range, and direct reading of peak-to-peak voltages.

For complete information on the new RCA WV-97A Senior VoltOhmyst, see your RCA Test Equipment Distributor, or write RCA, Commercial Engineering, Section 56X, Harrison, New Jersey.

\*Reg. U. S. Pat. Off.



The WV-97A measures peak-to-peak voltages directly. Hence, it quickly provides information essential for servicing TV receivers with their pulse-type waveforms.



#### SPECIFICATIONS

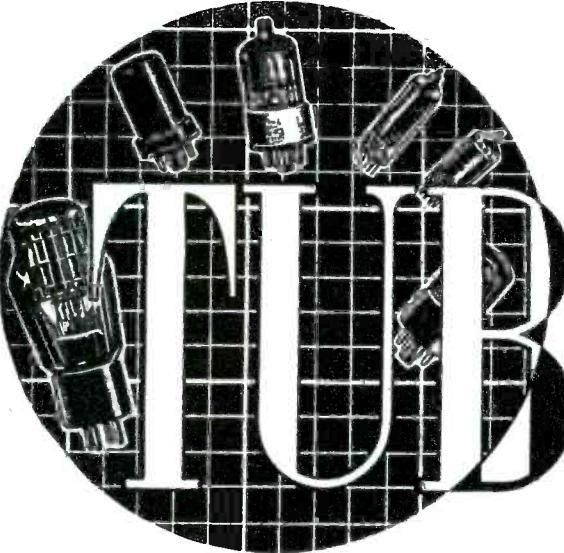
DC Voltmeter:	Seven continuous ranges.....	0 to 1.5, 5, 15, 50, 150, 500, 1500 volts
Input resistance (including 1 megohm in dc probe):	All ranges.....	11 megohms
Sensitivity for the 1.5-volt range.....	7.3 megohms-per-volt	
Over-all Accuracy.....	$\pm 3\%$ of full scale	
AC Voltmeter—Fourteen continuous ranges:		
Peak-to-peak ranges.....	0 to 4, 14, 40, 140, 400, 1400, 4000 volts	
Maximum peak-to-peak input voltage.....	1400 volts	
RMS ranges (for sine waves).....	0 to 1.5, 5, 15, 50, 150, 500, 1500 volts	
Maximum rms input voltage.....	1200 volts	
Input Resistance and Capacitance with WG-218 Direct Probe and Cable:		
1.5, 5, 15, 50, 150-volt ranges.....	0.83 megohm shunted by 85 $\mu\mu$ f	
500-volt range.....	1.3 megohms shunted by 85 $\mu\mu$ f	
1500-volt range.....	1.5 megohms shunted by 85 $\mu\mu$ f	
Frequency Response with WG-218 Direct Probe and Cable:		
1.5, 5, 15, 50, 150, 500-volt ranges flat from 30 cps to 3 Mc for voltage source having 100-ohm impedance		
Overall Accuracy:		
1.5, 15, 50, 150, 500, 1500-volt ranges.....	$\pm 5\%$ of full scale	
5-volt range.....	$\pm 0\%-10\%$ of full scale	
Ohmmeter:		
Seven continuous ranges.....	0.2 ohm to 1000 megohms	
Center scale values.....	10, 100, 1000, 10,000 ohms; 0.1, 1, 10 megohms	
Dimensions: 7 3/4" high; 5 1/4" wide, 3 3/4" deep		
Available Accessories:		
WG-264 Crystal Diode Probe. Extends range to 250 Mc		(\$7.75 suggested user price)
WG-289 High-Voltage Probe and WG-206 Resistor to extend range to 50,000 volts.		(\$9.95 suggested user price)

Available from your RCA Test Equipment Distributor

**RADIO CORPORATION OF AMERICA**  
TEST EQUIPMENT

HARRISON, N.J.





# TUBE News

by L. M. ALLEN

## Centering Adjustment Considerations for the Short Metal 16GP4

IN THE PICTURE-TUBE arrangement, there are three associated components which are particularly important; the deflecting yoke, focusing coil, and ion-trap magnet. Their proper adjustment is vital to the effectiveness of the reproductions on the screen. While these adjustments are normal factory procedures, there are many instances where readjustments must be made in the shop or home. For best results it is prudent to follow the adjustment procedures used at the plant. In the case of the deflecting yoke of the short metal 16GP4 tube, for instance, when the deflecting yoke is placed on the

neck of the tube, the screen end of the yoke is centered by pushing the yoke forward so that the windings are pressed firmly against the glass cone. To center the base end of the yoke and maintain its axial alignment with the tube neck, a small cylindrical wedge of insulating material is usually inserted between the base end of the yoke windings and the tube neck. The yoke should be mounted so that it may be rotated for alignment of the raster with the tube mask. Grounding of the

yoke core is advisable to keep radiation to a minimum.

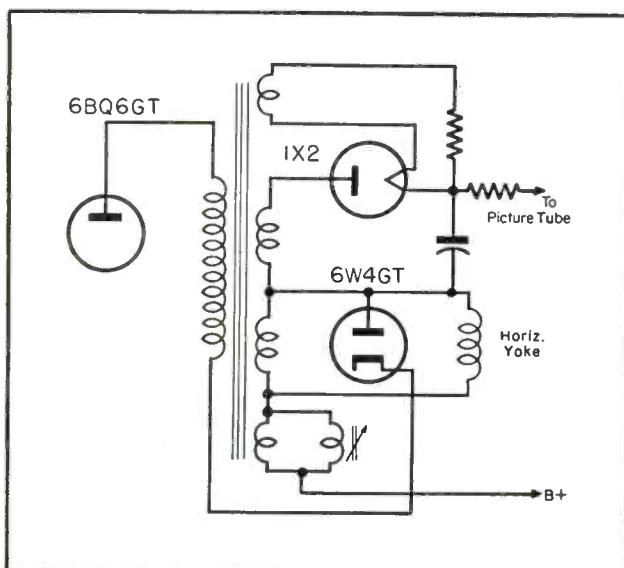
### Focusing Device Considerations

A focusing field, supplied by an electromagnetic coil, permanent magnet, or a combination of the two, is required to concentrate the electron beam into a focused spot at the screen. The field must have excellent radial symmetry. When a coil is used, it must be supplied with direct current from a well-filtered source. The focusing field must be spaced at least one-half inch from the deflecting coils to reduce interaction between the focusing and deflecting fields. If the focusing field is placed too close to the deflecting fields, interaction between them may produce reduced deflection sensitivity and corner resolution, as well as objectionable rotation of the fluorescent pattern as the focus is varied. On the other hand, if the focusing field is located too close to the electron gun, resolution will be reduced and pattern distortion may occur as a result of intersection of the focusing field with the ion-trap-magnet field.

As the air gap of the focusing device is moved away from the deflecting yoke, the corner resolution will be improved at the expense of a slight loss in center resolution. The strength of the focusing field required for focus will increase as the distance between

(Continued on page 50)

\*From copyrighted notes prepared by the tube department of RCA.



Circuit of typical fly-back power supply with a 6BQ6GT, 1X2 and 6W4GT. The 1X2, a miniature filament-type rectifier, which serves as a high-voltage rectifier supplying power to the anode of the picture tube, is being used as a replacement for the 1B3GT/8016.

(Courtesy Hytron)

# NEW INDICATOR ION TRAP

Now in all  
**Rauland**  
**Tubes**



The response to Rauland's new Indicator Ion Trap, after its introduction in the 12LP4-A, has been so enthusiastic that this feature has now been incorporated in all Rauland tubes—as a standard feature of the new Rauland Tilted Offset Gun.

In the field or on the assembly line, this new Indicator Ion Trap reduces Ion Trap Magnet adjustment time to a matter of seconds, eliminates mirrors and guesswork, and assures accuracy of magnet adjustment. It can increase profits for every service man and service dealer—and at the same time assure better customer satisfaction.

A bright green glow on the anode of the picture tube signals when adjustment is incorrect. Correct adjustment is made instantly, by moving the magnet until the glow is extinguished or reduced to minimum.

Only Rauland offers this advanced feature—one of a half-dozen important post-war developments from Rauland.



## RAULAND

**The first to introduce commercially  
these popular features:**

- Tilted Offset Gun**
- Indicator Ion Trap**
- Luxide (Black) Screen**
- Reflection-Proof Screen**
- Aluminized Tube**

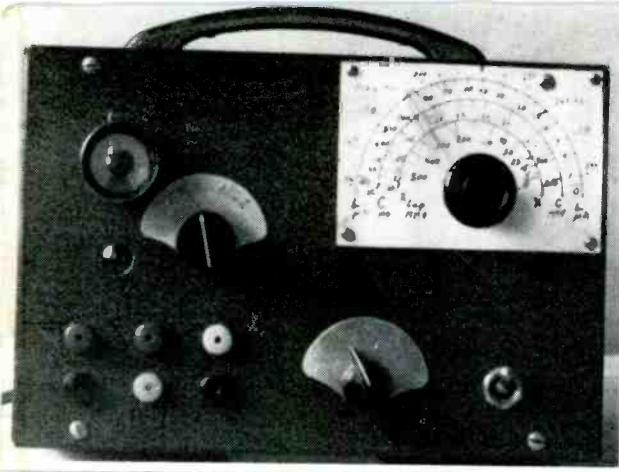
**THE RAULAND CORPORATION**



*Perfection Through Research*

4245 N. KNOX AVENUE • CHICAGO 41, ILLINOIS





# RF Reactance

[See Front Cover]



by PHILIP H. GREELEY

Above, at left appears rf instrument ready for operation. View at left, bottom, illustrates instrument ready for accessory tests. Only the two left pin jacks are required for rf testing.

RADIO-FREQUENCY TESTING can be unusually effective in spotting defective capacitors and inductors. By employing a favorable frequency range or ranges, satisfactory tests can be carried out on components in their circuits.

Basic principles of *rf* measurement testing are old in the art, having been described in such early texts as the *Wireless Telegraphist's Pocket Book*, J. A. Fleming, 1915. These employ the wavemeter approach, which takes the general form of the layout shown in Fig. 1, where two circuits, *A* and *B*, are loosely coupled and must be tuned to the same frequency for best response of the indicator, which can be a simple neon bulb. Provision is made for the insertion of an unknown capacitor or inductor in either circuit *A* or *B*, and one of the circuits *A* or *B* can then be retuned for a resonance indication. Reading the amount of retuning required gives the value of the unknown capacitor or inductor either directly or by calculation.

Service work normally follows a definite pattern: apparatus fails completely or works poorly for one reason or another with often a good preliminary indication of the type of trouble and sometimes its approximate location. Observation and testing of tubes, and tests with a simple ohmmeter or voltmeter will locate many troubles, but these are of negligible help if capacitor or coil defects other than straight breakdowns exist. The

*rf* measurement type tests are a particularly effective aid in specifically locating capacitor and coil defects such as: an open capacitor or one that has loose internal or external connections subject to changes when pressing or moving the part; an electrolytic capacitor that has deteriorated to the point of showing excessive series resistance; a coil that has shorted turns or a shorted tuning capacitor across it; a coil that is open or has loose connections or conductor defects; or, a coil that is inefficient by reason of moisture absorption or poor insulation.

It is true that perhaps only 25 per cent of radio, TV, and other electronic apparatus service jobs will have capacitor and coil defects, but much time is often spent in locating such troubles.

The idea of *rf* measurement testing is not related to signal tracing and has little direct concern with the tuning alignment of circuits or the checking of their performance. The main purpose is to provide quick and satisfactory means for identifying and noting the condition of reactance elements, capacitors and coils, in substantially similar fashion to the way an ohmmeter is used to identify and note the condition of resistance elements. Both the ohmmeter and the *rf* measurement type tester are primarily circuit and component checkers, working on their own power and adapted for point-to-point testing with ability to run down a specific circuit component that is defective or sub-standard. Re-

pair and replacement work can proceed efficiently only where faults are definitely located. It is obviously a waste of time, with a good chance of increasing difficulties, to experiment with tuning adjustments where failure or poor performance of apparatus is caused by a defective circuit component.

## Instrument Design

Circuitry of a general purpose *rf* test instrument<sup>1</sup> appear in the schematics on the cover and in Fig. 2 (p. 24). The tube, which may be a 6SK7, is operated as an electron-coupled Hartley type oscillator having a variable frequency range of slightly under 2 to 1 as from 150 to 296 kc, which requires a variable tuning capacitor range of 3.9 to 1. The plate output circuit of the tube is coupled through a capacitor and resistor to a specifically designed test circuit (*B*) having a control selector switch providing input connections for unknown capacitors and inductors. By employing a series-parallel coil arrangement for inductance tests and a series-parallel capacitor arrangement for capacitance tests, the frequency range of the test circuit can be held under testing conditions just within the oscillator frequency range. Circuit *B*, then, may have a frequency range of 155 to 284 kc which requires a capacitance or inductance change ratio of 3.35 to 1. This means, for example, that coil *L*<sub>2</sub> has 2.35 times the inductance of coil *L*<sub>1</sub>, so that if *L*<sub>2</sub> is

# Measurement Tests

shorted out on a test the inductance of  $L_1$  will be sufficient to keep the resonant frequency of circuit  $B$  from going higher than 284 kc, maximum. If different coils of increasing inductance value are test connected across  $L_2$ , the frequency of circuit  $B$  will decrease gradually to 155 kc, when the coil under test has a high inductance value exceeding 50 times that of coil  $L_2$ . An ac  $v/vm$ , coupled across circuit  $B$ , serves to show when oscillator circuit  $A$  and circuit  $B$  are tuned to the same frequency. Since, on inductance testing, any *rf* coil connected across coil  $L_2$  changes the frequency of circuit  $B$ , oscillator circuit  $A$  must be reset for resonance indication, and the dial of oscillator  $A$  can be calibrated for the inductance value inserted in circuit  $B$ . Capacitance tests are similar to inductance tests with, of course, the interchange of capacitance instead of inductance variation in circuit  $B$ , by the setting of the selector switch. When inductance testing, the tuning capacitance of circuit  $B$  is fixed and the effective inductance varies; when capacitance testing, the tuning inductance of circuit  $B$  is fixed and the effective capacitance value varies. The dial of oscillator  $A$  can also be directly calibrated for capacitance values tested in circuit  $B$ .

In designing circuit  $B$  and using the series-parallel testing scheme, as well as a limited oscillator-frequency range several factors were considered. Capacitor value measurement tests can have satisfactory accuracy only where comparison is made with a reference or standard capacitor not too far distant in value from that of the capacitor to be measured. About the limit of satisfactory accuracy has been found to be a reference ratio of 20 to 1, though useful indications can extend to a much higher ratio. Commonly used paper capacitors have a value tolerance of 10 per cent and have rated values up to .1 mfd. To have more than 1/20 the value .1 mfd, the main tuning capacitor of circuit  $B$  should have a value of .005 mfd or more, perhaps .006 mfd. The first capacitor measurement range of the instrument then can have satisfactory accuracy on values from .12 mfd to 300 mmfd, with useful qualitative indications on capacitors larger than .12 mfd. A second capacitor measurement range has been found to provide more accurate readings on values below 500 mmfd.

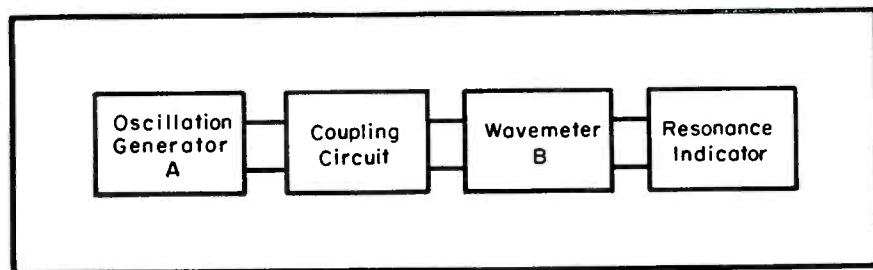
## Use of RF Test Techniques with Instrument Featuring One Inductance Test Range and Two Capacitor Test Ranges Found to be Effective for Locating Capacitor and Coil Defects, Including Open Capacitors or Those with Loose Internal Connections, Electrolytics That Have Deteriorated, Coils With Shorted Turns or Shorted Capacitors Across Them, Coils That Have Loose Connections or Poor Insulation, etc.

Good test coverage of capacitors used for bypass, audio and video coupling in common circuits is of major importance in service work. Test circuit  $B$  must, as stated, have a relatively large value main tuning and reference capacitor which makes it difficult to re-tune this circuit to any fixed oscillator frequency. Holding test circuit  $B$  to a specified frequency range and re-tuning the oscillator is not difficult, but resonance voltages applied to the  $v/vm$  indicator tend to vary widely on different capacitor and inductor tests and change of oscillator frequency. This resonance voltage variation is unpleasing and a nuisance in requiring constant resetting of the  $v/vm$  indicator control; however, this trouble has been overcome to a satisfactory degree in the plate output circuit of the oscillator tube. This plate circuit includes a choke of about 30  $mh$ , paralleled by a 30,000-ohm resistor, and the choke with tube inter-element and other small circuit capacities is resonant near 270 kc. On inductance tests this plate circuit has been found to have an effective impedance increasing from 25,000 to 30,000 ohms, with increase of frequency. Coil  $L_1$  of circuit  $B$ , designed to have a

$Q$  value of about twice that of coil  $L_2$  keeps up the effective resonance impedance of the circuit as the frequency increases and the inductance value is reduced when testing an unknown inductor. By increasing the applied oscillator voltage, resulting from the increasing plate impedance and the improved efficiency of circuit  $B$  at higher frequencies, indicator voltages can be left relatively even. On capacitance tests, switch  $S_2$  in the system connects a 50-mmfd capacitor across the plate circuit of the oscillator tube and the impedance falls from 25,000 to 12,000 ohms with an increase of frequency. The applied oscillator voltage then decreases to compensate for the rising impedance value of circuit  $B$ , as the effective tuning capacitance decreases.

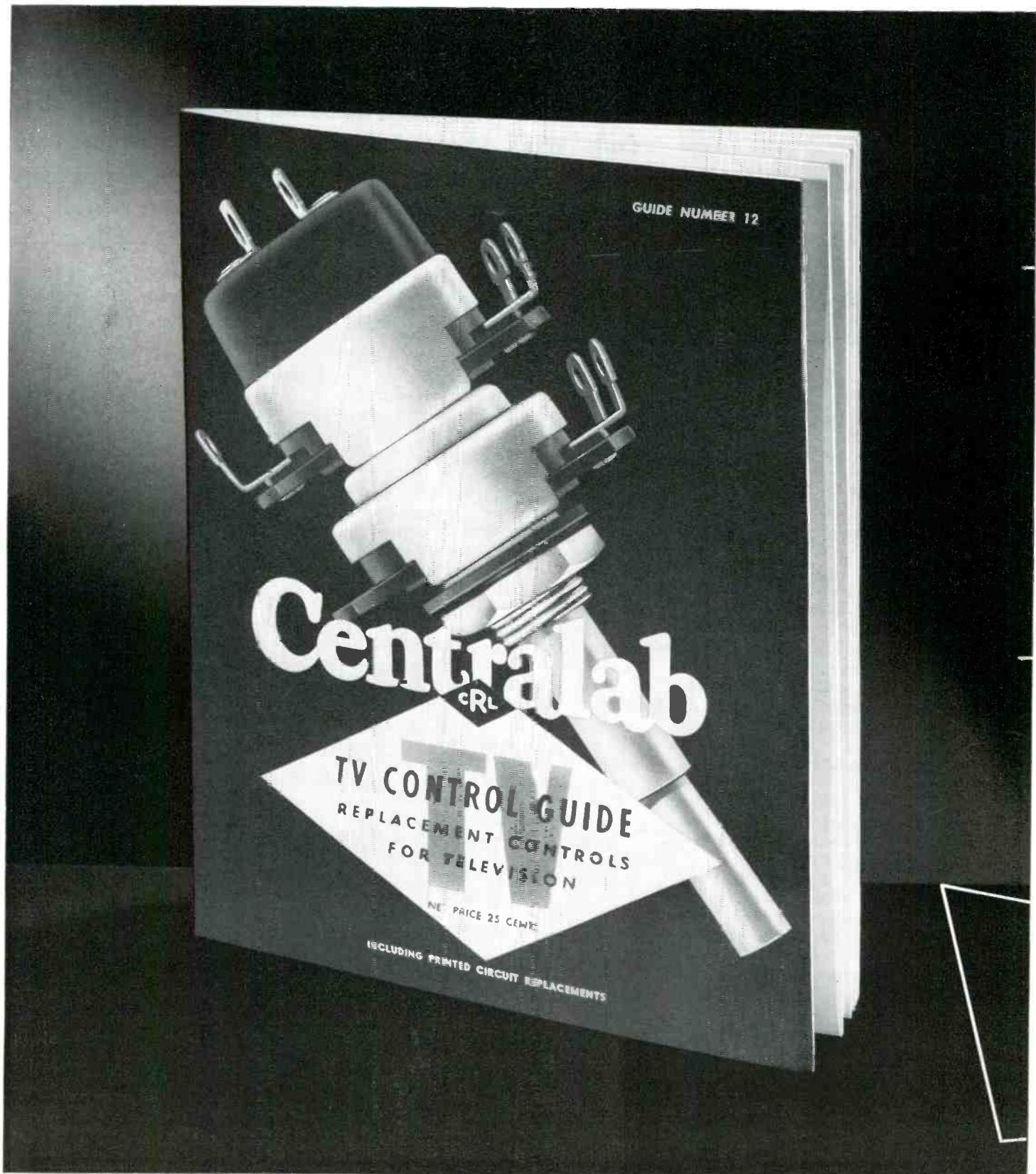
Series-parallel testing does sacrifice measurement accuracy, but provides a greatly increased operating speed desirable in service test work. By this arrangement a capacitor and an inductor scale may each cover a very wide value reading range, permitting a capacitor or inductor to be identified for value and condition within a single sweep of the oscillator tuning. Measurement accuracy, though sacri-

Fig. 1. Block diagram of *rf* measuring system featuring old wavemeter principles.



announcing **CENTRALAB'S**

---



**new**

# TV CONTROL GUIDE

*Service engineers! Here's the industry's most complete reference for TV control service . . . Lists 1600 controls . . . for all popular models.*

A  
**TIME-SAVER  
FOR YOU**

Centralab's new TV Control Guide lets you get *all controls you need from your Independent Parts Jobber. One source—one stop—for CENTRALAB QUICKEST FOR SERVICING CONTROLS.*

Yes! Centralab's new TV Control Guide is an absolute "must" for up-to-the-minute TV service engineers. It's a big time-saver when you can have one source for your special TV controls . . . controls that are ready to go — no time lost fumbling with assembly.

**A BONUS FOR YOU** — The new guide also contains the industry's *FIRST PRINTED ELECTRONIC CIRCUIT REPLACEMENT LISTING*. It shows you over 100 listings that can be serviced by only 11 standard Centralab printed circuit plates — all stock items.

# Centralab

Division of GLOBE-UNION INC., Milwaukee

TEAR OUT...  
MAIL AT ONCE **25c**

**Order your copy now, only 25c**

Order your copy of Centralab's new TV Control Guide now. If you act promptly, you'll not only get the guide and the Printed Circuit lists — we will include a price list and a valuable special control bulletin on custom controls for older radio models. Send 25 cents in stamps or coin together with the coupon below. You'll get your new TV Control Guide with all its other valuable features by return mail. Order now while the supply lasts.

Centralab Division of Globe-Union Inc., 908 E. Keefe Ave., Milwaukee, Wis.

I enclose 25 cents for Centralab's new TV Control Guide together with the Printed Electronic Circuit listing. Also include price list and listing of custom controls for older radios.

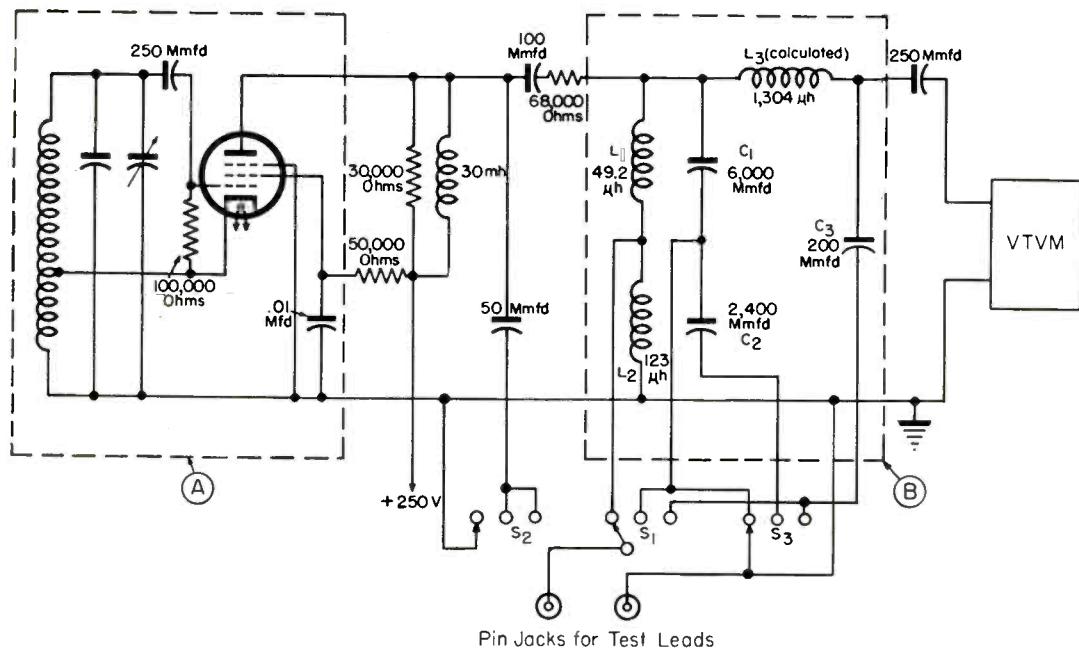
Name.....

Address.....

City..... Zone..... State.....

Please!  
I am a  Service Engineer  Ham  Jobber  Tv Set-Owner.

6SK7



Pin Jacks for Test Leads

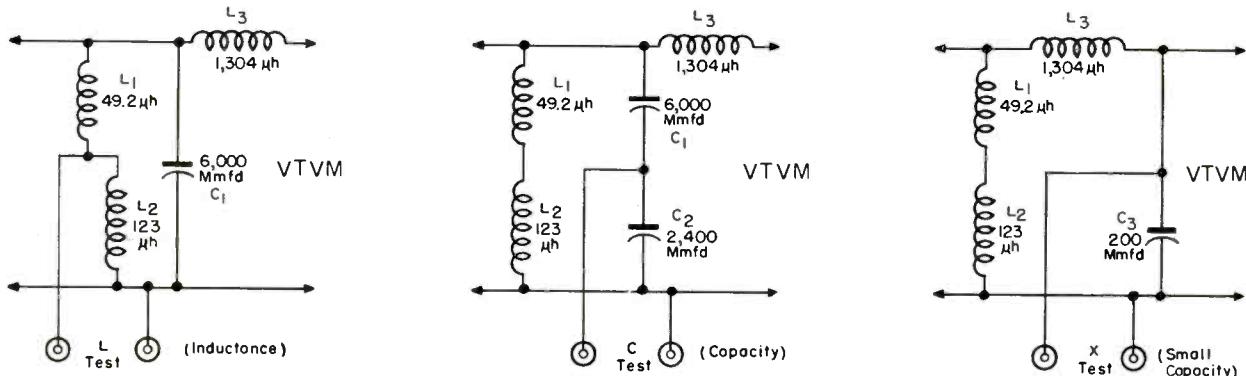


Fig. 2. The Greeley rf test circuit. The  $L$ ,  $C$  and  $X$  test circuits, shown separately are controlled by a three-pole three-position wafer switch. The  $C_1$ ,  $C_2$  and  $C_3$  capacitors are silver mica type with 2 per cent tolerances. The coils  $L_1$ ,  $L_2$  and  $L_3$  are adjusted to value through a powdered iron core. (The circuit shown on the cover is a simplified version of the system illustrating the main inductance and capacitance test circuits. The small capacitance omitted operates only when a small capacitor under test is disconnected from its circuit.)

ficed below precision standards, may still be as good as 3 per cent for center scale values and average 10 per cent over the major part of a scale range. The Service Man is primarily interested in rapid checking of parts in their circuits. For example, a capacitor suspected of cutting out or having a loose internal connection can be read for value, but with closer observation of steadiness of the resonance indicator, as the capacitor is pressed or moved. Measurements cannot be made with precision accuracy unless a part is removed from its circuit, which generally is not permissible or necessary in routine service testing.

Restricting the oscillator and test circuit frequency ranges to a ratio of less than 2 to 1 has the important ad-

vantage of eliminating harmonic or repeat responses in testing. A high-amplitude electron-coupled oscillator develops very strong harmonics in the plate circuit, but the second and higher harmonics give no response where the test circuit cannot resonate to harmonics which are two or more times the fundamental oscillator frequencies. Also, an oscillator circuit having a sizable tuning capacitor value is readily made to have good frequency stability. A fixed silver mica capacitor of 250 mmfd, across a variable capacitor having a maximum of 730 mmfd (a parallel connected 365 mmfd dual unit) in the oscillator circuit provides a tuning range just under 2 to 1. The minimum circuit capacity value is about 250 mmfd, and the effective tun-

ing capacity value of test circuit  $B$  has been found to be at least six times that of the oscillator circuit.

#### Uses of Instrument

This general purpose instrument has been found of practical usefulness in rapidly locating capacitor and inductor defects.

Ability to check components in their circuits and test tuned circuits themselves has been found to be a major advantage of the instrument. A .05 mfd capacitor, for example, has only about 20 ohms reactance at the test frequency and can be checked in a resistive circuit unless connected resistors are unusually low in value, as below 200 ohms. Capacitors employed in

(Continued on page 47)



**Only \$39.50**

**New INEXPENSIVE MODEL S-2  
ELECTRONIC SWITCH KIT**

Twice as much fun with your oscilloscope — observe two traces at once — see both the input and output traces of an amplifier, and amazingly you can control the size and position of each trace separately — superimpose them for comparison or separate for observation — no connections inside scope. All operation electronic, nothing mechanical — ideal for classroom demonstrations — checking for intermittents, etc. Distortion, phase shift and other defects show up instantly. Can be used with any type of make of oscilloscope. So inexpensive or you can't afford to be without one.

Has individual gain controls, positioning control and coarse and fine switching controls — can also be used as square wave generator over limited range. 110 Volt transformer operated comes complete with tubes, cabinet and all parts. Occupies very little space beside the scope. Better get one. You'll enjoy it immensely. Model S-2. Shipping Wt., 11 lbs.



**Only  
\$19.50**

**12 Improvements IN NEW 1951**

**MODEL O-6**

**PUSH-PULL**

# **Heathkit OSCILLOSCOPE KIT**

- ★ New AC and DC push-pull amplifier.
- ★ New step attenuator frequency compensated input.
- ★ New non frequency discriminating input control.
- ★ New heavy duty power transformer has 68% less magnetic field.
- ★ New filter condenser has separate vertical and horizontal sections.
- ★ New intensity circuit gives greater brilliance.
- ★ Improved amplifiers for better response useful to 2 megacycles.
- ★ High gain amplifiers .04 Volts RMS per inch deflection.
- ★ Improved Allegheny Ludlum magnetic metal CR tube shield.
- ★ New synchronization circuit works with either positive or negative peaks of signal.
- ★ New extended range sweep circuit 15 cycles to over 100,000 cycles.
- ★ Both vertical and horizontal amplifier use push-pull pentodes for maximum gain.

The new 1951 Heathkit Push-Pull Oscilloscope Kit is again the best buy. No other kit offers half the features — check them. Measure either AC or DC on this new scope — the first oscilloscope under \$100.00 with a DC amplifier.

The vertical amplifier has frequency compensated step attenuator input into a cathode follower stage. The gain control is of the non frequency discriminating type — accurate response at any setting. A push-pull pentode stage feeds the C.R. tube. New type positioning control has wide range for observing any portion of the trace.

The horizontal amplifiers are direct coupled to the C.R. tube and may be used as either AC or DC amplifiers. Separate binding posts are provided for AC or DC.

The multivibrator type sweep generator has new frequency compensation for the high range it covers; 15 cycles to cover 100,000 cycles. The new model O-6 Scope uses 10 tubes in all — several more than any other. Only Heathkit Scopes have all the features.

New husky heavy duty power transformer has 50% more laminations. It runs cool and has the lowest possible magnetic field. A complete electrostatic shield covers primary and other necessary windings and has lead brought out for proper grounding.

The new filter condenser has separate filters for the vertical and horizontal screen grids and prevents interaction between them.

An improved intensity circuit provides almost double previous brilliance and better intensity modulation.

A new synchronization circuit allows the trace to be synchronized with either the positive or negative pulse, an important feature in observing the complex pulses encountered in television servicing. The magnetic alloy shield supplied for the C.R. tube is of new design and uses a special metal developed by Allegheny Ludlum for such applications.

The Heathkit scope cabinet is of aluminum alloy for lightness of portability.

The kit is complete, all tubes, cabinet, transformer, controls, grid screen, tube shield, etc. The instruction manual has complete step-by-step assembly and pictorials of every section. Compare it with all others and you will buy a Heathkit Model O-6. Shipping Wt., 30 lbs.

EXPORT AGENT  
ROCKE INTERNATIONAL CORP.  
12 E. 40th ST.  
NEW YORK CITY (16)  
CABLE: ARIALAB-N.Y.

**The HEATH COMPANY**  
... BENTON HARBOR 11, MICHIGAN

# PHONO

## *installation and service*

by KENNETH STEWART

SHOP BUILDING OF HI-FI audio systems has become quite a popular practice among Service Men. With the excellent assortment of components and accessories in kit and completely assembled form available, it has become possible to provide an unusual assortment of setups to fit practically every requirement.

Kits, long absent from the audio scene, have been particularly interesting in their circuitry design. In one hi-fi type of kit<sup>1</sup> illustrated in Fig. 1, provision has been made for magnetic and crystal pickups, and 4, 8 and 16-

<sup>1</sup>HF-10; Triad Transformer Mfg. Co., 2254 Sepulveda Boulevard, Los Angeles 64, Calif.

### **Hi-Fi Amplifier Kit Circuitry . . . Two-Way Speaker Systems . . . Tweeters . . . 10-Watt Phono Amplifiers for Custom-Built Installations . . . Lab Type Amplifier with Noise Suppressor.**

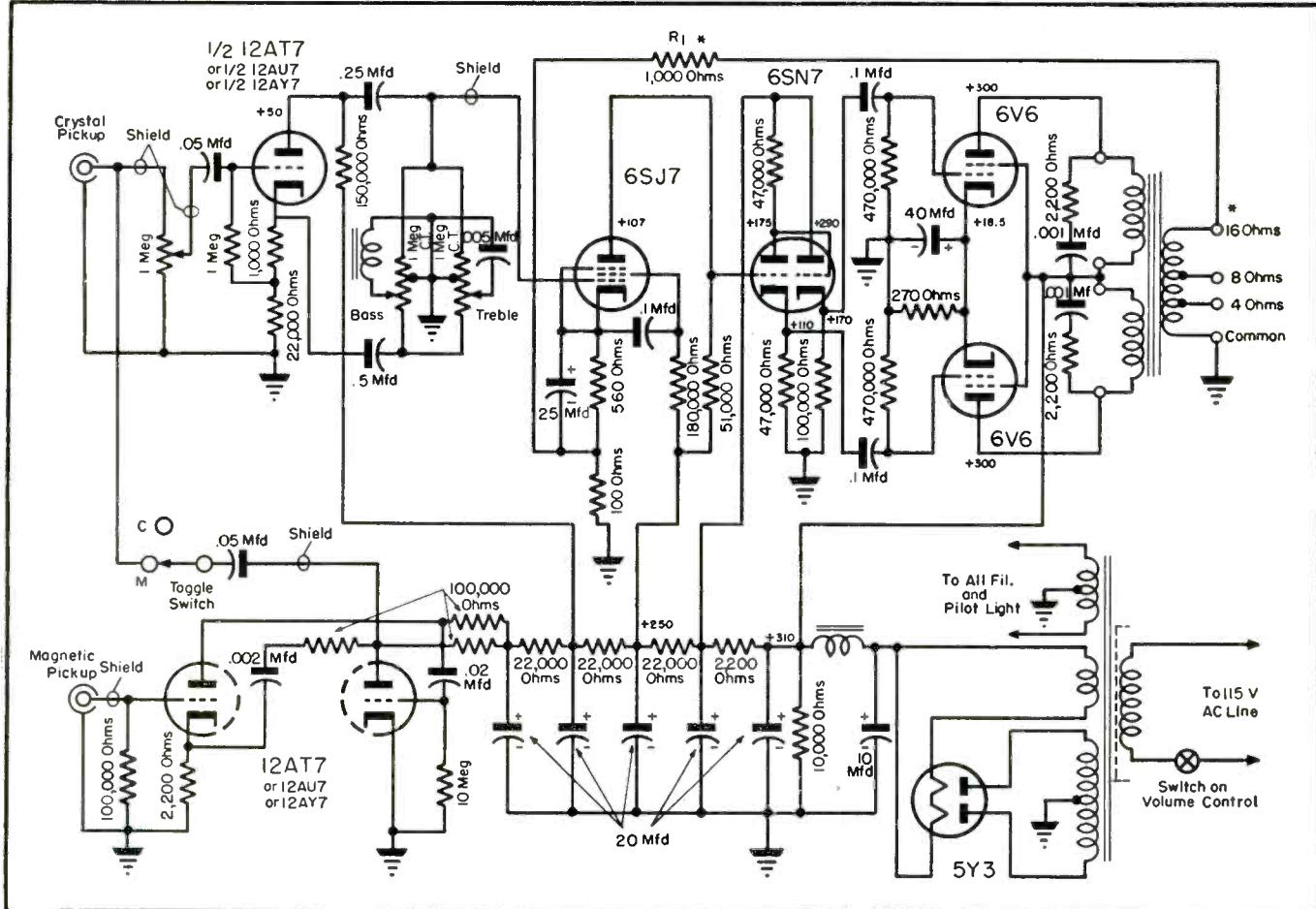
ohm output. The amplifier is said to have a distortion of less than 2% from 50-18,000 cps at 10 watts output, and less than 1% from 20-20,000 cps at 5 watts. Equalization is provided continuously, variable to +12 db or -30 db at 50 or 8,000 cycles. A gain of 74 db is said to be available from crys-

tal microphone or radio receivers; 96 db (equalized for magnetic pickup) through preamp.

Speakers and housings have received concerted attention on the design front, too, and as a result reproduction possibilities have been strik-

(Continued on page 28)

Fig. 1. Triad hi-fi amplifier kit circuit.



Why there's big profits ahead for Webster-Chicago dealers!

**12 million<sup>†</sup>  
RECORD CHANGERS  
need replacement**

**AMERICA'S FINEST!  
SENSATIONAL NEW  
Webster-Chicago  
Diskchanger\***



Balanced Tone Arm  
Gives perfect record touch on all size and all speed records.



Velocity Trip  
New mechanism gives all records increased quality playing life.



Cushion-Drop  
New spindle gently lowers records; heavy flock turntable cushions drop.



**Easiest to sell because it has every wanted feature!**

Webster-Chicago dealers are cashing in on this huge conversion market because they sell Webster-Chicago Diskchangers—the only replacement changer with *all* these features:

- Automatically plays 12-inch, 10-inch or 7-inch records at 33½, 45 or 78 rpm without any special adjustments.
- Pick-up arm comes to rest position after last record is played.
- Idler wheel retracts when control speed is off; eliminates flat spot which causes "wow."
- Fewer working parts for longer life of carefree operation.
- New automatic manual position plays home recordings or "inside-out" records without special adjustment.

<sup>†</sup> Radio and Television Retailing—May

Webster-Chicago dealers know fast sellers like this Diskchanger mean bigger profits...that's why they're stocking up now for the big fall-winter selling season!

\*T. M. Reg.

Another  Product

**WEBSTER-CHICAGO**  
Chicago 39, Illinois

# PHOTOFACt Users Write Our Best ADS!

Hundreds of unsolicited letters tell what the world's finest Radio & TV Data means to Service Technicians



Steve A. Frank, Jr.  
Record Center  
708 Broadway  
Farrell, Pa.

"I have all sets of PHOTOFACt and find them a priceless addition to my business. I have a standing order for all further sets with my supplier."



William Lavarieire  
734 Glide St.  
Rochester, N. Y.

"Just received two new PHOTOFACt Folders Sets. Your service is grand and we all look forward to it. I hope we can enjoy it for many years to come."



G. L. Lonsak  
10 Dix St.  
New Brunswick  
N. J.

"I have found and accepted the PHOTOFACt schematics and general service information as a must to success. I acquire PHOTOFACt Sets as issued."

## NOW! GET THE PROOF FOR YOURSELF!

**FREE**

We'll Send You a FREE Photofact Folder on any postwar set

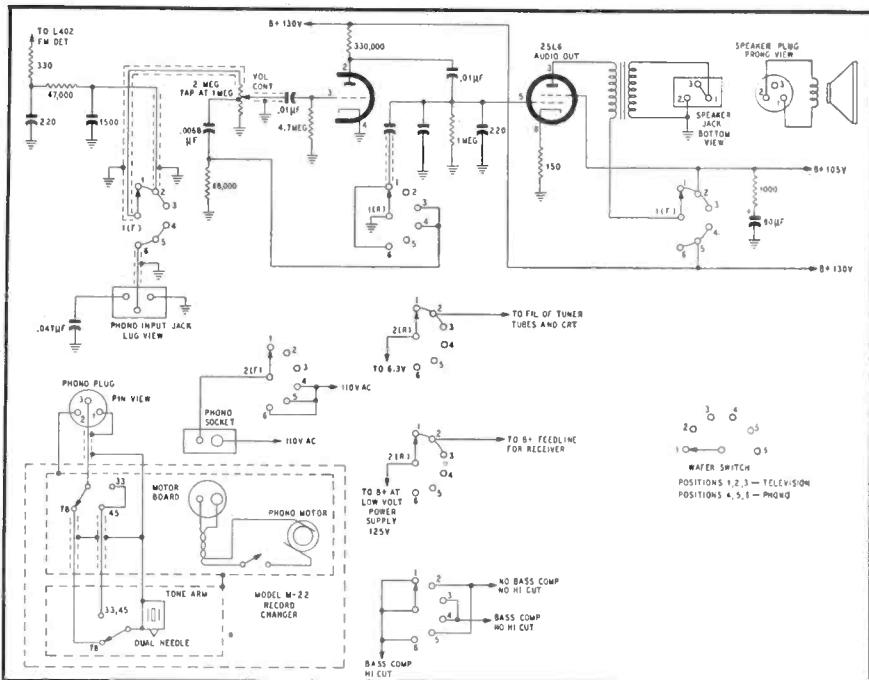
Learn for yourself—at our expense—how PHOTOFACt pays for itself by earning bigger repair profits for you! Ask for a FREE Folder covering any postwar AM, FM or TV receiver listed in the PHOTOFACt Cumulative Index. Examine it. Put it to work at your bench—then judge for yourself!

WRITE FOR FREE FOLDER TODAY!

**HOWARD W. SAMS & CO., INC.**  
2201 East 46th Street • Indianapolis 5, Indiana

## Phono

(Continued from page 26)



Sound system section of the Philco 51-PT1207 TV chassis series, which features use of the narrow-neck picture tube described in the Ser-Cuits section of November SERVICE.

ing. In one wide range type of cabinet-speaker system<sup>2</sup>, shown in Fig. 2, a low-frequency speaker, dividing network and high-frequency driver and horn have been included. Power input to these speakers has been stipulated as 25 watts (above 1200 cps for the hf unit).

A tweeter<sup>3</sup>, which is said to have a response to 12,000 cycles, with usable output to beyond 15,000 cycles, has also been developed. When used with a 12-15" cone speaker and proper network, the unit is said to handle 25-30 watts of program material. Its impedance is 15 ohms.

The horn (6½" w x 3" h x 6" d) is built of cast aluminum, and is flared for widest distribution pattern. Crossover is 1500 cycles.

## Factory-Built Amplifiers

Completely assembled amplifiers primarily designed for record reproduction in custom installations, have also become available. One such unit<sup>4</sup>, rated at 10 watts output, is equipped with a 3-position input selector switch for magnetic or crystal pickup and high level auxiliary input. Features include a built-in preamp for magnetic

pickup (not in circuit when high level inputs are used), separate boost-type bass and treble tone controls, and compensated volume control which increases lows when volume is reduced.

Output, measured at 100, 400, and 5,000 cps, is said to be 10 watts at 3% harmonic distortion. Percentage intermodulation distortion taken at 60 and 7,000 cycles with 4 to 1 ratio is said to be 2 watts 1.5% (home level), 5 watts 3%, 10 watts 5%. Gain for a magnetic pickup is said to be 103 db (10,000 ohms); crystal pickup (auxiliary) input, 80 db (500,000 ohms), 73 db (100,000 ohms). Tone controls:

Fig. 2. Lansing hf-if speaker system.



<sup>2</sup> D-130A If speaker, N1200 dividing network and D175H hf driver; James B. Lansing Sound, Inc., 2439 Fletcher Drive, Los Angeles, Calif.  
<sup>3</sup> CHU-5; Racon Electric Co., Inc., 52 East 19 Street, New York 3, N. Y.



Fig. 3. Racon tweeter.

bass, +13 db to -7 db at 40 cycles; treble, +10 db to -20 db at 15,000 cycles. Output impedances: 4, 8, 16 ohms. Tubes: 1-6SC7, 1-6SQ7, 1-6SL7, 2-6V6GT, 1-5Y3GT.

#### Laboratory Type Amplifier

An amplifier<sup>4</sup>, described as a lab type, which matches all speakers from 1 to 24 ohms, is also available for the hi-fi fan. Featured is a preamp which is operated entirely on *dc*. Has a 500 cycle turnover frequency. Effective turnover frequency is said to be adjustable by bass control to compensate for turnover frequency between 250 and 1,000 cycles.

An adjustable distortion filter allows maximum range to be limited when input signal is distorted: 6, 12 and 22 kc ranges.

Has a dynamic noise suppressor with wide-range dynaural gate circuits

(Continued on page 30)

<sup>4</sup> Model 1810; Rauland-Borg Corp., 3523 Addison St., Chicago 18, Ill.

<sup>5</sup> 210-B; Hermon Hosmer Scott, Inc., 385 Putnam Ave., Cambridge, Mass.



Rauland-Borg 10-watt amplifier.

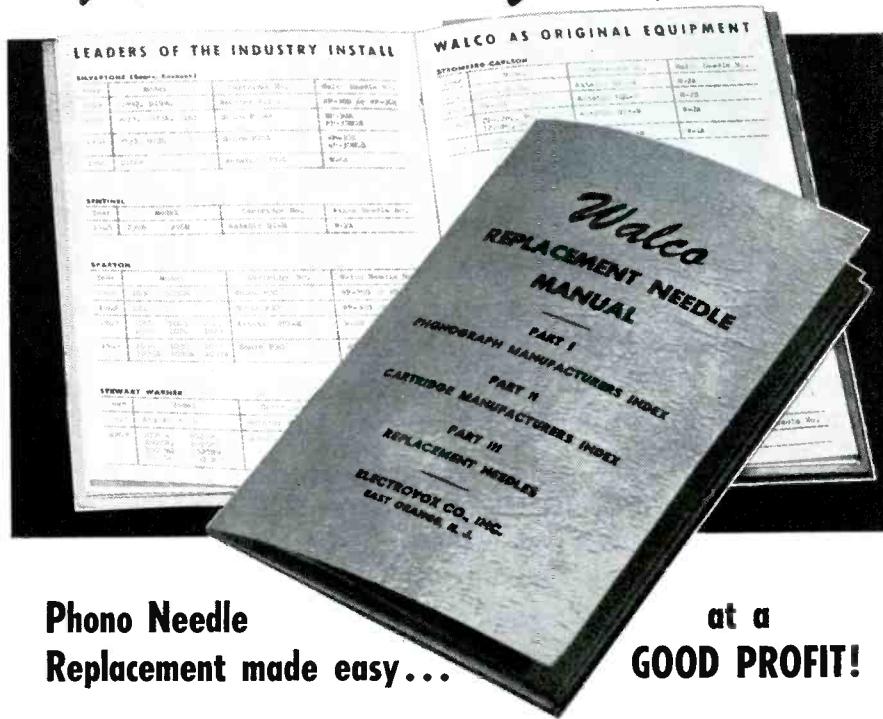
H. H. Scott amplifier.



# SERVICE MEN!

Here's the famous **Walco** **C-I PLAN**  
(Controlled Inventory)

## Tailor-made for You!



**Phone Needles**  
**Replacement made easy...**

at a  
**GOOD PROFIT!**

- ★ A concise up-to-date summary of all phones by year and model number, cartridge and needle.
- ★ A complete listing of all cartridges containing: drawings, model numbers, prices and installation notes on all needles and cartridges in use today.
- ★ And a special selection of 13 basic needles covering better than 90% of today's replacement demand.



The Manual is Yours FREE!

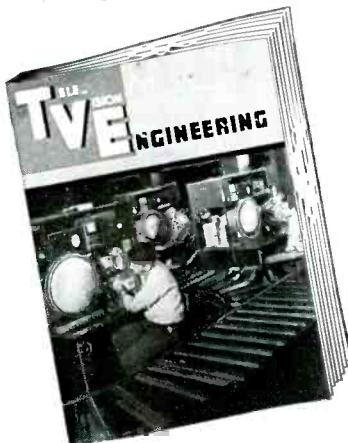


Here is the famous Walco Master Control Index in pocket-size. Take the guesswork and confusion out of replacement needles with this indispensable reference manual. Your

parts jobber has a limited supply—so why not order yours today and start making replacements pay off BIG.

**Walco** TRADE NAME OF ELECTROVOX CO.  
EAST ORANGE, NEW JERSEY

*... if you are commercially or professionally interested in TV, you must read*



## TELEVISION ENGINEERING

*every month!*

*Devoted exclusively to TV Research . . . Design . . . Production . . . Operation . . . Instrumentation*

**TELEVISION ENGINEERING** is the *only* trade publication which directs its *entire* editorial content to executives and engineers who design, manufacture, operate and maintain television receiving and transmitting equipment—both commercial and educational.

*Every issue is chock full of timely and thorough TV articles, authored by outstanding specialists. You'll find practical, carefully prepared reports and papers on such vital subjects as . . .*

*Color TV Systems . . . Ultrahigh Receiver-Transmitter Design Problems . . . Tube Production-Line Techniques . . . TV Broadcast Equipment . . . Camera Tube Research . . . Glass, Plastics and Metal in TV . . . TV Test Equipment in the Plant . . . Film Recording . . . Flying Spot Scanners . . . Tone Amplifiers for TV Films . . . Compact Motors for TV . . . TV Component Design . . . Mechanical Design Factors in Antennas . . . Quality Control Charting . . . Microwave Relays . . . Receiver and Transmitter Servicing . . . Production Aids . . . Instrument Activities . . . TV Sound Systems . . . Studio Lighting.*

**Enter your subscription NOW . . . Fill out the coupon below**

*(Not sold on newsstands)*

### MAIL COUPON

**TeleVision Engineering**  
**52 Vanderbilt Ave., New York 17, N. Y.**

Here is my remittance for my subscription to **TeleVision Engineering** at the

**SPECIAL RATE . . . 3 years (36 issues) only \$5.**

*(1 year subscription \$3.)*

NAME . . .

ADDRESS . . .

CITY . . . ZONE . . . STATE . . .

For our confidential records, open only to the Audit Bureau of Circulation, please supply the following information:

Occupation . . . Title . . .

Department in which employed

Operation

Production

Research

Employed by . . .

Nature of Business . . .

*(State If TV Manufacturer, TV Broadcast Station, etc.)*

## Phono

*(Continued from page 29)*

which open to full range of amplifier. Said to suppress high-frequency noise, (scratch, etc.) 20-30 db, low-frequency noise (tumble, etc.) 15-20 db. Adjustable or may be cut out completely when not needed.

Tubes: 2-12SL7GT, 1-6SN7GT, 1-6SQ7, 2-6SG7, 1-6J5, 2-6L6G and 1-5V4G.

### Needle Replacement Manual

A pocket manual<sup>6</sup>, which provides a concise, up-to-date summary of all phonos by year, model number, cartridge and needle, has been published. Presented is a listing of all cartridges with drawings, model numbers, prices and installation notes.

The manual, a condensation of the Walco master control index, is supplied with a purchase of thirteen basic needles.

<sup>6</sup> Electrovox Co., Inc., East Orange, N. J.



Push-button console switching system which provides instantaneous selection and playing of any one of over 371,000 different custom music component combinations. Console is connected to approximately 60 units: pickups, turntables, record changers, noise suppressors, equalizers, preamplifiers, tuners, tape recorders, power amplifiers, and speakers.

*(Courtesy Allied Radio Corp.)*

Portable 3-speed automatic phono featuring a featherweight pickup arm, utilizing dual needles. Full range tone and volume controls. Alnico 5 speaker. Size: 9" x 14½" x 16¾".  
(167; Tone Products Corp., 225 W. 17, N.Y.C.)



## Finding Your Way

(Continued from page 14)

has the same shape, but with a plate connection coming out from the top. The 1B3 has the GT shape, but it is taller and also has a plate connection on top. The newer 6W4 damping tube is the standard *GT* size and *shape*. The 6BQ6 and 1X2, horizontal output and high-voltage rectifier, are smaller editions of their predecessors, with anode connections on top. Both have the general *GT* shape, though not the exact size.

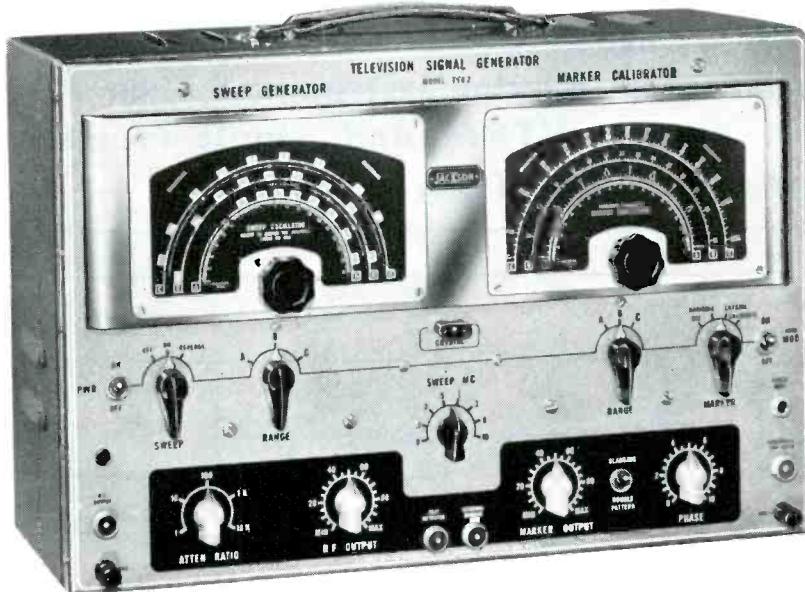
*Location with respect to other tubes and above chassis components:* Once the Service Man has a general idea as to which tubes are most common in various circuits, and the shapes of the tubes, one more clue to their identity is their location. Generally, the front end is located in the front of the chassis, either in the left or right corner. It is a self-contained unit, the antenna leadin is attached to it, and the channel selector switch comes out from it. There is no trouble in identifying it. The *rf* stage usually is alongside the antenna connections. The oscillator is generally more shielded than the other tuner stages.

Immediately behind the tuner, since long leads would be undesirable, will be found the first video *if* stage (6AG5, etc.), an *if* coil, the second video *if* stage, another *if* coil, a third *if* tube and coil, and perhaps a fourth and then a smaller tube, the 6AL5 video detector. The video *if* coils, incidentally, may not be in cans above the chassis. They very often are not enclosed and placed below the chassis. However, the bolts protrude through the top of the chassis (for tuning powdered iron cores) and they are instantly recognizable. In other words, where we have three or four of the same size tubes in a line with bolts or cans between them and going to a 6AL5, we can be fairly safe in assuming they are the video *if* stages, or common *ifs* in intercarrier sets.

The audio *if* transformers are usually in cans and located on top of the chassis. Also, the discriminator or ratio detector can generally is a little larger than the others. Therefore, where there is a can, a 6AU6, another can perhaps a little larger, and the unmistakeable 6T8 followed by a power tube (6K6, 6V6 or the miniature 6AQ5) we are obviously dealing with the audio strip. Instead of the 6T8, there may be a 6AL5 and a miniature pentode and then the power tube.

[To Be Concluded in January]

this makes TV alignment simple  
from End to End



## the NEW Jackson Model TVG-2

Service men the world over buy Jackson instruments for accuracy and simplicity of operation . . . . And why not? . . . . Just look at the features incorporated in this new '51 model Television Generator:

- Continuously variable sweep frequencies over all TV and FM bands
- Reversible single response pattern with base line or double pattern
- Adjustable sweep width from 100 KC thru 18 MC
- Marker Calibrator continuously variable from 100 KC thru 216 MC
- Separate Crystal Oscillator for use either as a marker or calibrator
- Video Modulation Jack provides for picture or pattern modulation
- Marker Calibrator IF frequencies all on highly stable fundamentals
- Multiple shielding of attenuators and circuits insures low leakage
- Complete Sweep and Marker Generators in one beautiful instrument
- Styled to match the famous Jackson Model CRO-2 Oscilloscope

Truly another "Service Engineered"  
electronic instrument.

Ask your Jackson Distributor  
or write for free bulletin.

# JACKSON

Electrical Instrument Co. Dayton 2, Ohio

In Canada: The Canadian Marconi Co.

# Servicing FM Detectors

## Part II . . . Comparison of the Ratio Detector and Discriminator Detector Systems and Their Alignment With a VTVM and Single-Frequency Generator of AM Type.

by ALLAN LYTEL

Temple University Technical Institute

THE RATIO DETECTOR, found in the majority of straight FM models and in the FM sections of the TV chassis, is quite unique in its circuitry. Actually, by means of several simple modifications, the discriminator may be changed into a ratio detector, which is insensitive to amplitude changes in the signal and thus requires no limiter stage. In Fig. 1 appears the circuit of a ratio detector which can be considered as an extension of the discussion of the discriminator.<sup>1</sup> One of the diodes is reversed so that the output voltages are now additive. The two load resistors are now connected series aiding and a large capacitor appears across both of these resistors. As the diodes conduct, in a manner similar to the discriminator, the large capacitor will be charged to the total voltage across the series resistors. The time constant of this capacitor in conjunction with  $R_1 + R_2$  is sufficiently large, so that it acts as a battery keeping the voltage across the load resistors constant, in spite of changes in input signal level. Thus, the ratio between the voltage drops across  $R_1$  and  $R_2$  can change, but the total voltage is kept constant by the 8-mfd capacitor shown in the circuit.

Audio output is obtained across one of the load resistors used alone, and not both. The voltage across both resistors or the voltage across the 8-mfd capacitor, which is the same thing,

(Continued on page 49)

<sup>1</sup>SERVICE, November, 1950.

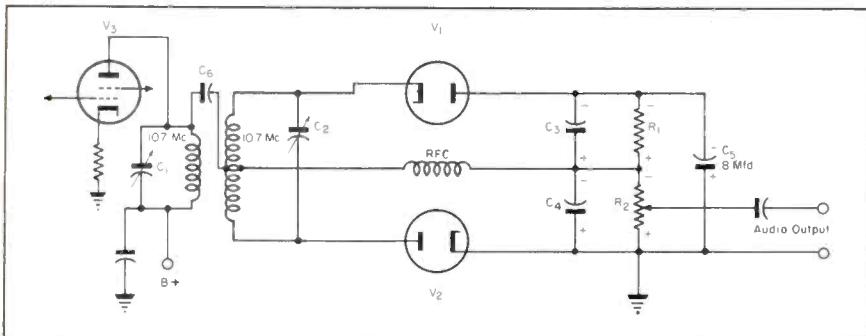
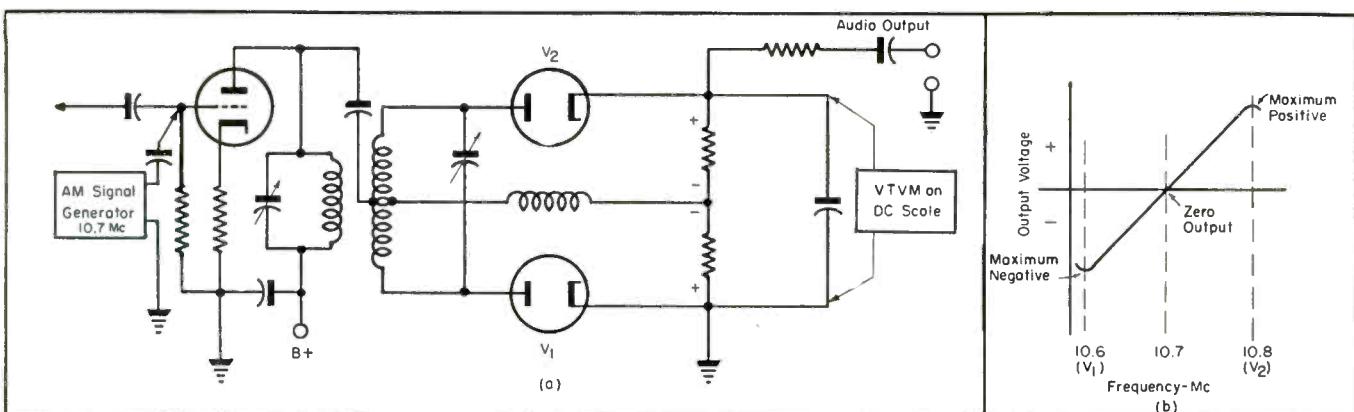


Fig. 1. Circuit of the ratio-detector system.

	Voltage Across $R_1$ (From $V_1$ )	Voltage Across $R_2$ (From $V_2$ )	Discriminator Output	Ratio Detector Output
	+2	-2	0	0
	+4	-4	0	0
Increase in Signal Amplitude	+3	-3		
	+6	-6	-6	-2
	+12	-12	-12	-2
	+6	-3	+3	No Change in Output
Increase in Signal Amplitude	+12	-6	+6	+2
	+24	-12	+12	+2

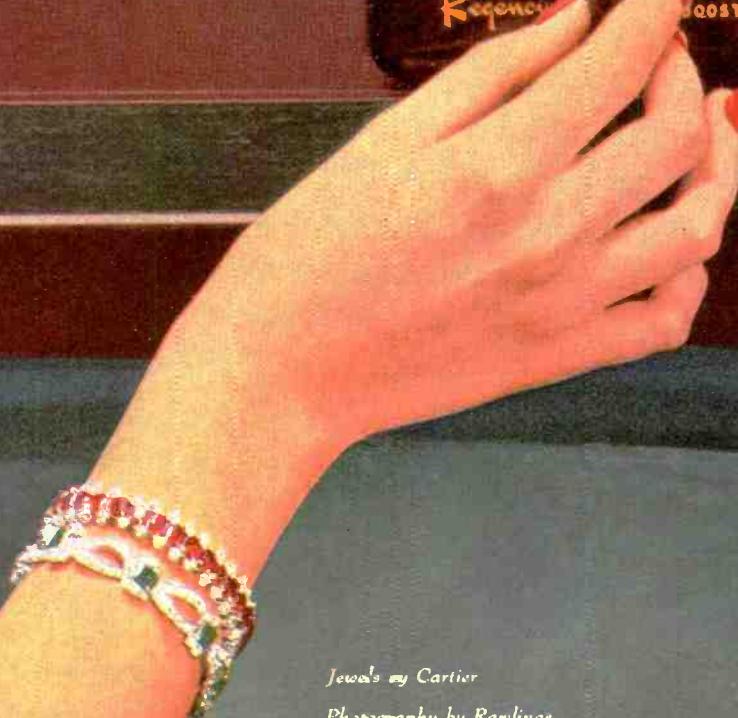
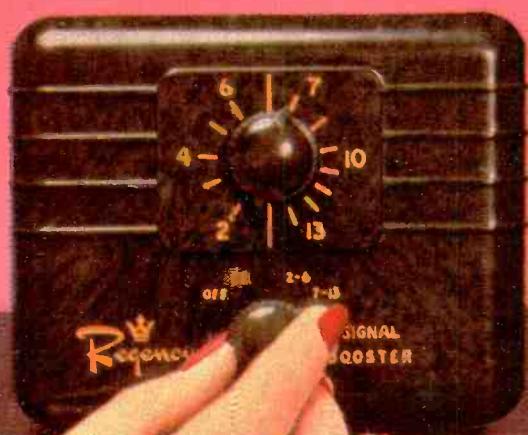
Table I. Compilation of voltage increases in the outputs of the ratio and discriminator type circuits.

Fig. 2. Discriminator alignment setup with an AM signal generator and a vtvm. At right appears a plot of the output voltage from a discriminator.



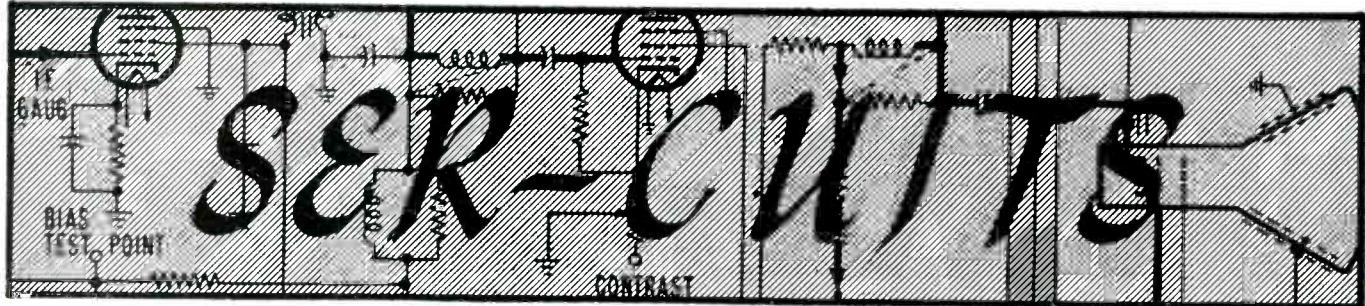
# Largest Selling Booster

AT ANY PRICE !



Jewels by Cartier

Photography by Rawlings



## Automatic TV/FM Booster System . . Raytheon 16 and 17-Inch Rectangular Picture-Tube Chassis Circuit Features.

IN THE INSTALLATION OF TV chassis in noise or interference-ridden areas, fringe locations, buildings where only window or indoor antennas can be accommodated, or low-signal obstruction and out-of-line local sites, the booster has become a must accessory. Many a sale has been salvaged by the introduction of a booster in what appeared to be a hopeless situation. Aware of the importance of these

Industrial Television, Inc.; IT-75A Auto-

units, the labs have set up intensive developmental schedules and evolved many effective amplifying systems.

Recently, one manufacturer<sup>1</sup> produced an automatic type of booster, which amplifies the TV and FM bands, eliminating the need for tuning or switching.

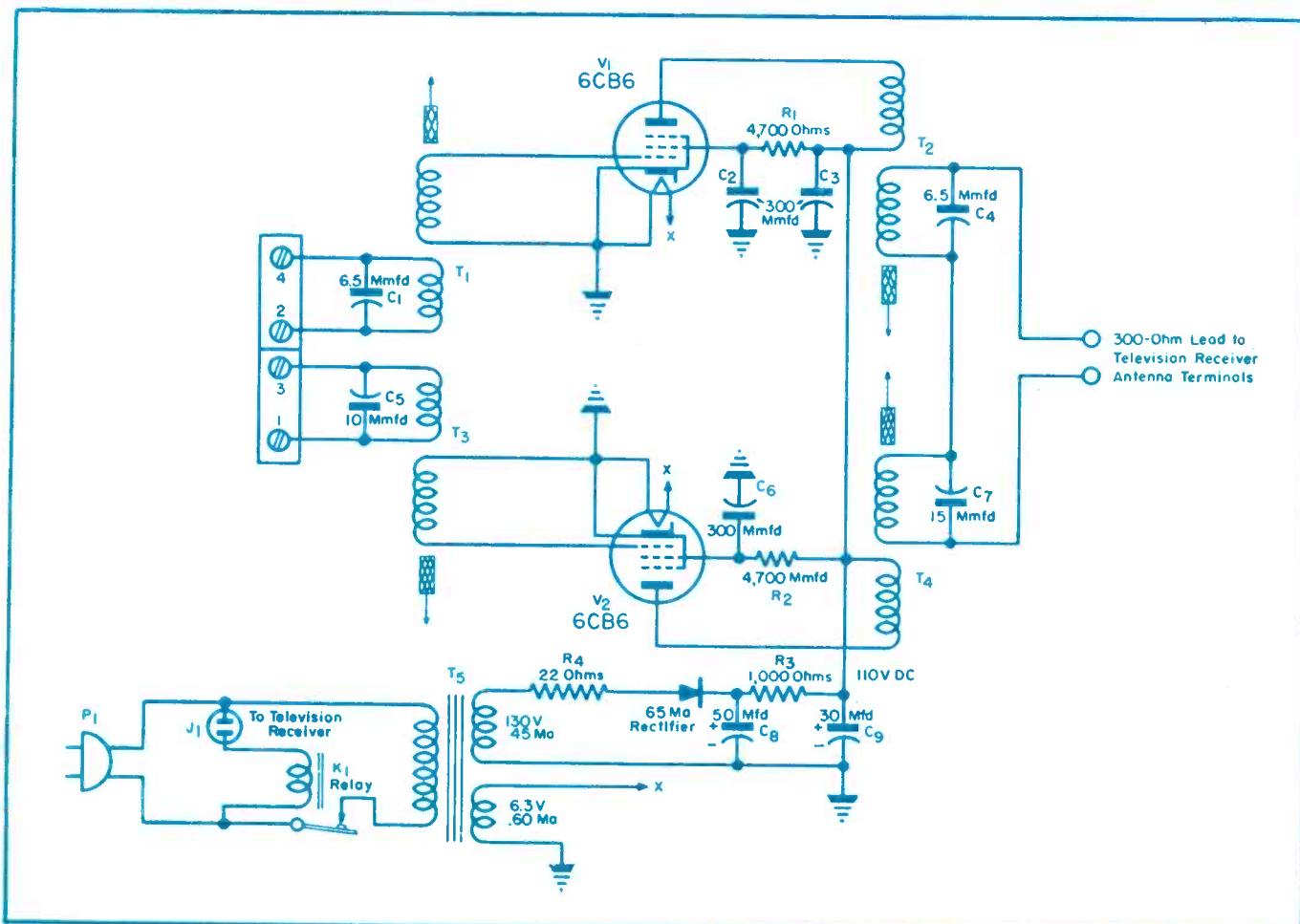
A magnetic relay provides *on* and *off* operation.

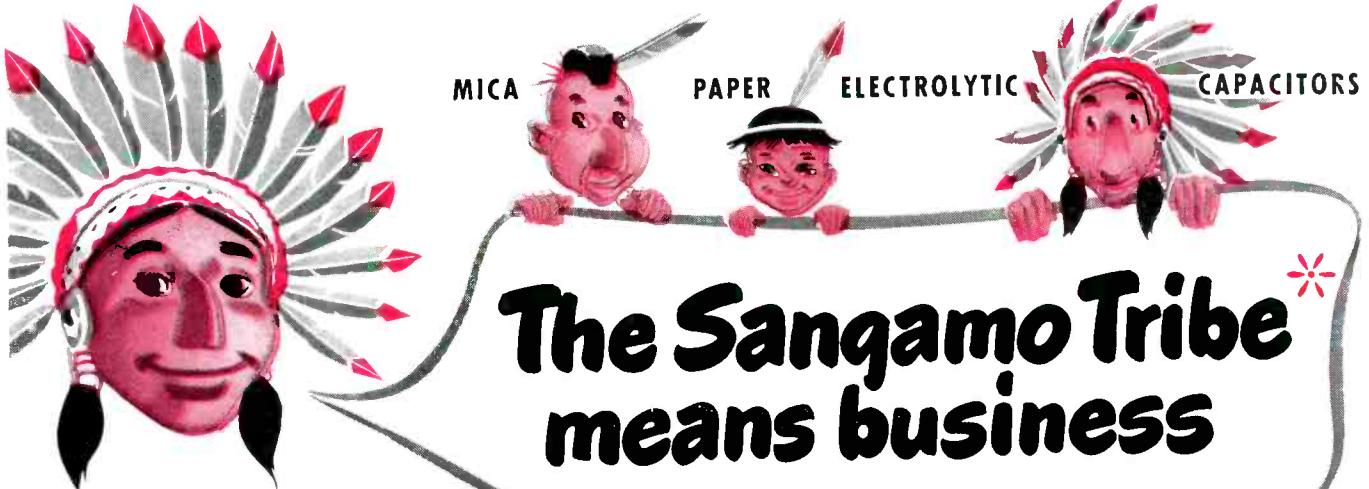
Two 6CB6s are used, which it is claimed, offers a 9 X (18 db) gain

on the low and a 5 X (14 db) gain on the high TV channels, with provision for field realignment to provide higher gain on troublesome channels. Booster provides for either a single or double input, permitting the use of separate high- and low-frequency antennas and transmission lines.

When employed with master antenna systems, the unit can be used alone or cascaded with other amplifiers. It can also be used as a primary source of in-

Fig. 1. The ITI FM/TV automatic booster.





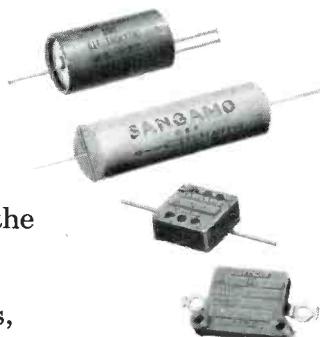
### 34 little Indians to fill your needs . . .

The Sangamo line offers 34 types of mica, paper, and electrolytic capacitors to take care of practically any replacement requirement in the radio and television field.

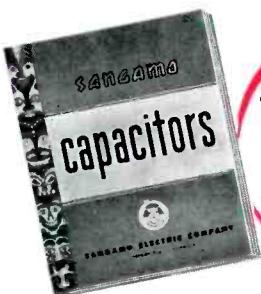
For example, the line includes Sangamo Micas, which have enjoyed a reputation for excellence throughout the radio and electronic industry since 1923. It includes the famous "Redskin" . . . the plastic molded paper tubular that is easy to work with because the flexible leads can't pull out. It includes a complete range of Electrolytics that will measure up to the toughest assignments in exacting applications where ordinary electrolytics might cause premature failure.

Sangamo Capacitors are packaged in distinctively designed cartons that you can identify with ease and that make inventory simple.

A trial of Sangamo Capacitors will convince you. Stock up at your Jobber.



\* Your Assurance of Dependable Performance



Send for our new Catalog No. 800. It's the most complete replacement catalog in the industry.

**SANGAMO ELECTRIC COMPANY**  
SPRINGFIELD, ILLINOIS

IN CANADA: SANGAMO COMPANY LIMITED, LEASIDE, ONTARIO



SC50-11A

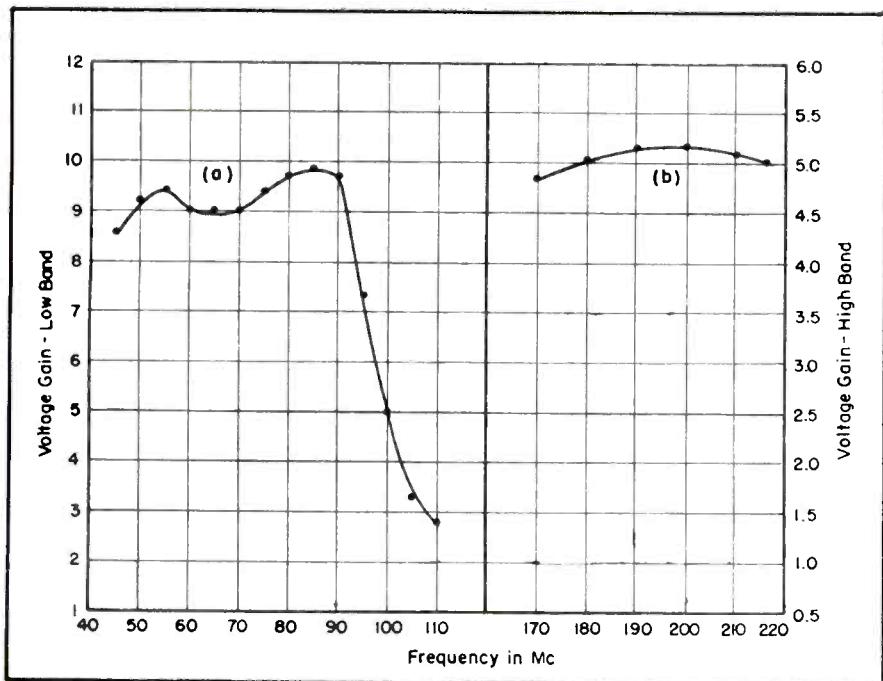


Fig. 2. Plot of insertion gain of ITI booster; curve in (a) represents response on channels 2 to 6/FM bands, while the (b) curve covers the high-band or 7 to 13 channels.

terference suppression, or in addition to other units that give insufficient rejection.

For decoupling and interference elimination, resistors (150 ohms on each side of the line in the 300-ohm case) are used to tap off the signal from the common transmission line. An unshielded 300 ohm line is then run to the booster which is mounted in the rear of the television cabinet. The output of the booster is then tied to the receiver. This method is said to provide a greater amount of isolation than any passive network, and each outlet is completely independent, including short or open circuits of all the other receivers connected to the system. The isolation does not result in any loss as encountered in other methods, but instead provides a considerable gain in signal level. It is claimed that coax lines between receiver and outlet can be eliminated because the unidirectional properties of the booster eliminate the undesired signals directly at the offending receiver. Thus, there is no possibility of the connecting line acting as an antenna and radiating the undesired signals, causing a large amount of interference. This type of decoupling is said to be particularly applicable to master antenna installations in existing buildings, for it is only necessary to run a single lead for each of the risers, rather than an individual lead for each of the receivers on the riser.

The use of this booster as a decoupling amplifier prevails, it is said, because of the automatic operation of

the unit. Since the magnetic relay turns the booster on and off automatically with the television on-off switch, power is not drawn by the preamp until the television set is turned on.

Reporting on the booster's circuitry characteristics, Walter Tyninski, ITI project engineer, states that one rather unconventional feature of the booster is the operation of the 6CB6 at zero grid bias. This was done to obtain the highest transconductance possible, resulting in an increased gain. A study of the transconductance curves of a pentode, plotted for a constant plate and screen voltage, reveals that the transconductance increases very rapidly as the grid bias is reduced to zero. Since the cathode current also increases it is necessary to lower the plate and screen voltages so as not to exceed the tube ratings, but even at reduced voltages, it has been found that an increase in transconductance can be obtained over conventional operation.

Provision at the input circuit to accept a single combined input, or separate high-band and low-band inputs

Fig. 3. Rear view of automatic preamp.



without switching, has been accomplished by operating the tuned inputs separately for the dual input, or by placing the two inputs in series (by connecting terminals 3 and 4 on the antenna input board) in the single input case. It might be pointed out that a double-tuned transformer is actually a bandpass filter which has a negligible impedance on the top band, when the frequency deviation is great. Thus, in the combined input the low-frequency voltages will appear across the low input transformer, and the high-frequency voltage across the high band input.

The magnetic relay will work over a range of 1 to 4 amps with a negligible voltage drop.

#### Raytheon TV Chassis

The rectangular picture tubes, a short while ago a feature of only a few chassis and usually in the 14-inch type, have become pretty much of a standard item on the runs of many manufacturers and in many sizes.

In models recently produced by Raytheon the 16 and 17-inch picture tubes appear in their 21-tube chassis; 16AY21, 17AY24, 16AY28 and 17AY21; Fig. 4, p. 38.

In these models, the tuner is composed of a separate sub-chassis using a 6AG5 (pentode) rf amplifier and a 12AT7 (twin triode) for the oscillator and converter. Separate high and low band coils and trimmers are used with a switching device to change bands. The tuner selects and amplifies the station signal and converts it to carrier frequencies of 26.75 mc for video and 22.25 mc for sound.

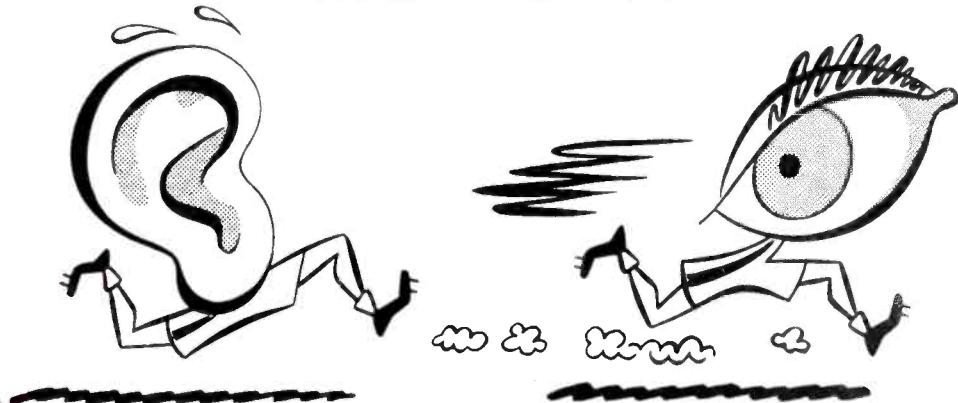
#### Video IF Amplifiers

The if amplifiers, video detector and dc restorer stages are all mounted on a subchassis. The if amplifier section consists of four stagger-tuned stages using 6AU6s (pentodes) with self-resonant slug-tuned coils. Since the receiver is of the intercarrier type, both the video and sound if frequencies are amplified simultaneously. The signal is then detected by one half of a 6AL5 (twin diode) and coupled to the video amplifier. The other half of the 6AL5 is used as a dc restorer.

#### Sound Section

The sound section is also mounted on a subchassis and consists of 6AU6 if amplifier, 6T8 (triode, triple diode) detector and audio amplifier and a 6K6 (pentode) output tube. Due to the heterodyne action between the video and sound if frequencies, a 4.5-mc signal

# THE EYE IS QUICKER THAN THE EAR



## IF YOU SERVICE TV, YOU KNOW THIS!

Customers are quick to *see* imperfections. Much slower to *hear* them. Therefore premium-quality Hytron receiving tubes for the tougher TV jobs. *At no extra cost!* You gain also: Through fewer expensive service call-backs. Better customer satisfaction and confidence. More profits.

How does Hytron do it? By working closely with leading TV set manufacturers. By endless striving

to better already superior performance. By improved design...processing...inspection...testing.

Try Hytron TV receiving tubes: 1X2A, 5U4G, 6AG5, 6AL5, 6AU6, 6BC5, 6BG6G, 6BQ6GT, 6CB6, 6SN7GT, 6V6GT, 6W4GT, 12BH7, 25BQ6GT, etc. Also Hytron rectangular picture tubes: 14BP4, 16RP4, 17BP4A, 20CP4. You pay no more for Hytron. But *see* the difference yourself...on the TV screen...on your cash register.

## THEY COST PENNIES, BUT SAVE DOLLARS!

Order from your Hytron jobber today

HYTRON SOLDERING AID

**HYTRON SOLDERING AID** — 49¢ net. Fork tip effortlessly, quickly unwraps "mechanically solid" joints. Straddles wire, grips, unwraps, pulls it free. Guides new wire; holds it firm while soldering. Spade tip reams solder from lug hole; pushes other wires aside. Tips are hardened, twist-proof, insulated, hard-chromed to shed solder. Tool handles like pencil. Reaches tight spots. Has dozens of other uses.



**HYTRON TUBE LIFTER** — 15¢ net. Lift 'em all the e-a-s-y prybar way! Tubes (GT, G, standard, lock-in, metal). Vibrators and plugs (Jones, Amphenol) — and knobs. A natural for compact auto radios, etc. Slotted end lifts lock-ins, snap-in trimounts...easily, safely. Of stainless steel with comfortable rolled edges.



**HYTRON TUBE TAPPER** — 5¢ net. Handy combination pencil, eraser and tube tapper. Discovers microphonism, shorts, and opens in tubes, etc. Compact, non-metallic, rugged. Doubles in brass for writing orders, etc.

HYTRON TUBE PULLER

— 75¢ net. Pull or insert 7-pin miniatures the e-a-s-y way. Neoprene rubber puller works by suction and friction on top of tube. Positive grip. Reaches tight spots. Another Hytron time-tempo-and-money saver.

HYTRON AUTO RADIO TOOL

— 24¢ net. Substitutes for control cables of universal auto radio. Quickly, precisely turns set on/off, tunes, adjusts volume and tone, re-aligns dial. Square also fits splines. Vee fits spade and other key fittings. Minimum backlash. Compact. Bright-zinc plated. Non-rolling large handle for fine adjustments.



HYTRON PIN STRAIGHTENERS,

7-Pin and 9-Pin — 55¢ net ea. You merely press tube gently into Hytron Straightener until button base seats squarely. Presto, pins are straight! Fast...safe. Avoiding one broken tube pays for Straightener twice over. Precise, stainless-steel insertion die. Comfortable knurled aluminum holder. For hand, bench or tube tester use.



OLDEST MANUFACTURER OF RECEIVING TUBES  
**HYTRON**  
RADIO AND ELECTRONICS CORP.

MAIN OFFICE:  
SALEM, MASSACHUSETTS



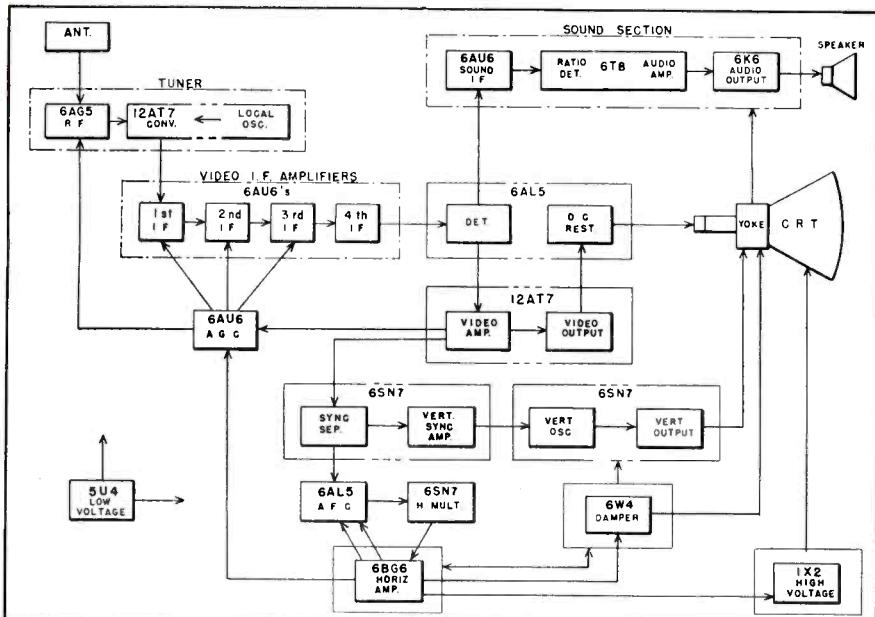


Fig. 4. Block diagram of Raytheon 16AY28, 17AY21, 16AY211 and 17AY24 chassis. In the 21 and 28 chassis, the audio output tube is a 6V6.

is obtained containing the audio information. After the detector, the audio information is separated from the video signal by a pick-off coil,  $T_8$ . The signal is then amplified, detected and further amplified by the triode section of the 6T8 and 6K6. (The 16AY28 and 17AY21 chassis incorporate a 6V6 audio output tube.)

#### Video Amplifier

The video section is a conventional two stage amplifier using the 12AT7 (twin triode) tube. A parallel resonant video trap coil ( $L_m$  and  $C_{10}$ ) is tuned to 4.5 mc to separate the audio from the video. A combination of shunt and series peaking coils are used with a degenerative contrast control to vary the signal to the grid of the picture tube.

#### DC Restorer

One half of the 6AL5 is used as the dc restorer. Since the video is coupled to the grid of the picture tube by capacitor  $C_{10}$ , the dc component of video signal will not be passed; therefore, the background level of the picture will vary. A bias voltage proportional to the average video signal level will be developed across resistor  $R_m$  and maintain proper brightness level.

#### Sync Separator and Vertical Amplifier

The sync pulses from the plate of the first video amplifier are coupled to the sync separator tube ( $\frac{1}{2}$  of 6SN7) through capacitor  $C_{103}$ . The sync pulses are then separated from the blanking pedestal and due to the low plate voltage, sync clipping is accomplished. The horizontal pulses are

coupled to the *afc* discriminator through capacitor  $C_{125}$  and the vertical pulses are coupled through capacitor  $C_{121}$ ; they are amplified by the other half of the 6SN6 before being fed to the integrating network of the vertical deflection circuit.

#### Vertical Deflection

The vertical deflection circuit consists of a 6SN7 (twin triode) one half of which is used as a blocking oscillator and the other half as a pulse amplifier. The vertical hold control varies the oscillator's operation point, thus providing an adjustment for synchronization. The vertical size control varies the amplitude of the pulse to the grid of the amplifier thus controlling the amount of vertical deflection. The vertical linearity control varies the cathode resistance, thus changing the operating characteristics of the amplifier tube to provide a linear sawtooth pulse. Therefore, it can be seen that the vertical size and vertical linearity controls must be operated in conjunction with one another.

#### AFC Discriminator

The automatic-frequency control section utilizes a 6AL5 (twin diode). The sync separator feeds the horizontal sync pulses to the *afc* tube, while at the same time two voltages of opposite polarity are fed back from the horizontal deflection transformer. Any phase shift between the horizontal sync pulses and the horizontal multivibrator signal will cause the input voltage applied to one diode section to differ from that of the other. This results in a *dc* bias voltage applied to the grid of the multivibrator. The output

of the *afc* discriminator thus synchronizes the horizontal multivibrator to the horizontal pulse of the video signal. This arrangement has been found to improve horizontal stability and offer ease of operation.

#### Horizontal Multivibrator

The horizontal multivibrator circuit (6SN7) is of the conventional cathode coupled type using a parallel resonant circuit ( $L_{20}$  and  $C_{107}$ ) as a hold adjustment to stabilize the frequency of oscillation. The horizontal sawtooth pulse is then fed to the grid of the pulse amplifier.

#### Pulse Amplifier

The horizontal drive control,  $C_{104}$ , which is in the grid circuit, controls the amount of voltage applied to the pulse amplifier. (Increasing the capacity decreases the drive). A 6BG6 (beam tetrode) is used to develop the necessary power for the flyback pulse and the horizontal deflection coil. The horizontal size coil,  $L_{24}$ , shunts a portion of the horizontal deflection transformer winding. Varying the inductance of the horizontal size coil varies the high voltage which in turn controls the size of the picture.

#### Damper

The damper tubes (6W4) main function is to damp out oscillations which occur over part of the horizontal scanning cycle. The damper tube is connected in such a way as to give an increase in plate supply voltage for the vertical output amplifier. This additional voltage is developed across a 10-mid 50-volt capacitor and provides an approximate 90-volt increase in plate supply voltage. Varying the inductance of the horizontal linearity coil,  $L_{26}$ , changes the damper tube's operating point and thus controls the linearity of the horizontal sweep.

#### High Voltage Supply

High voltage is obtained from an auto-transformer type primary winding of the horizontal output transformer. When the plate current of the pulse amplifier tube is cut off, the field built up in the primary winding collapses and induces a high voltage surge which is rectified by a 1X2, filtered by the capacity of the aqua-dag coating of the picture tube and then applied to the second anode.

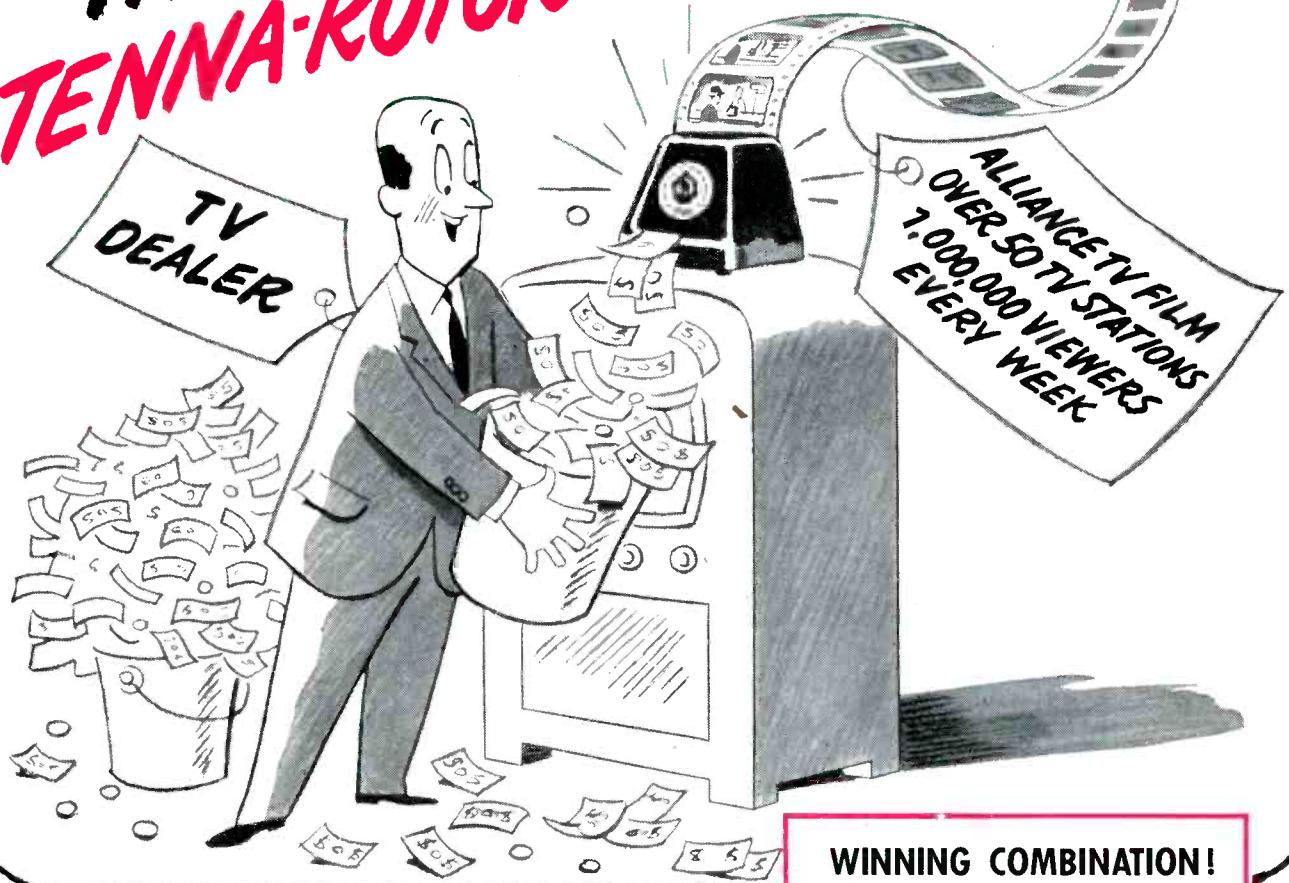
#### Automatic Gain Control

Plate voltage for a 6AU6 (pentode) gated *agc* tube is obtained from a separate winding on the horizontal de-

(Continued on page 50)

Smart TV Dealers are

# HITTING THE TENNA-ROTOR JACK-POT!



## PROOF IS IN RESULTS! Nation-wide TV Advertising Delivers Thousands of Sales—Every Week!

Over 50 key TV stations demonstrate Alliance Tenna-Rotor to 7 million viewers! Tenna-Rotor is the only TV accessory backed by a powerful, sustained television campaign—national in scope! Hundreds of thousands of Alliance Tenna-Rotors are in use!

Alliance Tenna-Rotor offers faster installation with Alliance 4-conductor "Zip" cable—Works in all weather—Guaranteed for one year—Approved by Underwriters' Laboratories.

**NEW DELUXE MODEL HIR IS FULLY AUTOMATIC!**

### WINNING COMBINATION! *Just Set It and Forget It!*

The only fully automatic rotator. Set the pointer—an antenna turns to that point and stops! North—East—South—West—direction indicator dial shows exact antenna position at all times. Extremely accurate!



MODEL HIR TENNA-ROTOR

### ALLIANCE TENNA-SCOPE

—The New TV Booster! Features one simple control. Automatic on-off switch. Gives maximum uniform high gain on all channels —quick to install! An excellent companion item to Tenna-Rotor.



TENNA-SCOPE

**ALLIANCE MANUFACTURING COMPANY • Alliance, Ohio**

We CHALLENGE the performance of any 12" speaker with a

# Permoflux ROYAL EIGHT™

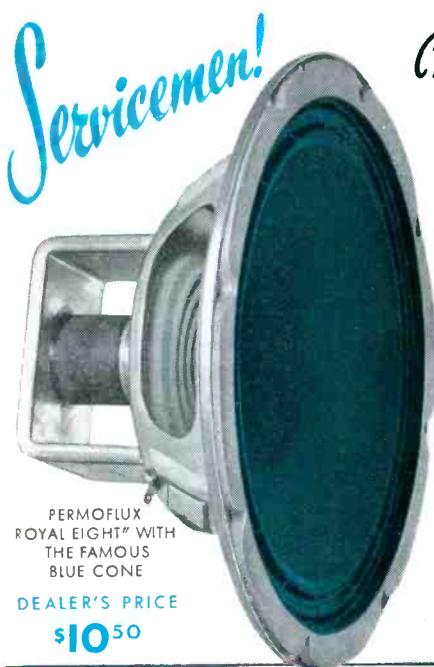
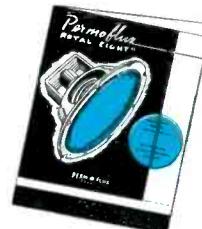
SAYS PERMOFLUX'S MR. HY-FY

This averaged laboratory response curve of the Permoflux 8T-8-1 proves that it compares with the finest speakers regardless of size or price.

PERFORMANCE CURVE  
FREQUENCY IN CYCLES PER SECOND

Hi-Fi Fans the country over have accepted this challenge—have asked their "soundman" for a demonstration—then, have installed a Permoflux Royal Eight™ in their own audio equipment. Now they possess a magnificent speaker at a reasonable price which reproduces sound with superior sensitivity and fidelity as well as tonal qualities which YOU too will want to add to perfect the excellence of your own equipment.

Send for beautifully illustrated catalog No. J201 to address listed below for further information including a full page devoted to correct baffling of Royal Eight™ and other size speakers.



DEALER'S PRICE  
**\$10.50**

**10-DAY TRIAL—MONEY BACK GUARANTEE**

**PERMOFLUX®**  
TRADE MARK  
"SOUND IN DESIGN"

PERMOFLUX CORPORATION  
4904 W. Grand Ave., Chicago 39, Ill.  
 Please send \_\_\_\_\_ Permoflux Royal Eight™  
 Check  Money order enclosed



Name of Favorite Distributor .....

Your Name .....

Address .....

City .....

Zone .....

State .....

## Association News

### NAET

THE FORMATION of a national association of electronic technicians was proposed during a recent meeting of representatives of the Empire State Federation of Electronic Technicians, the Federation of Radio Servicemen's Associations of Pennsylvania, and other Service Men's associations in Boston, Washington, Trenton, and Rochester.

It was pointed out that the proposed association, expected to include membership of employers and employees, would strive to accent the caliber of Service Men and their reliability. The formation of a plan which would provide coordinated sales and distribution practices between manufacturers, distributors, and Service Men, was also suggested at the meeting.

Temporary officers named included Dave Krantz of PRSMA and FRSAP, chairman; Max Liebowitz, ARTSNY presxy, vice chairman; and Norman Chalfin, also ARTSNY, secretary.

The delegates were asked to outline the national plan to the members of their groups and return, with perhaps members of other groups, on January 28 in Washington, D. C., to consider the official formation of the national group.

### ARTSNY

A BILL proposing the regulation of television servicing, which was reintroduced by Councilman Charles E. Keegan, in New York City, was soundly criticized by Max Leibowitz, association presxy, during a recent meeting of the group. Liebowitz declared that the independent Service Man was not responsible for the present malpractices around which the bill is written, and therefore, he should not be penalized for conditions beyond his control. Liebowitz felt that the levying of a high license fee, featured in the measure, was not just. In his opinion, if one year contracts were replaced by per-call arrangements, most of the present abuses would disappear.

It was pointed out that ARTSNY has had a very successful year with their policing system, featuring the operation of a grievance committee, who have protected the public from any unsatisfactory servicing practices.

The bill was also the subject of special consideration during an open meeting of the association in the grand

(Continued on page 48)

# ANNUAL

# INDEX

JANUARY-DECEMBER, 1950

## ANTENNAS

- Connecting TV Receivers to Master Antenna Systems; *Ira Kamen* ..... Jan.  
Coupling Two TV Sets to One Antenna; *Jerome Berger* ..... Aug.  
Input Which Discriminates Against Diathermy and SW Type of Interference in IF Bands ..... Aug.  
Installing and Servicing Antennas (*Marine Radio*) ..... Mar.  
Installing and Servicing Direction Finders (*Marine Radio*) ..... Mar.  
Master-Antenna System Expansion System ..... Apr.  
Master-Antenna Systems; *Jerome Berger* ..... Apr.  
Master Antenna System Setup for 72- and 300-Ohm Leads ..... Apr.  
Master TV Antenna Systems; *Ira Kamen* ..... Jan.  
Multiple Dwelling Installations Involving 72 and 300-Ohm Input Systems; *Ira Kamen* ..... Jan.  
Multiple-Outlet Systems for Smaller Dealers ..... Apr.  
Simplified TV Master-Antenna Systems; *Jerome Berger* ..... Apr.  
Single Antenna System Used to Feed a Pair of 75 or 300-Ohm Receivers Through a Coupler ..... Aug.  
Suppression of Local Oscillator Interference and Matching to 72 or 300-Ohm Lines ..... Apr.  
TV Antenna Orientation Circuitry ..... Mar.  
TV Channel Traps ..... Mar.  
Westinghouse TV Receiver Built-In Antennas ..... July

## AUTO RADIOS

- Adapter for Flexible Cables in Remote-Control Servicing ..... Nov.  
Air Testing Techniques ..... July  
Ash-Tray Mounts ..... June  
Auto Power Supply Testing with a 'Scope ..... May  
Auto Radio Automatic Tuners; *Jack Darr* ..... Oct.  
Auto Radio Noise Cures; *Jack Darr* ..... May  
Auto Radio Remote-Control Head and Shaft Installation and Servicing; *Jack Darr* ..... Nov.  
Auto Radio Service Shop Facilities; *Jack Darr* ..... July  
Auto Radio Speaker Installations; *Jack Darr* ..... June  
Auto Radio Tools and Test Equipment; *Jack Darr* ..... Aug.  
Auto-Receiver Installation in a 1950 Studebaker ..... May  
Chevrolet Speaker Mounting Positions ..... June  
Cleaning Techniques ..... Oct.  
Constructional Features of Modern Batteries ..... Oct.  
Design and Application of Auto Tubes ..... May  
Detecting Trouble in Power Supplies Using Sync and Non-Sync Vibrators ..... Aug.  
Determining Sizes of Power Cables Used Between Power Supply and Storage Battery in Car Setups ..... Aug.  
Direct-Driven Cams ..... Oct.  
Dry Batteries ..... Oct.  
Electric Pushbuttons ..... Oct.  
Electric Turrets ..... Oct.  
Elimination of Spark-Plug Generator Front-Wheel and Intermittent Noises ..... May  
Fabricating Mounting Brackets for Speaker Mounts ..... June  
Federal Industries 12AU7 Remote-Control Transmitter (For Garage Door Opening) ..... Feb.  
Federal Industries Remote Receiver (For Garage Door Opening) ..... Feb.  
Hand and Power-Tool Requirements ..... Aug.  
How to Check Vibrator Supplies with Alternate Methods ..... Sept.  
How to Replace Coils and Slugs ..... Oct.  
How to Replace Vibrators ..... Aug.  
How to Set Up Audio Tests ..... Aug.  
Installing Extension Facilities ..... Aug.  
Installing Selector Switches ..... June  
Instrument Panel Speaker Mounting ..... June  
Instruments Required for Shop and Out-door Servicing ..... Aug.  
Mallory VP-540 Sync Vibrator Power Supply ..... Aug.  
Mallory VP-555 Non-Sync Vibrator Power Supply ..... Aug.  
Mechanical and Electric Automatic Tuning Systems ..... Oct.  
Meter Applications ..... Aug.  
Motor Adjustments ..... Oct.  
Mounting in Kickpads of Jeep Cars ..... June  
Mount Problems and Solutions for Dash and Extension-Type Speakers ..... June  
Placing Rear-Seat Speakers in Package Trays ..... June  
Power Supplies ..... July  
Radelco Side Cowl Antenna and Cable Connector Mountings ..... May

## CIRCUITS

- Radiart 6R10 ViPower ..... Aug.  
Remote-Control Custom-Type Head Characteristics ..... Nov.  
Remote-Control for Garage Doors: *Max Ath* ..... Feb.  
Remote-Control Head and Shaft Mount Setup ..... Nov.  
Remote-Control Shaft Construction and Repairing ..... Nov.  
Remote-Control Systems Design Features ..... Nov.  
Speaker Mount Positions ..... June  
Speaker Plugs ..... July  
Strap Mounting ..... June  
Test Bench Construction ..... July  
Testing Vibrator Power Supply Systems; *Ralph Bray* ..... Sept.  
Test Instrument Requirements ..... July  
Test Lead Design ..... July  
Troubleshooting Series and Shunt-Drive Type Vibrator Systems with the Aid of 'Scope Waveforms ..... Sept.  
Tuning Tools ..... July  
Usage of Adapter Mounts for Shafts During Servicing of Remote Controls ..... Nov.  
Vibrator Test Jigs ..... Sept.  
Wire Size Table to Determine Length and Type of Cable to Use Between Power Supply and Car Battery ..... Aug.  
  
Admiral Adjacent-Channel Sound Trap ..... Aug.  
Admiral Dual-Trap Installation ..... Sept.  
Admiral Single-Trap Installation ..... Sept.  
Admiral 6AU6 Audio Circuit (Replacing 6SQ7) ..... June  
Admiral 2A11 Power Supply ..... June  
Admiral 20X1-20Y1 Chassis ..... Mar.  
AM Detector Using Diode Modified for FM or Slope Detector Work ..... Nov.  
AM Diode-Detector Circuit ..... Apr.  
Amplifier Signal-Tracing Test Points ..... June  
Automatic Preamp ..... Dec.  
Auto Radio Bench Test-Antenna-Lead Wiring ..... July  
Auto Radio Portable Test-Ammeter Circuitry ..... July  
Auto Radio Power-Supply-System Setup ..... July  
Auto Radio Test-Speaker Arrangement ..... July  
Bendix 2051, 3051, 6001, 6003 and 6100 TV Chassis ..... Sept.  
Bimorph Crystal-Cartridge Circuitry ..... June  
Block Diagram of Heterodyne Sweep-Generator System ..... Aug.  
Bogen H-623 23-Watt PA ..... Nov.  
Bogen H-625 20-Watt Power Supply ..... Aug.  
Bogen PA Circuit (Medium Power) ..... June  
Bridge Connection of S Meter in Tetrode-Screen Circuit ..... Mar.  
Cam-Lever Mechanical Automatic Tuning System ..... Oct.  
Capacitive-Operated Presence Detector (Cover) ..... Oct.  
Clankstan 125 AF Sweep Generator ..... Feb.  
Coax Line to 300-Ohm Teflafar Transformer ..... Jan.  
Coupling Signal Generator to TV Mixer Tuner ..... Oct.  
Decimeter 2-Stage TV Pream (Cover) ..... Mar.  
Deflection System Using HV Doubler ..... Nov.  
Diagram Illustrating Interfering Path of Oscillator Signal Through RF Stage ..... Nov.  
Discriminator Alignment Setup with AM Signal Generator and VTVM ..... Dec.  
Discriminator Detection System and Vector Relationship Plots ..... Nov.  
Double-Tuned FM Detector System ..... Nov.  
Dry-Disc Voltage-Doubler Circuitry ..... May  
Dual-Triode Modified Flip-Flop Circuit ..... Nov.  
Eight-TV-Receiver Hookup Using Four 2-Set Couplers ..... Aug.  
Electronic Magnifier Circuit for Air King, Ansley, Base, Crosley, DeWald, Hoffman, International Television, Nielsen, Philmore, RCA, and Starrett Chassis ..... May  
Electronic Magnifier Circuit for Artone, Gamble-Skogmo, Hallicrafters, United Motors and Video Corp. of America Chassis ..... May  
Electronic Magnifier Circuit for Federal Television, Olympic, Philharmonic, Tele-tone, U. S. Television and Western Auto Supply Chassis ..... May  
Electronic Magnifier Circuit for Midwest and Scott Chassis ..... May  
Electronic Magnifier Circuit for Sears Roebuck Chassis ..... May  
Electronic Training System ..... June  
Electric Turret Tuning System ..... Oct.  
Emerson (470606) TV Tuner ..... July  
Emerson Low-Capacity Probe ..... Sept.  
Emerson 634B Receiver Three-Speed Changer ..... May  
Equivalent Circuits of Phone Setup Using Double-Torque Drive ..... June  
Federal Industries Garage Door Opening Receiver ..... Feb.  
Federal Industries Single-Tube 12AU7 Transmitter (For Garage Door Opening) ..... Feb.  
14 Watt Amplifier (Cover) ..... June  
G. E. Balanced Output Adapter ..... July  
G. E. Clock-Radio Capacitor Arrangements ..... Feb.  
G. E. Clock-Radio Loop Connections ..... Feb.  
G. E. 802 Contrast Control Circuit ..... May  
G. E. 817 and 821 (Sync-Separation) ..... Jan.  
G. E. 500 and 501-Type Clock-Radio Circuit ..... Feb.  
G. E. High-Channel Trap ..... Aug.  
G. E. 910 Two-Tube Front End ..... Apr.  
G. E. 12T1, 12C101, 12C105 DC Restorer Circuit ..... Apr.  
G. E. TV Alignment Attenuator and Balanced-Output System (Cover) ..... July  
G. E. 254 Detector (1H5GT) Circuit ..... Apr.  
Greely RF Test Circuit (Cover) ..... Dec.  
Half-Wave Diode-Detector Circuit ..... Apr.  
Half-Wave Diode-Rectifier Circuit ..... Apr.  
Hallicrafters S-40 S Meter and Magic-Eye Systems ..... Mar.  
Hartley Oscillator Basic Circuitry ..... Oct.  
Hickok 620 (Cover) ..... Jan.  
Hoffman TV Chassis Revisions Providing for the Elimination of Smear and Better Contrast ..... Nov.  
Horizontal Output Circuit ..... Mar.  
Hytron Flyback Power Supply ..... Dec.  
IF and Ratio-Detector Strip ..... Apr.  
ITI FM/TV Automatic Booster ..... Dec.  
Kickback High-Voltage Supply Circuit ..... Oct.  
Lampkin Micrometer Frequency Meter Ratio-Couple Circuit ..... Nov.  
Magic-Eye and External Triode Circuit for Wide-Angle Tuning ..... Mar.  
Magic-Eye Tuning Indicator Setup ..... Mar.  
Magnavox M-1 Two-Tube TV Tuner (Cover) ..... Sept.  
Magnavox CT-247, 248 and 249 (Cover) ..... Feb.  
Master Antenna Receiver Connections ..... Jan.  
Master-Antenna System Setups for 72 and 300-Ohm Leads ..... Apr.  
Master Antenna System Layout ..... Aug.  
Motorola TS 16/TS-30 Chassis ..... May  
Motorola TV Chassis Modification ..... Oct.  
Network for Matching 300 and 50-Ohm Unbalanced Lines ..... July  
Network of 430-Ohm Resistors to Match Generator Sweep Lead ..... July  
1x2 Filament Circuit Modification in Raytheon Chassis ..... Apr.  
Parallel-Connected Speaker Voice-Coil Test Setup ..... July  
Philco Channel-Adjuster (Basic Circuit) ..... Apr.  
Philco Circuit Revision to Reduce Vertical Sweep Radiation ..... Jan.  
Philco Discriminator ..... Apr.  
Philco Discriminator Circuit ..... Apr.  
Philco Electronic Scratch Eliminator ..... Feb.  
Philco 48-700 Channel-Adjuster Circuit ..... Apr.  
Philco 48-700 Sound Detector ..... Apr.  
Philco 48-700 Video Detector ..... Apr.  
Philco 48-1000 Channel Adjuster ..... Apr.  
Philco 48-2500 Channel Adjuster ..... Apr.  
Philco 50-T1400 Filter Network, For Vertical Jitter Reduction ..... Sept.  
Philco 51-T1601 Horizontal Linearity Circuit ..... Sept.  
Philco 51-T1836 First and Second IF Stages ..... Aug.  
Philco 51-T1836 Gated AGC System ..... Aug.  
Philco 51-T1836 Second and Third IF Stages ..... Aug.  
Philco 76-5747 Tuner ..... Aug.  
Philco M-20 Record Changer ..... Feb.  
Philco Narrow-Neck Chassis Power and Filament Supply ..... Nov.  
Philco Narrow-Neck Chassis Vertical Sweep ..... Nov.  
Philco Narrow-Neck Horizontal Output Transformer ..... Nov.  
Philco Remote-Control Assembly Wiring Setup ..... Sept.  
Philco Shunt Drive and Series Drive Full-Wave Vibrator System ..... Sept.  
Philco TV Chassis with Narrow-Neck Picture Tube ..... Nov.  
Philco Vertical Retrace System ..... Aug.  
Philco Vibrator Test Jig for 'Scope Use ..... Sept.  
Philco Wavetrap Connections to Eliminate Interference at IF ..... Jan.  
Philips Duo-Vue Schematic ..... Nov.  
Ratio Detectors and Discriminator Type FM Detectors ..... Nov.  
Ratio-Detector System ..... Aug.  
Ratio-Detector System Circuit ..... Dec.  
Raytheon Adjustments to Eliminate Horizontal Shift or Oscillation of Horizontal AFC Circuit ..... May  
Raytheon 1X2, 6X4 or 6BQ6 Circuit Revision ..... Apr.  
Raytheon 12AX22 TV Chassis ..... May  
Raytheon 16- and 19-Inch Rectangular Picture-Tube Chassis ..... Dec.

Raytheon 16AY28, 17AY21, 16AY21 and 17AY24 Chassis	Dec.
Raytheon TV Built-In Antenna	May
RCA 8T270 (Front End)	Jan.
RCA Experimental UHF Converter	May
RCA Experimental UHF Tuner and Power Supply	May
RCA IF High-Pass Input Filter	Aug.
RCA IF Unit to Minimize Broadcast Interference	Aug.
RCA Isolation Transformer System	Feb.
RCA Master Antenna Outlet	Jan.
RCA (1950) TV Chassis Horizontal Oscillator	Oct.
RCA (1950) TV Chassis Horizontal Output	Oct.
RCA (1950) TV Chassis Sync Separator and Amplifier	Oct.
RCA (1950) TV Chassis Vertical Oscillator	Oct.
RCA Ti20 B-Filter Modifications	Aug.
RCA (12½-Inch) TV Chassis Second Detector and Video Amplifier System	Oct.
RCA 206 E 3 Printed Circuit TV Tuner (Cover)	May
Receiver-Amplifier-Changer Assembly Circuit	July
Signal-Tracing System Using 6SF5 and 6AL5	June
6BN6 Gated-Beam FM Sound Limiter-Detector	Feb.
6BN6 Tube Circuitry	Jan.
6L6 Tetrode Amplifier Plate Characteristics	Jan.
6SC7 Phase Inverter	Jan.
6V6 Push-Pull Amplifier	Feb.
Sonic 1T-4 TV/FM Preamplifier (Cover)	Apr.
Sound-System Signal-Tracing Circuits	June
Speaker Matching Test System	Aug.
Stewart-Warner 9104 Chassis Fixed-Coil and Selector-Switch RF Tuner	Apr.
Stewart-Warner 9104 Chassis Turret-Type RE Tuner	Apr.
Stewart-Warner 9104 FM Tuner, AM Mixer and Overall Power Supply	Apr.
Stewart-Warner 9104 Sight and Sound Circuit	Apr.
Stromberg-Carlson (16RPM) Phono Compensation Circuitry	Sept.
Stromberg-Carlson TS-125, 15 and 16 TV Chassis	June
Stromberg-Carlson TV-125 Sound Detector	June
Stromberg-Carlson TV-125 Video (6AL5) Detector	Apr.
Sylvania 500 TV-FM Sweep Generator (Cover)	Apr.
Three-Stage Bandpass If Amplifier	Apr.
TV Antenna Orientation System	Mar.
TVI: Filters in Ham Transmitter Inputs	Oct.
TVI: Filter Systems to Prevent Radiation in Ham Bands	Oct.
TVI: High-Pass Filters for 72 and 300-Ohm Inputs	Oct.
TV Oscillator Radiation Paths	Jan.
TV Signal Paths	Jan.
University Three-Way Speaker System	Nov.
Variable-Reluctance Equalizer and Preamp	June
Voltage-Doubler Circuit	Nov.
Westinghouse Built-In Antenna (Electrical Circuit)	July
Westinghouse Electronic Magnifier Circuitry	May
Westinghouse H-223 TV Receiver	Jan.
Westinghouse H-242 HV Supply	Jan.
Westinghouse H-627K16, H-628K16 and H-629K16 Phase Detector	Dec.
Westinghouse H-633C17, H-634C17, H-635T17, H-636T17 and H-638K20 Phase Detector	Dec.
Westinghouse Keyed AGC	July
Westinghouse Sound Takeoff Modifications	Oct.
Westinghouse V215-2125-61 Sync System	July
Westinghouse V-2150-01 Revised IF	Apr.
Westinghouse V-2150-01 TV Sound System	Nov.
Westinghouse V-2150-61 IF Channel System	July
Westinghouse V-2150-61 Sync System	Sept.
Westinghouse (V-2150-106) Revised AGC Circuit	Sept.
Wide-Angle Deflection Circuit with HV Doublers (Cover)	Nov.
Zenith 6V6GT Vertical-Output Circuit	Sept.
Zenith S-14022 Three-Speed Intermix Record Changer System	Mar.
Zenith S-14024 Intermix Record Changer	Mar.
Zenith S-14025 Phono System	Mar.
Zenith S-14027 Phono System	Mar.
Zenith 23G22/23 Picture-Tube Circuit	Sept.
Zenith 24G22/23/24/25 TV Chassis	Feb.

## COVER DIAGRAMS

Capacitive-Operated Presence Detector; Alan Smolen	Oct.
DeciMeter (A 2-Stage TV Preamp)	Mar.
14 Watt Amplifier (Custom Building an AM-FM Phono Combination); Herbert G. Eidson, Jr.	June
G. E. TV Alignment Attenuator and Balanced-Output System (TV Alignment Procedures); M. E. Clark	July
Greeley RF Test Circuit (RF Reactance Measurement Tests); Philip H. Greeley	Dec.
Hickok 620 (Cross Hatch Generator); Allan Lytel	Jan.

Magnavox CT247, 248, 249 (12½"-16" TV Chassis); J. F. Bigelow	Feb.
Magnavox M-1 Two-Tube TV Tuner; C. S. Root	Sept.
RCA 206E3 (Printed Circuit TV Tuner)	May
Sonic IT-4 (TV/FM Preamp)	Apr.
Sylvania 500 TV-FM Sweep Generator (Precautions, Limitations and Uses of Sweep Generators); M. J. Aucremanne	Aug.
Wide-Angle Deflection Circuit with HV Doublers (Conversion to Large-Screen TV); Joseph Rocker and Philip Selvaggi	Nov.
<b>EDITORIALS</b>	
Advertising and the Serviceman	Apr.
A Rainbow Plan for Callbacks	June
A Tribute to the Serviceman	Sept.
Chaos in the Picture-Tube	Mar.
Color TV (A Complete Report)	Oct.
Component Ratings	Mar.
Conversions and Honesty	Sept.
Does TV Damage the Eyes?	Jan.
Foolhardy Promises	Apr.
Forecast for TV Service	Aug.
Installation Service Charges	Jan.
Manpower and Servicing	Aug.
New Stations and Servicing	Feb.
Service Operation Coordination	May
Small TV Chassis	Mar.
Sound and TV	Aug.
Sound Review	June
Standard Brands	Jan.
Standards for TV Service	July
Successful Management in the Shop	Dec.
The Healthy Road Ahead	Jan.
The Sound Market	Nov.
TVI	June
TV Radiation	Mar.
TV Service and Quality	Aug.
Ultrahighs Begin to Sparkle	May
<b>FEATURES</b>	
A One-Tube Square-Wave Generator; Richard H. Dorf	Nov.
Annual Index, 1950	Dec.
Application of Diodes in AM, FM and TV; A. T. Parker	Apr.
Association News	Jan.-Dec.
A 2-Stage TV Preamp (Cover)	Mar.
A 2-Tube TV Tuner (Cover); C. S. Root	Sept.
A TV/FM Preamplifier (Cover)	Apr.
Auto Radio Automatic Tuners; Jack Darr	Oct.
Auto Radio Noise Cures; Jack Darr	May
Auto Radio Remote Control Head and Shaft Installation and Servicing; Jack Darr	Nov.
Auto Radio Service Shop Facilities; Jack Darr	July
Auto Radio Speaker Installations; Jack Darr	June
Auto Radio Tools and Test Equipment; Jack Darr	Aug.
Cabinets for a Custom-Built FM/AM Phono Combination; Herbert G. Eidson, Jr.	July
Capacitive-Operated Presence Detector; Alan Smolen	Oct.
Center Frequency Measurement; Wyn Martin	Nov.
Connecting TV Receivers to Master Antenna Systems; Ira Kamen	Jan.
Conversion to Large-Screen TV (Cover); Joseph Racker and Philip Selvaggi	Nov.
Coupling Two TV Sets to One Antenna; Jerome Berger	Aug.
Custom Building an FM-AM Phono Combination; Herbert G. Eidson, Jr.	June
Custom-Built Cabinet Finish Techniques; Herbert G. Eidson, Jr.	Aug.
Dry Batteries	Oct.
Evolution of the Single-Tipped Stylus for 3-Speed Phono Systems; Howard M. Durbin	June
Experimental UHF TV Tuner and Converter; E. I. Jeffrey	May
Factors Influencing Horizontal Size and Linearity; J. F. Bigelow	Mar.
Finding Your Way Around a TV Chassis; Cyrus Glickstein	Dec.
Improving the Audio System; Melvin C. Sprinkle	Sept.
Keyed AGC and Sync Systems (Westinghouse H-600T16, H-603C12, H-605T12, H-606K12, H-607K12, H-608C12, H-609T10 Chassis)	Sept.
Marine Radio Installation and Service; Max Ath	Mar.
Outboard Tuning Indicators; Ronald L. Ives	Mar.
Phono Installation and Service; Kenneth Stewart	Jan.-Dec.
P-A System Servicing; John B. Ledbetter	July
Precautions, Limitations and Uses of Sweep Generators (Cover); Marcel J. Aucremanne	Aug.
Printed Circuit TV Tuner (Cover)	May
Public-Address System Servicing; John B. Ledbetter	June
Remote-Control for Garage Doors; Max Ath	Feb.
RF Reactance Measurement Tests; Philip H. Greeley (Cover)	Dec.
<b>FM</b>	
Application of Diodes in AM, FM and TV; A. T. Parker	Apr.
Bendix 6100 AM/FM Chassis	Sept.
Cabinets for a Custom-Built FM/AM Phono Combination; Herbert G. Eidson, Jr.	July
Custom Building an FM-AM Phono Combination; Herbert G. Eidson, Jr.	June
Electronic and Mechanical Construction of Complete AM-FM Receiver, LP and Standard Phono System	June
FM and TV VHF Basic Circuit and Component Factors in Diode Applications	Apr.
Miniature 6BN6 Beam Tube	Jan.
Ratio Detector and Discriminator Type FM Detectors	Nov.
Ratio Detector Vector Plots	Apr.
Selecting an AF-AM Tuner	June
Servicing FM Detectors; Allan Lytel	Nov.
Servicing FM Detectors; Allan Lytel	Dec.
6BN6 Gated-Beam FM Sound Limiter-Detector	Feb.
Sonic IT-4 TV-FM Preamp (Cover)	Apr.
Stewart-Warner AM/FM/TV 9104 Chassis Series	Apr.
Stromberg-Carlson 1121-1135; Correcting FM Drifts	Aug.

## MANAGEMENT

Advertising and the Serviceman.....	Apr.
A Tribute to the Serviceman.....	Sept.
Callback Plan .....	June
Complete Report on Color TV.....	Oct.
Component Ratings .....	Mar.
Conversions and Honesty .....	Sept.
Foolhardy Promises .....	Apr.
Forecast for TV Service .....	Aug.
Installation Service Charges .....	Jan.
Manpower and Servicing .....	Aug.
New Stations and Servicing .....	Feb.
Service Operation Coordination .....	May
Sound and TV .....	Aug.
Sound Possibilities .....	June
Standard Brands .....	Jan.
Standards for TV Service .....	July
Successful Management in the Shop .....	Dec.
The Healthy Road Ahead .....	Jan.
The Sound Market .....	Nov.
TV Service and Quality .....	Aug.

## PRODUCTION CHANGES

Buzz-Modulation Correction (G.E. 802 and 803) .....	Jan.
Cures for Severe Horizontal Shift in Raytheon 12½" Models .....	May
Eliminating Squegging in Horizontal AFC Circuit in Raytheon Chassis .....	May
G.E. 12T1, 12C101, 12C102, 12C105 DC Restorer Correction .....	Apr.
G.E. (12T3, 12T4, 12C107, 12C108, 12C109) Filament Circuit Changes .....	Sept.
Improved HV Power Supply and Picture-Tube Circuit Alterations (Westinghouse H-242; V-2150-31A) .....	Jan.
Philco Channel-Adjusted Circuitry Uses .....	Apr.
Philco 48-700 Channel Adjuster .....	Apr.
Philco (50-T1600, 50-T1632, 50-T1633) AGC Circuit Modifications .....	Sept.
Raytheon Chassis Alteration to Limit 1X2 Filament Voltages .....	Apr.
Raytheon Chassis Revision to Avoid Failure of 1X2, 6X4 and 6BQ6 .....	Apr.
Raytheon 12AX22 Chassis Modifications .....	May
Removing Motorboating in Philco Sets .....	June
Securing Better Picture Centering, Increasing Range of Vertical Hold Control, Improving High-Voltage Supply Dressing, Providing 6V6 Tube Protection and Eliminating Folding in Raytheon Receivers .....	May
Separate Picture-Tube Filament Winding Addition (G.E. 811 and 814) .....	Jan.
Stromberg-Carlson Servicing Hints: Correcting Locking-In Action of Vertical Hold Control, Cures for Excessive Hum, Eliminating Picture Folding, Focus-Coil Position Improvements, Horizontal Frequency-Control Modifications .....	June
Stromberg-Carlson Servicing Hints: Improving Simultaneous Picture and Maximum Sound Reception in Remote Fringe Areas, Improving Control on Focus Potentiometers, Improved Signal-to-Noise Ratio at Sound Detector, Improving Resolution .....	June
Stromberg-Carlson Servicing Hints: Noisy Volume-Control Repairs, Removing Barkhausen Lines, Securing Better Vertical Speed Range, Stepping-Up Audio Response, Tone-Control Action Improvements, Tube-Type Substitutions in RF Positions of Low-Band Section of Tuner, Vertical Size and Scanning Action Circuit Changes .....	June
Vertical Size Circuitry Modifications (G.E. 901 and 910) .....	Jan.
Westinghouse H-242 HV Supply (With 6Y6G in place of 6V6GT) .....	Jan.
Westinghouse V-2150-01 Chassis IF Amplifier Changes .....	Apr.
Westinghouse (V-2150-106) Revised AGC .....	Sept.
Westinghouse V-2150-176 Chassis Changes .....	May

## SERVICING HELPS

Admiral 20A1, 20B1, 21A1 TV Receivers: Eliminating Adjacent Sound Interference, Polishing Mars and Fine Scratches on Plastic Escutcheons, Removing Picture Window and Control Escutcheon Static Charges .....	Aug.
Admiral (24 Series, 2021 and 21B1, 21C1) Service Helps: Removing Adjacent Channel Interference; Single and Dual Interference Traps .....	Sept.
Admiral Chassis Revisions: Eliminating Audio Hum and Sync Buzz; Reducing Vertical White Bars at Left of Picture; Securing More Picture Width; Tube Substitutions .....	Nov.
Admiral Receiver Service Suggestions: Increasing Audio Gain, Removing Focusing Difficulties in 16" Tube Models .....	June
Battery Repair Techniques .....	Oct.
Cabinet Repair Suggestions .....	May
Clock-Trouble Remedies .....	Feb.
Clock-Type Receiver Alarm and Switch Adjustments .....	Feb.
Clock-Type Receiver Cleaning and Lubricating Suggestions .....	Feb.
Correcting Tunable Audio Hum .....	Feb.

Curbs for Interference from Gasoline Generators, Electrolytic Action (Marine Radio) .....	Feb.
Dry-Disc Rectifier Circuit Trouble Shooting .....	Mar.
Dry-Disc Voltage Doublers .....	May
Dual Magic-Eye Tubes .....	Mar.
Eliminating Cash Registers and Electric Range Switch Interference in TV Receivers .....	Feb.
Elimination of Audio Buzz in TV Receivers .....	Mar.
Eliminating Parasitic Oscillation in Horizontal Output Circuit .....	Jan.
Emerson Low-Capacity Probe .....	Sept.
Emerson Low-Capacity Probe (Revised Circuit) .....	Nov.
Evaluating Battery Adjustments .....	Oct.
Farm Pack Designs (Dry Batteries) .....	Oct.
G.E. 801, 802, 803 TV Modifications Involving Insufficient High Voltage, Picture-Width Circuitry, Linearity and Contrast Control .....	May
G.E. 810, 811, 814, 820, 830, 835, 840 Modifications: High Channel Interference Traps .....	Aug.
Germanium Diode Markings .....	Jan.
Hoffman (170) TV Chassis Modifications: Contrast Improvement; Eliminating Christmas-Tree Effects; Eliminating Smear .....	Nov.
How to Secure Wide-Angle Tuning .....	Mar.
How to Stop Arcing or Corona in 16-Inch TV Models .....	Feb.
Identifying and Eliminating Various Types of TV Interference .....	Jan.
Installation of 6C4 Phase Detector in Place of 6C4 Phase Inverter and 6AL5 Horizontal AFC in Westinghouse Chassis .....	Dec.
Installation Precautions to Avoid Power Drain Using Separate Indicators .....	Mar.
Motorola TS-89/TS-94/TS-95 TV Chassis Modifications: Elimination of Vertical Collapse; Improving Picture Quality; Vertical Sync Stabilization; Reduction of Horizontal Radiation .....	Oct.
Phase-Reversal Tubes .....	Mar.
Philco (50-T1400 Series, Runs 1 and 2) Chassis Service Hints: Reducing Vertical Jitter; Preventing Horizontal Sync at Minimum Contrast Settings .....	Sept.
Philco (50-T1600, 50-T1632, 50-T1633) Sync Circuit Changes .....	Sept.
Providing Series-Filament Continuity When Picture Tube Is Removed .....	Jan.
RCA T100, T120, T124, TC125, TC127, TA128, TA129, TV Chassis Hints: Deflection Yoke Circuit Changes; Eliminating EM-PM Focus Coil Troubles; High-Pass Filter Cutoff Remedies; Minimizing AM Broadcasting Interference; Preventing Poor Vertical Linearity .....	Aug.
S-Meter and Magic-Eye Indicating Systems .....	Mar.
Stromberg-Carlson Service Notes: Improving Picture Focus; Removing Audio Buzz and Vertical White streaks on Right Side of Picture; IF Tube Substitutions; Securing Ganged Cores to Tuner Carriage .....	Dec.
Stromberg-Carlson 1121-1135: Correcting FM Drifts .....	Aug.
TV Antenna Orientation Circuitry .....	Mar.
TV Channel Trans .....	Mar.
TV Component Constructional and Application Features (Converter Transformer, Picture IF Transformer and Cathode-Circuit Traps) .....	Mar.
Westinghouse Chassis Alterations: Improving Horizontal Linearity Control; Securing More Filament Voltage for 1X2A; TV Tube Substitutions .....	Oct.
Westinghouse H-196, H-207, H-210 and H-188 Revisions to Prolong Tube Life, Improve Vertical Hold, Eliminate Audio Hum, Cabinet Buzz and Dial Pointer Rattle .....	May
<b>SOUND</b>	
AF Sweep Generator in Servicing Operations; John B. Ledbetter .....	Feb.
Alterations Which Can Be Made in G.E. Single-Speed Mounting Boards to Accommodate Two and Three-Speed Changers .....	June
A One-Tube Square-Wave Generator; Richard H. Dorf .....	Nov.
Applying Stage-by-Stage Amplifier Gain Measurement Procedures to Determine Absolute Operating Condition of PA Systems .....	June
Astatic LP Crystal Cartridge Design .....	Oct.
Bell Remote-Controlled Amplifier .....	Oct.
Bias Voltages Effect on Quality and Erasures (Wire-Recorder) .....	Jan.
Bogen Medium-Power PA System .....	June
Bridging Amplifiers .....	Apr.
Cabinets for a Custom-Built FM/AM Phono Combination; Herbert G. Eidson, Jr. ....	July
Cardiod Crystal Microphone Characteristics .....	Aug.
Cartridges with Universal Tips Featuring Truncated Cone and 2.3-Mil. Design .....	June
Changer-Amplifier Design Highlights .....	May
Checking for Intermittents, Audio Oscillation (Motorboating), Noise, Hum and Distortion .....	July
Clarkstan 125 AF Sweep Generator .....	Feb.
Coax Speaker Designs .....	Aug.
Cobra Paging Speaker .....	Nov.
Combination of Two Cartridges in Single Units .....	June
Constructional Details of the Record Cabinet .....	Aug.
Constructional Details on Cabinets Required for Receiver Preamp, Main Amplifier and Phone Mechanism .....	July
Correcting Tunable Audio Hum .....	Feb.
Curing Toy Record-Player Motor Sluggishness .....	Apr.
Custom Building an FM/AM Phono Combination; Herbert G. Eidson, Jr. ....	Aug.
Custom-Built Cabinet Finishing Techniques; Herbert G. Eidson, Jr. ....	Aug.
Cycling Methods Used in Zenith Multiple-Speed Changers .....	Aug.
Determining Speaker Phasing with Simple Battery Test .....	July
Development of Cartridges, of the Shear-Plate and Bimorph Systems, and Styli for Multiple-Speed Changer Systems .....	June
Dual-Tip Stylus Models .....	June
Electronic and Mechanical Construction of Complete FM-AM Receiver, LP and Standard Phono System .....	June
Electro-Voice Pickup Cartridges .....	Nov.
Eliminating Distortion in Philco Two-Needle Cartridge Assemblies .....	Feb.
Emerson 634B Receiver Three-Speed Automatic Record Changers .....	May
Evolution of the Single-Tipped Stylus for 3-Speed Phone Systems; Howard M. Durbin .....	June
Finishing Cabinets Designed to House Receiver and Amplifiers, and Phone Gear .....	Aug.
Flush Grilles (Wright) .....	Nov.
14-Watt Amplifier Response Curves .....	June
G.E. 4SJ2A1 Consolette Type Toy Record Player .....	Jan.
G.E. 4J3J3A1 Toy Radio-Phono Consolette .....	Jan.
G.E. 4SJ4A1 Paper-Recording disc play-back unit .....	Jan.
G.E. 186-3A Toy Record Player .....	Jan.
G.E. Three-Speed Dual-Stylus Changer Features .....	May
Hi-Fi Amplifier Kit Circuitry .....	Dec.
High-Power Amplifiers .....	Aug.
How to Build a Crossover Network .....	Jan.
How to Develop a Special Phono Preamp-Equalizer for Variable-Reluctance Pick-ups, Build a High-Gain Amplifier (14 Watts), Check Amplifier Efficiency and Choose the Necessary Speakers .....	June
How to Replace Vibrators in PA Systems .....	Aug.
How to Set Up Audio Radio Audio Tests .....	Aug.
Improving the Audio System; Melvin C. Sprinkle .....	Sept.
IFD Radio-Phono Switches .....	Nov.
Lab Type Amplifier with Noise Suppressor .....	Dec.
Lafayette 718 Amplifier Frequency Response .....	Sept.
Locating Troubles in Intermediate and Output Transformers .....	July
Magnavox CR-156 Audio Frequency Response .....	Sept.
Mallory VP-540 Sync Vibrator Power Supply for PA Work .....	Aug.
Masco Plastic-Tape Recorder .....	Nov.
Matching (PA Systems) .....	Aug.
Measuring Amplifier Efficiency .....	July
Methods of Detecting Trouble in Power Supplies Using Synchronous and Non-Synchronous Vibrators .....	Aug.
Miniature Microphone System .....	Sept.
Newcomb Three-Speed Phonos .....	Oct.
NJK TV Audio Amplifier .....	Nov.
PA Frequency-Response Measuring Setup .....	June
Panel Cutouts by G.E. to Convert Single-Speed Mounting Board for Two and Three-Speed Changers .....	June
Parallel-Connected Speaker Voice-Coil Test Setup .....	July
PA System Servicing; John B. Ledbetter .....	July
Philco Electronic Scratch Eliminator .....	Feb.
Philco M-20 Three-Speed System .....	Feb.
Phone Needle-Point Selection Hints .....	Mar.
Philco Phone Combination Three-Speed Changer .....	Feb.
Philco Three-Speed Automatic Record Changers .....	July
Phono Installation and Service; Kenneth Stewart .....	Jan.-Dec.
Power Output Measurement Setup .....	July
Properties of Response .....	Oct.
Public-Address System Servicing; John B. Ledbetter .....	June
Racon Cross-Over Network .....	Jan.
Rauland-Borg Sixty-Watt Bi-Power Amplifier .....	Oct.
Rauland-Borg 32-Watt Amplifier Design .....	Sept.
RCA Duo-Cone Speaker .....	Oct.
RCA Line Amplifiers .....	Nov.
Record-Thickness Problems and Cures .....	Apr.
Remedies for Inoperative LP Changers .....	Apr.
Replacing Phono Parts and Assemblies in Philco Chassis .....	Feb.
Replacement Cartridges .....	Mar.
Replacement of Output Transformers to Step-Up Efficiency of Amplifiers and AF Systems .....	Sept.
Response Curves of Preamp .....	June
Scott 800B AF Frequency Response .....	Sept.
Scratch-Eliminator Circuitry .....	Feb.

Searching and Curing Such Troubles as Hum, Noise, Hash, Interference in PA Systems ..... Aug. Sears-Roebeck Wire Recorders ..... June Sears-Roebeck Wire Recorder Speed Variation Control ..... Jan. Servicing PA Systems; *John B. Ledbetter* Aug. 6L6 Tetrode Amplifier Plate Characteristics, Jan. Speaker Consoles: Data on Types of Wood Necessary, Finishing Techniques, Speaker Baffle, Structure and Mounting Procedures ..... July Sound-Equipment Design Trends ..... June Speaker Baffle Layout ..... July Square-Wave Patterns on 'Scope ..... Nov. Stromberg-Carlson Receiver Record Changers and Cartridges (Complete Chart Listing) ..... June Stromberg-Carlson 16 RPM Phono Compensation Systems ..... Sept. 10-Watt Phono Amplifiers for Custom-Built Installations ..... Dec. Test Techniques to Check Tubes, Components and Circuits (*PA Servicing*) ..... June Tracing Troubles in Microphones and Cartridges ..... July Turntable News ..... Sept. Tweeters ..... Dec. Two Cartridges in Individual Tone Arms ..... June Two-Way Speaker Systems ..... Dec. University Three-Way Speaker System ..... Nov. Velocity-Trip Mechanism Operation ..... May Webster-Chicago 100-641 Portable Phono - Multiple-Speed Changers ..... July Webster-Chicago 130 Three-Speed Phono ..... Aug. Webster-Chicago Tape Recorder for 3 1/4 and 7 1/2 Inches Per Second Operation ..... Nov. Westinghouse V-9022 and V-9114 Receiver Three-Speed Changers ..... May Wire-Recorder Servicing; *Mar. Ath.* ..... Jan. Zenith S-14022, S-14024, S-14025, S-14027 Intermix Record Changers ..... Mar. Intercarrier Sound, Master Oscillator, Turret Tuner and RF Shelf ..... Sept.

## TELEVISION

Admiral Chassis Revision; Eliminating Audio Hum and Sync Buzz, Reducing Vertical White Bars at Left of Picture, Securing More Picture Width, Tube Substitutions ..... Nov. Admiral Receiver Service Suggestions: Increasing Audio Gain, Removing Focusing Difficulties in 16" Tube Models ..... June Admiral 20A1, 20B1, 21A1 TV Receivers, Eliminating Adjacent Sound Interference, Polishing Mars and Fine Scratches on Plastic Escutcheons, Removing Picture Window and Control Escutcheon Static Charges ..... Aug. Admiral 20X1 and 20Y1 ..... Mar. Admiral (24 Series, 20Z1 and 21B1, 21C) Service Helps: Removing Adjacent Channel Interference, Single and Dual Interference Traps ..... Sept. Application of Diodes in AM, FM and TV; *A. T. Parker* ..... Apr. Avoiding Streaks in Picture Tubes in Raytheon 1X2, 6X4 or 6BQ6 Circuitry ..... Apr. Bendix 17-Tube TV Chassis (Data on RF, IF, AGC, Video, Sound, Sync Separation, Vertical Deflection, Horizontal Sweep and Power-Supply Circuitry) ..... Sept. Brilliance Factors (*TV HV Systems*) ..... Oct. Buzz-Modulation Correction (G.E.) ..... Jan. Classification Chart for General Purpose and TV Power Amplifiers ..... Oct. Connecting TV Receivers to Master Antenna Systems; *Ira Kamen* ..... Jan. Controlling Picture Width and Linearity Through Circuitry and Component Applications ..... Mar. Conversion to Large-Screen TV; *Joseph Racker and Philip Selvaggi* ..... Nov. Converter and Rectifier TV Tube Chart ..... Nov. Converting 10-Inch Chassis to 12-Inch and Larger Types Up to 19-Inch ..... Nov. Correcting Tunable Audio Hum ..... Feb. Coupling Two TV Sets to One Antenna; *Jerome Berger* ..... Aug. Cures for Severe Horizontal Shift in Raytheon 12 1/2-Inch Models ..... May Decimeter 2-Stage TV Preamplifier (*Cover*) ..... Mar. Determining Requirements for Picture-Tube Visibility ..... Oct. Dry-Disc Rectifier Circuit Trouble Shooting ..... May DuMont 16TP4 Bent-Gun Rectangular Picture Tube ..... May Electrical and Mechanical Properties of RCA Ultrahigh Tuner and Converter for Pickup of 529-535 Mc Signals ..... May Eliminating Cash Register and Electric Range Switch Interference in TV Receivers ..... Feb. Eliminating Parasitic Oscillation in Horizontal Output Circuit ..... Jan. Eliminating Squegging in Horizontal AFC Circuit in Raytheon Chassis ..... May Emerson TV (470606) and Stromberg-Carlson Chassis (TS) Tuners ..... July Experimental UHF TV Tuner and Converter; *E. I. Jeffrey* ..... May Factors Affecting TV Radiation ..... Nov.

Factors Influencing Horizontal Size and Linearity; *J. F. Bigelow* ..... Mar. Finding Your Way Around a TV Chassis; *Cyrus Glickstein* ..... Dec. Five Basic TV Test Instruments ..... Oct. Gated AGC (Zenith 24G22/23/24/25) ..... Feb. G.E. Aluminized 16- and 19-Inch Rectangular and Metal-Envelope Picture Tubes ..... Nov. G.E. Balanced Output Adapter ..... July G.E. DC Restorer System ..... Apr. G.E. 801, 802, 803 TV Modifications Involving Insufficient High Voltage, Picture-Width Circuitry, Linearity and Contrast Control ..... May G.E. 810, 811, 814, 820, 830, 835, 840 Modifications: High Channel Interference Traps ..... Aug. G.E. 817 and 821 (*Sync Separation*) ..... Jan. G.E. 4SJ2A1 Consolette Type Toy Record Player ..... Jan. G.E. 4SJ3A1 Toy Radio-Phono Console ..... Jan. G.E. +SJ4A1 Paper-Recording Disc-Play-back Unit ..... Jan. G.E. 14CP4 14-Inch Rectangular Picture Tube ..... May G.E. 186-3A Toy Record Player ..... Jan. G.E. Sweep Generator, Marker Generator and 'Scope in Aligning TV Receivers ..... July Hoffman (170) TV Chassis Modifications: Contrast Improvement; Eliminating Christmas-Tree Effects; Eliminating Sinear ..... Nov. Horizontal Output Circuitry ..... Mar. How to Stop Arcing or Corona in 16-Inch TV Models ..... Feb. Identifying and Eliminating Various Types of TV Interference ..... Jan. Improved HV Power Supply and Picture-Tube Alterations (Westinghouse) ..... Jan. Input Which Discriminates Against Diathermy and SW Type of Interference in TV Bands ..... Aug. Installation of 6C4 Phase Detector in Place of 6C4 Phase Inverter and 6AL5 Horizontal AFC in Westinghouse Chassis ..... Dec. Intercarrier System (Zenith 24G22/23/24/25) ..... Feb. Installation and Servicing of Adapter Plug for TV Sets ..... Feb. Iso Units for Transformerless TV Models While Troubleshooting ..... Feb. ITI Automatic TV/FM Booster System ..... Dec. Keyed AGC and Sync Systems (Westinghouse H-600T16, H-603C12, H-605T12, H-606K12, H-607K12, H-608C12, H-609T10) ..... Sept. Kickback High-Voltage Supply Troubles ..... Oct. Large-Screen Conversion: Use of Modified Sweep and High-Voltage Circuits Involving Wider Deflection Circuits, 6CD6G Driving Tubes Instead of 6BG6s and Voltage Doubler Techniques ..... Nov. Locating Defects in Picture-Tube Circuitry ..... Oct. Locating Defects When Schematic or Chassis Data Are Not Available ..... Dec. Magnavox CT247, 248, 249 (12 1/2"-16" TV Chassis); *J. F. Bigelow* ..... Feb. Magnavox M-1 2-Tube TV Tuner; *C. S. Root* ..... Sept. Master-Antenna System Setup for 72- and 300-Ohm Leadins ..... Apr. Master-Antenna Systems; *Jerome Berger* ..... Apr. Master-Antenna System Expansion System ..... Apr. Master TV Antenna Systems; *Ira Kamen* ..... Jan. Motorola TS-16/TS-30 Series (Data on Squelch Diode, Automatic Linearity Control, Anastigmatic Deflection Yoke System, and Input for UHF Converter) ..... May Motorola TS-89/TS-94/TS-95 TV Chassis Modifications: Elimination of Vertical Collapse; Improving Picture Quality, Vertical Sync Stabilization; Reduction of Horizontal Radiation ..... Oct. Multiple Dwelling Installations Involving 72- and 300-Ohm Input Systems; *Ira Kamen* ..... Jan. Multiple Outlet Systems for Smaller Dealers ..... Apr. TV2 Application Notes ..... Jan. Philco Channel Adjusters ..... Apr. Philco (50-T1400 Series, Runs 1 and 2 Chassis) Service Hints: Reducing Vertical Jitter; Preventing Horizontal Sync at Minimum Contrast Settings ..... Sept. Philco (50-T1600, 50-T1632, 50-T1633) AGC Circuit Modifications ..... Sept. Philco Narrow-Neck Picture-Tube Models ..... Nov. Philco RC-1 Remote-Control Design and Operational Characteristics ..... Sept. Philco Remote-Control Gear and Clutch Assembly ..... Sept. Philco TV Chassis Analysis: Common IF Amplifier, Incremental Version of Tapered Line Tuner, Horizontal Linearity System, Gated AGC Amplifier, and Vertical Retrace Suppression ..... Aug. Picture Size Control Through High-Voltage Regulation ..... Mar. Precautions, Limitations and Uses of Sweep Generators (*Cover*); *Marcel J. Acremaine* ..... Aug. Preventing 1X2 Filament Failures ..... Apr. Providing Series-Filament Continuity When Picture Tube Is Removed ..... Jan. Racon Crossover Network ..... Jan. Raytheon 12AX22 Chassis Modifications ..... May

Raytheon Receiver Modifications to Secure Better Picture Centering, Increase Range of Vertical Hold Control, Improve High-Voltage Supply Dressing, Provide 6V6 Tube Protection and Eliminate Folding ..... May Raytheon TV Built-In Antenna ..... May Raytheon Video IF Amplifier Tubes ..... May RCA Iso Tap ..... Feb. RCA T100, T120, TC124, TC125, TC127, TA128, TA129 TV Chassis Hints: Deflection Yoke Circuit Changes; Eliminating EM-PM Focus Coil Troubles; High-Pass Filter Cutoff Remedies; Minimizing AM Broadcasting Interference; Preventing Poor Vertical Linearity ..... Aug. RCA 12 1/2", 16" and 19" TV Chassis ..... Oct. RCA 20E3 TV Tuner (*Cover*) ..... May RCA UHF Converter ..... May RCA UHF Tuner and Power Supply ..... May Removing Focusing Difficulties in Admiral 16" Tube Models ..... June Removing Motorboating in Philco Sets ..... June Separate Picture-Tube Filament Winding Addition (G. E.) ..... Jan. Servicing TV Flyback HV Systems; *Cyrus Glickstein* ..... Oct. Simplified Circuit Modifications of Front Ends, IF Picture Amplifiers, IF Sound Amplifiers, Oscillator Systems ..... Apr. Simplified TV Master-Antenna Systems; *Jerome Berger* ..... Apr. Single Antenna System Used to Feed a Pair of 75- or 300-Ohm Receivers Through a Coupler ..... Aug. 6AL5's in Video Detectors and Sound Channel Detectors ..... Apr. 6AU5GT Application Notes ..... Jan. 6CB Application Notes ..... Jan. 16GU4 Centering Adjustments ..... Dec. Solving Problems of Instrument Matching, Leakage, Attenuation and Linearity ..... July Sonic It-4 TV/FM Preamp (*Cover*) ..... Apr. Sources of TV Interference and New Methods to Eliminate Problems ..... Aug. Stage-by-Stage Check Procedures ..... Dec. Streamlining Trends in TV Circuitry; *David T. Armstrong* ..... Apr. Stewart-Warner AM/FM/TV 9104 Chassis Series ..... Apr. Stromberg-Carlson AM/FM/TV Front-End (TS Series) ..... June Stromberg-Carlson Servicing Hints ..... June Stromberg-Carlson Service Notes ..... Dec. Stromberg-Carlson TS TV Models Analysis (*Data on Automatic Black Level Diode, Automatic Frequency Control of Horizontal Sweep, Dual Function AGC Delay System and High and Low-Band Inputs*) ..... June Sweep Generator Circuitry Requirements and their Relation to Application Possibilities ..... Aug. Sweep-Generator Procedures Found Effective in Operation as TV or FM Alignment Tool ..... Aug.sylvania 19C8 Miniature Tubes with Three Diode and High-Mu Triode Sections ..... Maysylvania 19-Inch Metal Picture Tube ..... May Sync Separator (Zenith 24G22/23/24/25) ..... Feb. TV Alignment Procedures (*Cover*); *M. E. Clark* ..... July TV and General Purpose Tube Classification Charts for RF, IF, AF and Power Amplifiers ..... Oct. TV Electronic Magnifier Conversion Installations (*Circuits for Air King, Ansley, Bace, Crosley, De' Wald, Hoffman, International Television, Nielsen, Philmore, RCA, Starrett, Federal Television, Olympic, Philharmonic, Teletone, U. S. Television, Western Auto, Artone, Gamble-Skagmo, Hallicrafters, United Motors, Midwest, Scott, Sears Roebuck*); *B. W. Marwyn* ..... May TV and FM Basic Circuit and Component Factors in Diode Applications ..... Apr. TV Servicing Isolation Transformers; *Arthur Lichscher* ..... Feb. TV Cross Hatch Generator (*Cover*); *Allan Lytle* ..... Jan. TVI ... Causes and Remedies (*Report on Status of Nine Sources of Interference*); *Ira Kamen* ..... Aug. TVI ... Causes and Remedies (*Part II*); *Ira Kamen* ..... Oct. TVI: Electromedical and Industrial Apparatus Interference ..... Aug. TVI: FM Receiver Radiation on Channels 5 and 6 ..... Aug. TVI: Interference Due to Lack of Image Rejection in TV Chassis ..... Aug. TVI: Interference from Hams ..... Aug. TVI: Interference from Ignition Systems ..... Aug. TVI: Local Oscillators of TV Sets Interference ..... Aug. TVI: Prewar Diathermy Equipment Interference ..... Aug. TVI: Second Harmonic of FM Stations ..... Aug. TVI: TV Receiver Sweep and Video Circuit Radiation ..... Aug. TV Receiver Production Changes; *Donald Phillips* ..... Jan., Apr., May, Sept. TV Remote-Control Systems ..... Sept. TV Sync and Inter-Sync Systems; *Edward M. Noll* ..... May Use of Projection System for 30- by 40-Inch Pictures from a 10-Inch Tube ..... Nov. Vertical and Horizontal Sweep (Zenith 24G22/23/24/25) ..... Feb.

Vertical Size Circuitry Modifications (G. E.). Jan.  
 Westinghouse Chassis Alterations: Improving Horizontal Linearity Control; Securing More Filament Voltage for 1N2A;  
 TV Tube Substitutions ..... Oct.  
 Westinghouse Electronic Magnifier Circuitry May  
 Westinghouse H-223 ..... Jan.  
 Westinghouse H-223 DC Restore, Phase Inverter and Sync Separator, and Audio Channel Circuitry ..... Feb.  
 Westinghouse H-242 HV Supply (With 6V6G in place of 6V6GT) ..... Jan.  
 Westinghouse RF Tuner, IF Amplifier and Noise Clipper Circuit Revisions ..... Apr.  
 Westinghouse TV Receiver Built-In Antennas and Sound IF Channel Circuitry ..... July  
 Westinghouse V-2150-176 Chassis Changes, May  
 Westinghouse (V-2150-106) Revised AGC, Sept.  
 Westinghouse (V-2152-01) TV Sound System Circuitry ..... Sept.  
 Zenith Circular-Screen Models for 1950 ..... Feb.  
 Zenith 1950 Circular Screen Model, HV Supply, Damping Tube and Beam-Bending System ..... Mar.  
 Zenith TV Chassis Overall Video IF Response ..... Sept.  
 Zenith 23G22 Chassis Alignment of IF, Intercarrier Sound, Master Oscillator, Turret Turner and RF Shelf; AGC and AFC Adjustments ..... Sept.

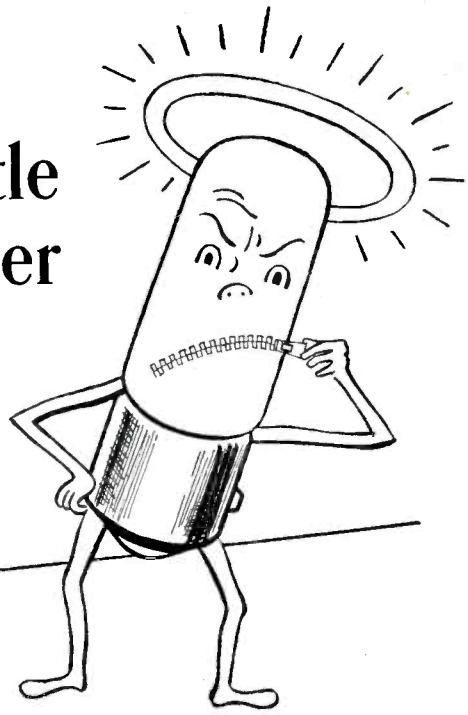
#### TEST EQUIPMENT

AF Sweep and 'Scope Check on Frequency Response, Noise, Hum, Harmonic Distortion and Transient Response ..... Feb.  
 Alignment of the Ratio-Detector and Discriminator Detector Systems with a VTVM and Single-Frequency Generator of AM Type (Part II); Allan Lytel ..... Dec.  
 Alignment Techniques, TV Receiver Visual; Martin Meyerson ..... Sept.  
 Alignment with Single-Frequency Signal Generator of AM Type and VTVM ..... Nov.  
 A One-Tube Square-Wave Generator; Richard H. Dorf ..... Nov.  
 Auto Radio Tools and Test Equipment; Jack Darr ..... Aug.  
 Battery Efficiency Testing ..... Oct.  
 Center Frequency Measurement; Wyn Martin ..... Nov.  
 Checking Frequency of Local Oscillators of Receivers, Lab Oscillators and Transmitters ..... Nov.  
 Checking Instrument Efficiency ..... July  
 Clarkstan 123 AF Sweep Generator ..... Feb.  
 Control Measuring Technique Employing Heterodyne Type Band-Spread Instruments ..... Nov.  
 Dual-Triode Instrument, Using an Aperiodic Flip-Flop Circuit (1-Tube Square-Wave Generator) ..... Nov.  
 Features Required in Allied Test Equipment to Assure Best Results with Sweep Generators ..... Aug.  
 Five Basic TV Test Instruments ..... Oct.  
 G. E. Balanced Output Adapter (TV Alignment) ..... July  
 G. E. Sweep Generator, Marker Generator and 'Scope in Aligning TV Receivers ..... July  
 Hickock 620 (TV Cross-Hatch Generator). Jan.  
 Instruments Required for Shop and Outdoor Servicing ..... Aug.  
 Location of Troubles Through 'Scope Patterns ..... Feb.  
 Measuring Amplifier Efficiency ..... July  
 Meter Applications in Auto Radio Testing, Aug.  
 Parallel-Connected Speaker Voice-Coil Test Setup ..... July  
 Power Output Measurements ..... July  
 Precautions, Limitations and Uses of Sweep Generators; Marcel J. Aucremanne ..... Aug.  
 RCA 7JP1 7-Inch 'Scope Tube with Anode Voltage of 6000 ..... Nov.  
 RF Reactance Measurement Tests; Philip H. Greeley (Cover) ..... Dec.  
 Servicing FM Detectors; Allan Lytel ..... Nov.  
 Servicing FM Detectors; Allan Lytel ..... Dec.  
 Solving Problems of Instrument Matching, Leakage, Attenuation and Linearity ..... July  
 Sweep Generator's Capabilities ..... Aug.  
 Sweep Generator Circuitry Requirements and their Relation to Application Possibilities ..... Aug.  
 Sweep-Generator Procedures Found Effective in Operation as TV or FM Alignment Tool ..... Aug.  
 Sylvania 500 TV-FM Sweep Generator (Cover) ..... Aug.  
 Testing 'Scopes for Square-Wave Response, July  
 The AF Sweep Generator in Servicing Operations; John B. Ledbetter ..... Feb.  
 TV Alignment Procedures (Cover); M. E. Clark ..... July  
 TV Receiver Visual Alignment Techniques; Martin Meyerson ..... Sept.  
 TV Servicing Isolation Transformers; Arthur Liebscher ..... Feb.

#### TUBE NEWS

Beam-Power Amplifier and Phase Inverter Problems and Solutions ..... Jan.  
 Classification Chart for General Purpose and TV Power Amplifiers ..... Oct.  
 Design and Application Features of Auto and PA Tubes ..... May

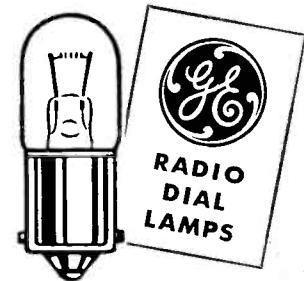
## The tough little lamp that never talks back



in wires—a vibration-proof joint. They take the shrillest soprano in stride without "talking back", last longer, assure customer satisfaction.

For full information on prices and types of G-E miniature lamps, call your G-E Lamp supplier. Or write Lamp Department, Division 166-S1, General Electric Company, Nela Park, Cleveland 12, Ohio.

1. Dependable, trouble-free performance.
2. High level of maintained light output.
3. Low current consumption.
4. Long life.
5. Profitable to handle.



**GENERAL ELECTRIC**

Design and Applications of PA Tubes ..... May	6SC7 Phase-Inverter Circuit ..... Jan.
Du Mont 12LP4A Picture Tube ..... Mar.	6V6 Push-Pull Amplifiers ..... Feb.
Du Mont 16TP4 Bent-Gun Rectangular Picture Tube ..... May	16-Inch Tube Identity Chart ..... Feb.
14", 16", and 17" Rectangular Picture Tubes, and 24" Circular Types ..... June	16GP4 Centering Adjustments ..... Dec.
G.E. Aluminized 16 and 19-Inch Rectangular and Metal-Envelope Picture Tubes ..... Nov.	Sylvania 19C8 Miniatures with Three Diode and High-Mu Triode Sections ..... May
G.E. 14CP4 14-Inch Rectangular Picture Tube ..... May	Sylvania 19-Inch Metal Picture Tubes ..... May
G.E. TV Receiving Tubes ..... Mar.	Sylvania Portable Receiver Tubes ..... Mar.
High-Rating TV Rectifiers and Twin Triodes ..... June	Tube Chart for RF-IF, AF and Indicator Applications ..... Oct.
High-Voltage Tubes ..... Nov.	Tube Curves to Predict Possible Circuit Problems and Solutions ..... Jan.
Indicator Gun Picture Tube Design and Application ..... Apr.	Tube Plots for Push-Pull Amplifiers ..... Feb.
Ion Trap Adjustment Procedures ..... Apr.	TV and FM Tubes 6BN6, 1V2, 6CB6, 6AU5GT ..... Jan.
Multi-Function Tube Chart ..... Nov.	TV and General Purpose Tube Classification Charts for RF, IF, AF, and Power Amplifiers ..... Oct.
Picture Tube Interchangeability Data ..... Apr.	Use of Tube Curves to Diagnose Circuit Performance (Part III); Edward M. Noll ..... Jan.
Raytheon Video IF Amplifier Tubes ..... May	Use of Tube Curves to Diagnose Circuit Performance (Part IV); Edward M. Noll ..... Jan.
RCA 7JP1 7-Inch 'Scope Tube with Anode Voltage of 6000 ..... Nov.	
Rectifiers, Voltage Regulator and Control Service TV Tube Chart ..... Nov.	
6L6 Tetrode Amplifier and Plate Characteristics ..... Jan.	

# BECOME EXPERT

## with OSCILLOSCOPES

This practical book tells you everything you should know about an oscilloscope! **WHAT** it is . . . what it can **DO** . . . and **HOW** to use it properly!

## ENCYCLOPEDIA ON CATHODE-RAY OSCILLOSCOPES AND THEIR USES

by John F. Rider and Seymour D. Uslan

The FIRST and ONLY book that so fully and clearly describes the 'scope . . . its construction . . . its capabilities . . . its applications in servicing, engineering, research . . . with thousands of time-saving and labor-saving references, charts, waveforms, etc.



All oscilloscopes produced during the past ten years, a total of more than 70 different models, are accurately described—with specifications and wiring diagrams.

Planning to buy a 'scope? This book will help you select the type best suited to your needs! If you already own one, the book will show you how to increase your instrument's usefulness and, naturally, its value to you!

We GUARANTEE that it will **SAVE** and **EARN** many, many times its cost for you! 992 Pages • 500,000 Words • 3,000 Illustrations 8½ x 11" Size • 22 Chapters • Completely Indexed Easy to Read • Cloth Bound . . . And only \$9.00

## with ANTENNAS

### TV and OTHER RECEIVING ANTENNAS

(Theory and Practice)

by Arnold B. Bailey

Tells you . . . **WHAT** each type can do . . . **HOW** to use it . . . and **WHICH** is best!

This is a text book on all types of receiving antennas. If you have any questions—you'll find the answers in this book! Teacher, engineer, student, service technician—all can use this text. WE GUARANTEE IT! Antenna data never before published anywhere will be found in it. And it's readable—because mathematics has been translated into charts and graphs.

**Everything you hoped for . . . and asked for!** 606 Pages . . . 310 Illustrations . . . And only \$6.00

## at TV INSTALLATIONS

Stop wasting time, patience, and money in trying to "dope out" those difficult TV installations!

## TV INSTALLATION TECHNIQUES

by Samuel L. Marshall



Order this RIDER book, the ONLY text that gives you complete information on all the mechanical and electrical considerations.

KNOW the absolute facts about such things as ice loading, wind surface, and mounting requirements—whether for short chimney-attached mast or an 80 ft. tower, including foundation.

HAVE at your fingertips, accurate data on receiver adjustments in the home . . . municipal regulations governing the installation of TV antennas and masts in all of the major television areas in the U. S.

SURE to help you wherever and whenever an installation becomes a problem! A TIMELY and IMPORTANT book!

336 Pages • 270 Illustrations • 5½" x 8½" Size Cloth Bound . . . And only \$3.60

10 - DAY MONEY - BACK GUARANTEE—Make these books PROVE their value! Unless you agree they are the best investments you've ever made—return the books, in good condition, for refund.

## RUSH THIS COUPON TODAY

JOHN F. RIDER PUBLISHER, INC.  
480 Canal Street, New York 13, N. Y.

Please send me the following books on your 10-day MONEY-BACK GUARANTEE. If not satisfied, I will return the books, in good condition, for refund.

"ENCYCLOPEDIA ON CATHODE-RAY  
OSCILLOSCOPES AND THEIR USES" . . . \$9.00  
"TV and OTHER RECEIVING ANTENNAS" . . . 6.00  
"TV INSTALLATION TECHNIQUES" . . . 3.60

Name . . . . .  
Address . . . . .  
City . . . . . Zone . . . . State . . . .

SAVE POSTAGE. If you enclose check or money-order WITH coupon, we will prepay postage charges. Money back if you return books within 10 days.

Check Enclosed.  Money-Order Enclosed

□ C.O.D. 6

## Servicing Helps

(Continued from page 16)

and ground presents a relatively low impedance to the 15,750-cps sync pulses, and the control grid can be considered to be at ground potential at this frequency. Since the negative-going sync pulses are applied between the cathode and ground and the control grid is effectively at ground potential, it is apparent that the cathode is negative with respect to the control grid during the time of each sync pulse. Under this condition, the grid conducts and the flow of current charges  $C_{410}$ . After the sync pulse passes,  $C_{410}$  discharges and current flows down through  $R_{428}$  and  $R_{429}$  developing a voltage ( $E_d$ ) which is negative at the grid with respect to ground.

### Sawtooth Lagging Sync

If the sync pulse is applied to the cathode at the same time as the most-negative part of the sawtooth is applied to the plate (sawtooth lagging sync), the negative potential on the plate will allow maximum grid current to flow, and maximum negative ( $E_d$ ) will be developed. At the same time, the negative potential on the plate will prohibit any plate current flow. The negative correction voltage ( $E_d$ ) is filtered by  $C_{410}$ ,  $R_{421}$  and  $C_{420}$  and is applied to the grid of the horizontal multivibrator to correct the oscillator frequency.

However, if the sync pulse is applied to the cathode at the same time as the most-positive part of the sawtooth is applied to the plate (sawtooth leading sync), the positive potential on the plate causes plate current to flow. The flow of plate current up through  $R_{429}$  develops a voltage ( $E_k$ ) that is positive on the cathode end of the resistor. At the same time, the positive voltage on the plate causes a reduction in grid current flow, and the voltage across  $R_{428}$  ( $E_g$ ) is reduced. The voltages  $E_g$  and  $E_k$  add algebraically to produce a correction voltage ( $E_d$ ) which is positive with respect to ground.

Since the correction voltage varies from negative to positive depending on the relationship between the sync pulses and the sawtooth output, it follows that the voltages will balance out to zero under the intermediate or synchronized conditions.

### Stromberg-Carlson Service Notes

**Model 119 . . . Improved Picture Focus:** The action of the focus control has been improved by removing the  $R_{266}$  4,700-ohm resistor which shunted

## SHOOTS TROUBLE FASTER!

Makes more money  
for you on job or  
at service bench!



## Signalette

### MULTI-FREQUENCY GENERATOR

In radio service work, time means money. Locate trouble faster, handle a much greater volume of work with the SIGNALETTE. As a trouble shooting tool SIGNALETTE has no equal. Merely plug in any 110V. AC-DC line, start at speaker end of circuit and trace back, stage by stage, listening in set's speaker. Generates RF, IF and AUDIO Frequencies, 2500 cycles to 20 Megacycles. Also used for checks on Sensitivity, Gain, Peaking, Shielding, Tube Testing. Wt. 13 oz. Fits pocket or tool kit. Satisfaction, or money back! See at your distributor or order direct.

## Clippard INSTRUMENT LABORATORY Inc.

DEPT. C, 1125 BANK STREBET  
CINCINNATI 14, OHIO  
QUALIFIED JOBBERS WRITE,  
WIRE FOR DETAILS.

## The World's Finest LIGHTNING ARRESTERS

### MODEL RW-204



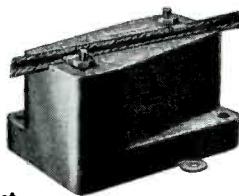
The first and only lightning arrester that will accommodate 4-wire line for antenna rotator installation as well as regular 2-wire transmission line.

Only \$1.50 List



### MODEL RW-300

For use with 2-wire standard antenna ribbon type transmission line for TV or FM. An air gap plus resistors provide double protection.



Only \$2.00 List

# VEE-D-X

LaPointe-Plascomold Corp., Unionville, Conn.

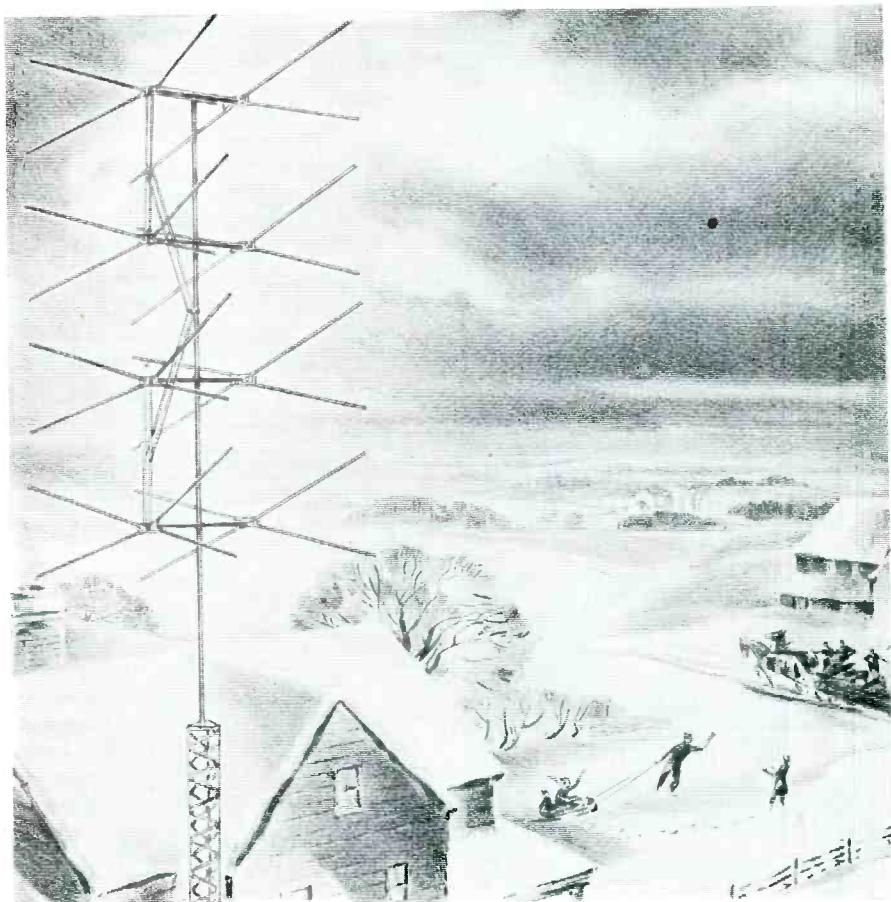
the focus potentiometer and the  $R_{286}$  series resistor. This change allows proper picture focus to be obtained nearer the mid-range of the focus control. The beam spot on the picture tube screen has been reduced in size to improve the overall in-focus picture area by raising the voltage supplied to the picture-tube screen. This voltage increase has been accomplished by disconnecting the screen lead from video amplifier screen supply point and reconnecting it through a 100,000-ohm resistor to the boosted dc voltage that appears at the No. 3 terminal of the horizontal output transformer. The screen side of the 100,000-ohm resistor is bypassed to ground with a .01-mfd capacitor.

**Model 17-RPM . . . Audio Buzz:** Some cases of *audio buzz* with the volume control completely off, have been experienced in these receivers. This condition has been traceable to vertical sync getting into the leads to the tone control and hence into the audio circuits. The tone control lead is now being shielded in production units, and receivers in the field can be cured by physically separating the lead wires going to the vertical control and to the tone control.

**Model TC19 . . . Vertical White streaks on Right Side of Picture:** The condition can usually be corrected by replacing the 100-ohm parasitic resistors ( $R_{202}$  and  $R_{203}$ ) in the grid circuits of the two 6BG6 horizontal sweep output tubes.

**Model 17 . . . IF Tube Substitution:** In anticipation of shortages of 6AH6s, the wiring at the fourth if socket has been modified. Pin 2 of the if ( $V_{21}$ ) socket is now being wired to pin 7 of the same socket instead of to ground. This wiring revision permits 6AH6s and 6BH6s to be used interchangeably. Realignment is required when direct tube substitutions are made in receivers so modified. Tube labels and circuit diagrams designate the 6AH6 type in this position, but replacements of tubes in this position should be made with same type removed. Slight loss of gain in this stage can be expected when 6BH6s are used.

**Models 116, 17, and 119 . . . Securing Ganged Cores in Tuner Carriage:** The powdered iron cores, mounted in the movable carriage of the tuner unit, are being held in position after aligning adjustments by a rubber cement compound applied at the junction of the adjusting screw body and the supporting rubber grommet. Speed nuts were previously used in this position. If these core positions are changed with respect to the carriage, they should be recemented in place.



*To Distributors, Dealers and Service Men,*  
everywhere, we extend our best wishes for a Merry Christmas and a Happy, Prosperous New Year. Our sincere thanks for your splendid help in bettering TV reception by installing famous-for-performance TELREX Conical-V-Beams. We, in turn, will continue to cooperate with every segment of the industry in making television bigger, and better in every way!



### RF Test

(Continued from page 24)

common audio and video amplifiers, other *rc* circuits, and in many bypass applications can be checked quickly and effectively. This is a check for capacity value, good terminal connections, and no leakage breakdown; slight leakage does not affect the capacity value test. If a capacitor must be replaced because of leakage as may have been shown by tests with a *vtvm*, a replacement capacitor may be matched with the original by this test.

[To Be Continued]

### TUBE SALES AID



Above: Julius Haber, (left) RCA tube department advertising and sales promotion manager presenting first copy of copper tube display plaque to L. S. Thees, (right) general sales manager of the tube department.

**ATOM**

SPRAGUE ATOMS

TWIST-LOK

Every SPRAGUE TV  
dry electrolytic  
is processed

FOR 185° F (85°C)  
OPERATION!

Sprague leads again with the largest, most complete line of replacement electrolytic capacitors for television receivers. Each type is engineered especially for tough video applications and will stand up under the high temperatures, high ripple currents and high voltage surges encountered in TV equipment. Every Sprague TV capacitor rated at 450 d-c working voltage or less has been processed for 185°F. (85°C.) operation. Send postcard for special TV Bulletin.

**SPRAGUE PRODUCTS CO.**  
61 Marshall Street  
NORTH ADAMS • MASS.

## Associations

(Continued from page 40)

auditorium of the Central Commercial High School, N. Y. City.

The extremely interesting series of television lectures, inaugurated last year, are being continued, and recently representatives of Emerson and Oak Ridge Products appeared to deliver talks on horizontal sync circuits and rapid servicing methods of television receivers, respectively.

### ESFETA

THE '50-'51 SERIES of TV lectures were recently begun by the Empire State Federation of Electronic Technicians with a talk in New York City by John F. Rider. In other talks detailed for the New York area, Hickok, Bendix and Philco representatives have been scheduled to appear. Members of these companies have also been calendared for appearances in Long Island, Poughkeepsie-Kingston, Endicott-Binghamton, and Rochester. In the latter two areas, Motorola experts are expected to appear, also.

Irving Brown will present the talks for Emerson on horizontal *afc*.

### NATESA

A LETTER from Frank Moch, president of the National Alliance of Television and Electronics Service Associations, sent out recently covered the proposed plans of their new group, and in addition contained an invitation to industry to participate in a discussion in Chicago of such problems as material, warranties, manpower, color TV.

Moch declared in his letter: "This association is suggesting this meeting in a cooperative spirit. We know that the serious problems of the industry can not be solved by one group, and that rather than expend strength in fighting each other, the many elements of the industry should recognize existing problems and join in mutual solutions of these problems."

## ELECTRONICS TECHNICIANS WANTED

The RCA Service Company, Inc., a Radio Corporation of America subsidiary, needs qualified electronics technicians for U. S. and overseas assignments. Candidates must be of good character and qualified in the installation or maintenance of RADAR or COMMUNICATIONS equipment or TELEVISION receivers. No age limits, but must have at least three years of practical experience.

RCA Service Company offers comprehensive Company-paid hospitalization, accident and life insurance programs; paid vacations and holidays; periodic review for salary increases; and opportunity to obtain permanent position in our national and international service organization, engaged in the installation and maintenance of AM, FM and TV transmitters, electronic inspection devices, electron microscopes, theatre and home television, r-f heating equipment, mobile and microwave communications systems, and similar electronic equipment.

Base pay, overseas bonus, payments for actual living and other expenses, and benefits mentioned above add up to \$7,000 per year to start for overseas assignments, with periodic review of base salary thereafter. Openings also available at proportionately higher salaries for specially qualified technicians with supervisory ability.

Qualified technicians seeking an advantageous connection with a well-established company, having a broad-based, permanent peacetime and wartime service program, write to:

Mr. G. H. Metz, Personnel Manager  
RCA Service Company, Inc.  
Camden 2, New Jersey



## NEED A FREQUENCY METER?



... for Two-Way Mobile,  
Marine or Aircraft Radio?

If you do you'd better investigate the MICROMETER FREQUENCY METER (MFM). Unusually well suited to a serviceman's needs, the MFM will measure an infinite number of transmitter or oscillator frequencies from 0.1 to 175 MC. with an accuracy of 0.005% to 0.0025%.

The MFM doubles as a signal generator above 30 MC for final alignment of super-selective receivers.

Four models. Prices \$129.00 to \$202.00. Prompt delivery

Write, wire or phone

**LAMPKIN LABORATORIES, INC.**  
Measurements Division • Bradenton, Florida

## FM Detectors

(Continued from page 32)

a steady state *dc* voltage, which may be used for *avc*. The audio-output voltage will now be a function only of frequency change and not amplitude change. As the diodes conduct different amounts, due to the phase shift introduced above and below resonance, the output resistors and their associated capacitors, act only as a voltage divider network whose total voltage is kept constant. In this manner, no amplitude variations are effective, since the total output voltage across  $R_1 + R_2$  is constant and can only change at a very slow rate.

The ratio detector shown in Fig. 1 is similar to the discriminator, at least insofar as the voltage relations in the secondary are concerned. The *if* amplifier,  $V_A$ , operates at 10.7 mc, which is the frequency to which its tank circuit is tuned with capacitor  $C_1$ . Two signals are introduced in the secondary of this transformer. One is coupled directly, by means of the capacitor  $C_8$  and the other signal is induced by the magnetic coupling between primary and secondary. The transformer arrangement and its voltage relationships are the same for the ratio detector as they were for the discriminator: Only the diodes and their load resistors are different.

By reversing one of the diodes, the output loads are now additive; this may be seen by tracing the current flow for either tube from cathode to plate through the secondary winding, through the *rf* choke, and from minus to plus across the load resistor.

The action of the ratio detector, in being non-responsive to amplitude variations in signal, may be seen from Table 1. Let us suppose that we had a discriminator whose output voltage we could compare to this ratio detector. If one output load resistor had a positive 2 volts and the other output resistor a negative 2 volts, the ratio detector output would be zero and the discriminator output would also be zero under the same conditions. These two output voltages would only be zero when the frequency being received was 10.7 mc, corresponding to an unmodulated *if* signal. If the two output voltages were +4 and -4 volts, both the ratio detector and discriminator would again have zero output.

When a modulated signal is being received, the output load resistors are unbalanced to provide an output signal. If the voltages are +3 and -6, the discriminator would have the difference between these as its output, or -3 volts. A ratio detector would have an output proportional to the ratio between these



"A jack of all trades is a master of none".

We, at Oxford, are devoting our efforts solely to making speakers and have been specializing in outstanding speaker production since 1924.

Our highly skilled engineers and technicians, our expansive volume production facilities, and our every effort are for the sole purpose of manufacturing speakers. Because we are SPEAKER SPECIALISTS, Oxford has met the most exacting needs, which has resulted in countless satisfied customers. Our sales policies are always fair and workable for your benefit.

The next time you need speakers, specify OXFORD . . . the product of men who know the speaker business . . . specialists to serve your every need.

Write for your copy of our new catalog today!

Leading jobbers carry Oxford Speakers for TV, FM, AM, AUTO and PA.



**OXFORD ELECTRIC CORPORATION**

3911 South Michigan Avenue • Chicago 15, Illinois

EXPORT: ROBURN AGENCIES, NEW YORK CITY

voltages, or -2 volts. If the incoming signal increases in amplitude (and the frequency stays the same) the output voltages could change to +6 and -12 (which is twice the first output voltage of -3). This output voltage is -6 for the discriminator. The ratio detector, however, still has an output of -2, since 3 is to 6 as 6 is to 12 and the ratio in both cases is 2. A further increase in signal amplitude providing a +12 and -24-volt signal across the load resistors, would produce a -12 volts in the discriminator. But, the ratio detector output would remain at -2 volts. An increase in signal amplitude, but not frequency, would result in an increase in the discriminator out-

put, but not in the ratio-detector output.

We have been considering an output voltage which is negative; exactly the same action can be seen with a positive output voltage. If the two load resistors produced voltages of +6 and -3, the discriminator output would be their difference or +3 volts, while the ratio detector output under the same conditions would be +2 volts, which is the ratio of 6 to 3. If an increase in signal amplitude doubles these voltage outputs, we would have +12 and -6 or a +6 volts for the discriminator and the unchanged +2 volts from the ratio detector.

[To Be Concluded in January]

# PHOENIX

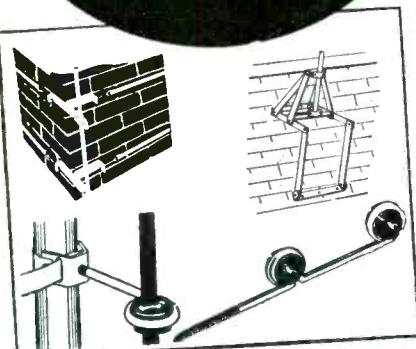


SPEED-MOUNTS and

## HARDWARE

**WILL  
REDUCE**

.... HIGH COSTS  
.... INSTALLATION  
TIME  
... CALLBACKS



**PHOENIX ELECTRONICS INC.**  
LAWRENCE, MASS.

### Tube News

(Continued from page 18)

the deflecting yoke windings and air gap of the focusing device becomes greater.

#### Ion-Trap-Magnet Requirements

The 16GP4 employs a tilted gun to provide correct beam alignment with a single-field ion-trap magnet. The ion-trap magnet is placed on the neck of the picture tube approximately opposite grid No. 1. The direction of the magnetic field of the ion-trap must be such

that the north pole is adjacent to vacant pin position No. 8 and the south pole to pin No. 2. The field strength required of the ion-trap magnet will vary directly with the square root of the anode voltage.

When difficulty is encountered in obtaining centering, reversing the field of the focusing device often provides easier centering. When an electromagnetic type of focusing device is used, reversal can be accomplished by changing the direction of current flow. For a permanent-magnet type of focusing device, the field can be reversed only by turning the focusing device end for end. This expedient, however, is not recommended if the air gap is not physically symmetrical with the two ends of the focusing device. If centering of the raster still remains difficult, the desired centering range can be provided by rotating the picture tube or by turning the ion-trap magnet end for end but keeping the poles on the same side of the gun. When an ion-trap magnet having a non-uniform field in the region where the beam passes is used, turning the magnet end for end will place a different field strength in the region where the beam passes.

### Ser-Cuits

(Continued from page 38)

flection transformer. The plate voltage is thus applied at a horizontal rate, while the grid signal is obtained from the output of the first video amplifier. The *agc* voltage is developed across a resistor,  $R_{50}$ , and fed to the first three *if* amplifiers. Due to the divided network of  $R_{44}$  and  $R_{51}$ , only a portion of this voltage is fed to the *rf* amplifier. The *agc* voltage will vary considerably according to the strength of the transmitted signal, but should be in the vicinity of the voltage across  $R_{57}$  (detector output).

#### Antenna Distribution Outlet

An antenna distribution system has been developed to provide any combination of ten 300 or 72-ohm receivers with television signal from a master-antenna amplifier; Jerrold ADO-10.

In addition to distributing television signal to many number of receivers, the unit also decouples the receivers from each other, thereby preventing interaction.

The isolation of receivers from the line is said to be accomplished by the use of 6AK5s connected as pentodes, which are heavily loaded in the plate circuit to obtain broadband characteristics.

## Presenting THE NEW

**Mueller**

### NEEDLE CLIP



#### PIERCES INSULATION TO MAKE QUICK CONTACT

Solid bronze, non-corroding. Wire centers itself in notched jaw. Teeth on sides of jaw allow use for many other applications.

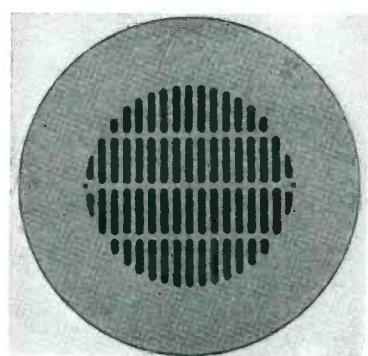
#### — USED IN —

Electric and radio service shops  
Telephone and power company  
testing and maintenance  
Laboratory test work  
Hooking up truck trailer lights  
Field telephone and signal work

SEND FOR FREE SAMPLE AND CATALOG 810

**Mueller Electric Co.**

1565 E. 31st St., Cleveland 14, Ohio



Model 10-P Grille

More and more Sound Engineers are finding the 10-P Flush Mounting Grilles the answer to many of their problems.

They come in two finishes; beautiful chrome plate or bonderized and given a baked-on prime coat for painting. The grille opening is made for a 7- or 8-inch speaker. To be assured of excellent results we recommend the use of the NP-7316 7" speaker or the NP-832 8" speaker for large room installations and NP-8680 where extreme volume is required.

Price \$4.40

Write for literature.

**WRIGHT Inc.**

2237 Univ. Ave., St. Paul 4, Minn.

# NEWS

## HESS NAMED VEE-D-X SALES MANAGER

Frederick A. Hess has been appointed sales manager for Vee-D-X TV antennas and accessories. Hess was formerly connected with Harold A. Chamberlin, Vee-D-X rep.



F. A. Hess



Austin Ellmore

## AUSTIN ELLMORE NAMED CRESCENT VICE PRESIDENT

Austin Ellmore, formerly director of sales and engineering with Crescent Industries, Inc., Chicago, has been appointed vice president in charge of sales and engineering.

Ellmore was formerly with Utah Radio, where he was vice president in charge of Utah Radio Products Division of International Detrola Corp.

\* \* \*

## RIDER PUBLISHES TV MASTER ANTENNA SYSTEMS BOOK

A 368-page book *TV Master Antenna Systems* by Ira Kamen and Richard H. Dorf, has been published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N. Y.

Presented are detailed explanations of amplified and nonamplified master antenna systems, complete with actual schematic diagrams, performance figures, and design data.

Book contains 234 illustrations and is priced at \$5.00.

\* \* \*

## RUSSELL NOW UTC GSM

Hank Russell has become United Transformer Company's general sales manager replacing Ben Miller, who retired from his post.



Hank Russell



Ben Miller

\* \* \*

## ALTEC'S MIKE WINS AWARD

Altec Lansing's miniature condenser microphone received the *Electrical Manufacturing* product design award for 1950 recently.

\* \* \*

## BILL ROLLINS BECOMES CRESCENT VP

Bill Rollins has been named vice president in charge of production and purchasing.



**Music—sweet music to his ears!**

And why not? A satisfied customer has telephoned—yes, actually telephoned—to thank this service-dealer for the swell repair job on his TV sets.

Your customers may not take the trouble very often to do this, but you can bet your last dime that a dissatisfied customer will lose no time in telling you what he thinks. This means call-backs on which you lose time, money, and reputation.

The trick, of course, is to eliminate call-backs. Unfortunately, you can't eliminate them all. But, you can keep them to a minimum by using only parts on which you can stake your reputation.

Look at any tube marked TUNG-SOL. There is the same tube—the same performance standards—the same dependability

which eight out of ten leading set manufacturers use for initial equipment. All TUNG-SOL tubes are made to meet their requirements. So, when you make replacements with TUNG-SOL tubes, you're putting back into the set the same high quality with which it left the factory.

This TUNG-SOL "one standard" policy safeguards your service work, your prestige and your profit.

Tell your distributor's salesman you'd rather have TUNG-SOL tubes.

**TUNG-SOL** LAMPWORKS INC., NEWARK 4, N.J.  
Sales Offices: Atlanta, Chicago, Dallas, Denver, Detroit, Los Angeles, Newark



**ONE STANDARD—The best that can be made—**

For Initial Equipment and Replacement

## SECOND EDITION OF SAM'S RED BOOK

A second edition of the *Radio and TV Industry Red Book* has been published by Howard W. Sams and Co., Inc., 2201 E. 46 St., Indianapolis, Ind. Covers TV and radio replacement parts for approximately 20,000 sets made from '38-'50.

Includes complete listings of all major replacement components. Lists correct replacement parts made by 19 leading manufacturers. Covers original parts numbers, proper replacement numbers and installation notes on: TV and radio tubes, capacitors, transformers, controls, if's, speakers, vibrators, phono-cartridges, batteries, selenium rectifiers, plus TV replacement parts for sweep oscillator and horizontal and vertical output systems. Over 600 pages, 8½" x 11". Price, \$3.95.

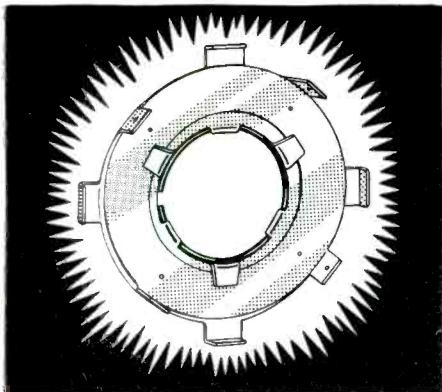
## MURRAY HILL BOOK NAME CHANGE

Murray Hill Books, Inc., Technical Division, publishers of the Ghirardi and other technical books will now operate under the name Rinehart Books, Inc., Technical Division, 232 Madison Avenue, New York 16, N. Y.

\* \* \*

## ERIE RESISTOR CERAMIC-CAPACITOR CHART

A ceramic capacitor interchangeability chart, covering general-purpose bypass and coupling ceramics, temperature compensating types, disc types in single and dual styles, feed-thru models, stand-off's, *hv* capacitors, ceramic trimmers, tubular TV trimmers and *hv* transmitting capacitors has been published by the Erie Resistor Corp., Erie, Penna.

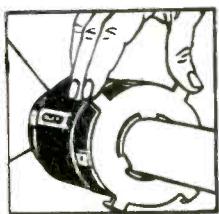


**Over 3,000,000 TV Sets  
Need The**

## **BeamaJuster**

**Centers Pictures in 3 Seconds.  
No Drift!**

Service men everywhere are enthusiastic about the BeamaJuster. It cuts the job of centering pictures from 20 to 30 minutes down to 3 seconds. Instead of tilting the focus coil and holding it at the proper angle with brackets, springs and wing nuts and other centering jigs, the service man merely slips a BeamaJuster on the back cover of the tube yoke, and turns the outer plate until the picture is centered.



1. Snap BeamaJuster on back cover of tube yoke. (Fits any standard yoke and any size tube.)
2. Rotate BeamaJuster as shown here for approximate centering of picture.
3. Make final adjustment by sliding outer plate of BeamaJuster vertically or horizontally.

Far better than electrical centering systems too. It saves many parts and approximately 20 connections. The BeamaJuster is ideal for conversions from 10 and 12 inch tubes to larger size tubes. Order today from your supplier!

### **PERFECTION ELECTRIC COMPANY**

2641 South State Street  
Chicago 5, Ill.

*Made by the Makers of  
Perfection Alnico 5  
Speakers and Ion Traps*



## **WE DON'T RUN A HOSPITAL\* . . .**

*\* but we do have one of the most modern condenser plants in the industry today!*

\*It seems as though everyone who makes condensers today likes to talk about non-contamination, dust-free rooms, white coated and gloved workers, etc.

Well, we have all this too, but we have an idea that you fellows would rather hear the hard facts about the condensers you use. We would like you to know this about Illinois Condensers: (1) Every condenser that leaves our factory is *Unconditionally Guaranteed* for One Full Year from Date of Purchase! (2) We have been producing electrolytic capacitors continuously for 16 years. Literally millions of Illini-Hycap Capacitors are giving FAITHFUL SERVICE every day!



**ILLINOIS CONDENSER CO.**

1616 NORTH THROOP STREET • CHICAGO 22, ILL.

## **New Parts . . . Tools . . . Instruments**

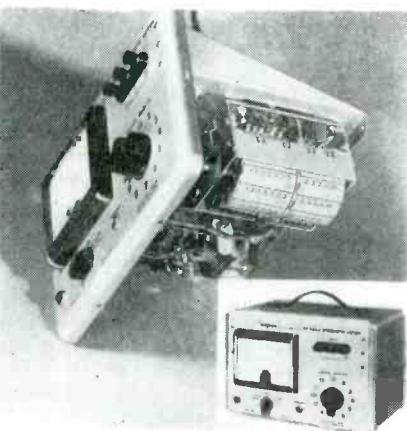
### **SIMPSON FIELD STRENGTH METER**

A TV field strength meter, model 488, which incorporates a 12-channel television tuner (Standard Coil Products tuner) with each channel separately adjustable, has been announced by Simpson Electric Co., Chicago, Ill.

There are four ranges of sensitivity: 50 microvolt full scale range for fringe area installation; 500-microvolt range; 5,000-microvolt range; and 50,000-microvolt range.

A phone jack is included for making audible tests so that the operator can identify the type of signal being measured.

Meter is a 4 1/2" type. Case measures 8" x 11" x 8 1/2".



### **JFD VOLTAGE REGULATOR**

Voltage regulators for TV chassis have been developed by JFD Manufacturing Co., Inc., 16th Ave., Brooklyn 4, N. Y.

Two types are available: No. 93-7, 300 watts, and No. 93-8, 375 watts.

The male end of the regulator is plugged into the wall socket and the TV set line cord is plugged into the female end of the regulator. The voltage drop of the regulator is said to be negligible at 110 volts, but increases as the line voltage.



Write today for catalog—complete listings of highest quality tubular, twist prong, plug-in and screw mounted electrolytics in single or multiple units. Also tubular paper condensers, high voltage buffer and TV capacitors and auto generator condensers.

## **NOW! SPEED UP ALL SOLDERING WITH UNGAR FEATHER-LIGHT SOLDERING PENCILS WITH HI-HEAT INCREASED WATTAGE TIPS**

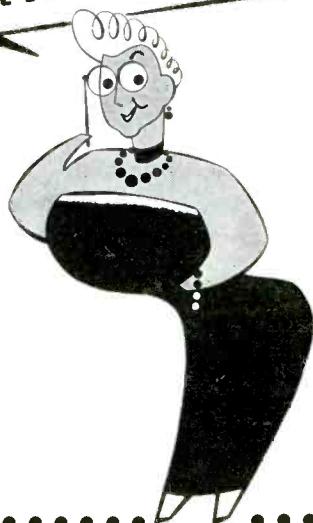


For use with No. 776  
Handle & Cord Set

Stop wrestling with big irons. New HI-HEAT TIPS in your Ungar Electric Soldering Pencil produce a really versatile tool that'll perform on a par with the big, bulky 100-150 watt irons. If you can't get immediate delivery, please be patient, for production hasn't yet caught up with demand. Ask your supplier for No. 1236 Pyramid or No. 1239 Chisel. List price, \$1.25 each.

**Ungar**  
ELECTRIC TOOL CO., Inc.  
LOS ANGELES 54, CALIFORNIA

"HAVE YOU HEARD  
THE SOUND OF QUALITY?"



- NEWCOMB SOUND IS BETTER
- Manufacturers of public address, mobile, phonograph, musical instrument and wired music amplifiers • Portable systems • Portable phonographs and radios • Transcription players • Rack and panel equipment.
- Write today! Circle items of interest and indicate whether you are a Dealer, Parts Jobber or Sound Specialist.
- NEWCOMB AUDIO PRODUCTS CO.
- DEPT. E, 6824 LEXINGTON AVE.
- HOLLYWOOD 38, CALIFORNIA

### RCP TUBE TESTERS

A line of tube testers and combination tube and set testers has been announced by Radio City Products Co., Inc., 152 West 25th Street, N. Y. C.

Testers provide two additional, not used, element circuit switches and two additional socket blanks.

Approximately 1,000 listings are on a high speed roll chart.

Testers provide short leakage tests, with each element tested individually.

Available in open face, model 323C, combination case 323PC, and 323M counter merchandiser.



### HOFFMAN PLATING SET

A plating set permitting electroplating in gold, silver, nickel, copper, brass, cadmium, tin, and zinc is now available from Hoffman Manufacturing Co., Wilkes-Barre, Pa.

Set consists of 1-ounce jars each of gold, silver, nickel, copper, brass, cadmium, zinc, tin; 1-ounce jars each of cleaner, metal polish, and gold and silver polish; and anode brush and clips, all packed in a wooden chest with built-in power supply for use in 110-volt ac.



### BURGESS NO. 6 CELL BATTERIES

The Burgess Giant No. 6 is now available in two styles, with screw terminals for ignition applications and with spring clips for telephone service: No. S461 6-volt battery consists of four No. 6 cells sealed in a weatherproof Metalclad container with strap handle and insulated terminals.



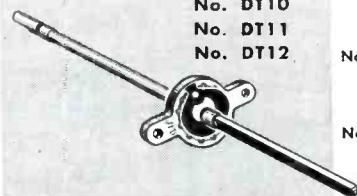
L. H. Harris, Burgess sales manager, and the recently developed giant dry cells.

**IT'S JFD FOR DETENT SWITCH CONTROLS**

### ★ Durable BRASS Spring ★ BRASS and PHENOLIC Shafts

Look to JFD for the most complete line of Detent Switches on the market! ... exact replacements for RCA, Emerson, Admiral, Telefone and other TV sets. Designed for RCA tuners used in 630, 700 and 721 type chassis. Available with or without locating plates.

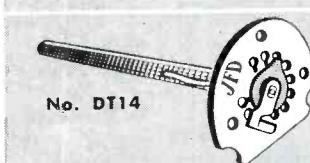
No. DT10  
No. DT11  
No. DT12



No. DT13



No. DT14



Write for FREE  
Replacement Reference Chart

No. DT10 . . . Short shaft, complete with locating plate. (Replaces RCA part No. 71463)

No. DT20, without locating plate.

No. DT11 . . . Long shaft, complete with locating plate. (Replaces RCA part No. 72743)

No. DT21, without locating plate.

No. DT12 . . . Extra long shaft, complete with locating plate. (Replaces Admiral part No. 76814 used in entire Model Series No. 30A and 8C.)

No. DT22, without locating plate.

[Designed for use with RCA TV Tuner  
part No. 71531—Replacement type 201E1.]

No. DT13 . . . All phenolic shaft, complete with locating plate. (Replaces RCA part No. 73440.) Designed for use with RCA Tuner Replacement Types No. 74941, 73435, 74571.

No. DT14 . . . All phenolic shaft, complete with locating plate, for new RCA TV sets. (Replaces RCA part No. 75162.)



MANUFACTURING CO., INC.  
6129 16th Ave. Brooklyn 4, New York  
FIRST In Television Antennas and Accessories

## 8 WAYS BETTER THAN FRICTION TAPE\*

### Polyken® No. 163 ELECTRICAL TAPE

#### \*Check These 8 Extras:

- Higher dielectric strength
- Better moisture barrier
- Less bulk—equal strength
- Higher tack (quick stick)
- Cleaner (doesn't collect dirt)
- Unwinds easily
- Doesn't fray
- Sticks firmly



Now for the first time in over 7 years comes a basic revolutionary improvement over sticky, old-fashioned friction tape. It's POLYKEN No. 163 Electrical Tape . . . available now through your electrical distributor in three convenient packages. And dependable POLYKEN No. 163 costs no more than most ASTM friction tapes. See your distributor or write today for free folder "Test It Yourself". Address POLYKEN, Dept. S-2, 222 W. Adams Street, Chicago 6.

**Polyken®** DEPARTMENT OF  
BAUER & BLAIS  
DIVISION OF THE KENDALL COMPANY  
222 W. ADAMS ST., CHICAGO 6

# NEW! RCP

**"Triple Duty"**

**MASTER**

## MULTITESTER

**1 HIGH VOLTAGE**  
25,000 Volts

**2 HIGH FREQUENCY**  
400 Megacycles

**3 HIGH SENSITIVITY**  
20,000 Ohms per Volt

MODEL 453



**ET PRICE \$47.95**

amplify measurements for Tele-M and AM, Model 453 was  
or direct metering — elimi-  
nating time — grounding, etc.  
regular probes, high volt-  
probe and high fre-  
They are housed in a  
hinged cover oak  
ment for leads.

units selected ac-  
0-500-1000-5000-  
per volt.  
500-1000.

29, 28



2, 1950 • 53

## JOTS AND FLASHES

RECTANGULAR TUBES have become a feature of the majority of the new television chassis, according to a report from RTMA in Washington. October sales of these tubes comprised 58 per cent of the sales to set producers. The trend to larger type picture tubes is also continuing; 92 per cent of the sets made during October had tubes 16 inches and larger. . . . A new organization, the Phonograph Manufacturers Association, Inc., has been formed and Ronald J. Kalb (vice president of Steelman Phono & Radio Co., Inc., Mt. Vernon, N. Y.) has been named president. Joseph Dworsky, president of Dynavox Corp., Long Island City, was named secretary-treasurer; while Ben Birns, president of Sonic Industries, N. Y. C., was appointed vice president. Other charter members of the association are: Al Herbst, president of Tone Products Corp., N. Y. C.; Isador Rothman, secretary-treasurer of Electronic Creations, Inc., N. Y. C.; Bernard Berger, president of B & R Electronic Corp., N. Y. C.; Jerome L. Herold, president of Herold Radio and Television Mfg. Co., Mt. Vernon, N. Y.; Fred Buhlman, vice-president of Hedco Mfg. Co., Mt. Vernon, N. Y.; Harvey L. Everett, secretary of Hudson Electronic Corp., Mt. Vernon, N. Y.; Alfred H. Suekoff, Portofonic Sales Corp., Long Island City, N. Y.; Ben Schiffman, president, United Case Corp., Mt. Vernon, N. Y.; and Walter Klug, secretary-treasurer of Porto Case Co., Inc., N. Y. C. . . Drawing for space at the 1951 Parts Distributors Show will be held at the Hotel New Yorker, January 10, according to Ken Prince, show manager. . . . Round and rectangular tubes in 16, 17, 19 and 20-inch sizes are now being made by Zetka Television Tubes, Inc., 131-137 Getty Avenue, Clifton, N. J. . . Warren Freibell has been appointed purchasing director of the Majestic Radio & Television division of the Wilcox-Gay Corp., Brooklyn, N. Y. . . A second edition of the *Radio Operator's License Q and A Manual* by Milton Kaufman, instructor at RCA institutes, has been published by John F. Rider, Publisher, Inc., 480 Canal St., New York 13, N. Y. Book contains 776 pages and is priced at \$6.60. . . Recent issues of the *Telrex News* contain an interesting assortment of technical antenna information disclosing the characteristics of bi-directional reception, and installation procedures. . . . A 4-page bulletin describing high fidelity music systems has been published by the Concord Radio Corp., 901 West Jackson Blvd., Chicago 7, Ill. . . Sidney A. Joffee is now president of Pathé Radio and Television Corp. and Harley R. Wahl has been elected treasurer. . . Clifford M. Rigsbee is now manager of the radio-phono-television group of the RCA Service Co. . . Ben Snyder, president of Snyder Manufacturing Co., returned recently from a trip to the southwest and west coast. . . A 16-page manual, No. 110, entitled *How to Make Your Job Easier with the Amprobe* is now available from Pyramid Instrument Corp., 49 Howard St., New York 13, N. Y. . . A plating plant has been added to the facilities of Phoenix Electronics, Inc., Lawrence, Mass.

## ADVERTISERS IN THIS ISSUE

### SERVICE INDEX—DECEMBER, 1950

ALLIANCE MFG. CO.	39
Agency: Foster & Davies Inc.	
ANCHOR RADIO CORPORATION	10
Agency: Symonds, MacKenzie & Co.	
BAUER & BLACK DIV., THE KENDALL CO.	53
Agency: Leo Burnett Co., Inc.	
CENTRALAB DIV., GLOBE-UNION, INC.	22, 23
Agency: Kluu-Van Pietersum-Dunlop Associates, Inc.	
CLAROSTAT MFG. CO., INC.	7
Agency: Austin C. Lescarboura & Staff	
CLIPPARD INSTRUMENT LABORATORY	46
Agency: The S. C. Baer Co.	
CORNELL-DUBILIER ELECTRIC CORPORATION	Inside Front Cover
Agency: Reiss Advertising	
ELECTRONIC INSTRUMENT COMPANY, INC.	55
Agency: H. W. Hauptman Co.	
ELECTROVOX, INC.	29
Agency: H. W. Hauptman Co.	
GENERAL ELECTRIC CO.	1
Agency: Maxon, Inc.	
GENERAL ELECTRIC LAMP DEPT.	45
Agency: Batten, Barton, Durstine & Osborn, Inc.	
HEATH COMPANY	25
Agency: G. Dean Arend, Advertising	
HYTRON RADIO & ELECTRONICS CORP.	37
Agency: Bennett, Walther & Menadier Inc.	
ILLINOIS CONDENSER CORP.	52
Agency: Rudolph Bartz, Advertising	
J. F. D. MFG. CO., INC.	53
Agency: Shappe-Wilkes Inc.	
JACKSON ELECTRICAL INSTRUMENT CO.	31
Agency: The Parker Adv. Co.	
JENSEN INDUSTRIES INC.	9
Agency: Frank C. Nahser, Inc.	
KESTER SOLDER CO.	6
Agency: Frank C. Nahser, Inc.	
LAMPKIN LABORATORIES, INC.	48
Agency: Chapman and Chryst	
LAPOINTE-PLASCOMOLD CORP.	8, 46
Agency: P. W. Prell Co.	
P. R. MALLORY & COMPANY, INC.	Inside Back Cover
Agency: The Aitkin-Kynett Co.	
MUELLER ELECTRIC CO.	50
NEWCOMB AUDIO PRODUCTS CO.	52
Agency: Stuart Stevens, Advertising	
OXFORD ELECTRIC CORPORATION	49
Agency: Sander Rodkin Adv. Agency	
PERFECTION ELECTRIC CO.	52
Agency: Scantlin & Co.	
PERMOFLUX CORPORATION	40
Agency: Symonds, MacKenzie & Co.	
PHOENIX ELECTRONICS, INC.	50
Agency: Milton Richards Adv. Agency	
PRECISION APPARATUS CO., INC.	4
Agency: Shappe Wilkes, Inc.	
THE RADIART CORPORATION	3
Agency: Stern and Warren	
RADIO CITY PRODUCTS CO.	56
Agency: Janair Advertising, Inc.	
RADIO CORPORATION OF AMERICA	5, 17, Back Cover
Agency: J. Walter Thompson Co.	
RCA SERVICE CO., INC.	48
Agency: J. Walter Thompson Co.	
RADIO MERCHANDISE SALES, INC.	55
Agency: Reid Associates	
RADIO RECEPTOR COMPANY	54
Agency: Walter J. Zimmerman & Associates	
RAULAND CORPORATION	19
Agency: MacFarland, Averyard & Co.	
REGENCY DIV. I.D.E.A., INC.	33
Agency: Burton Browne, Advertising	
JOHN F. RIDER PUBLISHER, INC.	46
Agency: Shappe Wilkes Inc.	
HOWARD W. SAMS & CO., INC.	28
Agency: George Brodsky, Advertising	
SANGAMO ELECTRIC CO.	35
Agency: Arthur R. Mogge, Inc.	
SNYDER MFG. CO.	15
Agency: Brooks and London	
SPRAGUE PRODUCTS CO.	48
Agency: The Harry P. Bridge Co.	
TELREX, INC.	47
Agency: George Homer Martin Associates	
TUNG-SOL LAMP WORKS, INC.	51
Agency: E. M. Freystadt Associates, Inc.	
UNGAR ELECTRIC TOOL COMPANY, INC.	52
Agency: A. James Rouse Company	
WEBSTER-CHICAGO CORPORATION	27
Agency: Fuller & Smith & Ross, Inc.	
WRIGHT, INC.	50
Agency: Kay Advertising, Inc.	

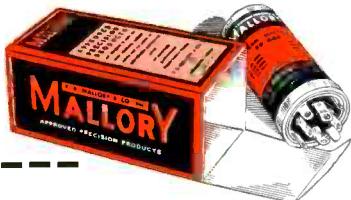


## No Need To Worry About Moisture When You Use The MALLORY PLASCAP\*

### MALLORY FP CAPACITORS

When you select Mallory FP Capacitors, you can be sure of their performance even in circuits where heat is a problem. Every Mallory FP Capacitor will operate continuously at 85° C. In addition, Mallory FP Capacitors are famous for their long shelf-life . . . you can depend on them when you need them. Buy the one line that services both AM and TV sets. They are an outstanding example of Mallory Precision Quality at standard prices.

*See your Mallory Distributor right away!*



The Mallory Plascap plastic tubular capacitor exceeds R.M.A. requirements for humidity and immersion tests . . . even for metal-cased capacitors. It's the plastic tubular that's years ahead of the rest of the field.

No oil leakage, no unsoldered leads, no messy wax coating, no insulation problems! Check these four exclusive features which make your service jobs surer and easier:

- **TRISEAL CONSTRUCTION.** Sealed three ways . . . with moisture-free Mallotrol, tough outer plastic shell, exclusive Mallocene!
- **FASTITE LEADS.** Permanently fastened . . . sealed with Mallocene . . . unaffected by soldering-iron heat!
- **DISTORTION-FREE WINDING.** No flattened cartridges due to molding pressures . . . no failures due to "shorts"!
- **TRU-CENTER CARTRIDGES.** Cartridges centered every time . . . uniform insulation guaranteed at all points!

You don't have to handle the Mallory Plascap with kid-gloves . . . it is built to "take it"! See your Mallory Distributor, now. Remember, you pay no more for Mallory Precision Quality!

\*Trade Mark

P.R. MALLORY & CO. Inc.  
**MALLORY**

CAPACITORS • CONTROLS • VIBRATORS • SWITCHES • RESISTORS  
• RECTIFIERS • VIBRAPACK\* POWER SUPPLIES • FILTERS

\*Reg. U.S. Pat. Off.

**APPROVED PRECISION PRODUCTS**

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

THE QUALITY OF RCA TUBES IS UNQUESTIONED



## *Best Sellers*

Most used . . . by brand  
and by type . . . RCA kinescopes  
are the fast-moving  
profit makers

### **IN PICTURE TUBES . . .**

The largest and most profitable replacement business in television picture tubes comes from the types used in most television receivers . . . the Best Sellers.

RCA's types are Best Sellers. There are more of them in actual use in TV receivers than any other brand. Industry choice of these high-volume types reflects to your advantage. Inventory and stocking problems are simplified . . . and you have the assurance of rapid, profitable turnover.

In addition, when you sell RCA kinescopes, you gain from customer confidence in the RCA brand . . . solidly established by the proved performance of RCA kinescopes in millions of television receivers.

Remember, too, that the quality and dependability of RCA kinescopes mean fewer service failures and fewer costly call-backs. There is, therefore, more profit in every RCA kinescope you sell.

*Always keep in touch with your RCA Tube Distributor*



**RADIO CORPORATION OF AMERICA**  
ELECTRON TUBES

HARRISON, N.J.