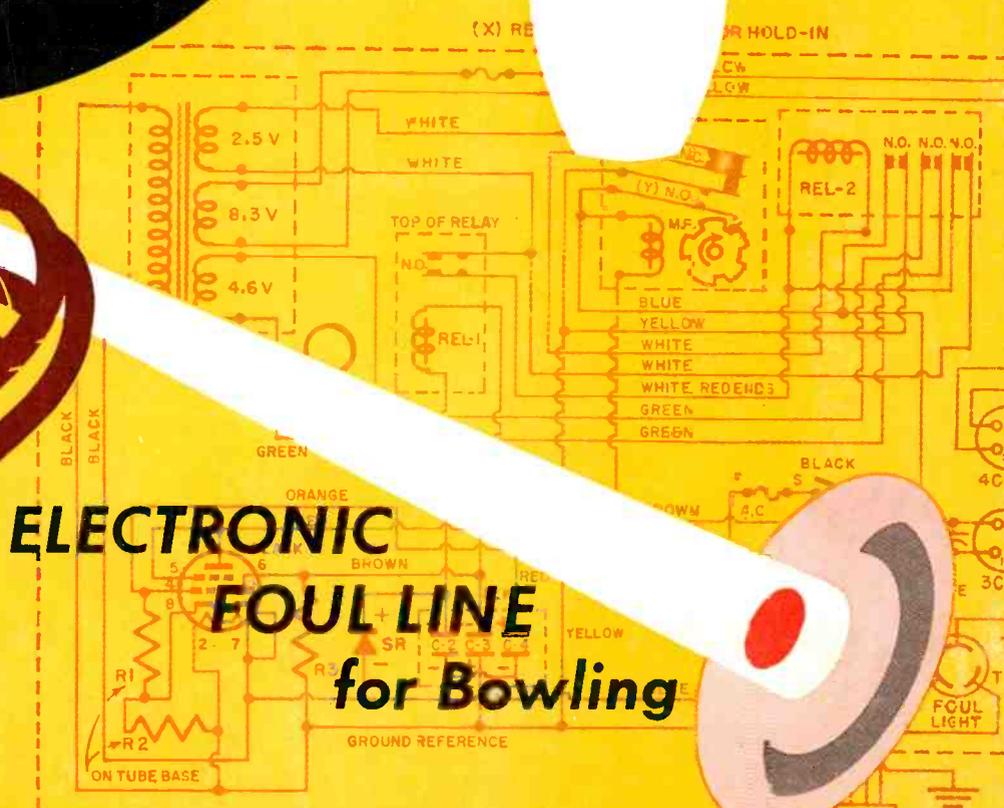
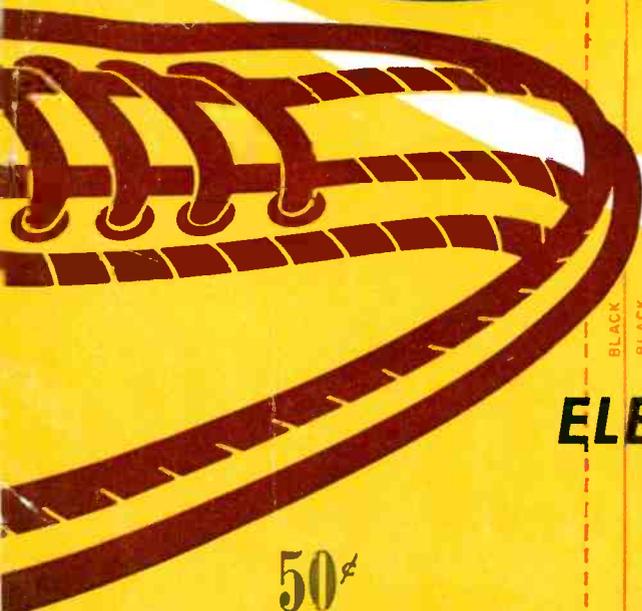


# ELECTRONIC TECHNICIAN

Including  
**SERVICE**  
Magazine



**ELECTRONIC  
FOUL LINE  
for Bowling**

50¢

November • 1960

NOTES: PRONG 3 - LIGHT INTERRUPTED 43V - UNINTERRUPTED 150V



# ELECTRONIC TECHNICIAN

Including  
**SERVICE**  
Magazine

World's Largest Electronic Trade Circulation

ALBERT J. FORMAN *Editor*  
ARTHUR P. SALSBERG *Managing Editor*  
JACK HOBBS *Technical Editor*  
B. V. SPINETTA *Assistant Editor*  
HARVEY WETZLER *Assistant Editor*  
ROBERT TALL *Washington Editor*  
HENRY SCHWARTZ *Contributing Editor*  
C. F. DREYER *Consultant Art Director*  
M. FARRIS *Editorial Assistant*



Address all mail to  
480 Lexington Ave., New York 17, N. Y.  
Telephone YUkon 6-4242

HOWARD A. REED *Publisher*

#### BUSINESS DEPARTMENT

C. HENNESSY *Regional Manager*  
R. L. KIPP *Regional Manager*  
N. McALLISTER *Production Manager*  
M. RUBIN *Circulation Manager*  
J. PREVET *Asst. Circulation Manager*  
M. KANE *Accounting Manager*  
A. MOYLAN *Accounting Supervisor*

P. H. DEMPERS JR. *Regional Manager*  
10 E. Huron St., Chicago 11, Ill.  
Telephone Mlchigan 2-4245

CHRIS DUNKLE & ASSOCIATES  
California Representative  
740 S. Western Ave., Los Angeles 5, Calif.  
Telephone DUnkirk 7-6149  
420 Market St., San Francisco 11, Calif.  
Telephone SUtter 1-8854

BERNIE EDSTROM *Regional Manager*  
15605 Madison Ave., Cleveland 7, Ohio  
Telephone LAkewood 1-7900

JOHN R. KIMBALL & CO.  
Mountain States  
420 Market St., San Francisco 11, Calif.  
Telephone DOuglas 2-9183



ELECTRONIC TECHNICIAN & Circuit Digests, including Service, November, 1960, Vol. 72, No. 5. \$5.00 a copy. Published monthly by Electronic Technician, Inc. Publication Office, Concord, N. H. Editorial, advertising and executive offices, 480 Lexington Avenue, New York 17. Telephone YUkon 6-4242.

Entered as Second-class matter at the post-office at Concord, N. H., October 19, 1960. Subscription rates: United States and Canada, \$4.00 for one year; \$6.00 for two years; \$8.00 for three years. Pan American and foreign countries: \$7.00 for one year; \$10.00 for two years; \$14.00 for three years; Copyright 1960 by Electronic Technician, Inc., New York. H. Reed, President, A. Forman, Executive Vice-President. Title registered in U. S. Patent Office. Reproduction or reprinting prohibited except by written authorization of publisher. Printed in U.S.A. by Rumford Press.

← For more data, circle 11-C2-1 on coupon, p. 50

November, 1960



**FRONT COVER** "Foul!" indicates the umpire, as the player's foot extends past the bowling alley's foul line . . . and no one disputes the decision because the "umpire" has an unerring electronic eye. That is, if the foul-line detector has been properly maintained by an electronic technician. For detailed technical information concerning this automatic facility of a popular sport, see article starting on page 34.

#### FEATURES and ARTICLES

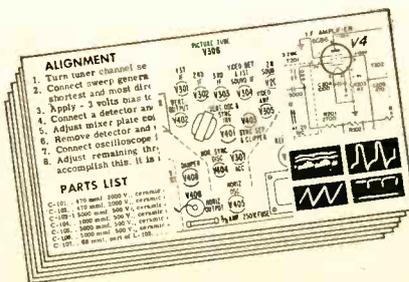
<i>The Day Electronic Service Stopped (Editorial)</i> . . . . .	31
"Tuning in the Picture" . . . . .	32
<i>Servicing Electronic Bowling Alleys</i> . . . . .	Walter Blair 34
<i>TV Deflection Yoke Defects</i> . . . . .	Harold West 36
<i>Single-Stage Audio Amplifier Troubleshooting Methods</i> . . . . .	Manny Horowitz 38
<i>Building a Technical Library</i> . . . . .	40
<i>Component and Transmission Characteristics at UHF</i> . . . . .	Allan Lytel 42
"Tough Dog" Corner . . . . .	L. C. Huneault, Jim Utterback 46
<i>Erecting Fringe-Area TV Antennas</i> . . . . .	Dan George 48
<i>Free Literature</i> . . . . .	50
<i>TV Ownership in U. S. and Canada</i> . . . . .	55
<i>Stereo Tape Glossary</i> . . . . .	Magnetic Recording Industry Assn. 62
<i>Shop Hints</i> . . . . .	A. J. Krukowski, H. J. Miller, G. F. Stillwell 65

#### DEPARTMENTS

Editor's Memo . . . . .	4	Audio Newsletter . . . . .	24
News of the Industry . . . . .	8	Calendar of Coming Events . . . . .	33
Reps. & Dists. . . . .	10	New Products . . . . .	51
Letters to the Editor . . . . .	14	Association News . . . . .	68
Catalogs & Bulletins . . . . .	20	New Books . . . . .	74

#### CIRCUIT DIGESTS

..... Preceding Back Cover



#### IN THIS ISSUE

(16 pp. latest schematics & data)

EMERSON: TV Chassis 120507A, 120508B, 120515C, 120516D, 120541C, 120542D

GENERAL ELECTRIC: AM-FM Radio Model C510A

RCA: Color TV Chassis CTC10 Series

TRAVELER: TV Chassis 1051-60

WESTINGHOUSE: Hi-Fi Tuner Pre-Amp V-2511-1, Amp & Power Supply V-2510-1, Model H-M 1300, 1301, 1302, 1303

# PHILCO LANDSLIDE



**24-Piece Stainless**  
SERVICE FOR SIX  
INTERNATIONAL  
SILVER COMPANY  
new "Night Sky"  
pattern

**FREE**  
with your purchase of  
75 PHILCO  
TUBES

ALL OFFERS GOOD  
UNTIL DEC. 10th

Wonderful  
GIFTS FOR  
CHRISTMAS

SERVICE AIDS  
for your business

## Brunswick Black Beauty Bowling Ball

CUSTOM DRILLED AND  
PERSONALIZED WITH  
YOUR INITIALS



The most popular  
bowling ball in America!



**FREE**  
with your purchase of  
375  
PHILCO TUBES

**Argus C-3**  
35mm Color Slide Camera



**FREE** with your purchase of  
500 PHILCO TUBES  
Also, FREE offers on other famous cameras!

**7 x 35 Center Focus  
Binoculars & Case**



**FREE** with your purchase of  
400 PHILCO TUBES

**Faribo Orlon  
Pak-A-Robe**

In Vinyl  
Carrying  
Case



**FREE** with your purchase of  
150 PHILCO TUBES



## Million Miler Bowling Bag

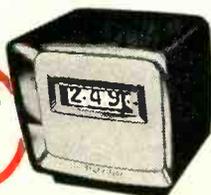
UNMATCHED FOR  
RUGGED DURABILITY

Popular triangle style. Moulded of genuine  
U. S. Royalite—scuff proof . . . everlasting!

**FREE**  
with your  
purchase of  
150  
PHILCO TUBES

"Glolite" Electric  
TV-Lamp Clock

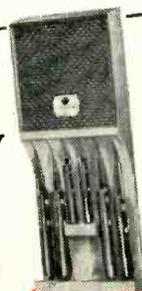
\$11.95  
value



**FREE** with your purchase of  
100 PHILCO TUBES

6-Piece  
Flint  
Cutlery  
Set

**FREE**  
with your  
purchase of  
200 PHILCO  
TUBES



\$19.95  
value

\$10.00 Value Airguide  
Barometer



**FREE** with your purchase of  
100 PHILCO TUBES

# OF FREE OFFERS!

with your purchases of

## PHILCO TUBES

There's something for everybody! All are FREE with your purchases of Philco Receiving Tubes you use every day!

### Million Miler LUGGAGE FOR MEN AND WOMEN



THREE  
SUITER  
\$49.95  
VALUE

Wide selection, including the 26" three-suiter, 24" two-suiter and 21" companion for men, shown above. The last word in durability and modern styling!

**FREE!**

3-Suiter with 400 PHILCO TUBES  
2-Suiter with 350 PHILCO TUBES  
Companion with 225 PHILCO TUBES  
Similar offers on women's luggage

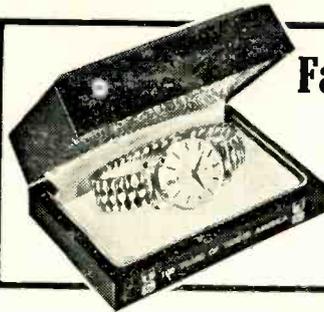
### Hamilton Cosco Folding Table and Chair Set

TABLE ONLY, **FREE**  
with your purchase of  
100 PHILCO TUBES  
TWO CHAIRS, **FREE**  
with your purchase of  
150 PHILCO TUBES

\$46.75  
value

**FREE**

Complete 5-Piece  
Set of Table and  
Four Chairs  
with your purchase of  
400 PHILCO TUBES



### Famous Waltham & Hamilton Watches

For Men—  
WALTHAM  
"SENATOR"  
**FREE**

with your purchase of  
300 PHILCO TUBES

For Ladies—  
HAMILTON  
"TRIXIE"  
**FREE**

with your purchase of  
400 PHILCO TUBES

Also: Free Offer on Hamilton "Gardner" for Men



### Choose from these Free Business Aids

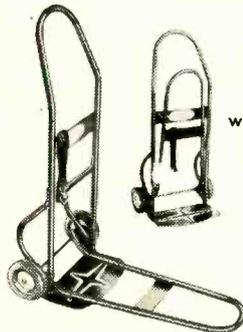
### "Big Eight" FOLDING POKER TABLE



Natural Harvest  
or Mahogany  
frame finish

Felt top—padded  
and upholstered with  
100% virgin wool green felt

**FREE** with your purchase of  
400 PHILCO TUBES



TV TOTER  
**FREE**

with your purchase of  
100  
PHILCO TUBES

**TUBE CADDY**

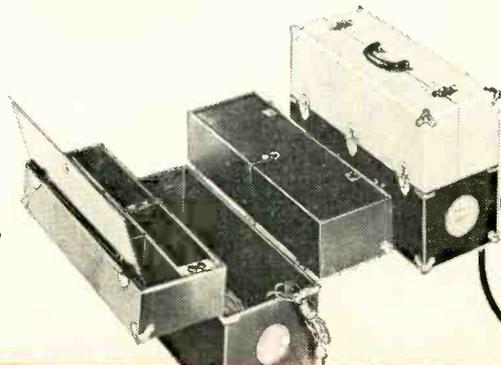
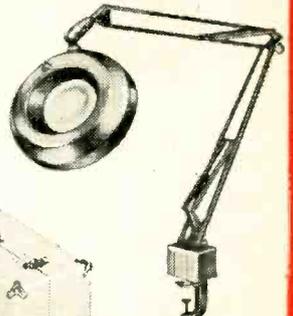
with built-in "Cheater Cord"  
and Pin Straightener  
Choice of two finishes

**LUXO**

Magnifier-Lamp for  
Difficult Service Jobs

**FREE**

with your purchase of  
500 PHILCO TUBES



EITHER  
CADDY  
**FREE**

with your purchase of  
175 PHILCO  
TUBES

## SEE YOUR PHILCO DISTRIBUTOR

For more data, circle 11-3-1 on coupon, p. 50

# AMPHENOL TV PRODUCTS

## help you serve your market better!

### ANTENNAS

Complete line of VHF, UHF, VHF/UHF and FM antennas. Famous Inline (re-issue U.S. Pat. 23,273) is considered by impartial authorities as the finest broadband VHF antenna ever built.

### ACCESSORIES

Antenna or set couplers, arrestors, other important products—all carefully engineered to highest quality standards.

### TWIN LEAD

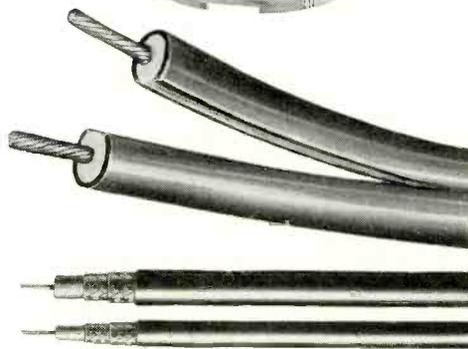
Both receiving and transmitting types are made by AMPHENOL, including the "hottest" twin lead on the market—AMPHENOL MARINE CORE, super low-loss Polyfoam.

### COAXIAL CABLES

AMPHENOL's Cable-bility is famous: More types of RG-/U (Polyethylene and Teflon), more experienced engineering, most modern production facilities.



**—INLINE\***



### Editor's Memo

When a person says something disagreeable, it's tremendously satisfying to snap back a reply that puts the wise guy in his proper place. All too often that perfect answer doesn't come to mind until too late. Like when you're ready for bed.

Sometimes an educational explanation serves the purpose better than a cutting remark, though the immediate personal gratification is not nearly as great. In particular, I'm thinking about the words spouted by detractors of the TV service industry.

Whether the derogatory comment comes from a friend or business acquaintance, I never pass up the opportunity to set the record straight. There are sour apples in every profession. Nine out of ten people are satisfied with their present TV service.

And I can't resist firing a letter off to a newspaper or magazine that demeans our industry. I hope more and more of our readers will become equally outspoken in presenting the case of electronic service.

Some people have a wonderful knack of quick-thinking under trying circumstances. They're never at a loss for words—or an ingenious excuse.

A humorous example of the ability to think quickly in an embarrassing situation is illustrated in the tale of the technician with slippery fingers. (Originally the story dealt with doctors delivering babies.) The poor fellow walked into the customer's home with a replacement picture tube. After removing the crt from the carton, it slipped from his grasp.

Horror struck, he waited for the expected implosion as the tube bounced on the carpeted floor. Luckily, it didn't break.

The customer then watched curiously as the all-thumbs technician dropped the crt a second time without shattering the glass. When this amazing performance was repeated still a third time, the customer asked what the devil was going on.

Most of us would have mumbled a weak excuse, but not our hero. Instantly he flashed his most confident smile, and told the customer: "Sometimes we have to drop them four or five times before they're ready to be put into the TV set."

*Al Foman*

stock the finest—stock

**AMPHENOL!**

**AMPHENOL**

**DISTRIBUTOR DIVISION**  
BROADVIEW, ILLINOIS

← For more data, circle 11-4-1 on coupon, p. 50

Amphenol-Borg Electronics Corporation

*the only one of its kind!*



NOW... THE *First* ANALYZER DESIGNED EXCLUSIVELY FOR TESTING TRANSISTOR CIRCUIT CAPACITORS!

## SPRAGUE MODEL TCA-1 TRANSFARAD\*

**THERE'S NOTHING LIKE IT ON THE MARKET ANYWHERE... AT ANY PRICE!**

Here, for the first time, is a precision-made instrument which is specifically designed to *safely* test low-voltage aluminum and tantalum electrolytic capacitors, film and paper capacitors, and ceramic capacitors. *No laboratory or shop working with transistor circuit capacitors can afford to be without one!*

**CAPACITANCE BRIDGE:**  $1\mu\text{f}$  to 2,000  $\mu\text{f}$  in five overlapping ranges, with laboratory accuracy.

**INSULATION RESISTANCE:** 50 megohms to 20,000 megohms. Only 25v d-c is applied, permitting measurements on low-voltage ceramic, paper, mica, and film capacitors. For ceramics rated below 25 volts, IR may be calculated from leakage current measurements at exact rated voltage.

**POWER FACTOR:** Measured by Wien Bridge from 0 to 50%.

**LEAKAGE CURRENT:**  $0.6\mu\text{a}$  to  $600\mu\text{a}$  in 7 ranges. Measured directly on meter at exact rated d-c voltage of capacitor. No guessing on eye-width or counting lamp blinks!

**A-C BRIDGE VOLTAGE:** Only 0.5v is applied to the bridge. The voltage across the capacitor is less than this applied voltage, the amplitude depending upon capacitance being measured. No danger of overheating and ruining even a 1-volt electrolytic or a 3-volt ceramic.

**POLARIZING VOLTAGE:** Continuously adjustable, 0 to 150v.

**STABILITY:** Dual regulation of the power supply assures short-time reliability, while specially processed etched circuits and complete encapsulation of the critical meter amplifier insure long-time stability.

**MAGIC-EYE TUBE:** Simplifies bridge balancing for capacitance and power factor measurements.

**HIGH GAIN AMPLIFIER:** Sensitivity control for magic-eye null detector permits accurate measurements of small capacitances.

**CAPACITANCE DIAL:** Latest design jet black dial with brilliant white calibrations for quick, accurate readings from any position.

**BINDING POSTS:** Shielded for protection against pick-up of strays, assuring greater accuracy during low-capacitance measurements. 5-way connection feature for use with all types of test leads.

**SAFETY DEVICES:** Automatic discharge of capacitor after testing. Three-wire line cord grounds instrument case.

**OPERATING PROCEDURES:** Easy-to-follow operating procedures clearly shown on pull-out slide at base of instrument. Always handy for ready reference.

**MODERN CASE:** Handsome grey Hammerloid finish on heavy-gage steel. Measures 8 $\frac{1}{2}$ " high, 14 $\frac{3}{8}$ " wide, 9 $\frac{1}{2}$ " deep. Weighs only 21 pounds.

See the remarkable new TCA-1 TRANSFARAD at your Sprague distributor or write for descriptive folder M-792a to Sprague Products Company, 65 Marshall Street, North Adams, Massachusetts.

ONLY  
**\$197.50**  
NET

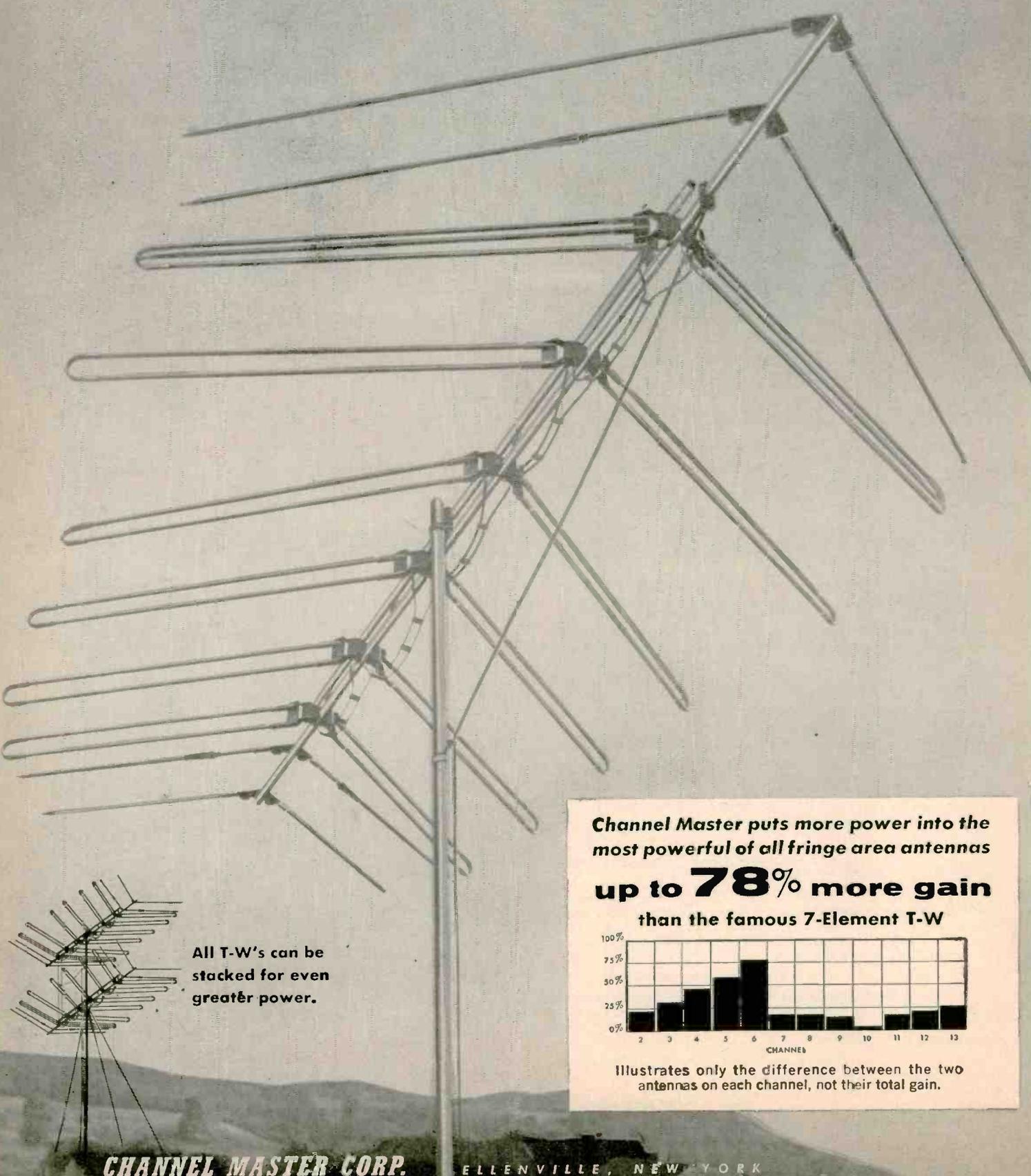
\*Trademark

# SPRAGUE®

world's largest capacitor manufacturer

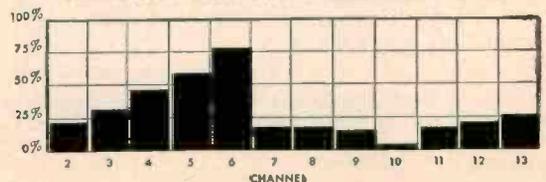
For more data, circle 11-5-1 on coupon, p. 50

# This is the one you've



All T-W's can be stacked for even greater power.

Channel Master puts more power into the most powerful of all fringe area antennas up to **78%** more gain than the famous 7-Element T-W



Illustrates only the difference between the two antennas on each channel, not their total gain.

**CHANNEL MASTER CORP.**

ELLENVILLE, NEW YORK

# been waiting for!

Out in the super fringes,  
where nothing less will  
do, step up to the new

## **CHANNEL MASTER<sup>®</sup> SUPER 10 T-W**

model no. 358

### **10-Element Traveling Wave Antenna**

Channel Master's T-W\* is the most thoroughly tried...the most widely used...and the most enthusiastically acclaimed of all the broad band fringe antennas. Its performance has never been equalled.

Now—Channel Master takes another forward step with a bigger and better version of the T-W. This new antenna has more of what you want...more of what you **need**...in the super fringe areas.

**New 10-Element T-W**...ingeniously combines Channel Master's famous hairpin dipoles with 4 parasitic low band and co-linear high band elements. Reaches new highs in gain and front-to-back ratios.

**New low band director and reflector system**...increases gain up to 2½ db more than a 7-Element T-W—a 78% power increase!

**New high band co-linear elements**...add 20% to the T-W's high band gain. The co-linear reflector and director are each actually 3 half-wave elements placed end to end.

**Ruggedized, all-weather construction**...Including heavy duty weatherproof harness that won't let rain or salt air impede reception.

**There is no substitute for a T-W**

Call your Channel Master Distributor today

**NOW...**

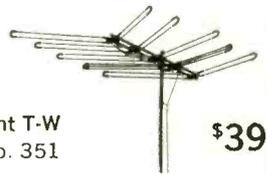
**THERE ARE 5**  
for every problem...  
for every area...  
**pick a T-W**

3-Element T-W  
model no. 352



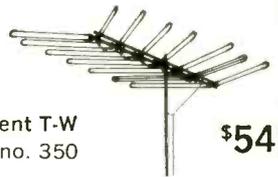
**\$23<sup>50</sup>**  
LIST

5-Element T-W  
model no. 351



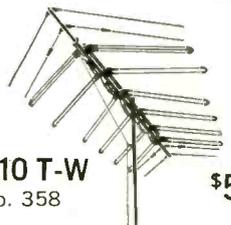
**\$39<sup>25</sup>**  
LIST

7-Element T-W  
model no. 350



**\$54<sup>95</sup>**  
LIST

Super 10 T-W  
model no. 358



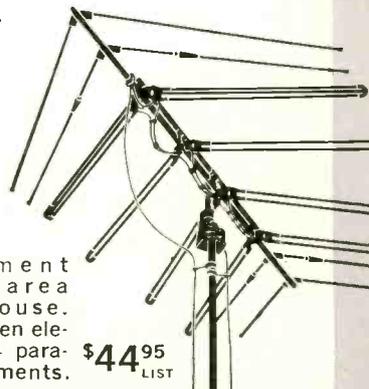
**\$59<sup>95</sup>**  
LIST

**and introducing  
the new**

### **SUPER 8 T-W**

Model no.  
359

8-Element  
fringe area  
powerhouse.  
Four driven ele-  
ments, 4 para-  
sitic elements.



**\$44<sup>95</sup>**  
LIST

ALL PRICES SLIGHTLY HIGHER IN CANADA

\*Pat. No. 2,817,085

## News of the Industry

SYLVANIA Electric Tubes Div. has appointed WILLIAM O. SPINK as Vice Pres.-Sales.

GONSET DIV. reports the appointment of JAMES W. NOLAND to the position of Gen. Mgr.

CLEAR BEAM has been awarded U.S. Patent protection No. 188-460 for their Slim-Line Indoor TV Antenna.

CHICAGO STANDARD announces the appointment of GEORGE E. MENA to the post of Field Sales Mgr.

JACK GILBERT ASSOC. advertising agency has announced its incorporation under the name of GILBERT & FELIX, INC.

PHILCO has named WALTER H. EICHELBERGER, JR. merchandise manager for the Radio and High-Fidelity Dept.

ROBINS INDUSTRIES announces formation of a new Research & Development Div. at 36-27 Prince Street, Flushing 54, N.Y.

NATIONAL RADIO INSTITUTE Instruction Dept. has been joined by OLIVER READ as Director of Publications.

SENCORE reports their sales are up 150% over the fiscal year preceding the 12 months ending July 31, 1960. The company is celebrating its 10th anniversary this year. "Old Tubes Seldom Die . . . They Just Fade Away," is the title of the slide film just released to show how Sencore testers are used for service.

IRC announces the following two appointments: CHARLES G. SMITH, Western Dist. Mgr. and HOWARD LARSEN, Sales Mgr. for the Midwest Dist. The engineering Sales Dept. has appointed a group of Midwestern manufacturer's reps as "a second sales organization" to report to RICHARD KLEM, Midwestern Sales Mgr.

GENERAL ELECTRIC Television Receiver Dept. reports a realignment of its field sales force to serve the distributor organization. The dept. has doubled its national sales districts and increased to 12 the number of its District Sales Reps. The Receiving Tube Department announces the appointment of LEO T. BOWLES as Mgr. of Product Planning for the marketing section. The Receiving Tube Dept. reports the appointment of ROBERT W. WACHA as Pittsburgh Dist. Mgr. for replacement sales.

(Continued on page 10)

For more data, circle 11-9-1 on coupon, p. 50  
ELECTRONIC TECHNICIAN • November, 1960

service dealer's  
**SEMICONDUCTOR  
COMPLEMENT  
MANUAL**

Complete guide, by equipment brand and model number TO Sylvania direct replacement transistors, diodes and rectifiers.

HI-FI  
PORTABLE RADIO  
AUTO RADIO  
INTERCOM  
ELECTRONIC ORGAN

50c

**New  
Timesaving  
Guide for  
Service  
Dealers!**

*Now at your Distributor's!*

A complete guide, by equipment brand and model number, to Sylvania direct replacement transistors and diodes. Interchangeability information is included for rectifiers, too. Gives Sylvania equivalents of foreign transistor-types. Helps you find the right replacement unit . . . fast! Get your copy from your SYLVANIA SEMICONDUCTOR DISTRIBUTOR or write Sylvania, P. O. Box 212, Buffalo 9, N. Y. Only 50¢ for this valuable booklet!

Check your semiconductor stock. Fill in with top-quality Sylvania transistors, diodes and rectifiers. Your Sylvania distributor has the best!  
*Sylvania Semiconductor Division, Woburn, Mass.*

# SYLVANIA

Subsidiary of **GENERAL TELEPHONE & ELECTRONICS**



<For more data, circle 11-7-1 on coupon, p. 50



They're so good, we bring them to  
you on a **Silver Platter** (a real one!)

Good News:

**Channel Master more than *DOUBLES*  
its line of replacement tube types**

How would you best describe Channel Master tubes? Most dealers use the word "dependable". Dependable uniformity, dependable performance, dependable long life.

And now, with the addition of many new tube types, you can make Channel Master your first choice in *over 75% of all service calls!* Find out for yourself why Channel Master Premium Quality tubes have become America's fastest growing line.



**FREE! Genuine Wm. Rogers  
Holloware Service**

Luxurious, beautiful Silverplate... made by International Silver Company.

**Well & Tree Platter • 16" Round Tray  
Chip 'N Dip Dish • Double Vegetable Dish**

Get the piece of your choice, free, with each purchase of only \$55.00 in Channel Master tubes, plus one Channel Master transistor radio. Tell your distributor how many holloware sets you'd like before Christmas.

(Continued from page 8)

RCA has named LLOYD R. DAY to the newly-created position of Mgr. of New Business Development, Electron Tube Div.

WESTINGHOUSE Radio Div. announces Technical Training Sessions for TV servicemen will be held again this fall throughout the U.S.

WELLER ELECTRIC announces the following Sales Dept. appointments: LOUIS W. WHITE, Asst. Sales Mgr.; RUSSELL WINKELMANN, Regional Sales Mgr. of Mich., Ohio, Ind., Ky.; JOHN W. HAND, Western Regional Sales Mgr. Calif., Nev. and Ariz.; and DONALD RATERREE, Regional Sales Mgr., Tex., Okla., Ark., Miss., and La.

QUAM NICHOLS has announced the eight distributors who found lucky keys which opened the treasure chest at the annual Parts Show as follows: JACK WHITAKER, CRABTREE WHOLESALE ELECTRONICS; ELWIN GLASS RODEN ELECTRICAL SUPPLY; FERRELL SMITH, SATTERFIELD ELECTRONICS; EUNICE BAUMAN, ELECTRONIC DISTRIBUTING CO.; HAROLD WISKER, CENTRAL RADIO SUPPLY; LEONARD OLSEN, NESLO ELECTRONIC DISTRIBUTORS; and KEN SCHNEIDER, SEYBERT'S RADIO SUPPLY. The winners were awarded American-made transistor radios.

# American Motel MAGAZINE

## SURVEY on TELEVISION in MOTELS reports...



FACT: More

**JERROLD**

## TV Master Antenna Systems Have Been Installed Than The Next 4 Makes Combined!

While the survey shows a tremendous acceptance of Master Antenna Systems—56% of the Motel operators report having one—there is still an overwhelming segment of the market yet to be sold! And construction of new Motels—new markets—is progressing at a faster-than-ever pace!

Look to Jerrold—the leader in Master TV Antenna Systems—to help you get your share of this profitable business. The top portion of this advertisement is now appearing in AMERICAN MOTEL MAGAZINE... doing a strong "pre-selling" job on your Motel prospects!

And remember—your trained Jerrold distributor is always ready to show you how to plan and install Master Antenna Systems quickly, easily, profitably.

Yes, look to Jerrold—the world's largest manufacturer of TV distribution systems and equipment. It's the profitable thing to do!

### FREE! Valuable Installation Handbook...



A complete "How-to-do-it" manual—normally selling for \$1—that covers almost every conceivable type of installation. Included are 150 typical system layouts in detail.

Jerrold Electronics Corporation  
Distributor Sales Division  
Dept. Ids-96, Philadelphia 32, Pa.

Gentlemen:  
Please send me the "TV Distribution Handbook." I am enclosing 25c to cover handling costs and postage.

Name \_\_\_\_\_  
Firm \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

**JERROLD**

**ELECTRONICS CORPORATION, Phila. 32, Pa.**

Jerrold Electronics (Canada) Ltd., Toronto

Export Representative: CBS International, New York 22, N.Y.

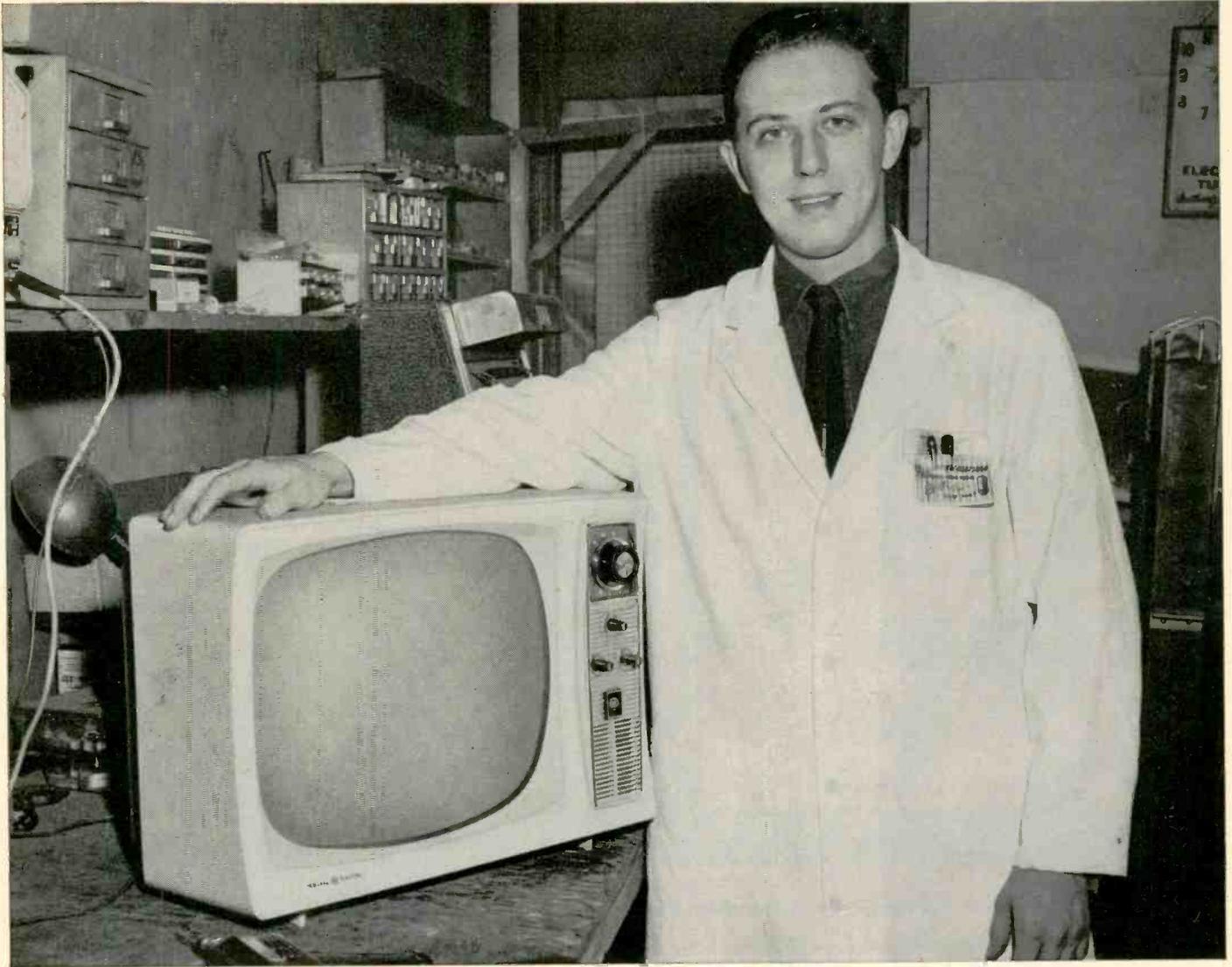
## Reps & Distributors

HENRY LAVIN ASSOC. reports the addition of ARNOLD LESTER BYMAN as Sales Engr. and assoc. to the staff of their Needham, Mass. branch office.

THOMAS ELECTRONICS announces the appointment of LAURENCE C. FREEMAN & ASSOC. as rep for the Industrial-Military Cathode Ray Tube Div. in the metropolitan N.Y. area and northern N.J.

PACIFIC ELECTRONIC TRADE SHOW has invited western electronic distributors to join in the sponsorship of the first Show scheduled for February 26-March 1, 1961, in Los Angeles' Great Western Exhibit Center.

COLMAN ELECTRONIC has announced appointment of the following new reps: DON H. BURCHAM SALES, Alaska, Wash., Ore., Idaho, western Mont., Hawaii; SHALCO, INC., Mich.; NORTHERN STATES SALES CO., Minn., N.D., S.D. and northern Wisc.; and VINES & CO., Rocky Mountain territory.



# “EASIEST TO SERVICE—

that's why I like General Electric Designer TV”

**says Albert Glasser, Manager of the Acme Television Service Company, 4750 Liberty Street, Pittsburgh, Pennsylvania.**

“We have no trouble with repairs on General Electric Designer sets. As a matter of fact, one reason our customer relationships are so pleasant is the high quality of the product.”

Mr. Glasser went on to say, “Designer sets are particularly easy to service because 90% of the key points are reachable when you take the back off. This makes it possible to do the bulk of the service work right in the home.”

The General Electric Designer chassis was created with exactly that simplicity in mind. It permits

you to get at the circuitry while the chassis is still in the set.

When you've serviced just one, you'll be an authority on the Designer, thanks to reliable, uniform Precision Crafted Circuitry. A painted schematic diagram makes it easy and quick to pinpoint repairs.

Designer TV—the easiest-to-service set in all television. General Electric Company, Television Receiver Department, Syracuse, New York.

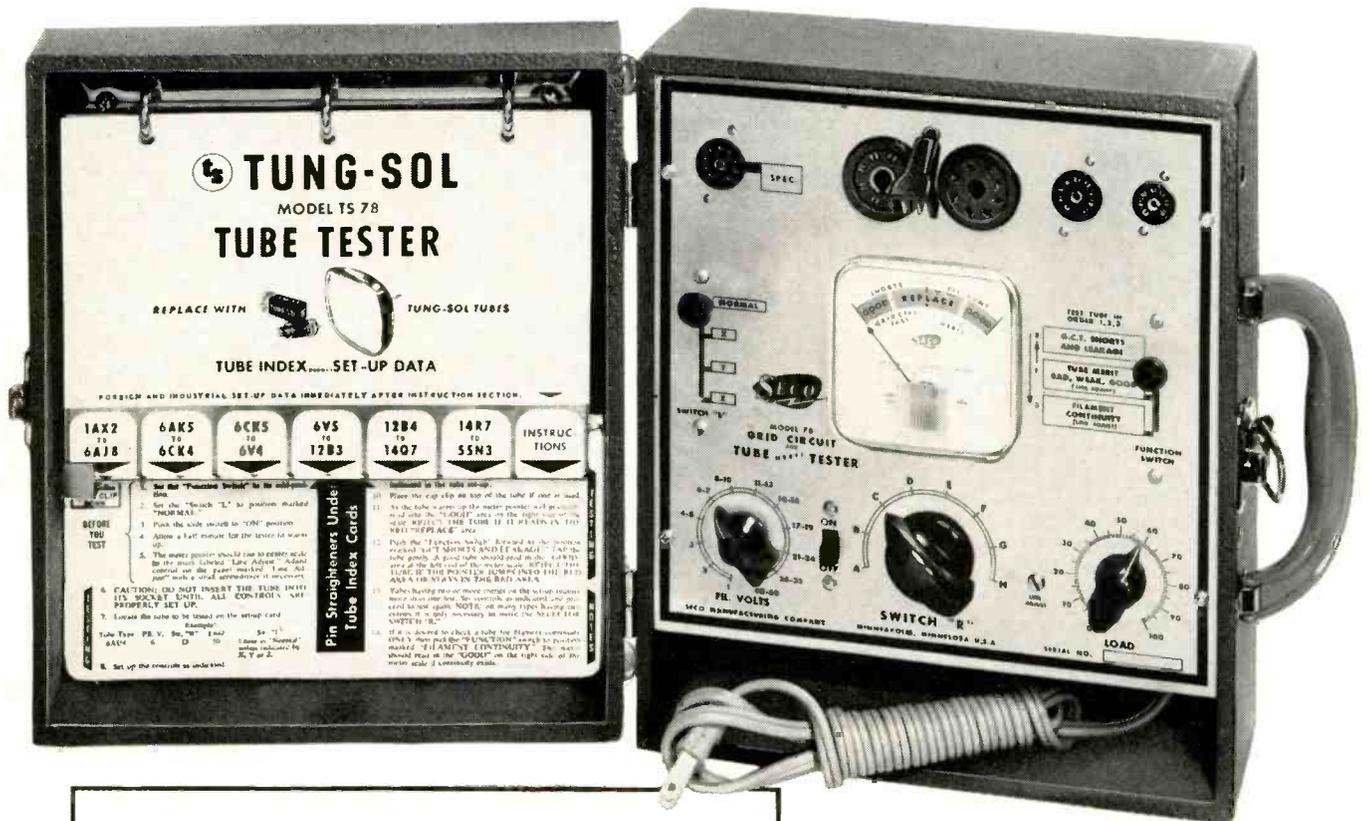
*Progress Is Our Most Important Product*



**GENERAL  ELECTRIC**

# Rebuild Tube Sales Volume

With the Tung-Sol "take home" tube tester plan



The Model TS-78 Tube Tester is a precision instrument, exceptionally fast and easy to use. Five sockets accommodate all tubes.  
 Gives results for both grid circuit and tube merit tests.  
 Comes equipped with all instructions and complete tube reference guide.

**TV servicemen** now can accommodate "do-it-yourself" customers who like to test their own tubes—and at the same time regain tube sales that have been slipping away.

The low-cost Tung-Sol "Take Home" Tube Tester enables you to provide a lending service that lets customers test their radio and TV tubes right in their own home.

Here's how it works! Customer borrows the tube tester. Checks all his tubes at home.

Returns the tester and buys the new tubes he needs from you.

In addition to boosting tube sales, the Tung-Sol plan will increase traffic to your place of business. You'll gain new service customers and increase in-store sales of other products.

Your Tung-Sol tube supplier has the whole story about the Tung-Sol "take home" Tube Tester plan. Get the information at once and begin to get back the tube sales you've lost. Tung-Sol Electric Inc., Newark 4, N. J.



**TUNG-SOL**<sup>®</sup>  
 ELECTRON TUBES • SEMICONDUCTORS

For more data, circle 11-12-1 on coupon, p. 50

# how much? \$24<sup>50</sup>

Consider the new 15" Wolverine full-range speaker—not just bigger—better, too!

The larger radiating area of the Wolverine LS15 gives it a performance edge in the bass region. The greater air load of the larger cone lowers the speaker's resonant frequency, allows the LS15 to radiate more sound power at those hard-to-get bass frequencies.

You can see the superior strength and rigidity of the cone of the LS15 that maintains truer rigid-piston motion at bass frequencies, and provides better control of the more complex modes of operation that come into play at higher frequencies.

Compare the Wolverine loudspeaker series with any other make. Whether you're interested in the LS8 (8"), LS12 (12") or the LS15 (15"), you'll find more quality per feature, and more features per dollar, in the remarkable Wolverine components . . . by Electro-Voice.

You get all these specific quality features. Heavy duty, diecast frames permanently maintain the alignment of the voice coil in the high-precision magnetic gap . . . glass coil forms maintain voice coil shape for life . . . edgewise-wound voice coil increases efficiency 18% over conventional coils . . . two specialized cones give efficient reproduction of both bass and treble frequencies . . . compact design makes them easy to install in today's sound-conditioned homes.

When your budget allows, you can get even wider range and better overall listening quality with Wolverine midrange and high-frequency step-up kits, easily added to any of the three basic Wolverine full-range speakers. Add the HF1 first, to bring out the subtle brilliance of modern stereo records, tape, and FM radio. Then, add the MF1, for greater midrange clarity, spread more evenly throughout the room by the famous E-V diffraction principle.

If you're shopping for quality and economy, your finest choice is an Electro-Voice Wolverine speaker.

Model LS15 — Specifications — Frequency response 35 to 13,000 cps; EIA sensitivity rating 46 db. Free-space cone resonance 35-45 cps. Power-handling capacity 20 watts program, 40 watts peak. Impedance 8 ohms. Mechanical cross-over 4500 cps. 15 1/4 inch diameter, 6 1/2 inch depth, 13 3/4 inch baffle opening; mounts with four holes 1/2 inches equally spaced on 14 1/8 inch circle. Net weight 11 pounds. Shipping weight 12 pounds. Net each \$24.50.

## Electro-Voice®

Dept. 110T, Consumer Products Division

ELECTRO-VOICE, INC., BUCHANAN, MICHIGAN

WOLVERINE LS 15 FULL RANGE 15-INCH LOUDSPEAKER

from **EICO**... a completely new  
CITIZENS BAND TRANSCEIVER

that meets  
FCC regulations\*



Model 760: 117 VAC  
Kit \$59.95 Wired \$89.95  
Model 761: 117 VAC & 6 VDC { Kit \$69.95  
Model 762: 117 VAC & 12 VDC { Wired \$99.95  
incl. mtg. bracket (Pat. Pend.)

\*EICO premounts, prewires, pretunes, and seals the ENTIRE transmitter oscillator circuit to conform with FCC regulations (Section 19.71 subdivision d). EICO thus gives you the transceiver in kit form that you can build and put on the air without the supervision of a Commercial Radio-Telephone Licensee!

Highly sensitive, selective SUPERHET (not regenerative) receiver with 5½ dual function tubes and RF stage. Continuous tuning over all 23 bands. Exclusive Super-Hush® noise limiter. AVC. 3" x 5" PM speaker. Detachable ceramic mike. 5-Watt crystal-controlled transmitter. Variable "pi" network matches most popular antennas. 12-position Posi-Lock® mounting bracket. 7 tubes and 1 crystal (extra xtals \$3.95 each). Covers up to 20 miles. License available to any citizen over 18—no exams or special skills required, application form supplied free. Antennas optional.

## YOU PROFIT WITH EICO

Everything in top-quality  
TEST EQUIPMENT for Shop  
and Field—at savings of 50%.



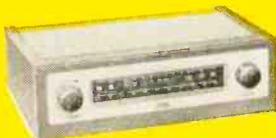
COLOR & Mono DC-5MC  
Lab & TV 5" Oscilloscope #460  
Kit \$79.95, Wired \$129.50  
5" Push-Pull Oscilloscope #425  
Kit \$44.95, Wired \$79.95



Peak-to-Peak VTVM #232 & \*UNI-PROBE®  
Kit \$29.95, Wired \$49.95  
\*U. S. Pat. No. 2,790,051  
Vacuum Tube Voltmeter #221  
Kit \$25.95, Wired \$39.95

More typical EICO values: Signal Generators from \$19.95, Tube Testers from \$34.95, Sweep Generators from \$34.95, Power Supplies from \$19.95, VOMs from \$12.90.

Everything in CUSTOM HI-FI:  
finest quality at 1/3 the cost.



FM Tuner HFT90  
Kit \$39.95, Wired \$65.95  
Cover \$3.95. Includes FET.  
AM Tuner HFT94  
Kit \$39.95, Wired \$65.95  
Includes Metal Cover and FET.  
FM/AM Tuner HFT92  
Kit \$59.95, Wired \$94.95  
Includes Metal Cover and FET.



Stereo Dual Amplifier-Preamp HF81  
Kit \$69.95, Wired \$109.95  
Includes Metal Cover.  
Stereo Dual Amplifier AF4  
Kit \$38.95, Wired \$64.95  
Includes Metal Cover.  
Write for free catalog ET 11 and name of nearest distributor.  
Most EICO distributors offer budget terms.

**EICO**

3300 N. Blvd., L.I.C. 1, N. Y.  
Add 5% in the West

For more data, circle 11-14-1 on coupon, p. 50

# LETTERS

## To the Editor

### Aspect Ratio

Editor, ELECTRONIC TECHNICIAN:

In all the hullabaloo about the 23 inch picture tube, let us not forget the passing of our staunch friend the 3 to 4 aspect ratio. Alas and alack, the new tubes have a face plate height to width ratio of only 3 to 3¼. By simple multiplication, a properly adjusted transmitted picture loses 1½ inches of its width in the dark limbo behind the mask, in addition to normal overlap. Personally, I'll take the round cornered 21EP4, which gives you the full width so important for the new wide screen movies.

HAROLD N. HOROWITZ

Sombrero Television Co.  
Phoenix, Ariz.

### Transistor Testing

Editor, ELECTRONIC TECHNICIAN:

We note with interest Herb Bowden's letter in your August issue commenting on your June "Transistor Testing" article. We disagree with his contention that a pencil type harmonic generator is unsuitable. We use "Mosquitos"—the absence of a ground lead is no disadvantage as a clip lead can be run from the pocket clip. Actually we went a step further and fitted a banana plug jack to the bakelite cap holding in the battery, a minor job. The lack of an output control is a disadvantage but the output can be varied by the position of the hand holding it and its lack is outweighed by the compactness of the pencil. As to inadequate power to drive a speaker direct, we have not found this to be so—enough signal exists to produce a clear note and one does not use this as a method of judging quality. The question of a second lead we have already dealt with. Regarding battery eliminators, we agree with Mr. Bowden to a point. We actually ordered one manufactured by his company, Sencore, but the distributor was out of stock. We purchased one from one of his competitors and have had to install a milliammeter in the top of the case. Incidentally, we think this an improvement on the dual purpose meter as simultaneous readings of voltage and current are frequently most informative. The lack of a bias tap, which Mr. Bowden's unit includes, is a considerable handicap and really the only point on which we can agree with him.

S. STEPHENSON,  
General Manager

Newtonhill Industries, Ltd.  
Welland, Ont., Canada

• Mr. Bowden replies: "I agree with Mr. Stephenson as he has really agreed with me and taken the time to add a ground lead. I agree with Mr. Stephenson that if you are good enough to control radiation from a generator by the use of your hand, you do not need an output control. I think that most people want the control as he suggests. I agree that if you add a ground lead, you may be able to operate a speaker directly—that is if you add the ground lead as he has done. The pencil that I tested would not drive the speaker; his may have. I am not concerned about speaker quality that he mentions. I am only interested in whether the speaker is working, as a transistor radio is really dead when it doesn't work. I agree that Mr. Stephenson now has a good power supply after adding the meter. However, he is just agreeing with me that the current is important. He agrees with me on the bias tap, so certainly I agree with him. Now that Mr. Stephenson has changed his units so they are more like the Sencore units, I am sure that he is happier."

(Continued on page 16)

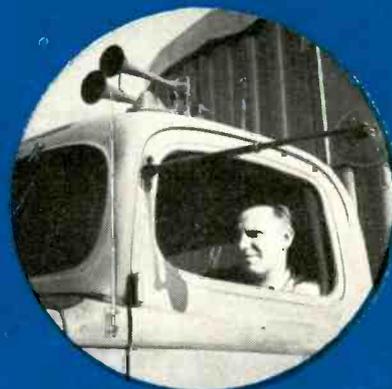
For more data, circle 11-15-1 on coupon, p. 50  
ELECTRONIC TECHNICIAN • November, 1960



TAXICABS



CITIZEN'S AVIATION



BUSINESS



HIGHWAY PATROL



MARINE

# 5 NEW SOURCES OF SERVICE BUSINESS

*You can qualify for them with new **Raytheon Communications Technician's Course***

There are over two million transmitters in the Safety and Special Radio Services now—and the number is expected to double each year. The opportunity for extra service business is endless, but . . .

Federal law requires an FCC license to service transmitting equipment. The Raytheon course assists in preparing you with the necessary technical background to take the FCC license examination through the following studies:

1. A review of electronic fundamentals
2. Typical circuits of two-way radio communications equipment
3. FCC rules covering laws and operating practices
4. Theory, operation, installation and maintenance of citizen's band equipment
5. Citizen's band frequency allocations, limitations, etc.
6. Frequency modulation theory
7. F/M techniques, detectors/discriminators, circuits

This is not a "cram" course just for the FCC examination but also includes exhaustive technical training that equips you to service two-way communications and allied industrial equipment as a practicing specialist.

Enrollment applications for this course necessarily involve an entrance examination to determine those qualified. On completion of course, you become a Raytheon Bonded Communications Technician, with diploma and merchandising aids to help you attract this new flourishing market.

Free Brochure and Application Papers—Mail Today

Send this coupon now for a booklet describing course and application for your entrance examination. Entrance exams will be graded as soon as received.

RAYTHEON COMPANY  
 DISTRIBUTOR PRODUCTS DIVISION  
 411 Providence Turnpike  
 Westwood, Mass.  
 Box No. 11

**GENTLEMEN:** Please send me your brochure describing the Raytheon Communication Technician's Course.

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

ADDRESS OF DEALER \_\_\_\_\_

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

DISTRIBUTOR'S NAME \_\_\_\_\_ ADDRESS \_\_\_\_\_



# RAYTHEON COMPANY

DISTRIBUTOR PRODUCTS DIVISION

# BUY PYRAMID! GET MORE!



Only Pyramid offers you so much! Only Pyramid gives you highest quality capacitors plus so many "all new" extras.

### THE VU-PAK

An entirely new way to package capacitors . . . clear plastic tubes, plainly labeled and packed with the highest quality electrolytic twist-mount capacitors. Each re-usable Vu-Pak comes with a blank label, ideal for storing small parts and tools on your bench or in your tool kit.

### EXTRA OFFER!

Save 50 Vu-Pak labels and get the fabulous new Pyramid storage rack the Capac-o-mat, at tremendous savings from your authorized Pyramid distributor. The Capac-o-mat fits right on your shelf, is dust-free and holds 54 Vu-Paks.



### JEWEL BOX

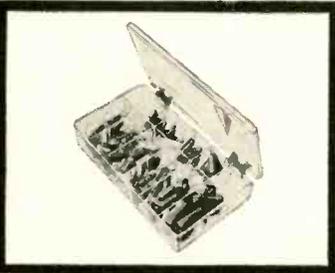
Handsome tan plastic, high impact cabinet with 9 drawers, contains 45 assorted Mylar\* paper Gold Dip capacitors, type 151. Practical . . . convenient . . . for storage in your shop, or home. Actual value of the Jewel Box with 45 Gold Dip capacitors—\$19.50, dealer net only \$9.25.



Gold Dip capacitors are also available in Clear-Vu paks . . . 5 to a package. Find them on Pyramid's new Whirl-o-mat on your favorite parts distributor counter.

### "GOLD STANDARD" 111 KIT

Clear Lucite hinged box containing 75 Pyramid's popular assorted Gold Standard Mylar\* capacitors. You'll find so many uses for the Gold Standard 111 Kit. Actual value is \$26.00, dealer net only \$13.00



### 515 LYTIK-KIT

Hinged cover, clear lucite box with 15 assorted miniature low voltage electrolytic capacitors for transistorized circuit replacements, type MLV. This Kit is a constant companion to any busy serviceman. Actual value, \$20.60, dealer net only \$10.30.



## PYRAMID ELECTRIC COMPANY

DISTRIBUTOR DIVISION: UNION CITY, NEW JERSEY

Factories: Gastonia, North Carolina • Darlington, South Carolina  
In Canada: Wm. Cohen, Limited, 8900 Tanguay Street, Montreal  
Export: Morhan Exporting Co., 485 Broadway, New York 13, N. Y.

For more data, circle 11-16-1 on coupon, p. 50

(Continued from page 14)

### Japanese Parts

Editor, ELECTRONIC TECHNICIAN:

In the August issue there appeared a letter from L. Cybulska, Lincoln Radio, opposing the use of Japanese tubes and parts. I agree with his comments. I wrote my congressman, and furnished him with trade paper literature on these items. He agrees with my point of view, but we are only two! Have other service technicians written to their representatives yet?

HOWARD MCCALL

Lister Television  
Canton, Ohio

### Dealer-Distributor Relations

Editor, ELECTRONIC TECHNICIAN:

Concerning the pressing problem of dealer-distributor relations, we would be glad to meet with our distributors to discuss these problems. Some of the don'ts we can think of at this time are: Dealers should not send a customer to a distributor's showroom to look at a large item he can't afford to stock, without a qualified salesman or representative from his store. Distributors should not maintain such attractive street level displays. Distributors should never write up a "cash" sale. Use the customer's name if he is in the trade. Distributors should show only list prices on showroom items. Any item for that matter. Quoting net prices over the 'phone is risky.

CLEM DAIGNEAULT,  
President

Worcester County Assn. TV Technicians, Inc.  
Worcester, Mass.

### Ooo La La!

Editor, ELECTRONIC TECHNICIAN:

I am currently a subscriber to ELECTRONIC TECHNICIAN Magazine. However, instead, you have sent me the October issue of *Mademoiselle*. Would appreciate it very much if you would send me your October issue as I enjoy this publication very much and do not wish to miss a single copy. Thank you. Do you wish *Mademoiselle* returned?

ARNOLD H. WEINER

New York City

• A copy of ET is being sent to reader Weiner. And he can keep the copy of *Mademoiselle* . . . courtesy of one distracted mailroom girl.—Ed.

Correspondence from readers is always welcome. Name and address, which must accompany letters selected by the editor for publication, will be withheld on request. Anonymous letters go right into the wastepaper basket.



"That's right. There is no charge if I cannot fix your set in your home."



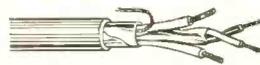
Shielded Power Supply Cables



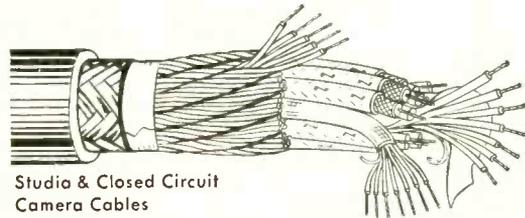
Plastic Microphone Cables



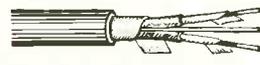
Shielded Interconnecting Cables



Strain Gauge Cables



Studio & Closed Circuit Camera Cables



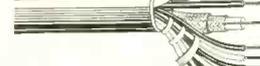
Broadcast Audio Cables



Sound System Cables



TV Eye Camera Cable



75-Ohm Video Cable



Portable Cordage



Low Impedance Lines



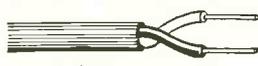
Call System Cables



PA System Cables



Sound & Alarm System Cables



Audio Cables



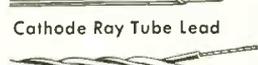
Cathode Ray Tube Lead



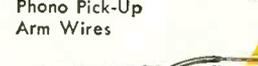
Phono Pick-Up Arm Wires



Stereo Wires



Grid Wires



Hi-Fi Connecting Cable



Control Cables



Antenna Roto Cables



Industrial Intercom Cables



Test Prod Wires



Juke Box Control Cables



Unpaired Intercom Cables



PERMOHM® Lead-in



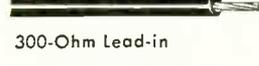
CELLULINE® Lead-in Cable



WELDOHM



300-Ohm Lead-in



Ham Antenna Lead-ins



Cards



Special Sound Cables



RG/U Transmission Line Cables



Community TV Antenna Cables



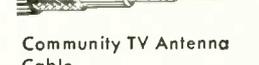
Multiple Pair Cables



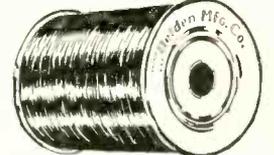
Community TV Antenna Cable



Control Cables



Cards



Magnet Wire



Juke Box Control Cable



Individually Shielded Intercom Cables



Rubber Microphone Cables



Hook-Up Wires



Duplex Priming Wires



Lamp Cordage



MIL-SPEC WIRES



TEFLON® Wires  
\* DuPont trademark



Here is just part of the  
**WORLD'S MOST COMPLETE LINE**  
of Electronic Wire and Cable!

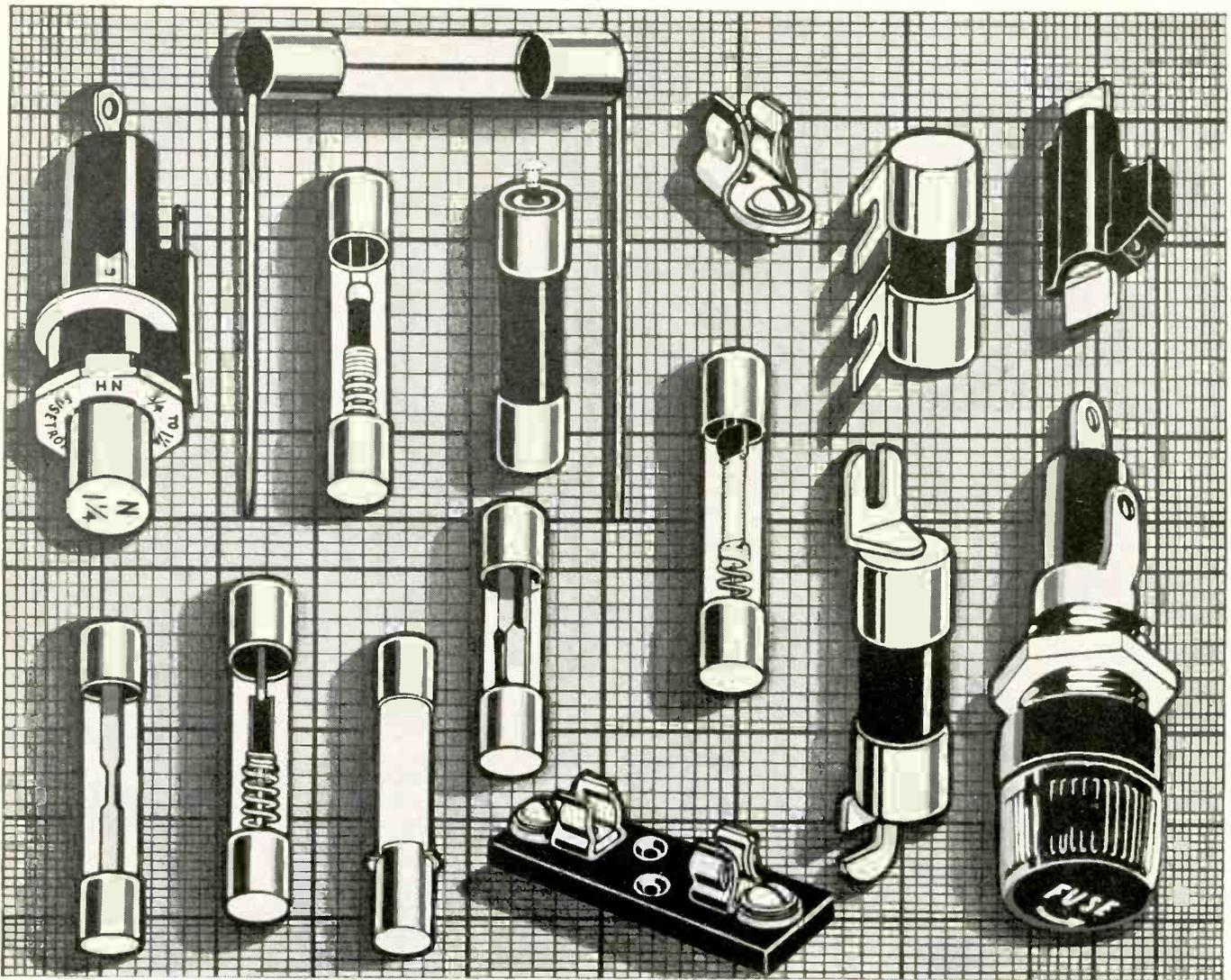


Available from Stock

One Wire Source for Everything  
Electronic and Electrical

- magnet wire • lead wire • power supply cords • cord sets • portable cordage • electronic wire • automotive replacement wire and cable • aircraft wire • electrical household replacement cords

8-3-9



# BUSS fuses can help protect *your profits and your reputation for service*

You get double protection when you install BUSS fuses.

**First**, BUSS fuses are designed and manufactured to give maximum electrical protection.

But it doesn't stop there.

Every BUSS fuse is carefully tested in a sensitive electronic device that automatically rejects any fuse not correctly calibrated, properly constructed and right in all physical dimensions.

This is your assurance that BUSS fuses will operate as intended.

**Second**, BUSS fuses help protect your reputation for quality service. A fuse that opens prematurely causes a needless shutdown. Likewise, one that doesn't function properly may cause other components to burn out or be damaged. In either case, it's an annoying headache for your customer and it may cost you his confidence. More often than not, he will blame you for his trouble.

With dependable BUSS fuses, you need have no worries that faulty fuses will threaten your profits or your reputation. That's why it makes good sense to install BUSS fuses.

*For more information on BUSS and FUSETRON small dimension fuses and fuseholders . . . Write for bulletin SFB.*

**BUSSMANN MFG. DIVISION**

McGraw-Edison Co.

University at Jefferson, St. Louis 7, Mo.

1160

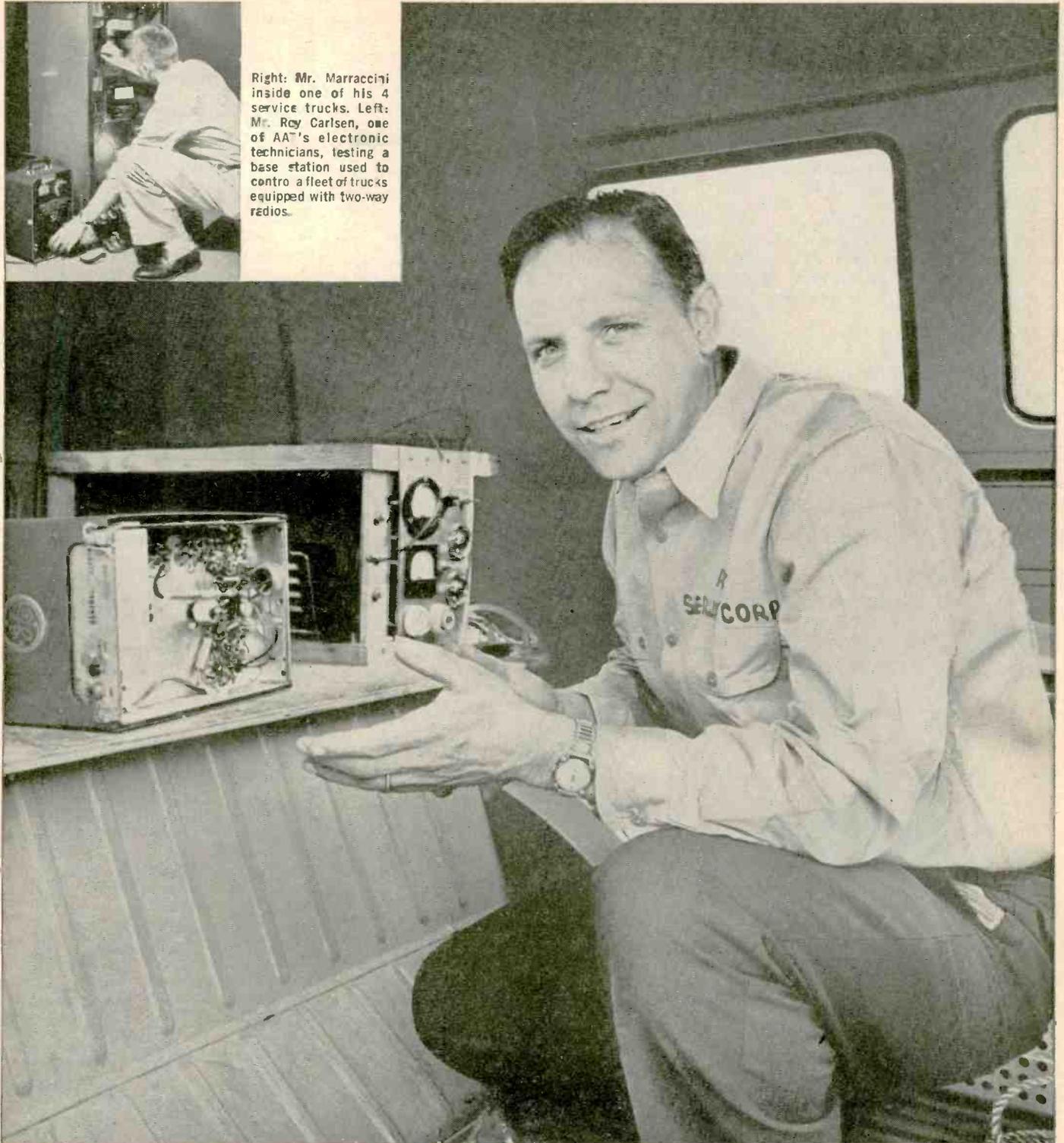
**BUSS FUSES ARE MADE TO PROTECT -  
NOT TO BLOW NEEDLESSLY**



BUSS MAKES A COMPLETE LINE OF FUSES FOR HOME, FARM, COMMERCIAL, ELECTRICAL, ELECTRONIC, AUTOMOTIVE AND INDUSTRIAL USE.



Right: Mr. Marraccini inside one of his 4 service trucks. Left: Mr. Roy Carlsen, one of AAT's electronic technicians, testing a base station used to contro a fleet of trucks equipped with two-way radios.



**"We spend 90% of our ad money on 36 ads in three Yellow Pages directories!"** says A. J. Marraccini, Pres., AAT Television Service Corp., Staten Island, N. Y. **"Half of our new business comes in through the Yellow Pages! Every week, we get some 15 calls for residential and industrial work as a result of our ads in 3 different directories. Many of our industrial electronic and radar service calls come in through the Yellow Pages. And our ads under 7 trade-marks pull in many people for name brand TV service!"** ■ Display ad (shown reduced at right) runs under TELEVISION DEALERS & SERVICE. Call the Yellow Pages man at your Bell Telephone office to plan your program.

Display this emblem. It builds your business!





**SERVICE & INSTALLATION ON**  
 ADMIRAL  
 C. I.  
 FIVECO  
 RCA  
 MOTOROLA  
 EMERSON  
 QUADRA  
 ZENITH  
 MAGNAVOX  
 CROLEY  
 SILVERTONE

ANTENNAS  
 INSTALLED, MOVED  
 REPAIRED

**AAT TELEVISION SERVICE**

SERVING ALL OF S. I. DAILY

"An Outstanding Division To Quality Service—Fully Equipped, Experienced Technicians—The Most Complete Electrically Equipped Shop—Exclusive on Staten Island"

we offer:

- 24 HOUR SERVICE
- WRITTEN GUARANTEE
- COLOR T.V. SERVICE
- TELEVISION REPAIRS
- STEREO HI FI
- U.S. Gov't Licensed Radar & Communications Electronic Devices

**ELgin 1-1333**

42 WINHAM AVE., S. I. 4

For more data, circle 11-19-1 on coupon, p. 50

## Catalogs & Bulletins

**NEEDLES:** Announced is the 9th annual Simplified Replacement Needle Reference Guide. Now includes a phonograph manufacturer's index, both monaural and stereo, a convenient cross-reference guide, spot check listing from needle to cartridge manufacturer and vice versa, and illustrations of the firm's replacement needles. Recoton Corp., 52-36 Barnet Ave., Long Island City 4, N. Y.

For more data, circle 11-20-2 on coupon, p. 50

**RELAY:** A new low cost general purpose a-c/d-c relay, interchangeable dimensionally with many relays of similar size, is described in current literature. Magnecraft Electric Co., 3354 W. Grand Ave., Chicago 51, Ill.

For more data, circle 11-20-3 on coupon, p. 50

**CAPACITORS:** Bulletin 6081 provides condensed listings of the firm's complete line of capacitors. Included among the new types are Series 134T, which comply with MIL C-14157B, and Series 9FM that provide film dielectric plus a plastic case at an attractive cost. John E. Fast & Co., 3598 N. Elston Ave., Chicago 18, Ill.

For more data, circle 11-20-4 on coupon, p. 50

**LOUDSPEAKERS:** "For the Discerning Listener" is a new 16-page catalog on Goodmans loudspeakers. Rockbar Corp., 650 Halstead Ave., Mamaroneck, N. Y.

For more data, circle 11-20-5 on coupon, p. 50

**WIRE & CABLE:** The new 1960-1961 20-page catalog, B-22, offers a comprehensive line of electronic wire, cable, guy wires, coaxial cable, tools and promotional merchandise. Saxton Products, Inc., 4230 Park Ave., Bronx 57, N.Y.

For more data, circle 11-20-6 on coupon, p. 50

**ANTENNAS:** Marine antennas, mounts and accessories are covered in current literature. Descriptions, illustrations, drawings and prices are included. Rowe Industries, Marine Div., 1702 Wayne St., Toledo 9, Ohio.

For more data, circle 11-20-7 on coupon, p. 50

**MAGNETIC TAPES:** The physical and magnetic properties of "Scotch" brand magnetic tapes for audible range recording are covered in a colorful brochure. Minn. Mining & Mfg. Co., 900 Bush Ave., St. Paul 6, Minn.

For more data, circle 11-20-8 on coupon, p. 50

**PICTURE TUBE TESTER & REACTIVATOR:** An illustrated circular covers model V300. The unit is adapted for testing color tubes and all black and white tubes including those with 110° deflection and new filament voltages. Vis-U-All Products Co., Hampshire, Ill.

For more data, circle 11-20-9 on coupon, p. 50

**SOLDERING IRON TIP CLEANER:** Literature is available covering the new "Little Joe" soldering iron tip cleaner, a low-cost handy device to keep tips clean and free from contamination. Macdonald & Co., 714 E. California, Glendale 6, Calif.

For more data, circle 11-20-10 on coupon, p. 50

**PHONE JACK:** Literature covers a new thick panel phone jack that can be mounted in any panel up to 1 1/4" thick. Its many applications include TV, radios, phonographs, speaker enclosures, microphones, and custom hi-fi installations. Switchcraft, Inc., 5555 N. Elston Ave., Chicago 30, Ill.

For more data, circle 11-20-11 on coupon, p. 50

**TV ANALYST:** Illustrated bulletin 1076 describes Model 1076 TV analyst . . . a complete, convenient TV signal-generating source with visual check. Bulletins 685 and 160 cover Model 685 Dyna-Quik tube and transistor tester and Model 160 transistor tester, respectively. B&K Mfg. Co., 1801 W. Belle Plaine Ave., Chicago 13, Ill.

For more data, circle 11-20-12 on coupon, p. 50

**HAND TOOLS:** Catalog #100 contains 24 pages of information, with illustrations, on a full line of pliers, snips and other hand tools. Includes leather-case sets of professional pliers for precision craftsmen, self-service displays, etc. Completely indexed. Kraeuter & Co., 585 18th Ave., Newark 3, N. J.

For more data, circle 11-20-13 on coupon, p. 50

(Continued on page 22)

# BUY A DOZEN VU-BRITES



...get the watch band

# FREE!

Handsome, practical Florentine expansion watch band—yours free with the purchase of 12 C401 or C402 Vu-Brites!

## WHAT A DEAL!

For a limited time, Perma-Power is offering you this wonderful gift absolutely free with the purchase of 12 Vu-Brites at the regular price. Vu-Brites are the brighteners that really do a job—on series or parallel sets (Model C401 for parallel; Model C402 for series). They come colorfully packaged in individual boxes . . . and are priced at \$9.95 the dozen, net.

Hurry—this special gift offer will end when current stocks are gone. Call your distributor today.

# Perma-Power<sup>®</sup> COMPANY

3104 N. ELSTON AVENUE • CHICAGO 18, ILLINOIS

For more data, circle 11-20-1 on coupon, p. 50

For more data, circle 11-21-1 on coupon, p. 50 ➤

ELECTRONIC TECHNICIAN • November, 1960

# Why are more Service-Dealers Switching to **JFD** EXACT REPLACEMENT TV ANTENNAS?



## because

50 per cent of all TV sets made in the last 4 years are portables—sending *more* antenna replacement business to service-dealers every day.

## because

with the JFD PA500 and PA515 Exact Replacement Kits, dealers are ready and able to service 90% of antenna replacements for portables and tote-ables.

## because

as JFD Exact Replacement Specialists, service-dealers can get out of the unprofitable “rabbit-ear” business—earn a *profit* on the antenna *sale* (at full mark-up) *and* on the *installation*.

## because

with JFD guides, streamers, and sales helps, service-dealers get the merchandising *know-how* that nets them a bigger slice of the 3,500,000 dollar portable antenna replacement market.

***NOW IS THE TIME TO WRITE JFD OR ASK YOUR JFD DISTRIBUTOR FOR YOUR EXACT REPLACEMENT PROFIT PLAN PORTFOLIO!***



Only JFD keeps you up-dated with the 1960 Portable TV Antenna Guide covering every portable TV set made since 1956 (compiled and edited by Howard W. Sams & Co., Inc.)  
**CHECK SAM'S PHOTOFACT FOLDERS For JFD Exact Replacement Antenna Information**



THE BRAND THAT PUTS YOU

# JFD

JFD ELECTRONICS CORPORATION BROOKLYN 4, NEW YORK  
 JFD International, 15 Moore Street, New York, New York • JFD Canada, Ltd., 51 McCormack Street, Toronto, Ont., Canada IN COMMAND OF THE MARKET

# SERVICE MASTER... EVERY TOOL YOU NEED 99% OF THE TIME



complete 23-piece kit for radio, TV,  
and electronic service calls

## 2 HANDLES:

shockproof plastic.  
Regular 4" length  
... 2" Stubby. Inter-  
changeable. Patented  
spring holds snap-in  
tools firmly in place.



## 9 NUTDRIVERS:

High Nickel chrome  
finish, 3/16" to 1/2"



## 3 STUBBY

NUTDRIVERS:  
1/4", 3/16", 3/8"



## EXTENSION BLADE:

Adds 7". Fits  
both handles.



## 3 SCREWDRIVERS:

Two slotted ...  
3/16", 3/32"  
#1 Phillips



## 2 REAMERS:

1/8-3/8", 1/4-1/2"



## ADJUSTABLE WRENCH:

6" thin pattern,  
1" opening



## LONG NOSE PLIER:

"Cushion Grip",  
2 1/4" nose



## DIAGONAL PLIER:

"Cushion Grip"  
hand-honed  
cutting edges



## ROLL UP KIT:

Durable, plastic-  
coated canvas.  
Compact, easy-  
to-carry.

Ask your distributor to show you kit 99 SM

# XCELITE

XCELITE, INC. • ORCHARD PARK, N. Y.  
Canada: Charles W. Pointon, Ltd., Toronto, Ont.

For more data, circle 11-22-1 on coupon, p. 50

22

(Continued from page 20)

**POWER SUPPLY:** Current literature covers model CVS-300 bantam size constant voltage regulated power supply, designed for the powering of solid state equipment on the bench or in the rack. Matthews Labs., 3344 Fort Independence St., New York 63, N. Y. For more data, circle 11-22-3 on coupon, p. 50

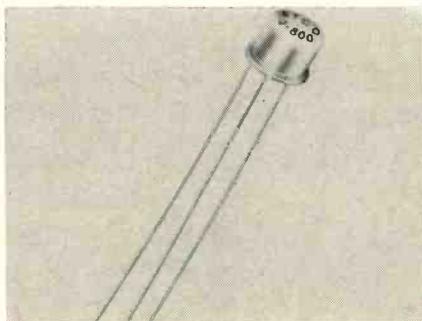
**ORGAN TUNING KIT:** Literature is available covering the new Autotuner. This pocket-size, stroboscopic, device is easy to use and tunes to an accuracy of 1/100 semitone. Available in completely assembled and tested form, or in simple assemble-it-yourself kit. Schober Organ Corp., 43 W. 61 St., New York 23, N. Y. For more data, circle 11-22-4 on coupon, p. 50

**SWEEP GENERATORS:** Catalog No. T-203B covers sweep generators used for TV receiver alignment and production. Includes descriptions and specifications of sweep generators for both UHF and VHF application, and details various accessories used in conjunction with the generators. Telonic Industries, Inc., Beech Grove, Ind. For more data, circle 11-22-5 on coupon, p. 50

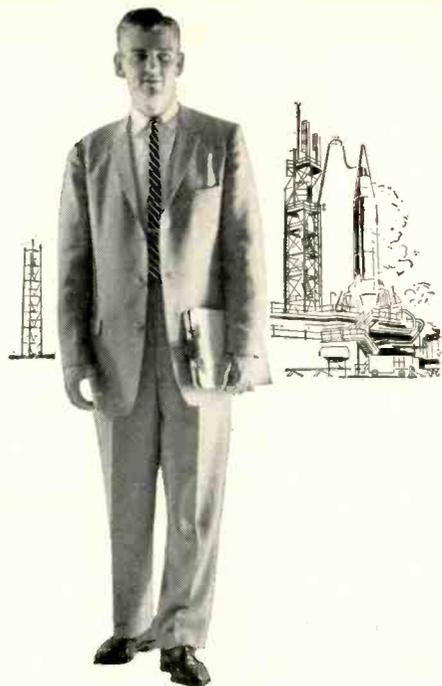
**LOUDSPEAKERS:** A new 16-page Goodmans loudspeaker catalog, "For the Discerning Listener . . ." describes each of the firm's loudspeakers: the 8" Axiote, the new 10" Axiom 110, the complete Triaxiom series, up to the 15" Audiom woofers. Catalog includes description of a complete "Stage-Built" system and other aids. Rockbar Corp., 650 Halstead Ave., Mamaronck, N. Y. For more data, circle 11-22-6 on coupon, p. 50

## ETC TRANSISTORS

Replacement transistors for Japanese-made radios are available in a complete line of over 100 different transistor types. An interchangeability chart enables technicians to check the Japanese transistor number, on



the unit, with the replacement number of the American-made transistor. Each transistor value is available singly so that the technician can order and stock only those values which are needed immediately. Electronic Transistors Corp., 9226 Hudson Blvd., North Bergen, N. J. For more data, circle 11-22-7 on coupon, p. 50



## Field Engineers

For Univac Missile-  
Guidance Computers!  
(Overseas & Domestic Assignments)

Field engineers are now being selected for maintenance assignments on ultra-reliable Univac missile-guidance computers and other military electronic data processing systems.

Openings involve maintenance of the Univac ICBM guidance computer, first of its size to be completely transistorized.

Applicants must have at least 2 years formal education in Electronics with 3 or more years in maintenance or maintenance-instruction. Experience should be associated with complex electronic equipment such as TV, radar, sonar or digital computing systems.

Before assignment, you will receive 2 to 6 months training at full pay in our St. Paul, Minnesota, laboratories. Benefits include company paid life insurance, hospitalization, medical and surgical benefits, relocation expenses and living allowances at field sites.

Openings also for qualified instructors with backgrounds similar to above.

Send complete resume of education and experience to:

R. K. PATTERSON, Dept. J-11

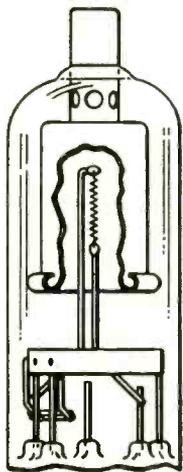
**Remington Rand**  
**Univac**

DIVISION OF SPERRY RAND CORPORATION  
2750 W. Seventh St., St. Paul 16, Minn.

For more data, circle 11-22-2 on coupon, p. 50  
ELECTRONIC TECHNICIAN • November, 1960

at my  
 .....  
 expense  
 .....  
 try the  
 CBS  
 1G3GT/1B3GT

(LET IT CUT YOUR CALL-BACKS)

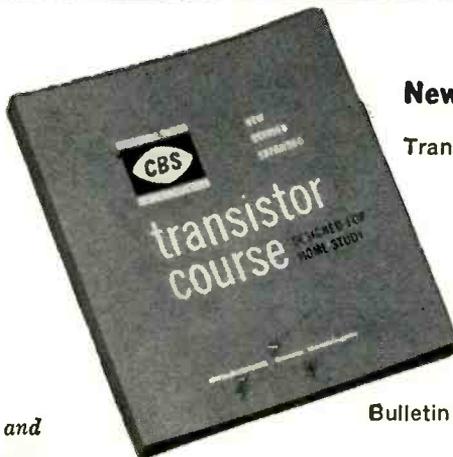


Yes, cut your call-backs four ways:  
 1. With the solid four-point suspension of my Bantet stem. 2. With my simplified two-weld filament support. 3. With my sagproof-flakeproof stretched filament coil (possible only with my costly cataphoretic coating applied *after* filament weld assembly). 4. With the permanent positioning of my anode with respect to my filament.

These four features keep me clean as a whistle inside . . . with no loose particles to make me get grouchy and sputter. My filament coating stays put. My filament and anode keep a respectful and arcproof distance. And you can stop worrying about arcs and burn-outs . . . because I like high voltage!

**HERE'S MY FREE TRIAL OFFER**

Get one CBS 1G3GT/1B3GT FREE with your purchase of nine from your distributor of CBS Electronics products. Let me prove to *you*, at my expense, CBS TOTAL RELIABILITY . . . proved in performance year in, year out by leading TV and radio set manufacturers. Act now . . . this offer ends November 30.



**New . . . Revised . . . Expanded**

1961 Edition of the popular CBS Transistor Home-Study Course is now available. Many added pages of important transistor information make this easy-to-understand, proven course a timely "must" for service technicians with an eye to the future. Join the thousands upon thousands of engineers and technicians who are already profiting from this practical course. Write today for Bulletin PFF-276 giving complete details.

**CBS ELECTRONICS**

Danvers, Massachusetts  
 A Division of Columbia Broadcasting System, Inc.

Receiving, industrial and picture tubes • transistors and diodes • audio components • and phonographs

For more data, circle 11-23-1 on coupon, p. 50

## For Push-Pull AND Push-Push Switch Type Controls

it  
all  
adds  
up  
to  
**Centralab**



Look at the figures—78% of the TV, radio and hi-fi sets now being produced utilize push-pull or push-push controls! Only CENTRALAB gives you a complete line of replacements for them—35 push-pulls, plus the *only* push-push units available! To multiply your choice, these CENTRALAB switch-type controls are divided into 4 types—Adashaft, Universal Shaft, Fastatch or dual concentrics, and Twin types for stereo. Whatever kind you need, you can be sure your CENTRALAB distributor has it. For a complete accounting on these push-pull and push-push controls, ask your distributor for Bulletin 42-936 or write us for your free copy.

# Centralab

B-6034

THE ELECTRONICS DIVISION OF GLOBE-UNION INC.  
902L EAST KEEFE AVENUE • MILWAUKEE 1, WISCONSIN  
CENTRALAB CANADA LIMITED—AJAX, ONTARIO

ELECTRONIC SWITCHES • VARIABLE RESISTORS • CERAMIC CAPACITORS  
PACKAGED ELECTRONIC CIRCUITS • ENGINEERED CERAMICS

For more data, circle 11-24-1 on coupon, p. 50



ELECTRO-SONIC elects Rene Snepvangers, ex-Fairchild, as vice pres.

NORTRONICS announces its new "J" Series of miniature record/erase/playback magnetic tape heads with track width of 0.070 inch. \$23.80 net.

DYNACO introduces the Dynatuner FM tuner kit which can be aligned without test equipment, featuring better than 4  $\mu$ V sensitivity (IHFM standards).

KINEMATIX introduces a portable transistorized PA system, "Roving Rostrum," which includes a Shure Commando microphone. Unit is 16" x 18" x 8-1/2" deep, @ \$149.95.

MAIER COMPANY, Wellington, O., announces "Register-Music". Attached to any furnace plenum or dome, unit channels music through ductwork and out of hot air registers in every room. \$39.95 retail.

CHECKER ELECTRONICS introduces a single unit portable PA system, the Raven 401, with 8 watts peak. Cabinet is 12" x 10" x 6" deep, 9 lbs. With 16 ft. mike cable, mike stand, and 8 ft. cord for AC-DC power line, \$64.95 list.

PACOTRONICS Pres. S. M. Weingast announces plans for 100% increase in production capacity. The publicly owned company named Sol Sparer exec. vp; Abe Kosakowsky sales vp; Sid Solomon asst. sales manager. Semi-kit bookshelf speaker system L-1 was introduced @ \$24.95, as well as test gear, depthfinder, and electronic kit builders tool kit.

(Continued on page 26)



# LAFAYETTE RADIO

## Years as Electronic Headquarters for the Service Technician

Choose from these Lafayette top-quality instruments. Fully Wired . . .  
Completely Assembled. Ready to go to work the day you get it

### NEW! Lafayette Tube Tester COMPLETELY WIRED — NOT A KIT

- Accurately Checks Over 1000 Different Tubes
- Tests for Cathode Emission, Leakage and Shorts plus Filament Continuity
- Highly Accurate Easy-To-Read Meter with "Replace—Good" Scale
- Fast-Setting Slide Switches
- Slide Out Tube Chart
- Completely Portable—Weights only 6 lbs.

★ **ONLY 19.95**

The ideal tube tester for any radio-TV serviceman, technician, experimenter, etc. Sockets provided for 7-pin miniature, 9-pin miniature, octal base, loctal base, noval and sub-miniature types. Alligator clip furnished for testing tubes with top caps. Leakage indicator light glows when inter-element short or leakage is present in tube. Easy-to-read meter calibrated 0-100 with a red-green "Replace-Good" scale, plus a special scale for checking diodes. Metal casing plus handy carrying case. For 105-125 volts, AC, 60 cps. Shpg. wt., 7 lbs.



Full Size  
9 3/4" W x 8 1/8" D x 2 3/8" H

TE-15 Tube Checker

Net 19.95



### NEW! 20,000 OHMS Per Volt Multitester

- 20,000  $\Omega/v$  DC Sensitivity
- 10,000  $\Omega/v$  AC Sensitivity
- 40 Microamp Movement
- 1% Resistors
- 0-0.6 Volt DC Range
- 28 Ranges

**17.95**

A new high-quality, portable multitester for technicians, servicemen, etc. Large, easy-to-read meter. Single knob selector and clearly marked positions permit easy operation. Recessed zero-ohms knob adjustment. Complete with color-coded, heavy duty test probes and battery. Size: 6x3 7/8x1 3/4".

TE-12

Shpg. wt., 1 1/4 lbs. Net 17.95



### NEW! 10,000 OHMS Per Volt Multitester

- Extra Large 3 1/2" Meter Face
- Handy Pocket Size
- All Accessories Included

Features unusually sensitive 10,000 ohms-per-volt AC-DC meter, 1% precision resistors, and the largest meter ever placed on an instrument of this size. Single range selector switch. Case and panel of durable bakelite. First capacity range requires 120 volts AC, second range requires 6 volts AC. Complete with leads and battery. Probes and flexible leads are plastic coated and color coded. Size: 4 1/2 x 3 1/2 x 1 1/8".

TE-10 Shpg. wt., 1 1/2 lbs. Net 9.95

TE-14 Pigskin carrying case for TE-10. Shpg. wt., 8 oz. Net 1.95

### NEW! 20,000 OHMS Per Volt Multitester

- 20,000 Ohms-Per-Volt DC; 10,000 Ohms-Per-Volt AC
- 40 Microampere 3" D'Arsonval Meter Movement
- High Input Resistance on All DC and AC Ranges

40 microampere meter movement permits a high input resistance on all ranges: 20,000 ohms-per-volt on DC; 10,000 ohms-per-volt on AC. This, plus 1% tolerance resistors, allow the measuring of voltages without unduly loading the circuit, thus preserving the accuracy of the readings. Uses one standard 1 1/2 volt penlight battery. Size: 3 3/4 x 5 3/4 x 1 7/8". Shpg. wt., 3 lbs. Net 13.50

RW-60 Net 13.50

### Lafayette Wave-Meter

- No Power Source Required
- Telescoping Antenna Included
- Portable for Use Everywhere

A miniature wave-meter for checking transmitter output. Determines relative strength of fundamental frequency and any harmonic or parasitic radiation. Tunes 1.6 to 150 mc in four calibrated bands. Antenna is 3 1/4" telescoped, 10 3/4" extended—fitted with banana plug and is removable. Size: 3 1/4 x 2 1/4 x 1 1/2". Shpg. wt., 8 oz. Net 8.95

TM-15 Net 8.95



TM-15

### NEW! Lafayette Radio Field Indicator

- Transmitter Output
- Rugged 200  $\mu$ a Meter Movement
- Completely Portable—Requires No Electricity, Battery or Transmitter Connection

Check the performance of marine, mobile or fixed transmitter . . . actually measures the RF field generated by any transmitter between 100KC and 250MC regardless of power. Phone jack at rear accepts earphones, thus providing an aural check of transmitter output. Magnet on bottom plate allows easy mounting on car dash or metal surfaces. Antenna extends from 3 1/4" to 10 3/4". Size (less antenna): 3 1/4 x 2 1/4 x 2". Net 7.95

TM-14 Net 7.95



Lafayette Test Equipment Available on Easy-Pay Plan on Orders for \$20.00 or More—Only \$2.00 Down.

Send for your FREE copy of Lafayette's  
324-page 1961 Catalog 610

LAFAYETTE RADIO

165-08 LIBERTY AVE., JAMAICA 33, N. Y.

Lafayette Radio, Dept. ETK-6  
P.O. Box 190 Jamaica 31, N. Y.

- Rush FREE 1961 Catalog 610  
 \$ ..... Enclosed. Send Stock # .....  
 \$ ..... Down Payment Enclosed for Stock # .....  
 Lafayette Easy-Pay Application Will Be Forwarded Upon Receipt of Down Payment

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

NEW YORK 13, N. Y.  
100 6th Avenue

BOSTON 10, MASS.  
110 Federal Street

PLAINFIELD, N. J.  
139 W. 2nd Street

BRONX 58, N. Y.  
542 E. Fordham Rd.

NEWARK 2, N. J.  
24 Central Avenue

PARAMUS, N. J.  
182 Route 17

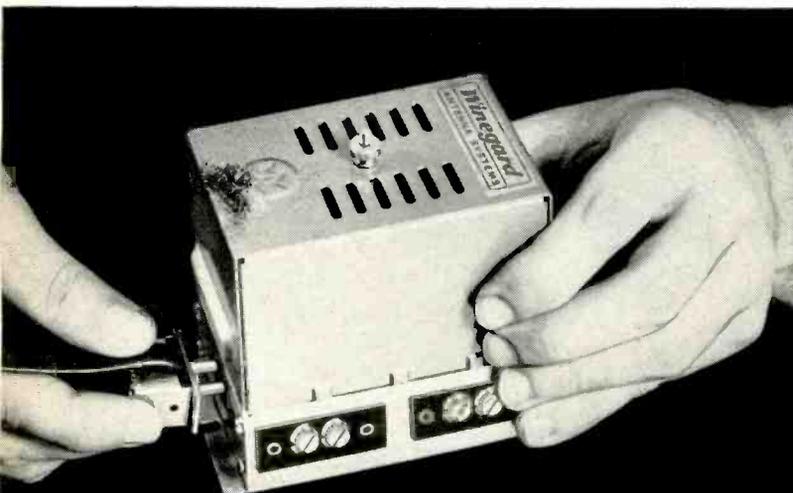
For more data, circle 11-25-1 on coupon, p. 50

**More Signal  
Power with Winegard  
TV Amplifiers and  
Booster Couplers!**



**New Precision Amplifier A-400** drives 1 to 30 TV sets. You get up to 26db gain on TV and FM bands with the Winegard A-400. Has four 6FY5 neutroelectrode tubes with extremely low noise characteristics. Dual 75 ohm outputs—300 ohm balanced input with no-strip disconnect plug and 75 ohm coaxial input. Unit completely fused. Finest amplifier in its class—\$79.95.

**Booster Coupler WBC4**—operates 1 to 4 TV and FM sets. Delivers up to 12.5 db gain all channels on one set. Operates 2, 3 or 4 sets with up to 6 db gain for each set. Powerful 6DJ8 tube, shielded and protected. 4 sets of no-strip lead-in terminals—quick disconnect plug for antenna lead-in—\$27.50.



Write today for full information  
on Winegard TV distribution systems  
and famous Winegard TV antennas.



**Winegard** Co.  
Burlington, Iowa

Antenna Systems  
Everything from the  
antenna to the set

(Continued from page 24)

LAFAYETTE announced the PA-104 microphone with response 40-13,000,  $\pm 3$  db @ 1,000 cps, 5 $\frac{3}{4}$ " high. \$9.75.

BRITISH INDUSTRIES and AVNET ELECTRONICS Boards of Directors have approved a merger, subject to stockholder approval.

ROBINS INDUSTRIES announces a complete line of phono and tape recorder drives featuring packaging with sales and replacement information.

JENSEN INDUSTRIES promotes its "Give a Diamond for Christmas" campaign, designed to feature the Jensen diamond needle in a gift package.

WALCO ELECTRONICS purchases CLEVITE WALCO. Frederick W. Richmond heads the new company with Herbert A. Bodkin as Gen. Sales Mgr. & Gen. Mgr.

FIDELITONE launches a nationwide advertising program featuring the Pyramid Point phonograph needle. Campaign to reach 2 $\frac{1}{2}$  million readers every month.

GENERAL ELECTRIC reports two new features to be included in its high fidelity stereo line: "Resonant Stereo," controlled vibrancy; and "Record Saver," a device to insure proper handling of records.

NORTH AMERICAN PHILIPS announced the Norelco "Auto Mignon," 45 rpm record player for automobiles featuring automatic operation—a record is pushed into the slot and thereafter everything is automatic, including removal. Model AG2101D/24 consumes 50 milliwatts. \$57.50 with mounting brackets and hardware.

HEATH announces new products: two new series of 4-speed changer models, AD-50, from \$49.95 to \$53.95 and AD-60, \$59.95 to \$61.95, depending on cartridge. Ready-built unfinished hi-fi cabinets include: AE-20, \$74.50; AE-30 12" speaker, \$29.50; and AE-40 15" speaker, \$35.50. The AJ-10 stereo tuner, 2  $\mu$ v sensitivity for 20 db quieting, \$59.95. Model AA-10 mono amplifier, 35 watts, \$49.95. AA-40 stereo power amplifier, 40 watts/channel, \$79.95.

SHOW ATTENDANCE: IHFM reports a total trade registration of 4500 dealers and their personnel at the 1960 N.Y. High Fidelity Music Show. Public attendance brought total to 32,000. Informal telephone poll of dealers by Billboard indicated greatly increased store traffic and sales resulting directly from the show. Chicago High Fidelity-Home Entertainment Show (not IHFM sponsored) drew an estimated 22,000 persons.

For more data, circle 11-27-1 on coupon, p. 50 →

← For more data, circle 11-26-1 on coupon, p. 50

# *silhouette of satisfaction*



## ALL-NEW HIGH-FIDELITY CUSTOM TURNTABLE

The dramatic shadow of the V-M extra-long, dynamically-balanced, feather-light Tone Arm signifies impending thrilling performance. Structural perfection and superb musical reproduction are here embodied in a fine High-Fidelity Turntable at a reasonable price. Here, truly, is the silhouette of a sparkling symphony in customer satisfaction ... in greater profits for you.

*these many "customer-benefit" features benefit YOU!*

- DIAMOND NEEDLE • STEREO CARTRIDGE • MICRO-PRECISION TURNTABLE BEARING SYSTEM WITH TEFLON THRUST BEARING • REMARKABLE V-M IDLER RETRACTION FEATURE • QUIET OPERATION • PLAYS ALL FOUR SPEEDS • SPECIAL V-M 45 RPM INSERT SPINDLE

V-M/Model 1580 in Beautiful Two-Tone Brown with Gold Trim — AMAZINGLY PRICED AT JUST . . . . . \$35.00 List\*

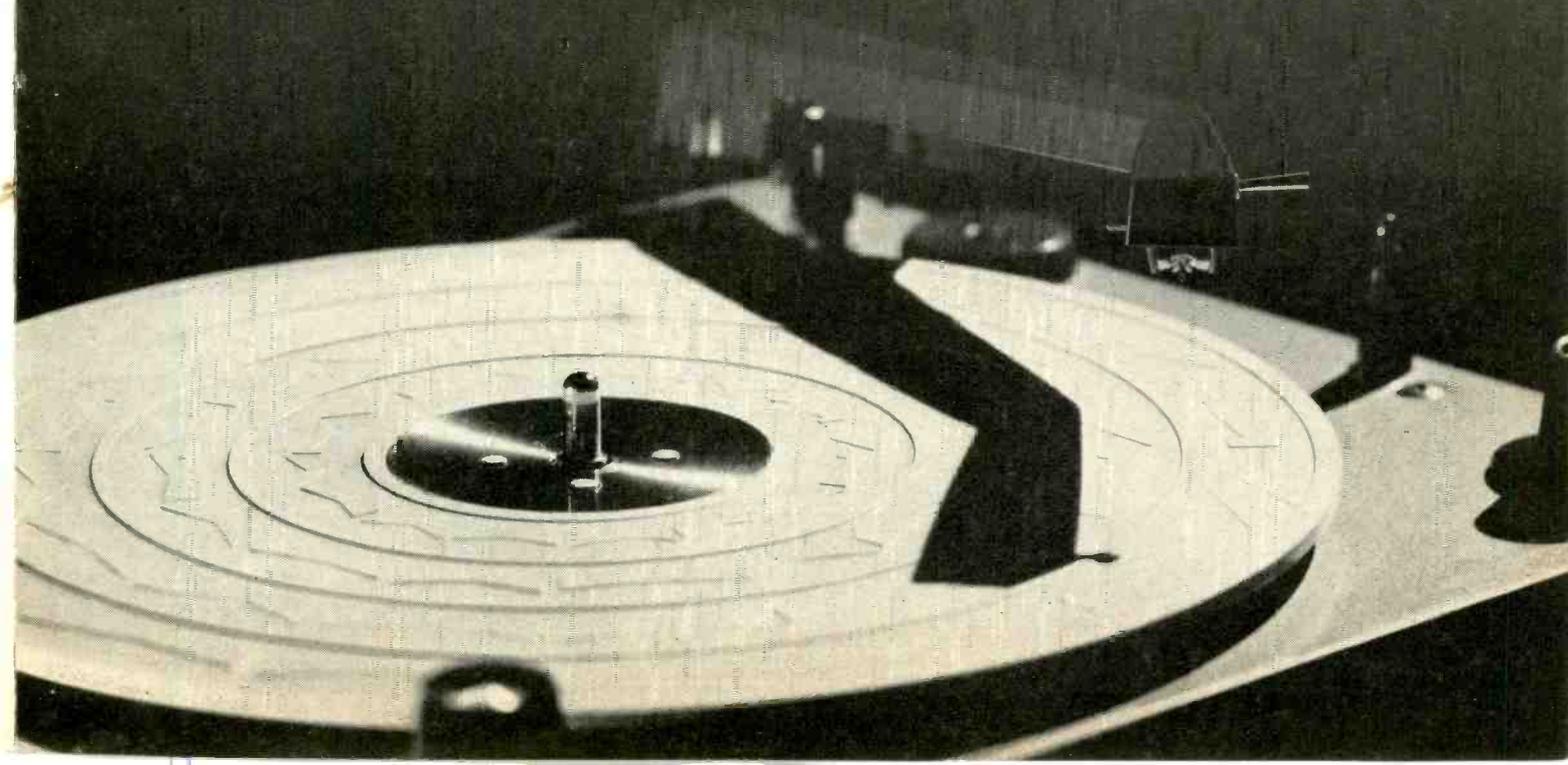
\*Slightly Higher West

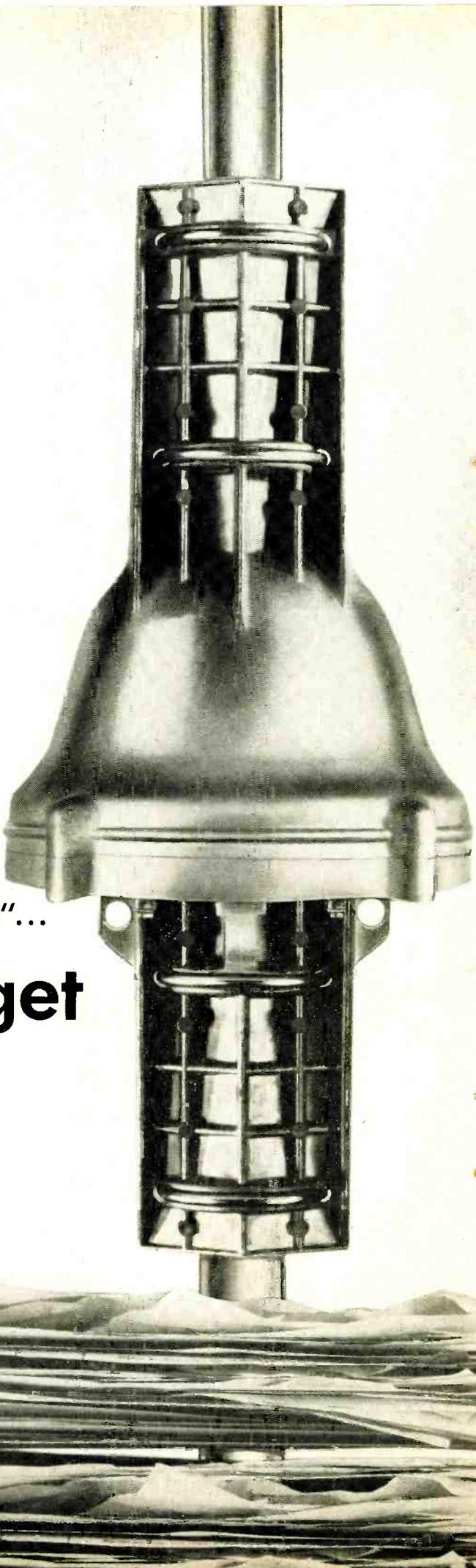


**CALL YOUR V-M REPRESENTATIVE NOW!**

the  **voice**  **of Music**<sup>®</sup>

V-M CORPORATION • BENTON HARBOR, MICHIGAN





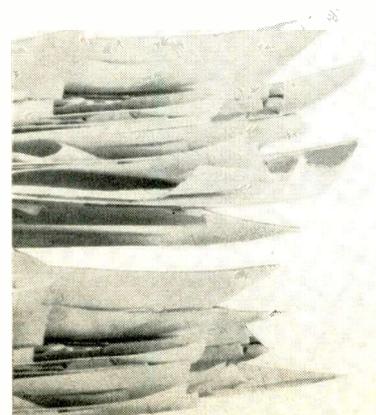
clear  
as  
a  
"bell"...

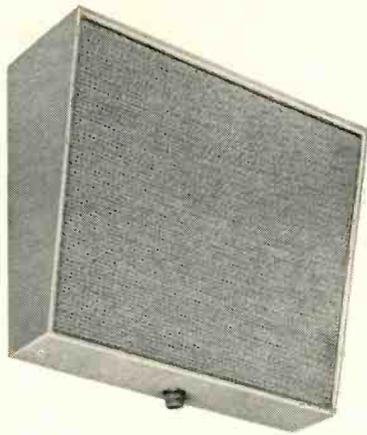
**CDE rotors get**

# the biggest customer reception!

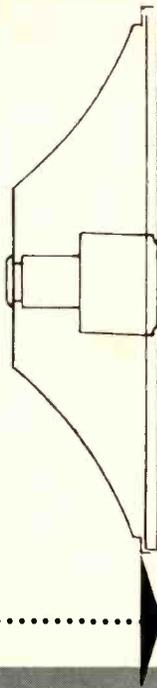
CDE TV antenna rotors are the big-ticket sales that build big customer acceptance for your reputation. Take the AR-22 for example; installed on roof or tower, this heavy-duty beauty weathers the winter like old St. Nick himself. The reason? A sealed, die-cast bell housing which encloses precision *planetary* drive gear instead of conventional worm gears. The AR-22 is also *automatic*. Just set the selector knob—and walk away. The AR-22 turns the antenna to the desired position, stops and locks itself in place—automatically! Examine this and other rugged CDE rotors . . . there are models for every budget . . . at your CDE Distributor. Or write today for catalog #1630 to: Distributor Sales, Cornell-Dubilier, South Plainfield, New Jersey.

**CORNELL-DUBILIER  
ELECTRONICS DIVISION**  
Federal Pacific Electric Company



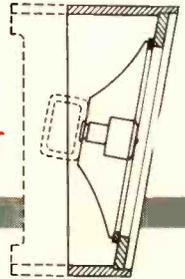


**Look!** 4 inches thin  
because Utah  
put the pot inside



A **Utah first!**  
Magnetic  
Structure inside  
—No loss  
of gap energy

**NO POT**



# Here's how Utah's New **Shape of Sound** will build bigger sales for you!

Utah first jettisons speaker weight (with the Dual Diameter's more power per pound of magnet) and then lobs off the bulk (by putting the pot inside). All to make possible the new Thin-Profile modern look of Utah Baffles. Utah's new Shape of Sound means greater eye appeal; greater installation convenience. And for you, greater profits!

*(In fact one Shape of Sound will be the BIGGER sound of your cash register.)*

**SEND NOW**

Please rush me your big Sound Catalog

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

# Utah

*developers of*

More Power Per Pound Speakers

Utah Radio & Electronic Corp.  
Huntington, Ind.

For more data, circle 11-30-1 on coupon, p. 50

# ELECTRONIC TECHNICIAN

Including  
**SERVICE**  
Magazine

## The Day Electronic Service Stopped

*Item:* Mrs. Alice P. Moore, a housewife of 810 Ridgeway Road, called four service dealers to repair the TV set which had broken down the night before. None of the shops were open.

*Item:* Three bank robbers made good their escape with \$30,000 from the First National Bank & Trust. Police were hampered by an inoperative two-way radio system.

*Item:* Planes were grounded at Municipal Airport when navigation and communications equipment failed. Maintenance technicians were not available to make repairs.

*Item:* King Petroleum's Southfield refinery was closed down when the electronic control system failed to operate properly. The facility will re-open when the control system is repaired.

Fanciful? Yes, in a way. But not far-fetched if electronic service all of a sudden stopped one fine day. The above items would be merely an infinitesimal taste of the inconvenience, and even disaster, which would result.

The nation depends on the entertainment and information provided by radio, TV and audio; it depends on the military defense offered by radar; the therapy of medical electronics; the efficiency of electronic instruments and controls; the commercial communications provided by radio; and much more.

Most of the 52,000,000 TV sets in this country will fail at least once this year. Many of the 155,000,000 radios and over 40,000,000 phonos and hi-fi systems will require repair and replacement parts.

Detractors of electronic service people notwithstanding, our industry will carry out its mammoth obligation effectively, and with dedicated effort. One thing too many unappreciative critics forget is that the job of maintaining the nation's vast array of electronic equipment *does* get done. And almost always economically and well done.

Maybe it's human nature that people don't appreciate what they have until it's gone. We shudder to think what would happen to the country if electronic service ceased. Fortunately, we don't expect this to happen. But the thought alone is sobering, and should make anyone who thinks of it more appreciative of the electronic service industry and the skilled technicians who carry out its functions.

# Tuning In the

*RADIO RECEIVER production is increasing, reports the Business & Defense Services Administration. The 1959 totals were more than 16 million units valued at almost \$424 million. This year's production is estimated at 17 million units valued at \$460 million. While U. S. exports of radio receivers continued a decline begun in 1950, totaling only 289,000 units valued at about \$7.7 million in 1959, imports of radio receivers reached a record high in 1959—more than 5.8 million units valued at almost \$70 million, or about 14% of the U.S. consumption. Japan accounted for the greatest part of these imports, about 5.5 million units valued at about \$55 million; and West Germany, about 265,000 units valued at \$13.5 million.*



"I'll have to take it back to the shop."

## TUBE PRINTS PICTURE



This electrostatic printer tube held by Raytheon engineer, Louis T. Jansen, can print three high quality pictures per second from signals transmitted by telephone or radio circuits. Photographic receiving machines presently used by news services require seven minutes to print one picture. The new tube can also print 20,000 characters per second. This is accomplished with wire matrices resembling stubbly beards across the tube faces. The 1 mil wires, spaced 250 to the inch, extend brush-like through the tube face. Varying cathode beam current deposits electrostatic charges on paper as it passes against the tube.

**ELECTRONIC LARYNX** introduced by the Bell Telephone System, is being produced in two models, one high-pitched for female voices and the other pitched lower for men. The unit resembles an electric shaver and is contoured to fit the hand with a finger control enabling the user to vary the pitch of his voice over a half-octave range to produce more natural inflections of speech. Designed to be held against the outside of the throat while being operated, it transmits sound waves into the throat cavity, replacing those normally produced by air passing over the vocal cords. Speech is produced by forming words with the lips and tongue just as in normal conversation. Some 20,000 persons in the U.S. are without the power of speech. Manufacturing costs of the larynx is \$45 which also is the cost to the customer. Information about the new device may be obtained at any Bell Telephone business office.

**COMMUNICATION TECHNICIANS' Correspondence Courses for TV and radio servicemen leading to FCC second class radio-telephone operators' licenses are offered by Raytheon. Graduates of the 24-lesson course will also be professionally qualified to service more complicated two-way radio equipment. Dealers applying for the course take a preliminary test of approximately 50 questions to determine qualifications to complete the course. Working in his spare time, the service dealer may complete it in six to nine months, with approximately five or six hours of study each week. Application forms are available from Raytheon distributors.**

# Picture .....



**SPACE VEHICLES** reentering the earth's atmosphere at 18,000 mph create a real problem for nose cone radio transmitters. Missile friction with the air produces temperatures as high as 3000° F. This heat causes sheets of highly conductive ionized air to form around the capsule, in effect short circuiting low and medium frequency radio signals. High frequencies offer a better chance of penetrating this ionized envelope.

*LOW ENERGY explosives can be detonated by electromagnetic fields, or even static electricity. In the case of the Experimental Fuze Unit at Picatinny Arsenal, an elaborate safety program is required to prevent such accidental detonation. The entire laboratory is shielded, all tools are grounded, floors are made of conductive rubber, light switches and telephones are explosion-proof, and workers must wear conductive-soled shoes and cotton clothing. Synthetic materials and combs which can generate static electricity are prohibited. Operators handle explosives behind lucite shields. This very hazard is turned to advantage by Smith, Kline & French Labs. SK&F has designed radio-detonated pellets for distributing medicine at various points in a patient's digestive tract.*

## CALENDAR OF COMING EVENTS

- Nov. 14-16: Mid-American Electronics Convention (MAECON), Hotel Muehlebach, Kansas City, Mo.
- Nov. 15-16: 4th Annual Conference, Professional Group on Product Engineering and Production, Sheraton Plaza Hotel, Boston, Mass.
- Nov. 15-17: Northeast Research and Engineering Meeting (NEREM), Sheraton Plaza Hotel, Boston, Mass.
- Nov. 20-21: Conference on Electro-Optical and Radiation Devices, Stanford Research Institute, Menlo Park, Calif.
- Nov. 25-27: Northwest High Fidelity Stereo and Music Show, Audio Div., Paul Bunyan Chapter, Electronic Representatives Assn., Leamington Hotel, Minneapolis, Minn.
- Dec. 1-2: 11th National Conference, Professional Group on Vehicular Communications, Sheraton Hotel, Philadelphia, Pa.
- Dec. 5-8: National Conference on the Application of Electrical Insulation, Conrad Hilton Hotel, Chicago, Ill.
- Dec. 12-14: URSI-IRE Fall Meeting, Radio Bldg., Boulder Labs., National Bureau of Standards, Boulder, Colo.
- Dec. 13-15: 10th Annual Eastern Joint Computer Conference, Hotel New Yorker, New York, N. Y.
- Jan. 8-12: Symposium on Thermo-electro Energy Conversion, Statler Hotel, Dallas, Texas.
- Jan. 9-11: 7th National Symposium on Reliability and Quality Control in Electronics, Bellevue-Stratford Hotel, Philadelphia, Pa.

**THE HEART IS MORE POWERFUL THAN THE BRAIN.** This is true electrically as well as poetically. The old ticker induces 0.001 to 0.002 volt on the body's surface, while the 10 billion nerve cells in our gray matter put out from 0.00002 to 0.0001 volt.

## RANDOM NOISE

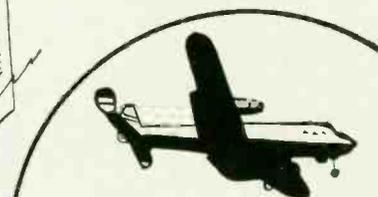
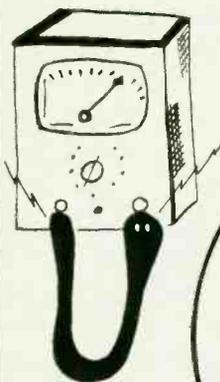
7 OUT OF 8 U.S. HOMES HAVE TV, REPORTS ARE.

5,793,000 HOMES HAVE MORE THAN ONE TV SET.

46,199,000 HOUSEHOLDS HAVE 52,500,000 SETS

93.8% OF HOMES WITH TELEPHONES HAVE TV, 66.6% WITHOUT PHONES.

ELECTRIC EELS GENERATE 500V,  
GIANT RAYS 60V AT 50 AMPS.  
FISH ELECTROPLAQUE  
MEMBRANES ACT LIKE  
CHEMICAL BATTERY  
FOR DEFENSE AND  
NAVIGATION.



AIRLINES DONT ALLOW PASSENGERS TO PLAY PORTABLE RADIOS. STRAY RADIATION CAN INTERFERE WITH COMMUNICATIONS.

L. ROTTER

# Servicing Electronic Bowling Alleys

## Alignment, Maintenance, & Repair

### Of "Foul Line" Violation Detection Equipment

WALTER BLAIR

• No one would normally associate electronics with the sport known as "10 pin" bowling, although chains of plush million-dollar electro-mechanically automated "lanes" and "bowlaramas" have mushroomed throughout the country. The photo-electric "foul line" or Telefoul, is only one of many "lanes" innovations now requiring the services of skilled electronic technicians. The system acts as an unseen, silent umpire that keeps the feet of a bowler on the honest side of a foul line.

A bowling alley foul line installation, shown in Fig. 1, consists of a light source, lens system, and photo-electric cell. Relative positions of

all the components to each other and the foul line are illustrated in Fig. 2.

A lens and photo-electric system is installed parallel to the alley base line. A lamp and lens assembly is placed on one side of the alley and focuses a light beam on the lens secured to the other side. This second lens diffuses the light beam on a photo-electric cell (PEC). Both lamp and PEC holders have adjustable mounts centered on the foul line leading edge. Secured behind the photo-cell lens, the "eye" waits for a wayward foot to touch the foul line and interrupt the light beam. When this happens, a buzzer or bell sounds, a light flashes "foul," and the bowler is penalized one ball. (Automatic pinsetter resets any pins knocked down).

#### Operation

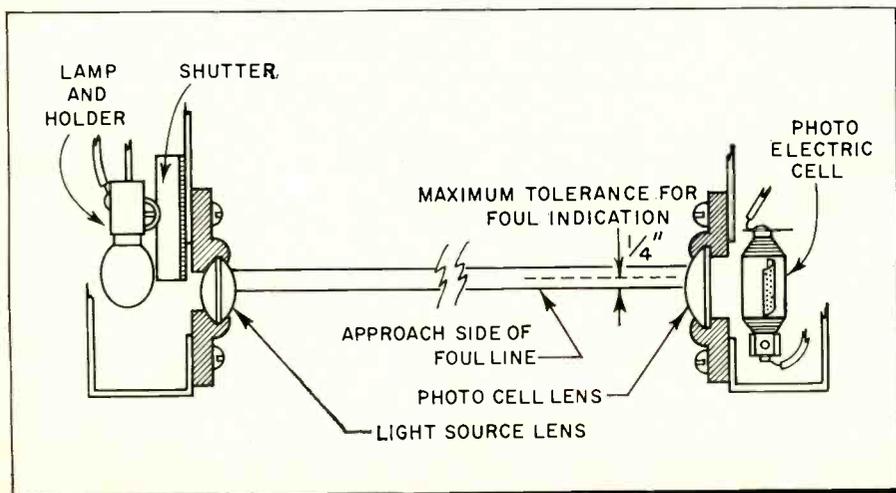
The light source lamp is frequently a double contact, bayonet base, 6-8 volt unit, similar to a standard #1154 automotive tail light. The photo-electric tube is generally a vacuum cartridge type (#922) which fits in a polarized socket. The photo-electric tube's anode is coupled to the grid of a 117L7 or M7 tube located in an amplifier-relay-signal unit. When light falls on the PEC cathode and the tube is conducting normally, the grid of the amplifier tube will be biased to cut-off. This point will be between 30 and 50 volts negative. When the light source is momentarily removed from the PEC's cathode it stops conducting, bias is removed from the amplifier grid, and the 117L7 conducts, operating the signal relay. A schematic diagram of the amplifier and control unit is shown in Fig. 3.

A-C voltage for the lamp is usually fed from a centrally located panel, or from individual control units located behind each alley. Paired wiring is used to transfer voltage to the desired location at the head of the alley. Voltages for the lamp normally range between 4.7 to 5.2 volts at the lamp when burning.

#### Adjustments

Mechanical adjustment of the lens system is not difficult when it is thoroughly understood. Since adjustment tolerances are critical, the

Fig. 2—Cut-away end-view of gutter-rails showing position of components in the electronic foul-detector's head end. Note the foul line's approach edge is on lens center.



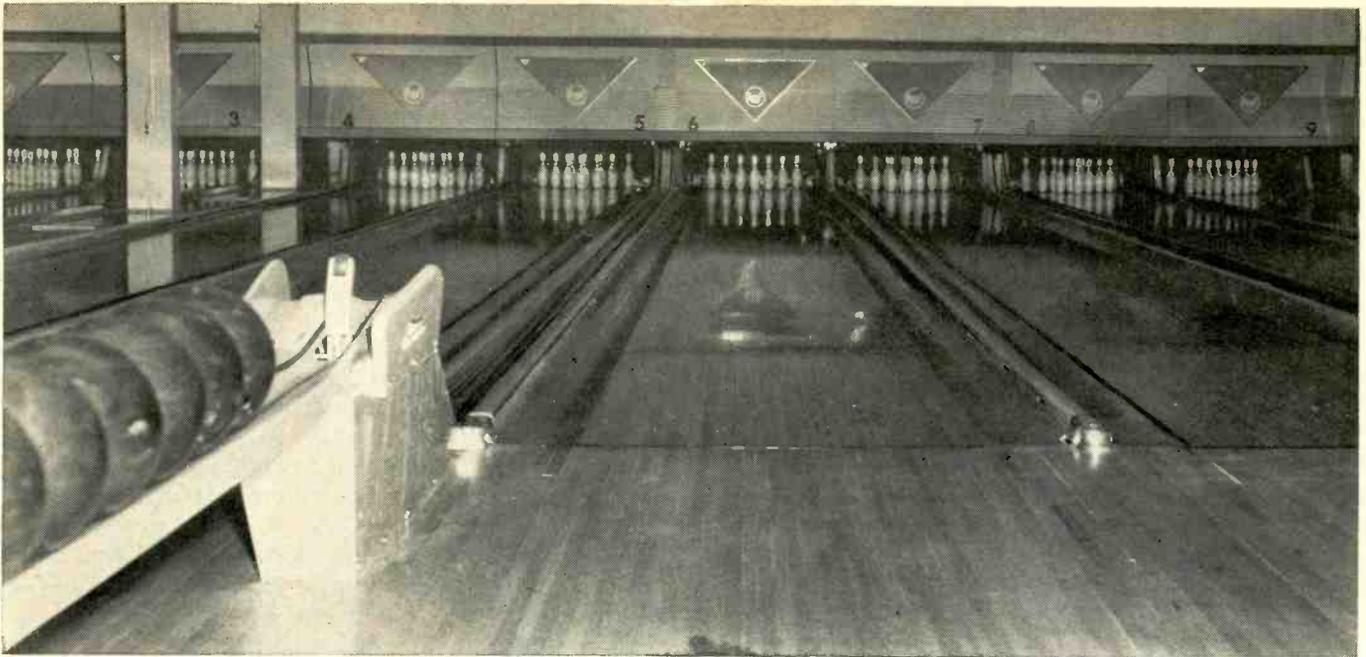


Fig. 1—A small area in a modern automated "bowlarama" where alleys or lanes are equipped with electronic foul detectors. A beam-light and projection lens assembly is mounted at the end of one gutter-rail, and a diffusion lens and photo-electric tube are mounted across the alley

at the opposite rail end—parallel to the foul line. When the light beam is broken by a bowler's foot touching the foul line's leading edge, a bell or buzzer sounds and the signal-board light flashes "foul." Automatic pin setter restores pins and bowler loses one ball.

service technician should not overlook the minutest detail or a trouble source may be overlooked.

Lamp, lens and PEC are treated as one integrated unit, but with all three interacting. Lenses must be

centered on the approach edge of the foul line. As illustrated in Fig. 2, only 1/4" tolerance forward from this edge is allowed. This alignment can easily be made, as follows:

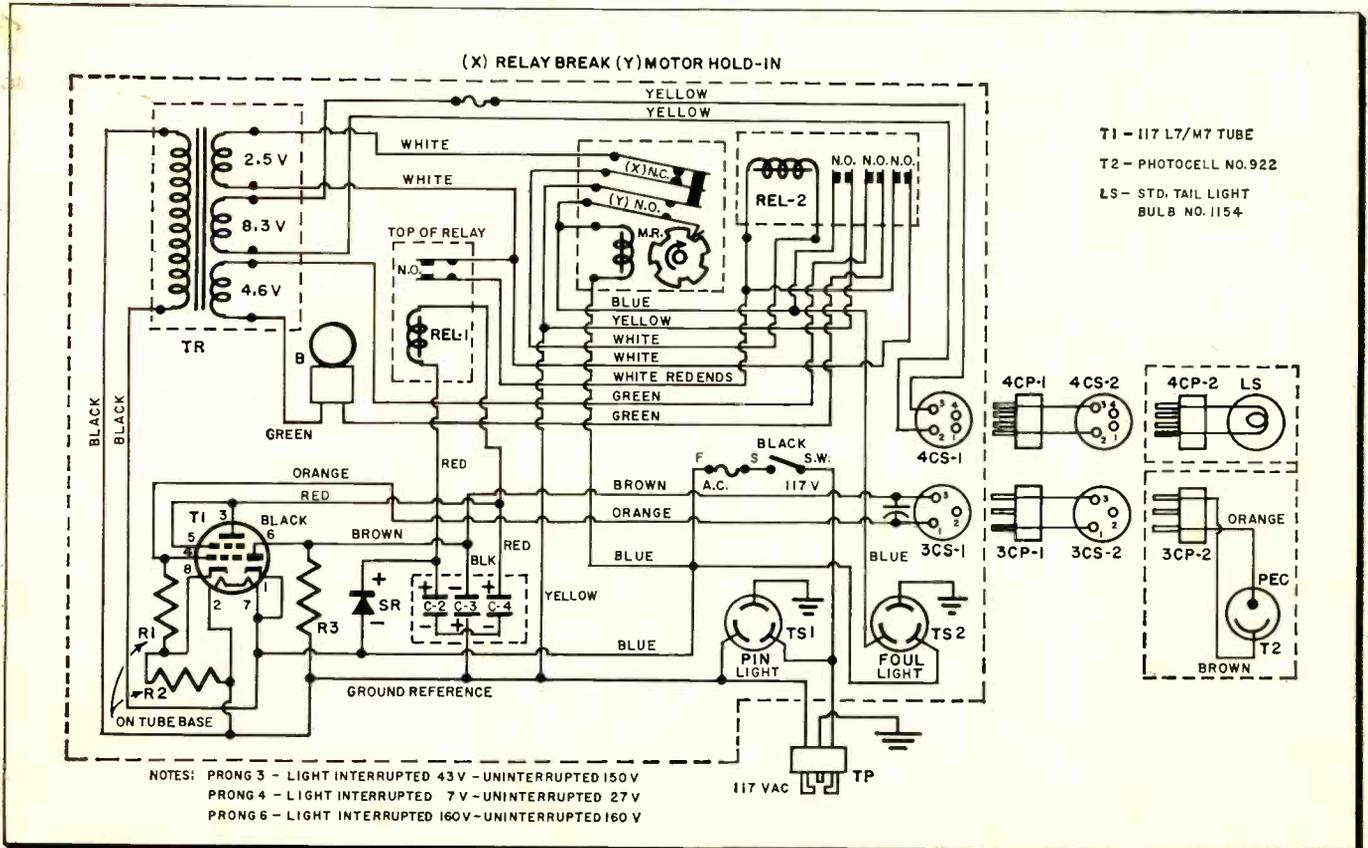
1. Rule a straight pencil line down

the center of a regular business or similar type white card.

2. Place the card in front of the PEC lens with the pencil line even with the foul line leading edge.

3. Observe position of image (lamp  
(Continued on page 56)

Fig. 3—Schematic diagram of amplifier, relays, and signal components employed in "telefoul" system.



# TV Deflection Yoke Defects

*Advanced Test Methods Correct Yoke Problems Caused By Mismatch*

• Technicians have experienced yoke failures that allow no vertical or horizontal sweep, trapezoid picture, ringing, no high voltage, etc. We all know a yoke plays an important part in overall set performance.

By using two individual coils, two magnetic fields control the beam's direction at any given point on a CRT screen. Separate fields created at right angles to the CRT neck concentrate their field around the CRT neck. The vertical deflection coils control the beam's motion in a vertical plane, while the horizontal coils control motion in a horizontal plane.

The variety of CRT sizes naturally created a need for different deflection yoke angles. Yoke angles may vary from 52° through 110°, depending upon the size and shape of the CRT they complement. In-

Fig. 1—Inter-winding deflection coil shorts create trapezoid patterns, as shown.

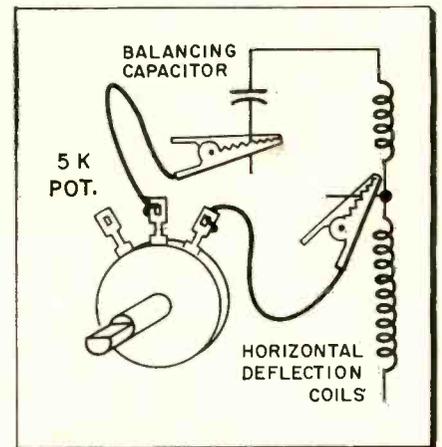
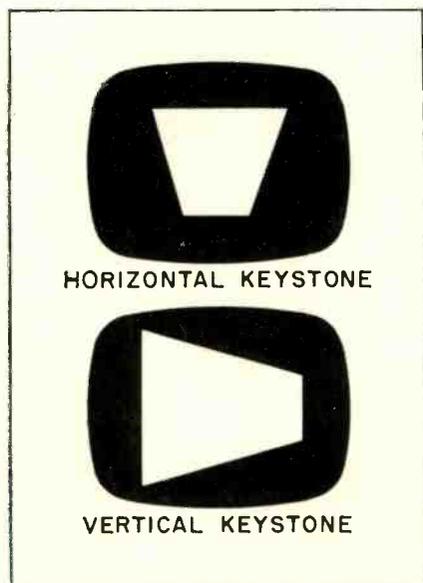


Fig. 2—Balancing the horizontal deflection coils to minimize ringing effect.

ductance specifications of vertical and horizontal windings vary, as well. Consulting yoke manufacturer's data will usually reveal the yoke impedance rating, as well as the approximate d-c resistance of the windings.

### Abnormal Deflection

Should the technician be confronted with a receiver displaying a trapezoid image, (Fig. 1), he may suggest replacement of the yoke or

troubleshoot to determine the reason for this abnormality. Replacement of this component may be the only service solution. But yokes can be repaired simply and economically in many instances.

Disconnecting the yoke from the circuit (either unsoldering or unplugging) permits the technician to check for short circuits in the horizontal and vertical windings. This may consist of one or two turns of the coil that allowed a high current spark to jump through poor insulation. By applying 200 volts d-c to each set of coils at different times, it may be possible to unshort the windings. Using a shellac spray may complete the repair.

Should the yoke check out normally, a balancing capacitor short-

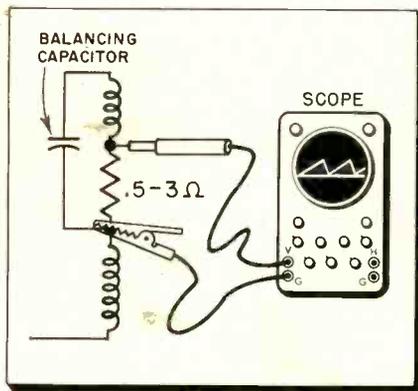


Fig. 3—Inserting resistor in series with horizontal deflection coil enables the technician to observe yoke's current waveform. Procedure is used to detect yoke abnormalities.

ing under load may cause this abnormality. This component is found in the network contained in the yoke section under the back cover. Substituting a capacitor will confirm or disprove suspicions.

Included in the yoke network are the damping resistors (in the vertical windings). Should a resistor open (as it often does) the picture will be over-run with vertical lines.

### Matching

A familiar precept of TV servicing is: isolate the stage, locate the defective component within the stage, and replace the unsatisfactory component with an "exact" replacement. "Exact" replacements,

however, frequently have slight performance differences. This is especially apparent when substituting a replacement yoke. It's exasperating to effect a simple yoke replacement and discover that performance is inadequate. Ringing (in the form of vertical stripes at the left side of a picture) can negate an otherwise excellent repair. This is usually caused by a slight yoke mismatch with the existing flyback. Correcting this common problem can be accomplished by balancing the yoke.

Using the test set-up in Fig. 2 will aid in balancing a replacement deflection yoke. A capacitor box containing 56, 60, 68, etc  $\mu\text{f}$  capacitors @ 1.5 KV and a 5K pot is shown. Inserting the variable 5K pot in series with the balancing capacitor will enable the technician to determine the value resistor needed in series with the capacitor to balance the yoke circuit.

Putting the yoke in place on the CRT, the pot is varied until the stripes disappear or are minimized. The resistance of the variable pot setting is then checked and an equivalent resistor is soldered in its place as a permanent addition to the yoke's horizontal circuit.

Should the chassis require deflection circuit troubleshooting, scope a yoke's current waveform to check for normal or abnormal operation. By inserting a 0.5 to 3 ohm resistor in series with the horizontal coil windings, and applying the scope leads directly across the resistor (as shown in Fig. 3), the current waveform of the yoke itself may be viewed. Though the voltage waveform of a yoke is essentially a square wave, the current waveform is a saw-tooth. Abnormal and normal waveforms (both current and voltage) are illustrated in Fig. 4.

Although pulsed voltage of high amplitude appears in the yoke, the dominating factor in CRT scanning is the large current. Damping tube conduction and non-conduction causes yoke current to start and stop. The rapid emancipation of energy in the yoke (via collapse of the magnetic field) and the transient oscillations that are developed as a result, form part of the working machinery called "horizontal scanning."

The prime example of improper scanning pulse is the raster show-

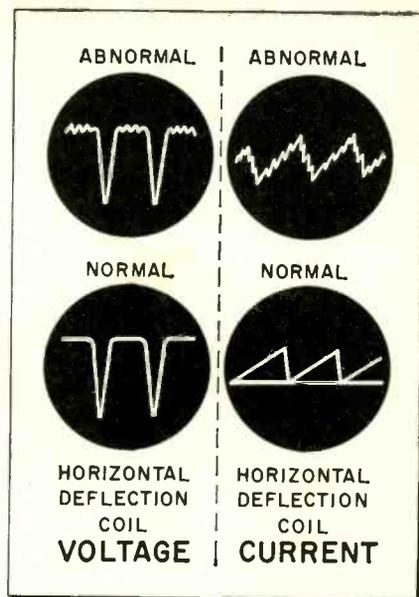
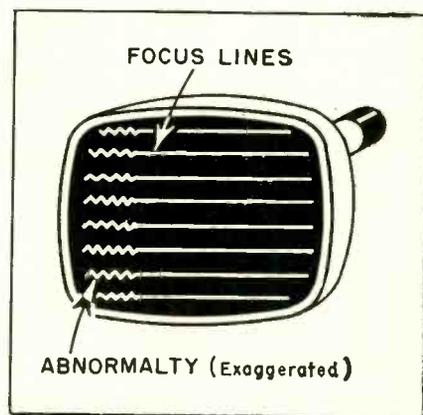


Fig. 4—Waveforms illustrated represent voltage and current traces, both normal and abnormal, as reproduced on an oscilloscope.

ing a wavy accumulation on about 1 to  $1\frac{1}{2}$ " of the CRT screen as shown in Fig. 5. By checking the current pulse in the horizontal winding and balancing the yoke network, the oscillations should disappear.

Obviously, replacing either a yoke or flyback doesn't always mean the successful completion of a repair job, as the preceding text illustrates. Rebalancing the yoke-flyback network after either one has been replaced is necessary in many cases and should be accomplished as an integral part of the service procedure for these components. ●

Fig. 5—Oscillations may be caused by unbalanced yoke-flyback circuit.



# Single-Stage Audio Amplifier

## Voltage & Resistance Measurements At Tube

MANNY HOROWITZ  
Electronic Instrument Co., Inc.

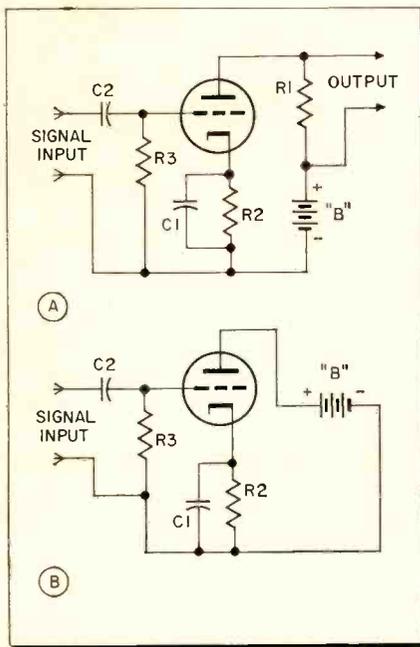
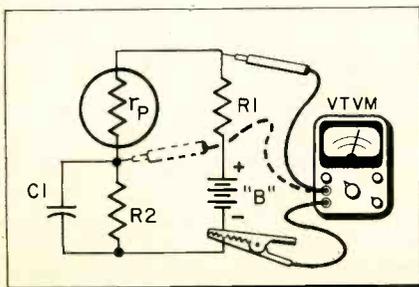


Fig. 1—Two commonly used audio amplifier circuits are shown. (A)—The common cathode amplifier circuit has a high input and output impedance. (B)—The cathode follower has a high input and a low output impedance.

Fig. 2—Fundamental amplifier circuit considering only d-c plate circuit resistances. No voltage drop appears across R-1 when  $r_p$  is open, and total B+ appears at the tube's plate. When R-2 is open the tube draws no current and a similar condition exists.



• At one stage in the evolution of hi-fi equipment, the triode tube was considered the most distortion-free type used in audio amplifiers. During the past decade, however, pentodes have been developed which exhibit good audio characteristics—but the triode, single or dual, still predominates in hi-fi preamplifiers and driver stages. The technician who has a thorough basic understanding of triode circuits is well equipped to begin mastering the techniques involved in troubleshooting and testing hi-fi amplifiers—from preamp to output.

Two frequently used simplified basic triode circuit arrangements for hi-fi applications are illustrated in Fig. 1. The most usual arrangement, at Fig. 1A, is a common cathode type circuit. It is characterized by a reasonably high input and output impedance. The cathode follower in Fig. 1B, presents an extremely high impedance to an input signal and has a very low output impedance.

### Troubleshooting

Every technician already knows that the first step in troubleshooting ailing amplifiers is to substitute the tube or tubes with a known good tube. It should be recalled at this point that the tube tester is an important instrument for making a preliminary analysis of the general condition of tubes in all kinds of electronic equipment. But it is not always completely fault-free as a precise troubleshooting indicator. Hence, a tube should be substituted at the beginning with a known good one to eliminate it as a source of trouble.

A check of the triode's d-c voltages will generally indicate most of the defects that may have developed. Since all voltages are meas-

ured with respect to a tube's cathode, the negative meter lead should be attached at this point if an exact voltage reading is desired. Whenever convenience dictates that the meter's negative probe be placed at B— or ground, errors in reading are generally negligible because of relatively low cathode voltages.

It is obvious that voltages measured at any electrode of a tube may fall into one of four categories: It will be (1) too high, (2) lower than normal, (3) non-existent or (4) relatively correct.

Normal procedure dictates checking plate voltage at the tube even if manufacturers specific service data is not at hand. After this, with or without data, the B+ supply source should be checked.

Measurement of plate and B+ supply voltages may seem superfluous when manufacturers' precise voltage data is not available. The experienced technician is well aware, however, that relative voltage readings can direct attention to circuit faults even if specified voltages are not known. In most cases, for example, plate voltages range between 30 and 80% of B+ supply voltages, depending on the load resistor value, and type of tube being used. If a reading is outside this range, it is a fairly good indication that the plate voltage is incorrect.

Of course, the 30 to 80% figure should be modified with some logic. When d-c passes through an output transformer, for example, the plate voltage is nearly equal to the supply voltage. Conversely, if the load resistor is exceptionally high, voltages may be well below the 30% figure. The specified percentage range can be used as a "rule of thumb" only—but it usually works.

Several factors can cause any

# Troubleshooting Methods

## Electrodes Generally Reveal Circuit Faults

one of the previously itemized conditions. Some of the more frequent causes will now be reviewed for each of the four conditions.

### Excessive Plate Voltage

A high plate voltage normally indicates the tube is drawing insufficient current. Referring to Fig. 1A, the voltage drop across load resistor R-1 is dependent upon the amount of current the tube conducts (voltage across R-1 equals plate current times resistance of the load resistor). If plate current is small, the voltage drop across R-1 is small. Therefore, most of the B+ supply voltage will appear at the tube plate.

This may be visualized more clearly by referring to Fig. 2, where only the d-c plate circuit resistances are considered. Here the tube's plate resistance is represented by  $r_p$ . The battery "B" is the only voltage source. All voltages throughout the circuit must be either equal to or less than this voltage source. Any voltage drop across a resistor is caused by plate current flowing through the particular resistor in the circuit.

When  $r_p$  is open, therefore, the tube does not conduct, and current cannot flow. Since there is no voltage drop across R-1, total B+ voltage appears at the tube's plate. As we already know, then, high voltage at the plate is usually caused by low plate current. The problem now is to locate the cause of low plate current.

A tube grid that is very negative with respect to the cathode will cause the tube to cease conducting entirely, or indicate only a small amount of current. Stating this another way, a cathode voltage that is very positive with respect to the

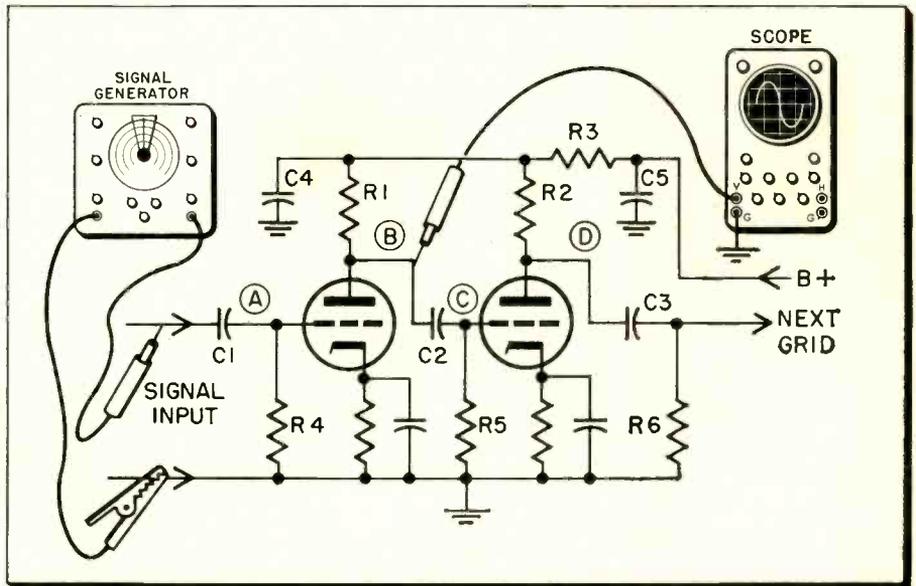


Fig. 3—Low plate voltages in this resistance-capacitance coupled amplifier circuit can be caused by a shorted or leaking grid coupling capacitor. No voltage at a tube's plate is generally caused by an open plate resistor or voltage not being delivered by the power supply.

tube's grid will cause only small amounts of current to flow through the tube. Check the cathode voltage! A high voltage here with respect to grid or ground can be caused by a cathode resistor (R-2) that has increased in value. If R-2 is open, the tube will not conduct. Again, full B+ supply voltage will appear at the tube's plate.

Other causes of high plate voltage are: load resistor R-1 lowered in value, open or high grid bias resistor (R-3 Figs. 1A and B), or a defective tube. Too much B+ can also be caused by abnormal load conditions in other sections of an amplifier.

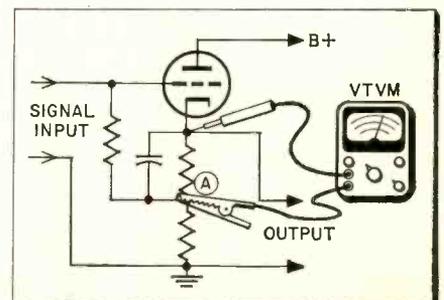
It should be recalled again that a number of tube defects can cause a high plate voltage reading. Poor cathode emission causes an increase in plate resistance and a subsequent decrease in plate current. A shorted or partially shorted

heater can cut-off cathode emission with similar results. Other inter-electrode shorts can cause either too much or too little plate current.

The reasons for low plate voltage are generally similar to those for high plate voltage—except in reverse. Low plate voltage is caused

(Continued on page 70)

Fig. 4—A very high input impedance meter should be used to measure cathode bias of this cathode-follower circuit.



Improve Your Skills By

# Building a Technical Library



## TWO-WAY RADIO

By Allan Lytel. For the communications technician, and those interested in entering the field, this book covers mobile and fixed base stations. Theory is presented with a minimum of math. Antennas, selective calling, power supplies and test instrument chapters are included. Photos, drawings and charts are generously used. Hard cover, 304 pages. Price \$9.50.

## INDUSTRIAL CONTROL CIRCUITS

By Sidney Platt. Excellent starting point for TV technician interested in learning about industrial electronics. Non-mathematical text explains circuitry and operation of power controls, relays, timers, photoelectric devices and instrumentation found in factories. Practical applications shown. Soft cover, 200 pages. Price \$3.90.

## 101 WAYS TO USE YOUR SIGNAL GENERATOR

By Robert G. Middleton. A fine collection of brief explanations on how to use the generator for various tests. Twenty-five equipment checks are presented, seven antenna tests, 27 AM-FM receiver tests, 28 TV tests, 10 component tests and four miscellaneous. Each description briefly lists the required equipment connections etc. Soft cover, 123 pages. Price \$2.00.

## ★ MAGNETIC AMPLIFIERS

Principles & Applications

By Paul Mali. Written at an intermediate technical level in the tried and proven picture/text style of presentation, this excellent book covers: magnetism; electromagnetism; saturable reactors; core, compensating and polarized magnetic amplifiers. Well illustrated with photographs and drawings. Soft cover. 261 pages. \$2.45.

## BASICS OF INDUCTION HEATING

By Chester A. Tudbury. Volumes 1 & 2. Vol. 1: presents principles of induction heating equipment. How it works, efficiency factors, etc. Higher mathematics avoided. Vol. 2: analyzes induction heating equipment from a practical viewpoint. Covers generators. Well illustrated. Soft covers. 140 & 144 pages. \$3.90 ea; \$7.80.

## BASICS OF DIGITAL COMPUTERS (3 vols.)

By John S. Murphy. Using the easy-to-learn picture book technique, these three volumes explain the theory and functions of digital computers. Very little mathematics. Covers counting systems, computer language, programming, memories, logic diagrams, flip-flops, clamping, input-output and data processing. Soft cover, 416 pages. Price \$8.40/set.

## IMPEDANCE MATCHING

By Alexander Schure. Divided into five major sections, this informative book covers power transfer, impedance matching devices, matching at audio and r-f, and matching in transistor circuits. Complete with tables, schematics and computation examples. Soft cover, 128 pages. Price \$2.90.

## RADIO OPERATOR'S LICENSE Q & A MANUAL

By Milton Kaufman. This sixth edition gives you the information you need to pass FCC license examinations. In question and answer form similar to actual FCC tests, all eight elements are covered, including law, radiotelephone, radiotelegraph, aircraft and ship radar. Abbreviations, code, etc. included. Hard cover, 736 pages. Price \$7.10.

## HOW TO INSTALL & SERVICE AUTO RADIOS

By Jack Darr. This second edition contains much practical information of real use to technicians. In addition to service data on antennas, intermittents, noise suppression, speakers and troubleshooting, transistorized and hybrid radios are covered. 6-12 volt conversions are explained. Soft cover 160 pages. Price \$3.25.

## TUBE CADDY TUBE SUBSTITUTION GUIDE BOOK

By H. A. Middleton. A pocket size guide for caddy use, includes a list of foreign tube substitutions. It covers direct substitutions only and is divided into 4 sections. Sec. 1: lists substitutions with a "good" or "excellent" coding. Sec. 2: some ruggedized substitutions. Secs. 3 & 4: European-American substitutions. Soft Cover. 56 pages. \$0.90.

## 2-WAY MOBILE RADIO HANDBOOK

By Jack Helmi. The fast growing mobile radio field is expertly covered in 10 illustrated chapters exploring mobile radio, including: basic systems, receivers, transmitters, antennas, and control systems. One chapter covers servicing and setting up the shop. 208 pages. Soft cover. \$3.95.

## INFRARED RADIATION

By Henry L. Hackforth. From the basic laws, through transmission and detection, to design and practical application in various industries, this book details theory and practice of infrared. Instruments and communications are also covered. Hard cover, 304 pages. \$10.

## ★ VIDEO TAPE RECORDING

By Julian Bernstein. This interesting and authoritative reference thoroughly treats the system used to rebroadcast live TV programs. Written at a level understandable to all interested in video recording, with mathematical formulas absent. The text outlines methods used and circuitry employed. Many photos and drawings. Hard cover. 272 pages. \$8.95.

## OBTAINING & INTERPRETING TEST SCOPE TRACES

By John F. Rider. This handbook shows how to get the most out of your oscilloscope. Over 800 traces are shown, including sine, square, rectangular, trapezoid, sawtooth differentiated and integrated types. Explains scope connections, manipulating controls and test setups. Soft cover, 190 pages. Price \$3.00.

## BASIC ULTRASONICS

By Cyrus Glickstein. This excellent book, replete with many illustrations, covers the subject of ultrasonics from the fundamentals of sound through the various types of equipment in use, to a wide variation of applications. Topics include ultrasonic generators, transducers, pulsed output and transistorized equipment. 144 pages. Soft cover. \$3.50.

**ELECTRONIC TECHNICIAN** editors have carefully selected these books by the world's leading technical publishers. Order direct from our Book Department. Fill in coupon or separate sheet. Money-back guarantee.

★ Star denotes book listed here for the first time.



### SERVICING TRANSISTOR RADIOS

By Leonard D'Airo. After a brief discussion of fundamentals, the text goes into radio circuits, servicing techniques, tests, measurements and dictionary of transistor terms. Interchangeability chart covers a variety of close replacements, including number and type. Soft cover, 224 pages. Price \$2.90.

### HOW TO RUN A SMALL BUSINESS

By J. K. Lasser. Here is a basic business guidebook for service dealers and other operators of retail and small manufacturing firms. Covers record keeping, avoiding frauds, tax management, credit sales, insurance programs, how to buy an established business, financing and other important topics. Hard cover, 400 pages. Price \$4.95.

#### Books Described Previously

BASIC TELEVISION (5 vols.)	\$10.00
BASIC ELECTRONICS (5 vols.)	\$10.00
CLOSED CIRCUIT & INDUSTRIAL TV	\$ 4.95
ELECTRONIC MUSICAL INSTRUMENT MANUAL	\$ 7.50
PINPOINT COLOR TV TROUBLES IN 15 MINUTES	\$ 5.95
VACUUM TUBE CHARACTERISTICS	\$ 1.80
FUNDAMENTALS OF TRANSISTORS	\$ 3.50
INDUSTRIAL ELECTRONICS HANDBOOK	\$22.50
AUDIO MEASUREMENTS	\$ 2.90
ELECTRONICS IN INDUSTRY	\$ 8.50
HOW TO SERVICE TAPE RECORDERS	\$ 2.90
FUNDAMENTALS OF RADIO TELEMETRY	\$ 2.95
HOME AIR CONDITIONING INSTALLATION & REPAIR	\$ 3.50
SERVOMECHANISM FUNDAMENTALS	\$ 5.50
ELECTRONIC COMMUNICATIONS	\$13.00
BASIC AUDIO	\$ 9.95
MODERN TRANSISTOR CIRCUITS	\$ 8.50
PHOTOTUBES	\$ 1.80
MARINE ELECTRONICS HANDBOOK	\$ 3.95
GUIDE TO MOBILE RADIO	\$ 2.85
MASTER RECEIVING PICTURE TUBE SUBSTITUTION GUIDE	\$ 7.45
SMALL APPLIANCE SERVICING	\$ 4.50
ENCYCLOPEDIA ON CATHODE-RAY OSCILLOSCOPES AND THEIR USES	\$27.00
A-C MOTOR CONTROL FUNDAMENTALS	\$ 5.95
HOW TO GET THE MOST OUT OF YOUR VOM	\$ 2.90
PIN POINT TRANSISTOR TROUBLES IN 12 MINUTES	\$ 5.95
HOW TO USE METERS	\$ 3.50
BASIC CARRIER TELEPHONY	\$ 4.75
101 WAYS TO USE YOUR AUDIO TEST EQUIPMENT	\$ 2.00

To order above books, write in title and price on coupon

### ★ GETTING THE MOST OUT OF VACUUM TUBES

By Robert B. Tomer. Using a reverse approach, the author presents the reasons for tube failures. He covers: selected and premium tubes, predicting tube performance; tube testers; special purpose tubes; and methods to lengthen the life of tubes. Absent is the usual mathematical formula and graphic explanation for tube failures. The text makes interesting, informative reading. Hard cover. 160 pages. \$3.50.

### 100 ELECTRONIC CIRCUITS

By Milton Aronson & Charles Kezer. Here is a useful basic circuit reference book covering a wide variety under eight major sections, including power supplies, amplifiers, oscillators, pulse circuits, test instruments, alarms, phototubes and miscellaneous. In addition to the schematic, a page or two of text accompanies each circuit, explaining the operation and characteristics. Soft cover, 180 pages. Price \$2.00.

Also See New Books on Page 74

### HOW TO TROUBLESHOOT TV SYNC CIRCUITS

By Ira Remer. Here is a practical and informative book on repairing that often troublesome part of the TV set, the sync section. After discussing fundamentals, the author digs into sync troubles, commercial sync circuits and color TV sync. Includes signal traces and raster photos. 128 pages. soft cover. \$2.90.

### BASICS OF FRACTIONAL HORSEPOWER MOTORS AND REPAIR

By Gerald Schweitzer. In this book the author examines: the operation of various motor types, including split-phase, capacitor, repulsion, shaded pole, universal and three-phase motors; enclosures, windings, control devices and protective devices. Two sections are devoted to motor testing, care and maintenance. 176 pages. Soft cover. \$3.90.

CUT HERE

#### ELECTRONIC MARKETERS (ELECTRONIC TECHNICIAN Book Dept.)

480 Lexington Avenue  
New York 17, N.Y.

I plan to build my technical library. Please send me the books I have indicated below. You will pay postage. I understand that if I am not satisfied with any book for any reason, I may return it to you prepaid in good, clean condition within 7 days of receipt and receive a complete refund.

Enclosed is my check or money order, in full payment, made out to **ELECTRONIC MARKETERS**.

.. Two-Way Radio	@ \$ 9.50	.. Infrared Radiation	@ \$10.00
.. Industrial Control Circuits	@ \$ 3.90	.. Video Tape Recording	@ \$ 8.95
.. 101 Ways to use Your Signal Generator	@ \$ 2.00	.. Obtaining and Interpreting Test Scope Traces	@ \$ 3.00
.. Magnetic Amplifiers	@ \$ 2.45	.. Basic Ultrasonics	@ \$ 3.50
.. Basics of Induction Heating (2-Volume Set) Vol. 1	@ \$ 3.90	.. Servicing Transistor Radios	@ \$ 2.90
.. Vol. 2	@ \$ 3.90	.. How to Run a Small Business	@ \$ 4.95
.. Basics of Digital Computers	@ \$ 8.40	.. Getting the Most Out Of Vacuum Tubes	@ \$ 3.50
.. Impedance Matching	@ \$ 2.90	.. 100 Electronic Circuits	@ \$ 2.00
.. Radio Operator's License Q & A Manual	@ \$ 7.10	.. How to Troubleshoot TV Sync Circuits	@ \$ 2.90
.. How to Install & Service Auto Radios	@ \$ 3.25	.. Basics of Fractional Horsepower Motors & Repair	@ \$ 3.90
.. Tube Caddy Tube Substitution Guide Book	@ \$ 0.90	BOOKS IN PREVIOUS ISSUES:	@ \$ ...
.. 2-Way Mobile Radio Handbook	@ \$ 3.95		

Enclosed is total payment of \$ \_\_\_\_\_  
(If you have New York City address, add 3% sales tax)

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

# Component And Transmission Characteristics At UHF

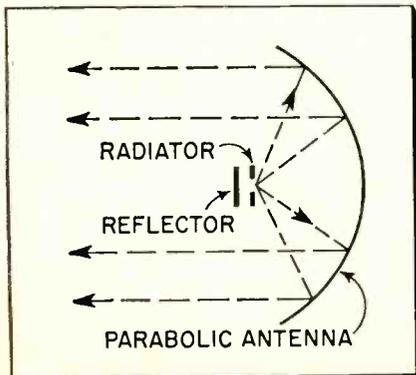
## How Industry Is Slowly Licking UHF's Problems

ALLAN LYTEL

An analogy between buildings and utilization of high frequencies can be made, since they are both going higher for a similar reason—lack of room. UHF is being energetically explored to accommodate increased communication needs. Problems exist, however, such as skin effect and component reactances differing at extreme frequencies. Watch this frequency band though; it is becoming increasingly important.

- Ultra High Frequencies are employed for mobile radio communications, radar, military communications, and a host of other services. Why UHF? One answer is simply—no other frequencies are available. Mobile radio, to give only one example, has expanded from a handful of stations to almost 1,000,000 transmitters

Fig. 1—Because of the very short wave lengths employed, a relatively small parabolic "dish" antenna can concentrate ultra-high-frequency energy into a narrow beam toward a similar type receiving antenna.



in 20 years. Further extension into UHF became necessary. TV and radar were allocated UHF frequencies primarily for the same reason.

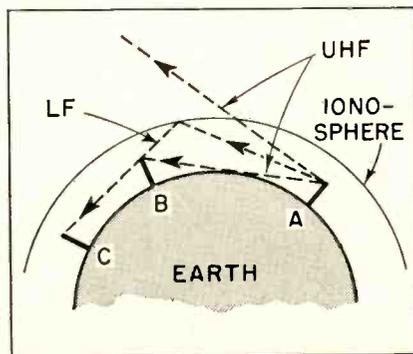
Because of the short propagation range of these radio waves, consistent coverage is usually limited to a line-of-sight distance. Consequently, UHF is well suited for communications covering a restricted range.

Some bands within the radio spectrum are listed in Chart I, together with their designations. Each band is further divided into specific allocations based primarily on a number of special factors, including the behavior of these waves and the requirements of particular services. UHF is a single division of the radio spectrum, known as band No. 9, extending from 300 mc to 3,000 mc.

### Development

Radio transmission and reception developed in the lower-frequency bands. Explorations within the UHF band revealed a number of unique

Fig. 2—Ultra-high-frequency waves usually travel in a straight line tangent to the earth's surface—out in space. This prevents long distance UHF communication except when special propagation methods are used.



Band	Megacycles	
	From	To
HF	3	30
VHF	30	300
UHF	300	3,000
SHF	3,000	30,000
EHF	30,000	300,000

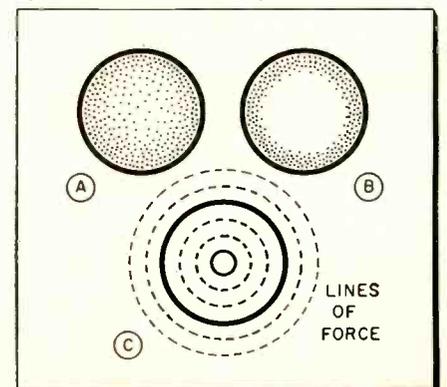
characteristics that were insignificant at lower frequencies. Consequently, the necessity arose for the development of new types of tuned circuits and unconventional components.

### Advantages

A number of reasons exist for the increasing utility of UHF, as follows:

(1) Wide-band modulation is possible: Certain types of communication services, TV for example, require wide-band channels. The channel containing the transmitted modulation increases in width as the amount of information is in-

Fig. 3 (A)— LF currents are almost uniformly distributed throughout a conductor's area. (B)—As frequency increases, current concentrates closer to surface. (C)—R-f energy dissipation increases as frequency rises.



creased. It is simpler to obtain this wide modulated channel at higher frequencies since the total bandwidth required at UHF is a smaller fraction of the operating frequency than it is at lower frequencies. For example, the modulation channel at high frequencies may be several megacycles, as in TV, although remaining small compared to the transmitted frequency of, say, several hundred megacycles. Many individual communication channels are readily feasible on one UHF carrier.

(2) Antenna structures are relatively compact and low power outputs can be directed to receiving

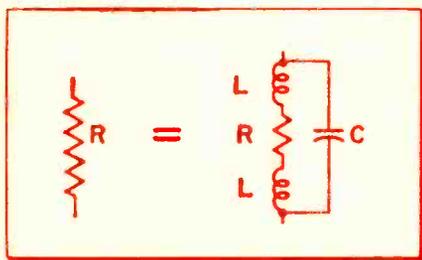


Fig. 4—At UHF frequencies, an ordinary pigtail lead resistor becomes a circuit having inductance, resistance and capacitance.

points for specialized types of communication: In any type of communication system, the physical dimensions of the antennas are comparable to the wavelength employed. Low frequency antennas are large and cumbersome. At the low-frequency end of the broadcast band, a quarter wavelength is approximately 447 feet. A directive antenna system involving a number of radiators, could possibly extend over considerable land area. In contrast, a simple directive UHF antenna system is small and convenient. A parabolic reflector, illustrated in Fig. 1, may be used to direct UHF waves. The diam-

eter of this reflector is only a few feet.

(3) It is easier to combine signal energy to a specific area: It would be incorrect to say that energy from a given UHF transmitter cannot be received beyond a certain radius. Normally, however, these waves extend only slightly beyond the line of sight along the earth surface. This characteristic permits allocation of similar frequencies to a number of transmitters sufficiently separated to prevent mutual interference. This is not possible at lower frequencies because upper ionospheric reflection provides long distance reception, and prohibits band-sharing techniques. (See Fig. 2.)

(4) Atmospheric and man-made interferences are less severe: Atmospheric noise is generally reduced as the frequency increases. Below the UHF band, it has been found that the noise entering a radio receiver from the antenna system, is much greater than the noise generated in the receiver itself. In the UHF band, this is not the case. The externally produced noises are of much less importance. UHF receivers are generally limited in sensitivity only by the noise created inside the receiver itself. However, man made noise, especially ignition noise, is not eliminated entirely.

#### Disadvantages

A difficulty peculiar to high frequencies is skin effect, the condition whereby as frequencies increase, the current tends to travel nearer the surface of the conductor. Therefore, as the frequency increases, the area available for current flow is reduced.

If the effective circular mill area of a conductor decreases, as with higher frequencies, the resistance of the conductor increases accordingly. This increased resistance results in a power loss, illustrated in Fig. 3. Because of this effect, it is unnecessary to use a solid conductor in the r-f sections of UHF circuitry. Copper tubing is more feasible. Resistance, naturally is lessened if the tubing is silver-plated.

In addition to skin effect, there are other significant factors normally ignored at lower frequencies.

Resistors in r-f circuits contain a definite amount of capacitance and inductance. The magnitude of induc-

tive and capacitive reactance, of course, varies with frequency. As frequencies increase these factors multiply and special design problems arise.

#### Components

The magnetic field of the current flow through the resistor and its associated leads produces a certain amount of inductance. A potential difference across a resistor also creates a capacitive effect.

There is a capacitance from one end of the resistor to the other end, as well as capacitance from the resistor and its leads to the chassis itself. A resistor, then, has an equivalent circuit, illustrated in Fig. 4, made up of resistance, inductance, and capacitance. This is a parallel-resonant circuit whose impedance varies with frequency. If the inductive reactance is much smaller than the ohmic resistance and the capacitive reactance is much greater, as it is in audio, the network is equivalent to a resistor in series with a small inductance and the capacitive effect will be negligible.

Any wire has inductance and this is no less true for capacitor leads. Although the total inductance of these capacitor leads, as shown in Fig. 5, is small, there is a frequency at which any ordinary capacitor will be self-resonant. Under this condition, the capacitor leads form the inductive part of the circuit and the capacitor itself supplies the capacitance.

The coil is designed primarily because of its inductive reactance. However, any inductor has a certain amount of capacitance, depending on the frequency since a capacitor is essentially two conductors, separated by a dielectric. An inductor having six turns of wire, for example, also has a certain definite capacitance value. This may be seen in Fig. 6.

Capacitance exists between the input leads to the inductance, between

Fig. 5—At higher UHF frequencies an ordinary in-circuit capacitor and its leads contain inductance, capacitance and resistance.

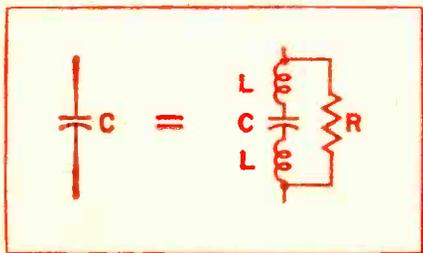
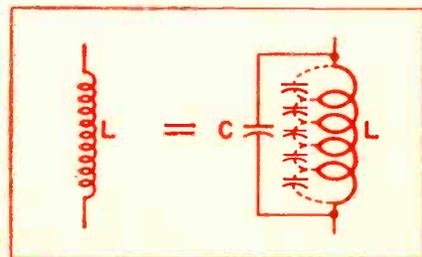


Fig. 6—An in-circuit inductance, with its distributed capacitance, becomes a parallel-tuned circuit at higher UHF frequencies.



any two adjacent turns and between any turn and ground. Since these individual capacitances are present at the same time, they may be replaced by a total equivalent capacitance. The overall effects of these individual capacitances, distributed capacitance, means a coil is never a pure inductance at UHF.

### Chassis Ground

In UHF, a common chassis ground point becomes a circuit design problem. At low frequencies any two points on the same chassis are considered at the same potential. At UHF a considerable difference in potential can exist between two points on the same chassis if they are separated by an appreciable part of a wavelength.

### Resonant Circuits

Parallel resonant line type oscillatory circuits are used in UHF up to approximately 1,000 mc. Beyond this frequency, wave guides and cavity resonators are generally used. A straight piece of wire carrying current has a definite amount of self-inductance. It is feasible, therefore, to use two ordinary pieces of wire or tubing for a resonant circuit, as shown in Fig. 7. To obtain resonance, the parallel line must be cut to an exact length for the operating frequency desired.

A quarter wavelength parallel resonant line can replace an ordinary coil and capacitor tuned circuit at UHF. This arrangement functions similarly in all respects to a circuit made of ordinary capacitors and coils. Parallel-resonant lines are used only at frequencies providing conveniently short element lengths. If used, for example, at 1,000 kc in the AM broadcast band, a quarter wave resonant circuit would be about 246 feet long. At 1,000 mc, however, a quarter wave line is only about 3 inches long.

### Production Development

A unique manufacturing technique easing UHF design problems is the printed circuit method of producing resistors, capacitors, inductors, and wiring for low power applications. Basically the method is simple. On a small plate of insulating material, a resistor may be made by depositing a thin line of a semiconductor. The greater the amount of material deposited, the less the resistance. Circuit wiring is made by a thin deposit

of any good conductor.

Capacitors are produced by employing the insulating base material as the dielectric. Depositing the required amount of conducting material on opposite sides of the dielectric forms the capacitor. An inductor may be made by depositing conducting material in the form of a simple coil. All of the necessary low-power components may be obtained by this procedure.

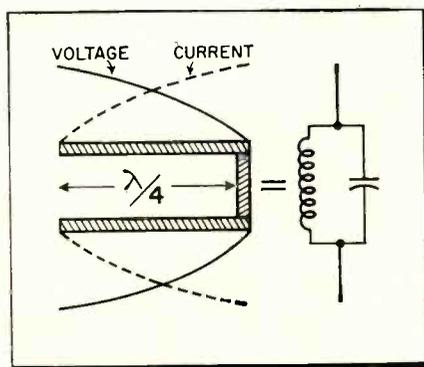


Fig. 7—When cut to exact quarter-wave length of a desired frequency, properly spaced and shorted at one end, two conductors become a parallel-tuned circuit at UHF frequencies.

Obviously advantages are the reduction in lead lengths and the fixed unvarying relations between elements. Lead dressing, once established, no longer arises as a problem. By having the capacitors and resistors in the same physical relation at all times, greater circuit stability is obtained. All are primary design considerations in UHF.

### Vacuum Tube Circuits

When original research began near the lower boundary of the UHF band, it became obvious that conventional vacuum tube circuits suffered from two fundamental limitations in high frequency operations. (1) Various circuit losses associated with the circuit wiring and circuit components and (2) the effects of UHF upon the operation of the tube itself.

As the frequency increased and the tank circuit became a single short piece of wire from the plate to the grid, tubes ceased to perform as oscillators and the capacitance between the various elements in the tube bypassed the signal and prevented amplification.

Over a period of time new tubes and circuits evolved, allowing progressively higher frequencies to be utilized. These included electron-orbit, magnetron, klystron, planar and

many other types of tubes and special circuits.

### Transistors In UHF

Commercial transistors have vast potential application to UHF in low power circuits. Experimental laboratory spacitors have operated above 1,000 mc. Printed UHF circuits with transistors form a new, small, inexpensive package of reliable electronics.

The spacistor, as a new semiconductor device, holds promise for amplification well beyond 1,000 mc. In this four-electrode semiconductor device transit time is reduced by accelerating the charge carriers. While this is still in the research stage it would appear useful in UHF communications, where small size and low power drain will make it an important amplifier.

### Solid State Devices

Circuitry noise has been a major factor in the UHF band. Two new devices have recently been developed for low-noise amplification. Both are solid state, operating on novel principles. One is the Maser (microwave amplification by stimulated emission of radiation) and the other is the parametric amplifier. In the Maser device, the transition of electrons from one level to another, in a crystalline material, is controlled by a microwave signal.

Parametric amplifiers depend upon non-linear reactance, either inductive or capacitive, for amplification. One form having possibilities as a low-noise UHF or SHF amplifier, is the variable-capacitance diode, employing semiconductor diodes as active elements.

Diodes acting as non-linear variable capacitors seem quite successful. Variable reactance is provided by a semiconductor diode or varactor diode, whose capacitance varies with the applied voltage.

The Tunnel Diode development offers promise of major advances. It presently oscillates to 1K mc. Further research indicates it may go to 10K mc.

The upper two thirds of the UHF band, capable of accommodating an unbelievable number of services, deserves careful observation during the next few years. Electronic events appearing to be in the distant future often turn up the following morning as accomplished facts. •

# DOUBLES YOUR EFFECTIVE MANPOWER



Fix "Tough Dogs" Fast!

Save Half Your Time!

Step Up Your Profit!

**B&K** NEW  
MODEL 1076

## TELEVISION ANALYST

for Black & White and Color



Check all circuits—Pinpoint any TV trouble...in minutes

**By Easy Point-to-Point Signal Injection,  
You See the Trouble on the TV Screen and  
Correct it—Twice as Fast and Easy!**

There's no longer any need to "lose your shirt" (and customers)—and worry about the lost hours you never recover—on "tough dogs" or even intermittents. The remarkable B&K Analyst enables you to inject your own TV signal at any point and watch the resulting test pattern on the picture tube itself. Makes it quick and easy to isolate, pinpoint, and correct TV trouble in any stage throughout the video, audio, r.f., i.f., sync, and sweep sections of black & white and color television sets—including intermittents. Makes external scope or wave-form interpretation unnecessary. Most useful instrument in TV servicing! Its basic technique has been proved by thousands of successful servicemen the world over.

The Analyst enables any serviceman to cut servicing time in half, service more TV sets in less time, really satisfy more customers, and make more money.

Model 1076. Net, \$29995

Available on Budget Terms. As low as \$30.00 down.

See Your B&K Distributor or Write for Bulletin AP16-T

Combines all the features of both  
the Model 1075 and Model A107

- |  |                                      |
|--|--------------------------------------|
| COMPLETE R.F. and I.F.                       | HI-VOLT INDICATOR                    |
| VIDEO TEST PATTERN                           | YOKE and HI-VOLTAGE TRANSFORMER TEST |
| COMPOSITE SYNC                               | <b>Also Now Provides:</b>            |
| FM MODULATED AUDIO                           | SWITCH-TYPE TUNER                    |
| COLOR PATTERNS                               | NEGATIVE BIAS SUPPLY                 |
| HORIZONTAL and VERTICAL PLATE and GRID DRIVE | AGC KEYING PULSE                     |
| B+ BOOST INDICATOR                           | PICTURE TUBE MODULATION              |



**B & K MANUFACTURING CO.**

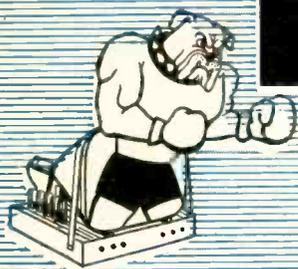
1801 W. BELLE PLAINE AVE • CHICAGO 13, ILL.

Canada: Atlas Radio Corp., 50 Wingold, Toronto 19, Ont.

Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.

For more data, circle 11-45-1 on coupon, p. 50

# "Tough Dog"



## Corner

### Difficult Service Jobs Described by Readers

#### Runaway Horizontal Oscillator

A Canadian GE TV, Model C719, came into the shop with the complaint: intermittent horizontal lock. When switching off-channel, the horizontal oscillator would "take-off" and go so far off-frequency the raster would either disappear completely or show as a "streaky mess," accompanied by loud whistling from

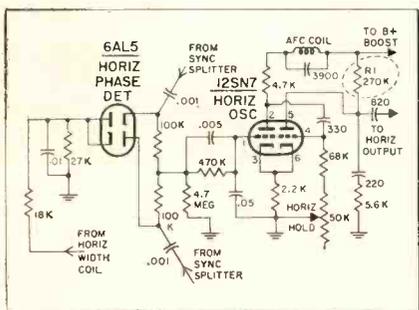


Fig. 1—Horizontal oscillator "take-off" was ultimately traced to the encircled resistor, which had increased in value.

the horizontal deflection circuit. When switching back to a live channel, the picture would usually return.

I replaced the 6AL5 horizontal phase detector, 12SN7 horizontal oscillator, and 12AU7 phase splitter. None had any effect. Disabling the horizontal sync by opening the circuit at the junction of R206, R207, R208, as shown in Fig. 1, the horizontal oscillator was running perfectly (free-wheeling normally, with the horizontal blanking bar "floating" sideways across the screen). The picture could be held with the horizontal control.

Occasionally, the horizontal oscillator would "take-off" on a signal. When this happened I found the grid (pin 1) of the 12SN7 oscillator measured slightly positive (less

than 1 volt); whereas it measured slightly negative when operating normally. When the oscillator was running way-off frequency, touching pin 1 with a negative bias lead restored normal operation. When the horizontal oscillator was allowed to free-wheel on its own (by disconnecting the a.f.c.) the same "streaky picture" condition and loud whistle could be reproduced simply by adjusting the horizontal a.f.c. coil (L1) a turn or so. If the slug was adjusted to give bars slanting to the left, or less than three bars slanting down to the right, everything was normal; but the oscillator would suddenly take-off with more than three bars slanting to the right. I now reflected the trouble could be in the oscillator, after all . . . and right I was! In very little time I found the 270K resistor had gone way up to 800K. Replacing the resistor corrected the trouble.—Lambert C. Huneault, Windsor, Ontario, Canada.

#### Poor Width, Sound Buzz

A Capehart TV Set Model # IT-174BS was brought to the shop for insufficient width and buzz in the sound. The customer said that the buzz had been in there ever since he purchased the set.

Replacing a defective horizontal output tube screen grid resistor restored the width but not quite to normal, as it would overscan the tube only about 1/8 inch. Varying the width control had no effect on the width but would cause the set to overload. The set used a keyed agc with the keying pulse obtained from a winding on the width coil.

Substitution of i-f, tuner and agc tubes had no effect. Overriding the

agc with a bias box locked the picture in perfectly and eliminated the sync buzz.

The keying pulse was about 100

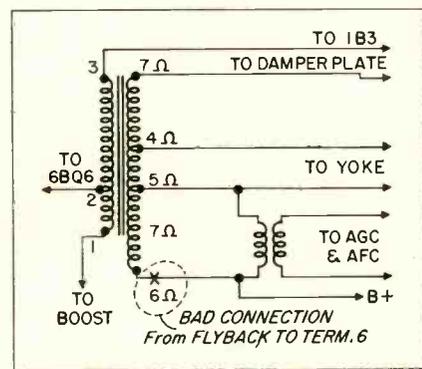


Fig. 2—Poor solder joint at flyback caused the agc pulse to compress and reduced the horizontal width of the set.

volts low so a new width coil was tried with no progress. All capacitors, resistors in the agc circuit were checked with no defects found. I-F alignment was also checked.

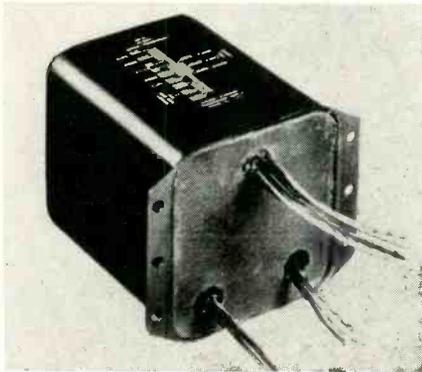
After studying the schematic I decided to check the flyback. Measuring the resistance between terminals 5 & 6 in Fig. 2, revealed a resistance of 500K instead of 0.7 ohm. Close inspection of the flyback revealed the wire coming from the flyback to terminal 6 on the board was poorly soldered. Soldering this connection returned the keying pulse to normal. The set performed correctly and had width to spare.—Jim Utterback, Columbus Junction, Iowa.

#### TOUGH DOGS WANTED

\$10 for acceptable items. Use drawings to illustrate whenever necessary. A rough sketch will do. Photos are desirable. Unacceptable items will be returned if accompanied by a stamped envelope. Send your choice entries to "Tough Dogs" Editor, ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

### Chicago HI-FI TRANSFORMER

Announced is a new 65-watt high fidelity output transformer, Chicago Part number BO-15. It can be used with 6550, EL34 or KT88's for construction of a 40-watt or 60-watt hi-fi amplifier with tertiary feedback. The



60-watt amplifier has a total harmonic distortion of less than  $\pm 1$  db from 20 to 10,000 cps. Power response of the 60-watt amplifier is 1 db from 20 to 20,000 cps. Chicago Standard Transformer Corp., 3501 W. Addison St., Chicago 18, Ill.

For more data, circle 11-47-2 on coupon, p. 50

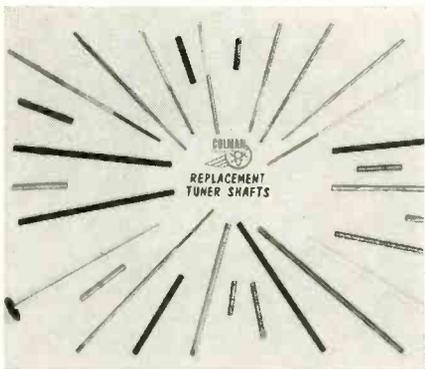
### Centralab CONTROLS

A complete line of 46 new push-pull and push-push controls is available in any of 4 types: Adashaft, Universal shaft, and Fastatch dual concentric type, as well as twin types for stereo. It is reported that 78% of the radio, TV and hi-fi sets, now being produced, utilize push-pull and push-push controls; and that these new units provide complete replacement coverage for all the original equipment types now in the field. Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis.

For more data, circle 11-47-3 on coupon, p. 50

### Colman TUNER SHAFTS

Announced is an assortment of 18 different "Multi-Fit" tuner shafts. Having wide replacement application,



the assortment is reported to fit 95% of all popular models; and in some cases one will replace ten original shafts. Colman Electronic Products, Inc., P. O. Box 2965, Amarillo, Texas.

For more data, circle 11-47-4 on coupon, p. 50

### Atlas SPEAKER

Announced is model DC-5 DeCor projector, equipped with a 5" diameter cone speaker with low-frequency response to 120 cps. Designed for use in churches, hotel lobbies and other locations where appearance is critical, the projector avoids loudspeaker-like appearance with modern, lighting fixture contours and brushed aluminum finish. Lock bracket permits the speaker to swivel both horizontally and vertically. Bell diameter, 7". Overall length, 14". \$22.00. Atlas Sound Corp., 1449 39th St., Brooklyn 18, N. Y.

For more data, circle 11-47-5 on coupon, p. 50



## NOW TEST ALL TUBES

with Models 500, 550, or 650 DYNA-QUIK

### SIMPLY BY ADDING THIS

## NEW MODEL 610 TEST PANEL



TESTS  
OVER 1600  
TUBE TYPES

TESTS OLD AND NEW TUBE TYPES  
*Measures Genuine Dynamic Mutual Conductance*

Also Tests Thyratrons, Voltage Regulators,  
Auto Radio Hybrid Tubes, Battery Radio Tubes,  
European Hi-Fi Tubes, and most Industrial Types

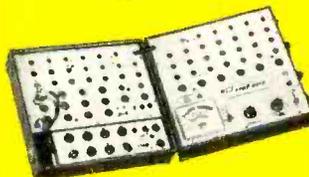
Merely by adding the new "610" to your Dyna-Quik, you have all the advantages of fast, multiple-socket testing, *plus freedom from obsolescence*. Makes your B&K Model 500, 550, or 650 Tube Tester *more useful and more valuable than ever!* Enables you to test all present plus future TV, radio and other tube types for all shorts—gives highly sensitive grid emission and gas test—checks for leakage and life—*with laboratory accuracy*.

Speeds complete tube test, sells more tubes on-the-spot, saves call-backs, insures your professional reputation, and brings more servicing profit. *It pays to invest in B&K professional equipment.*

Net, \$4995

### NEW TUBE INFORMATION SERVICE

Get test data on new tubes even before you encounter them in the field. Subscribe now to New Tube Information Service for owners of B&K tube testers. Issued every 3 months, at \$2.50 per year.



Photos above show how easily the new Model 610 Test Panel fits into the B&K Models 550 and 650 Dyna-Quik Tube Testers.



### B & K MANUFACTURING CO.

1801 W. BELLE PLAINE AVE • CHICAGO 13, ILL.  
Canada: Atlas Radio Corp., 50 Wingold, Toronto 19, Ont.  
Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.

For more data, circle 11-47-1 on coupon, p. 50

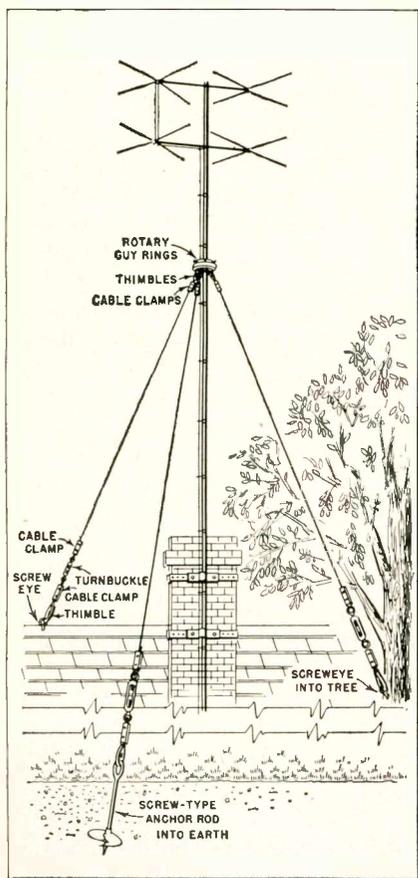
# Erecting Fringe-Area TV Antennas

## Installation Techniques For TV Antenna Towers, Extended Sectional Masts and Guy Supports

DAN GEORGE

- The demand for fringe area reception has created a need for a higher order of technical ability and ingenuity. TV owners in the distant suburbs are requesting reception equal in quality to that being enjoyed by their city dwelling counterpart. The technician is being called upon by the

Fig. 1—At least three suitable guy wires are needed to support a 30 or 40 foot mast with stacked antenna array under normal wind loading conditions. More are desirable.



fringe area TV owner to produce results. This development requires a little more than superficial consideration.

The question uppermost in the mind of the responsible technician appears to be: "How can I satisfy the demands of this customer?"

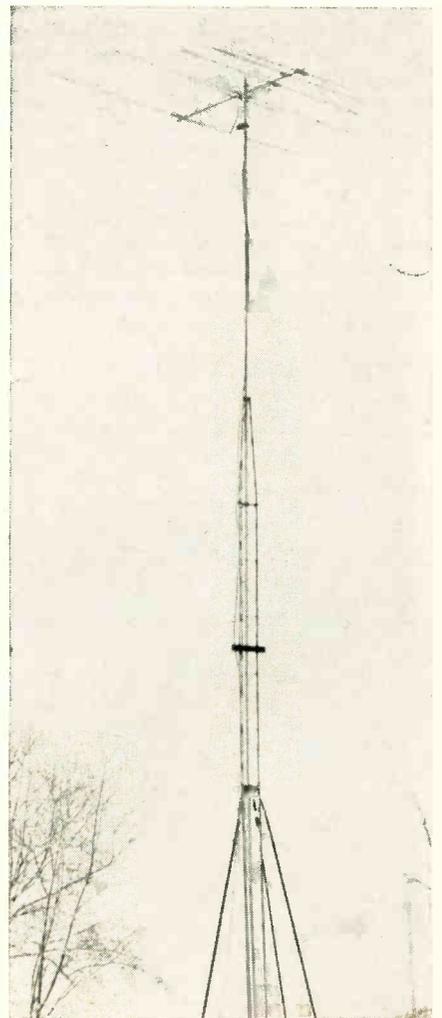
Most fringe-area technicians have been confronted with a customer recently moved from the city to establish neighborly relations with the grass-hoppers, ants and bees. The new suburban arrival just cannot understand why the antenna installation must cost as much as the TV set, or at least, double the standard city installation price. After exhausting all patience, explaining line-of-sight, below the horizon, etc., the technician finally convinces the set owner that an antenna tower of a certain height with a stacked array must be installed. Within three or four hours two technicians will have earned their pay, literally by the sweat of their respective brows.

### Getting The Job Done

From past callous-hand experience I have found it easier to assemble a telescoping tower than mount thirty feet of swage-ended mast lengths to the roof of a house. Raising 30 feet of mast even 16 ga, with a stacked array on one end, is apt to end in a buckled-collapse of the mast and damage to the antenna elements. A typical 30 foot installation with stacked conicals is shown in Fig. 1. The antenna choice may include the conical, V beam, in-line or any one of the so-called broad-band yagi arrays. Individual area problems will

generally govern the choice. If you are called from the city and are unfamiliar with the area, you should consult the local distributor for information regarding practical arrays, mast height requirements, etc.

Fig. 2—Proper connection of guy wire to mast ring and turnbuckle is important in aiding an antenna to stand up in a storm.



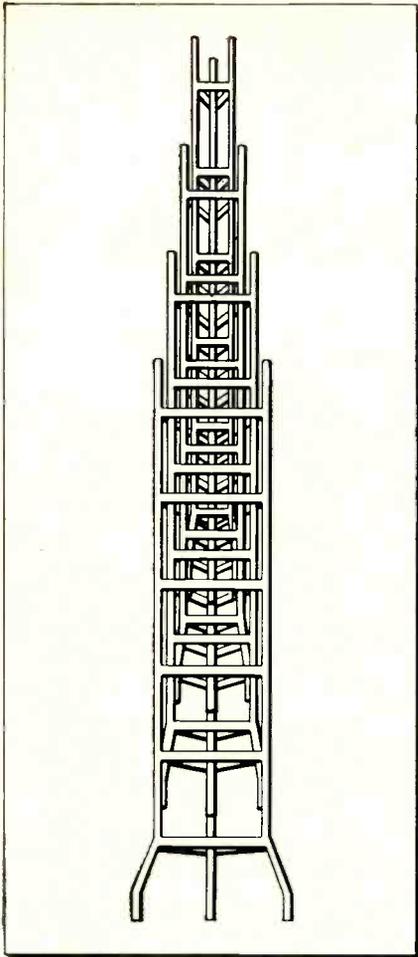


Fig. 3—Telescoping TV antenna towers are quickly and easily installed, and present a minimum of installation hazards.

Chimney mounts are frequently used as the base for a twenty or thirty foot guyed mast with stacked antenna array. Standard city procedure changes here since most of the assembly work is done while the two men are on a peak roof. It would be foolhardy to attempt to do a job of this kind alone. A sudden gust of wind, while adjusting this length of mast, could pitch the entire assembly and the installation technician from the roof.

After assembling the required length of mast the next job is placing the array and guy wire ring. The two antennas, joined by stacking bars, should be mounted with the top antenna mounted six or eight inches from the top end of the mast. It is important that both antennas are on the same plane when they are tightened. If not, an out-of-phase ghost signal may be observed on the TV screen. After the array is secure and the lead-in has been attached to the center of the stacking bars, the next

step is tying the guy wires in place. Three wires, preferably stranded aluminum alloy, should be attached to the guy ring at approximately 120 degrees apart. The ring should be attached to the mast a few feet below the bottom antenna. This spacing of the guy wires will allow the antenna to bear the effects of wind loading and sway. It is important that the guy wires be secured properly. Past experience with Boy Scout knots can prove helpful.

Typical mast and base connections for guy wires are shown in Fig. 2. Make sure the guy wire base connections are made to durable points. Otherwise you may run into an experience similar to that of a technician I know. It seems he installed a guy wire system so good that the wind didn't even budge the antenna. Instead, it ripped away part of the customer's roof at a point where the base turnbuckles were secured. He did not take the time necessary to carefully inspect the guy wire mounting point. He is now paying for a new roof. If possible, guy wire base mounts should be secured to lower

Fig. 4—The mast platform design should provide an ample margin of strength to safely support the heavy mast and array under all wind loading conditions.

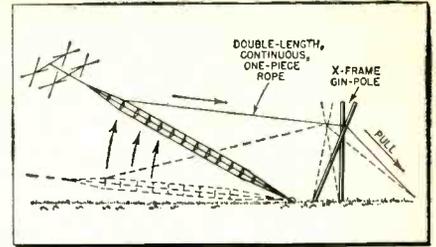
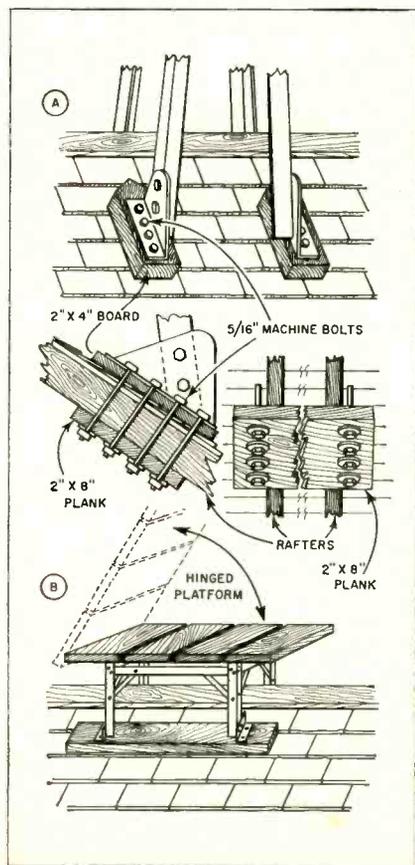


Fig. 5—Sectional type towers mounted at ground level must be assembled and erected with the aid of a gin pole. When mounted on a roof they are generally assembled from the first mounted section upward by climbing the mast.

areas of tree trunks or to adequate buried ground anchors.

## Towers

Installing a tower on the roof is a more difficult job. A collapsible tower, similar to the one shown in Fig. 3 is easier to install than the sectional type. After its base is secured it can be extended upward from within. The mast and antenna are fastened to the top section when in the collapsed position and the tower is then extended upward. There are two universal tower base mounts which should cover most intended applications. One type provides flat mounts for flat roof surfaces, and the other easily adapts to pitched roofs. An example of both types are shown in Fig. 4. In either case it is advisable to nail or bolt two three-by-six planks to the roof where the tower is to be mounted. The tower base is then bolted to these planks. The roof is protected and reinforced by this platform. The tower is now mounted to its base anchored to this solid platform. Naturally, all towers require a minimum of three guy-wires, anchored as close as possible to 120 degrees apart.

Aluminum towers are much lighter than steel. It is safer on a roof to handle a 125 pound aluminum tower than a 500 pound steel tower. This is no reflection on the steel tower. The steel tower's advantages are obvious when it is used at ground level. Common sense, however, advises the technician to use the lighter metal when making a roof installation.

Sectional tower installations made on the roof require the technician to climb the side of the tower when the added section is to be attached. This calls for an abundance of intestinal fortitude. You can picture a dare-

(Continued on page 63)

# FREE LITERATURE

To receive the literature below without charge, simply circle the numbers on the coupon.  
Cut out and mail to ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

**1 Transformers:** A yoke and fly-back cross reference index, bulletin YFX, lists Stancor equivalents as replacements for other brands. Chicago Standard Transformer Corp.

For more data, circle 11-50-1 on coupon

**2 Tubes:** A revised technical bulletin provides specifications and base diagrams for more than 60 Mullard receiving tube types. International Electronics Corp.

For more data, circle 11-50-2 on coupon

**3 Test Equipment:** Two-color, 8-page bulletin, No. 2062, covers a wide range of test equipment. Well illustrated. Prices included. Simpson Electric Co.

For more data, circle 11-50-3 on coupon

**4 Tools:** Form 660, a colorful 4-page brochure, covers specialized hand tools custom-made for assembly work or service where conventional hand tools proved inadequate. Xcelite, Inc.

For more data, circle 11-50-4 on coupon

**5 CB Transceiver:** Literature is available covering the new deluxe citizens band transceiver, model HE-20. Unit includes adjustable squelch control, automatic series gate limiter, push-to-talk microphone and relay, and illuminated dial. Lafayette Radio.

For more data, circle 11-50-5 on coupon

**6 CB 2-Way Radio:** Catalog C.4010 covers the Mark VII radio-phone, 27 mc citizens band 2-way radio, type CRM-P3A-5. Illustrations, features, uses and specifications included. Covered also, antennas available for unit's mobile application. Radio Corp. of America.

For more data, circle 11-50-6 on coupon

**7 Matting:** Literature covers "Koralite" 3/8" matting for bench and floor. Stops tube breakage and foot aches. 33 kv insulation. Ace Lite-Step Co.

For more data, circle 11-50-7 on coupon

**8 CB 2-Way Radios:** Brochure covers Citizens Band line including CB-200, 5/channel; CB-100 3/channel; and Pocketphone transistorized portable. Globe Electronics.

For more data, circle 11-50-8 on coupon

**9 CB Crystals:** Literature covers class D crystals, quartz crystals for every service, made to order crystals and others. Texas Crystals.

For more data, circle 11-50-9 on coupon

**10 CB Transceivers:** Literature on citizens band transceivers and equipment includes the new International Crystal Executive model. Greylock Electronics.

For more data, circle 11-50-10 on coupon

**11 Speakers:** A big Sound Catalog covers the firm's line of speakers. Features baffles with new thin-profile modern look. Utah Radio & Electronic Corp.

For more data, circle 11-50-11 on coupon

CUT HERE

Use this coupon, or your letterhead, before December 20, 1960

Please send me literature of companies whose code numbers I have circled below (includes editorial and advertised items):

Note: Code 11-3-1 means November issue, Page 3, 1st item on page.

11-3-1	11-20-5	11-22-7	11-50-3	11-53-3	11-62-1	11-70-2	11-76-1
11-4-1	11-20-6	11-23-1	11-50-4	11-53-4	11-63-1	11-71-1	11-76-2
11-5-1	11-20-7	11-24-1	11-50-5	11-54-1	11-65-1	11-71-2	11-76-3
11-7-1	11-20-8	11-25-1	11-50-6	11-55-1	11-66-1	11-72-1	11-76-4
11-9-1	11-20-9	11-26-1	11-50-7	11-56-1	11-66-2	11-72-2	11-77-1
11-12-1	11-20-10	11-27-1	11-50-8	11-57-1	11-66-3	11-73-1	11-77-2
11-13-1	11-20-11	11-29-1	11-50-9	11-58-1	11-66-4	11-73-2	11-77-3
11-14-1	11-20-12	11-30-1	11-50-10	11-59-1	11-67-1	11-73-3	11-77-4
11-15-1	11-20-13	11-45-1	11-50-11	11-60-1	11-67-2	11-73-4	11-78-1
11-16-1	11-21-1	11-47-1	11-51-1	11-60-2	11-67-3	11-73-5	11-78-2
11-18-1	11-22-1	11-47-2	11-51-2	11-60-3	11-67-4	11-74-1	11-78-3
11-19-1	11-22-2	11-47-3	11-51-3	11-60-4	11-68-1	11-75-1	11-78-4
11-20-1	11-22-3	11-47-4	11-51-4	11-61-1	11-68-2	11-75-2	11-79-1
11-20-2	11-22-4	11-47-5	11-52-1	11-61-2	11-69-1	11-75-3	11-79-2
11-20-3	11-22-5	11-50-1	11-53-1	11-61-3	11-69-2	11-75-4	11-80-1
11-20-4	11-22-6	11-50-2	11-53-2	11-61-4	11-70-1	11-75-5	11-C2-1

Name ..... Position .....

Firm ..... Address .....

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

### Jackson OSCILLOSCOPE

Model 600, a compact laboratory oscilloscope, has a sweep frequency pulse on the panel terminal for transformer ringing testing. Other features include: wide band vertical amplifier, flat within 1 db from less than 20 cy-

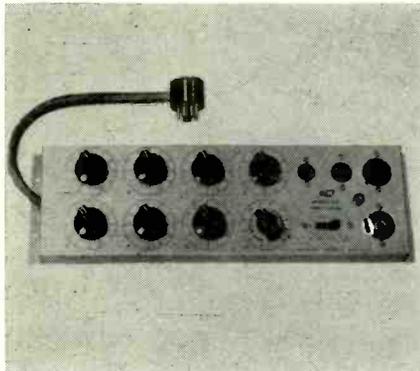


cles to 4.9 mc. Two range vertical sensitivity from 20 mv/inch. Horizontal amplifier response, uniform within 2 db from less than 20 cycles to 200 kc. \$335.00. Jackson Electrical Instrument Co., 124 McDonough St., Dayton, Ohio.

For more data, circle 11-51-2 on coupon, p. 50

### B&K TEST PANEL

By adding the new model 610 test panel to the B&K model 500, 550, or 650 Dyna-Quik tube tester, service technicians retain the advantages of fast, multiple-socket testing, and gain freedom from obsolescence. Tests old

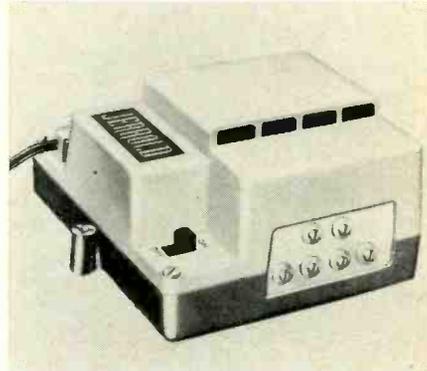


and new tube types used for radio and TV. It also tests thyratrons, voltage regulators, auto radio hybrid tubes, battery radio tubes, European hi-fi tubes, and most industrial tube types. The test panel comes in three types. \$49.95. B&K Mfg. Co., 1801 W. Belle Plaine, Chicago 13, Ill.

For more data, circle 11-51-3 on coupon, p. 50

### Jerrold TV/FM COUPLER

The new model HSA-43 amplified 3-set coupler can feed any combination of up to three TV and/or FM sets from a single antenna source. A single tube and special circuitry supply a minimum of 5 db gain on all TV/FM chan-

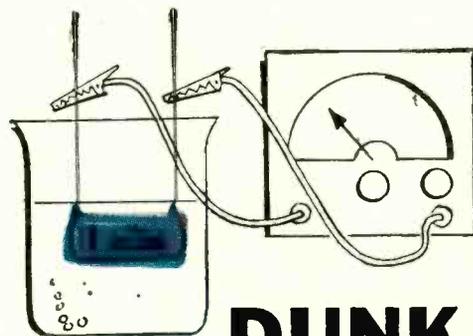


nels from two outputs and unity gain from a third output. Its built-in isolation and match prevent set interaction and ghosting. Input and output impedances of 300 ohms permit the use of twin lead. \$29.95. Jerrold Electronics Corp., 15th & Lehigh Ave., Philadelphia 22, Pa.

For more data, circle 11-51-4 on coupon, p. 50

*They're new! They're blue!*

**MALLORY**  
**PVC**  
**MYLAR\***  
**CAPACITORS**



**DUNK 'EM**

The Mallory PVC stays moisture-proof. Dunk it . . . soak it . . . boil it . . . bend the leads or solder them . . . the flexible blue vinyl jacket never cracks or shrinks, never loses its moisture protection. It's truly a PLUS VALUE CAPACITOR.

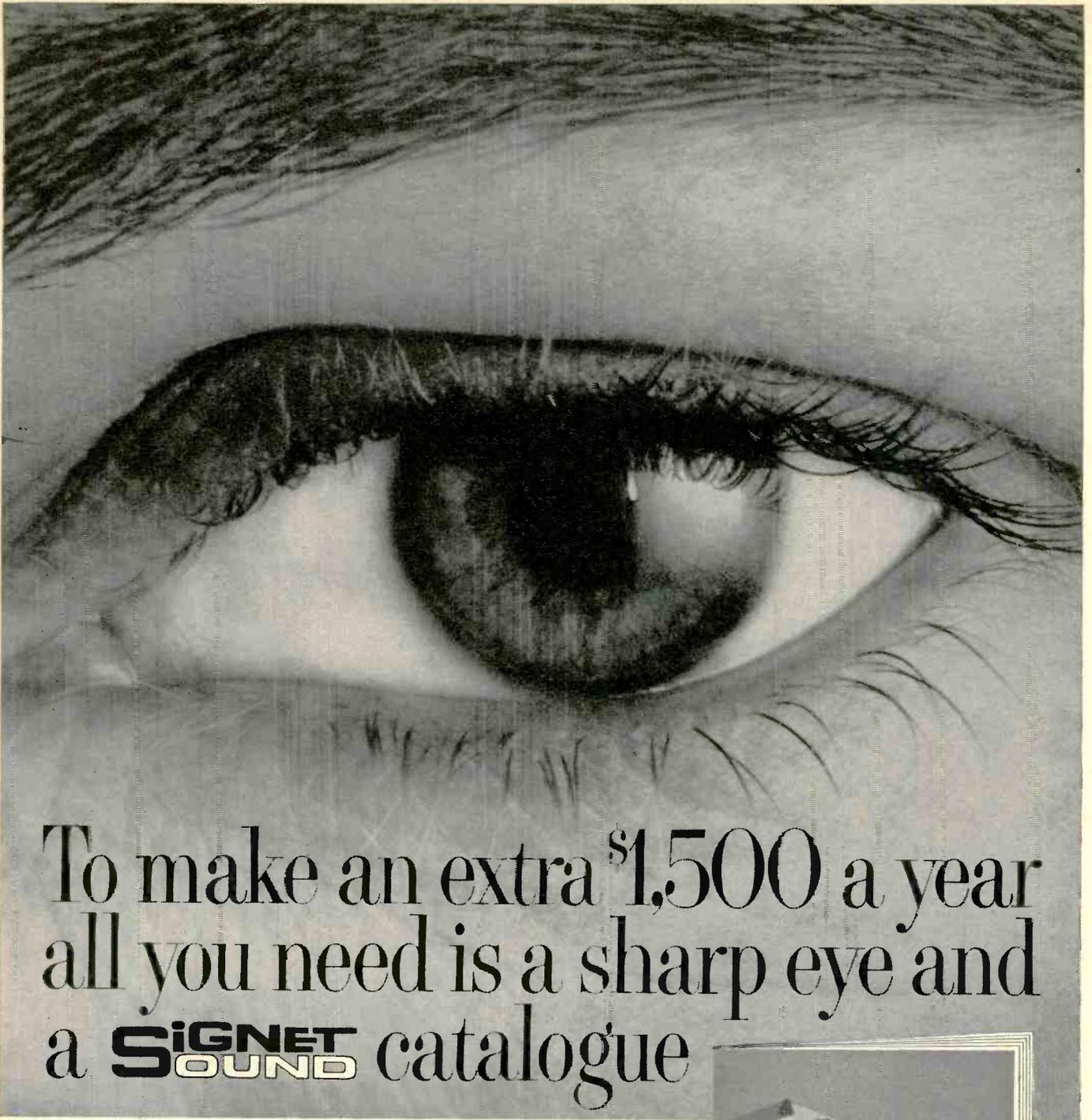
Test-proved at 105°C at double voltage, the Mallory PVC is perfect for those tough jobs. It will never let you down. See your Mallory distributor for PVC five-packs . . . they're priced to please . . . 100, 200, 400 and 600 volt ratings in a wide range of capacities.

Distributor  
Division  
Indianapolis 6,  
Indiana

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

\*Registered Trademark of E. I. du Pont de Nemours & Co., Inc.

For more data, circle 11-51-1 on coupon, p. 50



# To make an extra \$1,500 a year all you need is a sharp eye and a **SIGNET** catalogue

Look around you. There are hundreds of profit opportunities in your neighborhood . . . meeting halls, churches, sports and social clubs, fraternities, taverns, restaurants . . . all ready to be sold on the convenience, effectiveness and comparatively low cost of good sound equipment.

Take along a *Signet Sound Catalog* and you will have all you need to make an easy sale. You can offer professional equipment, expertly engineered by Stromberg-Carlson—the greatest name in sound. You can offer a complete choice . . . size and price-wise . . . of pre-planned, ready-to-install *Signet Sound Packages*.

Without any risk or investment you can earn a good profit on the sale. And each installation brings in an extra \$40 to \$200 profit.

"Electronic Technician" magazine revealed that 8,600 electronic servicemen in 1958 made an extra \$1,500 in profits selling this type of sound equipment and service. For detailed information and your copy of the *Signet Sound Catalog* write to: Commercial Products Division, 1461-11 North Goodman St., Rochester 3, N. Y.

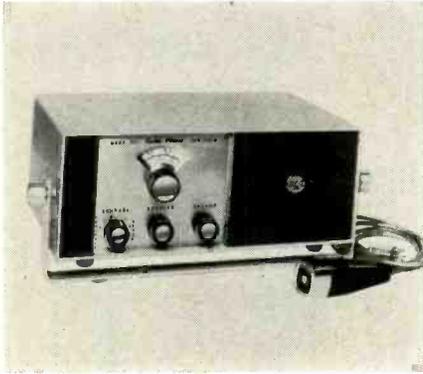


**STROMBERG-CARLSON**  
A DIVISION OF **GENERAL DYNAMICS**

For more data, circle 11-52-1 on coupon, p. 50

### RCA CB 2-WAY RADIO

Mark VII radio-phone, 27 mc citizens band 2-way radio, type CRM-P3A-5, is available in two models for operation from a 6v d-c battery or 115v a-c. Features include: highly selective superheterodyne receiver; 5-



watt transmitter; 4 crystal-controlled transmitting and receiving channels; tuneable receiver permits reception of all 23 channels in the band; push-to-talk microphone; built-in squelch control; and automatic noise limiter. Radio Corp. of America, Communications Div., Camden 2, N. J.

For more data, circle 11-53-2 on coupon, p. 50

### Vaco TOOL PROMOTION

The Crimcut tool carton now carries a sign stating that, with the purchase of the tool, the consumer can obtain, for 25¢ additional, a copy of the 91-page "Shop Kinks" book, regularly sold for \$1.00. The tool cuts wire,

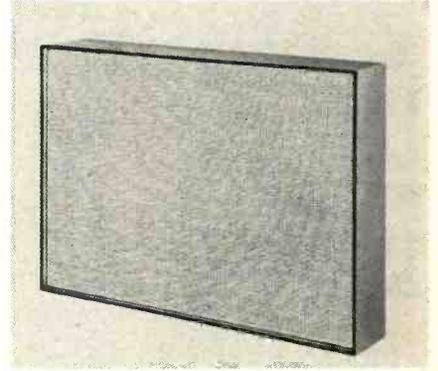


strips wire and crimps solderless terminals. It is also a bolt cutter, shearing five sizes of bolts and machine screws. Length is 8". Handles are covered with plastic insulation grips, ribbed to prevent slipping. Vaco Products Co., 317 E. Ontario St., Chicago 11, Ill.

For more data, circle 11-53-3 on coupon, p. 50

### Utah SPEAKER BAFFLE

Intended as a second speaker for a monaural or stereo hi-fi system, model PT-2 features a 6"x9" inverted woofer, a 3"x5" tweeter, and a bass relief port. Power handling, 8 watts. Impedance, 8 ohms. Wall mounting type, easy to

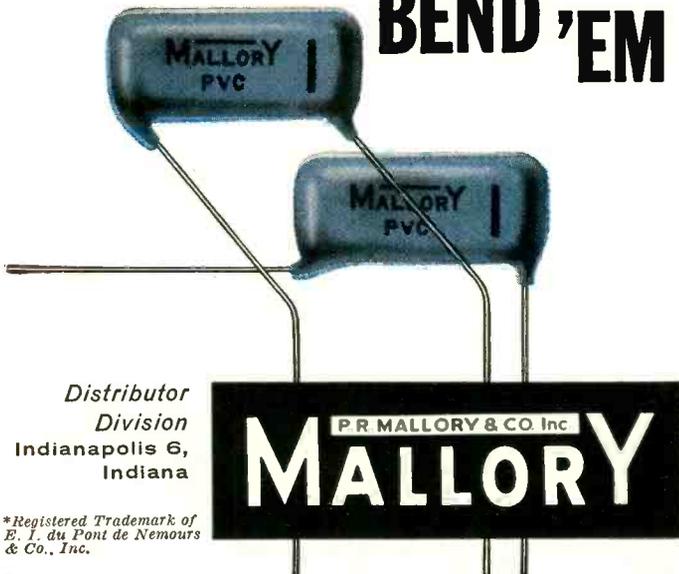


hang with the screw slots and "S" hooks provided. Screw terminals make it easy to connect with no soldering required. Designed for use where space is a problem, it is as thin as the average picture frame. Size, 12"x18"x3". Blonde or mahogany finish. \$32.50. Utah Radio & Electronic Corp., 1124 E. Franklin St., Huntington, Ind.

For more data, circle 11-53-4 on coupon, p. 50

*All new...all blue...*

**BEND 'EM**



Distributor  
Division  
Indianapolis 6,  
Indiana

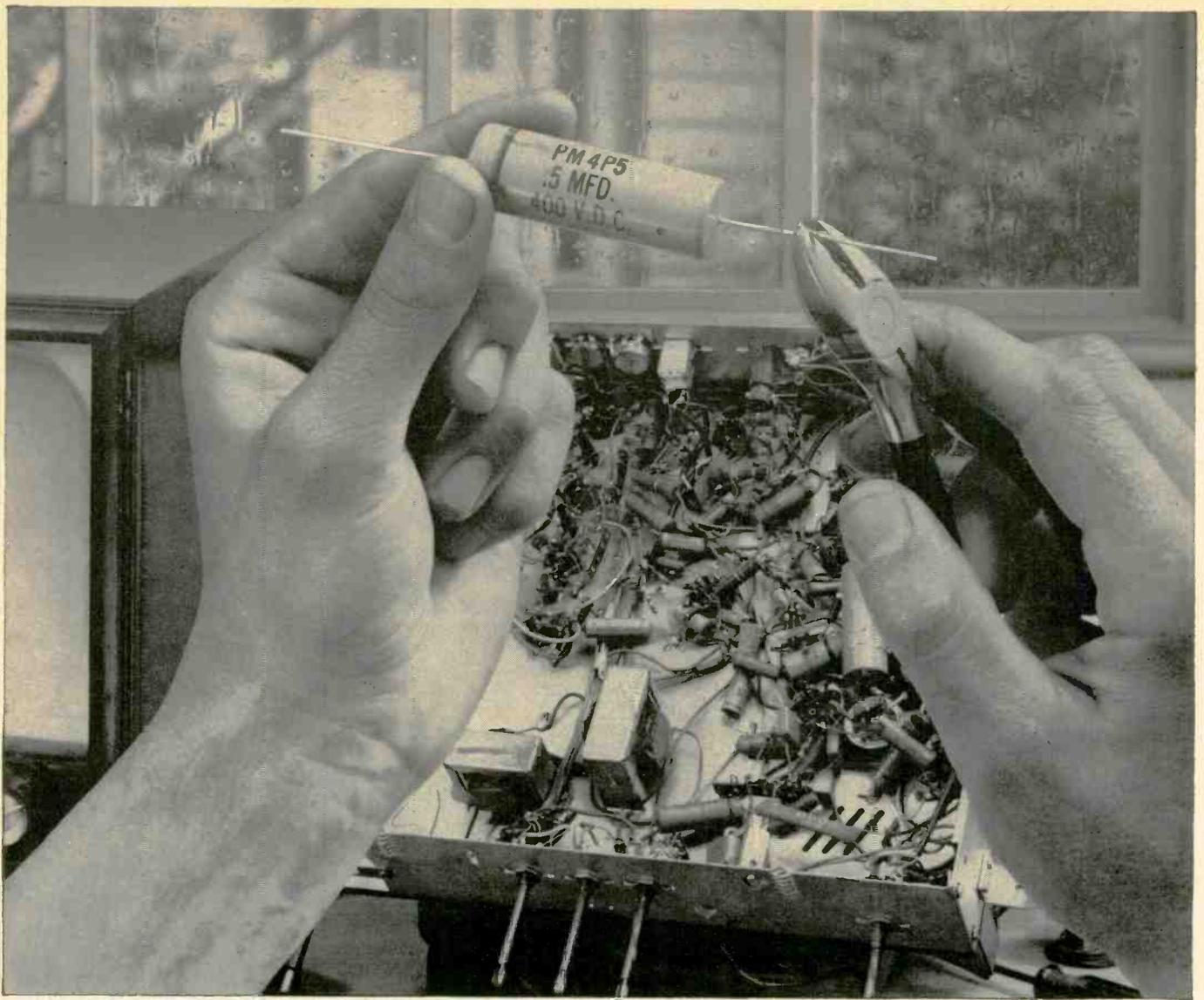
\*Registered Trademark of  
E. I. du Pont de Nemours  
& Co., Inc.

**MALLORY**  
**PVC**  
**MYLAR\***  
**CAPACITORS**

Bend those Mallory PVC leads to fit that tight spot . . . go ahead, the flexible, moisture-proof blue vinyl jacket won't crack . . . never loses its perfect seal. The PVC is a PLUS VALUE CAPACITOR . . . never lets you down.

Ideal for printed circuits, the PVC is test-proved for 105°C operation at double voltage. Popular-priced PVC's are available from Mallory distributors in handy five-packs . . . in a wide range of capacities and ratings of 100, 200, 400 and 600 volts.

For more data, circle 11-53-1 on coupon, p. 50



*This service man is installing*

## Protection against call-backs . . . moisture-resistant capacitors made with "Mylar"

Rainy weather or long periods of high humidity can cause failure of ordinary capacitors. But they won't affect units made with "Mylar"\* polyester film because "Mylar" won't absorb moisture. Insulation of "Mylar" can save you money by eliminating costly call-backs to replace newly installed capacitors. "Mylar" means superior performance for four important reasons:

1. **High breakdown strength...** "Mylar" averages 4,000 volts per mil dielectric strength.
2. **Long life . . .** neither time, temperature, nor highest humidity af-

fects the stability of "Mylar".

3. **Size reduction . . .** the high dielectric strength of "Mylar", coupled with its great physical strength, permits its use in thinnest gauges. Small capacitors save precious space . . . are ideal for hard-to-get-at jobs.
4. **Proven value . . .** leading manufacturers make high-reliability capacitors insulated with "Mylar" for critical military applications, mis-

siles and sensitive computers.

Ask your distributor for capacitors made with "Mylar". You'll get a bonus of extra reliability and long life at no extra cost. And for test data that detail the basic properties of "Mylar", write for Du Pont's free booklet. E. I. du Pont de Nemours & Co. (Inc.), Film Department, Room No. 16, Wilmington 98, Delaware.



\*"Mylar" is Du Pont's registered trademark for its polyester film.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

For more data, circle 11-54-1 on coupon, p. 50



# TV Ownership in U.S. & Canada

TV set ownership in the United States and Canada continues its climb toward the saturation limit. According to studies by the A. C. Nielsen Co., 45,200,000 U.S. homes own one or more TV receivers. This is 87% of the 52,000,000 homes in the country.

In Canada, the saturation is 80%, with 3,423,410 homes out of a total of 4,267,000 (excluding Newfoundland) owning TV.

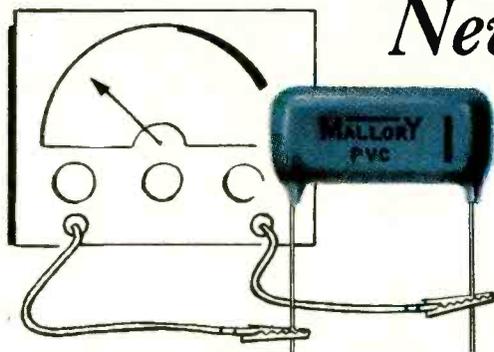
The following is a state-by-state breakdown of TV homes and the percent saturation (TV homes/total homes).

United States		
	Tele- vision Homes	% of all Homes
<b>TOTAL U. S.</b>	45,200,000	87%
<b>NORTH EAST</b>	12,043,800	92
NEW ENGLAND	2,725,060	92
CONNECTICUT	655,550	93
MAINE	234,580	90

MASSACHUSETTS	1,358,160	93
NEW HAMPSHIRE	153,320	91
RHODE ISLAND	232,810	93
VERMONT	90,640	88
<b>MIDDLE ATLANTIC</b>	9,318,740	92
NEW JERSEY	1,628,530	93
NEW YORK	4,694,940	92
PENNSYLVANIA	2,995,270	92
<b>NORTH CENTRAL</b>	14,061,900	90
E. N. CENTRAL	10,032,610	92
ILLINOIS	2,848,170	92
INDIANA	1,297,250	91
MICHIGAN	2,151,580	92
OHIO	2,700,660	93
WISCONSIN	1,034,950	90
W. N. CENTRAL	4,029,290	86
IOWA	775,950	90
KANSAS	557,660	83
MINNESOTA	847,360	87
MISSOURI	1,215,750	89

NEBRASKA	372,520	84
<b>NORTH DAKOTA</b>	124,890	73
<b>SOUTH DAKOTA</b>	135,160	68
<b>SOUTH</b>	11,908,440	80
S. ATLANTIC	5,700,400	82
DELAWARE	116,850	92
DIST OF COLUMBIA	223,900	92
FLORIDA	1,177,740	81
GEORGIA	809,900	79
MARYLAND	776,940	90
NORTH CAROLINA	877,480	79
SOUTH CAROLINA	459,800	77
VIRGINIA	854,550	82
WEST VIRGINIA	403,540	79
E. S. CENTRAL	2,366,000	74
ALABAMA	638,230	76
KENTUCKY	622,170	75
MISSISSIPPI	354,310	64
TENNESSEE	751,290	78

(Continued on page 58)



## OVERLOAD 'EM

The rugged, all-new Mallory PVC will operate at 105°C and twice its rated voltage—without de-rating. This test-proved, no-sacrifice performance is typical of the PVC. It's drift-free, too . . . and tolerance is  $\pm 10\%$ .

Flexible vinyl encapsulation keeps the PVC moisture-proof. Dunking won't change its perfect seal; neither will sharp bending of the leads for mounting in tight spots. See your Mallory distributor for this *Plus Value Capacitor* . . . popularly priced . . . in the handy five-pack. 100, 200, 400 and 600-volt ratings.

*New...Blue...*

**MALLORY**  
**PVC**  
**MYLAR\***  
**CAPACITORS**

Distributor Division  
Indianapolis 6, Indiana

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

\*Registered Trademark of  
E. I. du Pont de Nemours  
& Co., Inc.

For more data, circle 11-55-1 on coupon, p. 50

## Bowling Alleys

(Continued from page 35)

filament image) on card. It should center pencil line precisely, and should not be higher from the floor than the lamp's unit housing. If not in the correct position, move lamp mount to properly center image.

4. When image is properly centered, the lamp adjusting screw is tightened, locking the lamp in place.

After these adjustments are made the technician should observe the light beam falling on the PEC cathode. Care should be taken to check the PEC mounting to assure that its cathode is facing square to the light beam. Although it cannot be reversed because of its polarized socket, it can be rotated on a quadrant either 90 or 180 degrees from normal position.

Some installations have an adjustable shutter on the lamp to control the amount of light beamed to

the PEC. This shutter, in effect, can function as a sensitivity control to speed up the equipment's response time. Closing the shutter will shorten the time constant and opening will lengthen it. This adjustment will be approximately correct when a slow rolling ball breaks the beam but does not set off the system.

Another important factor should be mentioned at this point. Lenses must be kept clean, both inside and out. When floors are waxed or cleaned, various foreign material accumulates on the lens faces. Dust particles will cause erratic operation. Lenses should be cleaned with tissue, or soft lintless cloth and glass cleaner.

### Troubleshooting

Although a thorough understanding of the system's operation can aid in locating causes of malfunction, the electronic technician should find no difficulty with this equipment. A set of hand tools, portable VOM, solder gun and solder, will usually cover most circuit repairs. Problems generally fall into three categories: (1) Unit ceases to operate entirely. (2) System remains on constantly. (3) Operates erratically or intermittently.

When the unit ceases to operate entirely, check input voltage, fuses and amplifier tubes for proper function. If all sections test good, disconnect the PEC input to the amplifier. Should a short develop across the paired wiring to the amplifier's input, full negative potential is applied to the amplifier grid and the tube is cut off (see Fig. 4). Obvious faults, including defective on/off switches, should also be investigated.

When the system remains on constantly the relay contacts in the amplifier should be checked. They can be stuck. This can happen when bias voltage is removed from the amplifier tube grid or for other causes. Obvious trouble may be a burned-out beam lamp, a dirty lens, or defective PEC. The unit can be manually shorted out to complete the circuit (across the PEC socket terminals) which applies full bias to the control tube. If the PEC cathode voltage is normal and wiring is not defective, this should restore the unit to cut-off. If this shorting trick restores the amplifier

## Lowest Priced Tube Tester with the HICKOK Gm Circuit



### Service Technician's Portable Tube Tester, Transistor and Diode Checker

- Built-in roll chart contains test data on latest tubes, including NUVIDISTORS
- Inter-element leakage and shorts read directly on the meter
- New filament continuity test speeds checking series-string tubes
- Cathode reserve measurement provided
- Only HICKOK offers roll chart subscription service

See Your Distributor, Ask for a Demonstration!  
\$169.50 net

## The Hickok Electrical Instrument Co.

10523 DUPONT AVENUE • CLEVELAND 8, OHIO

For more data, circle 11-56-1 on coupon, p. 50

unit to normal operation, change the PEC or look for bad connections in its immediate area.

The lamp-holder should be checked to determine if it has been moved out of adjustment. No possibility should be overlooked when attempting to isolate the cause of abnormal operation.

If the trouble has not been located to this point, short out the PEC terminals at the amplifier unit. If this restores normal operation the trouble is no doubt in the wiring. If this does not help, a re-check of the detector unit is in order.

As in all electronic equipment, erratic or intermittent operation poses the most difficult problems. Causes for steady state fault conditions, previously covered, are generally easier to locate.

Loose or high resistance connections are frequent reasons for intermittent operation. Voltage fluctuations in either a-c or d-c supplies can also produce erratic operation. High ripple content in the B+ or bias supplies can create unstable conditions. Borderline low voltage may also become a real problem.

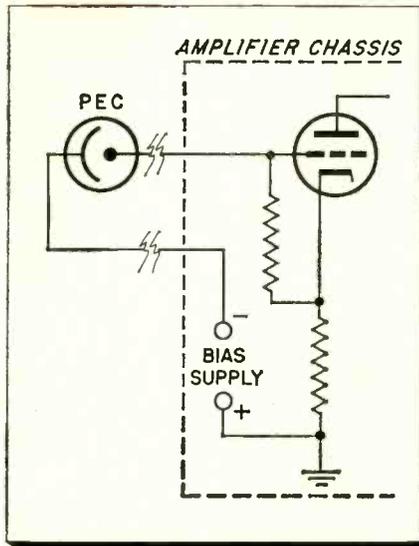


Fig. 4—If a short develops across the paired wiring connecting the PEC to the amplifier, full bias voltage will be placed on the amplifier tube's grid—cutting off the tube.

The technician should memorize the proper voltage values existing at various points in the amplifier unit when it is operating normally. A VOM should be used to measure various voltage points in the amplifier in an effort to spot sudden

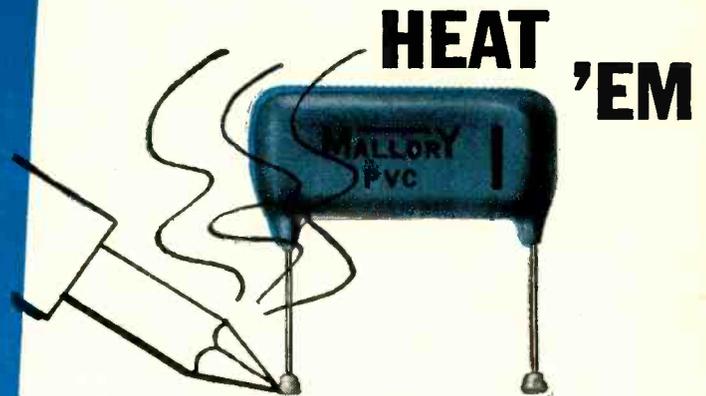
changes at a particular point when erratic operation occurs.

Wiring frequently becomes chafed, or the insulation is badly damaged. Visually inspect all wiring that is not hidden from sight. It may become necessary at times to disconnect wiring from both ends (from amplifier and PEC unit) and check insulation resistance. Set the VOM on its highest R scale. If an infinite reading is not obtained, the wire is doubtful. The "initial kick" a meter needle may show when placed across the line is caused by the distributed capacity of the line. Using the R X 1 ohmmeter scale, continuity of both wires in the line should be checked. Short one end of the line and check from the other. A bad splice may show up as an added resistance in the line. Of course, on this test, it is important to have a record of the normal resistance of the line when in good condition. •

Information and illustrations credit: Brunswick-Balke-Collender Co., Inc., Englewood Cliffs, N.J. American Machine & Foundry Co., New York, N.Y.

## New and Blue

**MALLORY  
PVC  
MYLAR\*  
CAPACITORS**



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

Distributor  
Division  
Indianapolis 6,  
Indiana

\*Registered Trademark of E. I. du Pont de Nemours & Co., Inc.

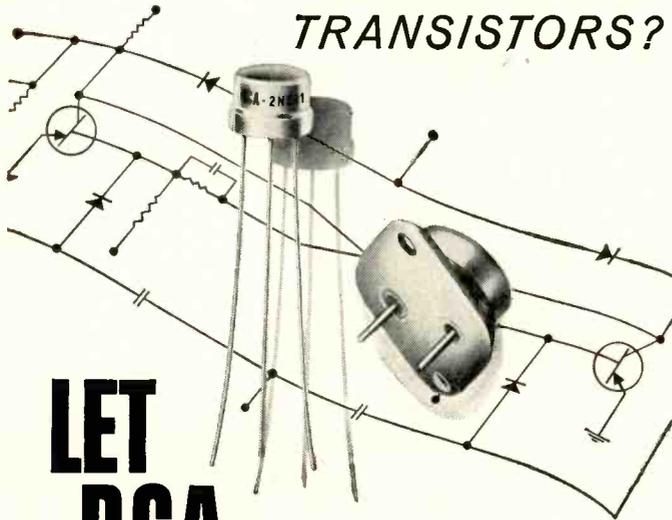
Soldering heat won't damage the moisture protection of the all-new Mallory PVC—the Plus Value Capacitor. Its bright blue vinyl jacket actually tightens its grip when leads are soldered . . . stays flexible in high heat or below freezing . . . never cracks when leads are

sharply bent for mounting in tight, hard-to-reach spots.

Your Mallory distributor carries the new, blue PVC . . . at popular prices . . . in a wide range of capacities at 100, 200, 400 and 600-volt ratings. Handy five-pack keeps leads free from kinks.

For more data, circle 11-57-1 on coupon, p. 50

Need to  
know more about  
**TRANSISTORS?**



# LET RCA TRAIN YOU AT HOME

in semiconductor physics  
and transistor applications

RCA Institutes Home Study School's new Transistor course is designed to meet the needs of men and women in the field of electronics who realize the growing importance of semiconductor technology. The course covers transistor characteristics and testing methods... prepares you to move up in your job as you increase your knowledge and skills. *No monthly installment payments.* Pay-as-you-learn using the most economical possible home study plan... you pay for your next study group only when you order it.

Courses also available in Electronic Fundamentals, TV Servicing, Color TV, and Electronics for Automation.

SEND FOR THIS FREE 64-PAGE CAREER BOOK TODAY!



**RCA INSTITUTES, INC.**  
A Service of Radio Corporation of America

The Most Trusted Name  
in Electronics



Licensed by the University of the State of New York

RCA Institutes, Inc., Home Study Dept. ET-NO  
350 West Fourth Street, New York 14, New York  
Please rush me your FREE illustrated 64-page book "Your Career in Electronics," describing your home training programs, including complete information on the new Transistor course. No obligation. No salesman will call.

Name \_\_\_\_\_ Age \_\_\_\_\_  
(PLEASE PRINT)

Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

Korean Vets: Enter discharge date \_\_\_\_\_

IN CANADA: No postage, no customs, no delay. Send coupon to:  
RCA Victor Company, Ltd., 5581 Royalmount Ave., Montreal 9, Que.

For more data, circle 11-58-1 on coupon, p. 50

## TV Ownership

(Continued from page 55)

W. S. CENTRAL	3,842,040	80
ARKANSAS	344,100	71
LOUISIANA	676,420	79
OKLAHOMA	556,310	82
TEXAS	2,265,210	81
<b>WEST</b>	<b>7,185,860</b>	<b>86</b>
MOUNTAIN	1,528,330	79
ARIZONA	297,940	83
COLORADO	425,520	83
IDAHO	142,100	77
MONTANA	137,040	64
NEVADA	69,040	77
NEW MEXICO	182,150	74
UTAH	216,060	89
WYOMING	58,480	61
PACIFIC	5,657,530	88
CALIFORNIA	4,401,480	90
OREGON	466,920	79
WASHINGTON	789,130	85

### Canada

	Tele- vision Homes	% of all Homes
<b>CANADA</b>		
(9 PROVINCES)†	3,423,410	80%
MARITIMES	228,930	72
PRINCE EDWARD ISLAND	14,390	62
NOVA SCOTIA	129,980	78
NEW BRUNSWICK	84,560	65
QUEBEC	983,130	88
ONTARIO	1,336,930	86
PRAIRIE PROVINCES	536,860	66
MANITOBA	159,610	69
SASKATCHEWAN	148,000	61
ALBERTA	229,250	68
BRITISH COLUMBIA	337,560	72

†Newfoundland available at later date



"He says he's adjusting the detector stage."

pick the  
power to do  
the job best  
...at the  
price you  
want to  
pay

## BLONDER-TONGUE TV & FM AMPLIFIERS

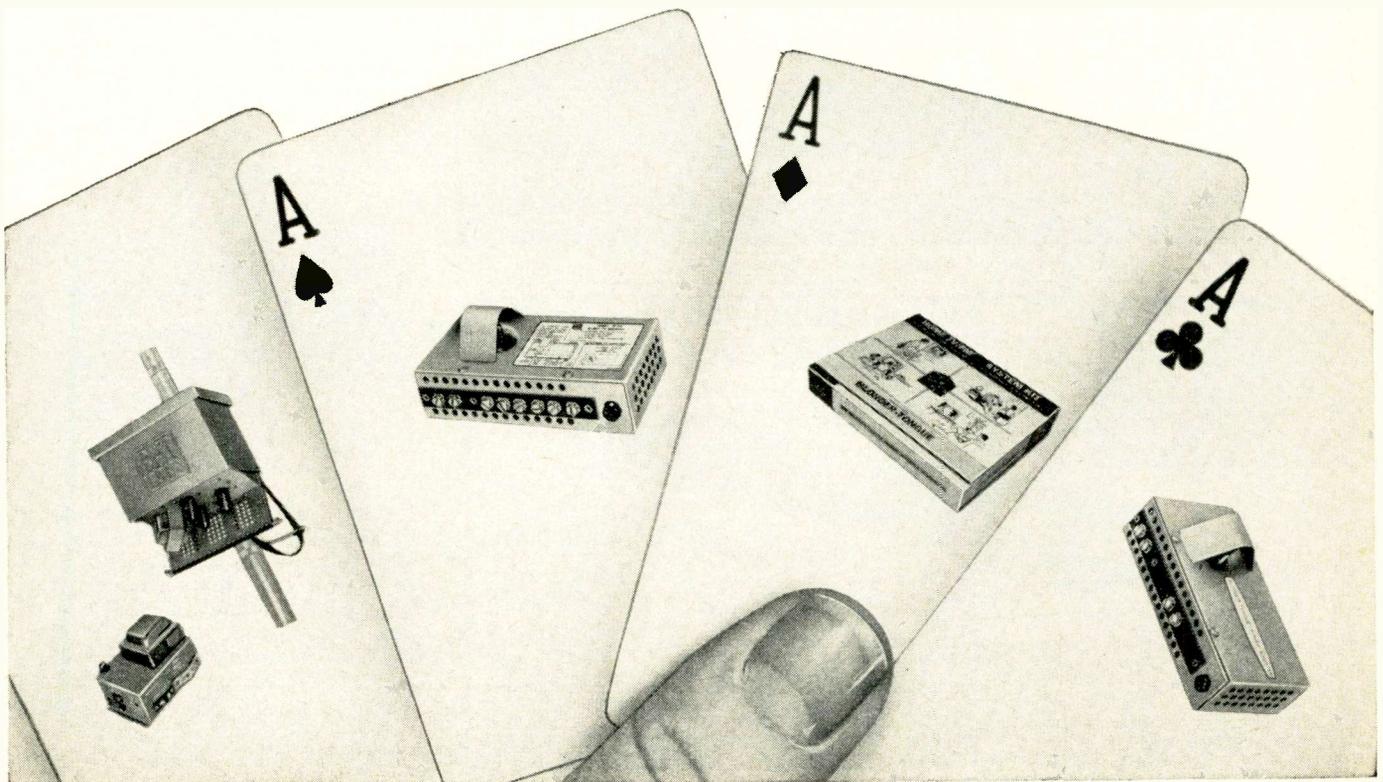
**NEW TV/FM ANTENNA AMPLIFIER—MODEL AB-3.** No matter how difficult the reception area, this mast-mounted amplifier brings in all TV and FM signals. Provides over 22 db gain on TV and FM band. Simultaneous transmission of TV and FM signals on 75 or 300 ohm cable. Remote operation on either 19 or 117 volts. Amplifier can be located up to 8,000 feet from remote control unit. 75-ohm solderless coax fittings and stripless 300-ohm connectors at input and output. Operates automatically with TV "on/off" control. List \$104.95.

**TV/FM POW'R BOOSTER—MODEL B-24.** It's a booster . . . or an amplified coupler. Perfect for a low cost home system. Provides improved performance for 2, 3 or 4 TV sets operating from a single antenna. Gain: 1 set: over 10 db on low band, over 7 db on high band. Correspondingly less when using more sets. Frame-grid tube, stripless 300 ohm terminals. List \$24.95.

**NEW TV/FM POWER BOOSTER—MODEL BTA.** Remarkable low cost amplifier improves TV (black and white or color) and FM reception. Gain: 7-9 db, channels 2-13; 3-8 db, FM. Installs in seconds with only a screwdriver. Stripless 300 ohm terminals at input and output; on/off switch. Frame-grid tube. List \$18.95.

**ANNOUNCING A NEW TV/FM HOME SYSTEM KIT—MODEL HK-1.** Provides brilliant TV or FM performance on up to 4 sets from an amazing new antenna that can be installed in attic or any other convenient indoor area. A quality-engineered 4-set coupler with stripless terminals provides a low loss, matched installation delivering more signal to each TV or FM set with greater interset isolation than other couplers. Isolation: 10 to 20 db. Also includes 100 feet of 300 ohm wire plus installation instructions and accessories. Installs with only a screwdriver. \$9.95 list.

engineered and manufactured by  
 **BLONDER-TONGUE LABORATORIES, INC., 9 Alling St., Newark 2, New Jersey**  
 Canadian Division: Benco Television Assoc., Ltd., Toronto, Ontario    Export: Morhan Export Corp., New York 13, New York  
*home TV accessories • UHF converters • master TV systems • industrial TV systems • FM-AM radios*



For more data, circle 11-59-1 on coupon, p. 50

yes

# STANCOR<sup>®</sup>

has a complete line of  
**RF-IF COILS**

The Stancor name is a synonym for quality and dependability. Just as you rely on Stancor for the best in exact replacement flybacks and yokes, so you can expect the highest standard of performance from Stancor coils. Your parts distributor has them in stock.



**CHICAGO STANDARD TRANSFORMER CORPORATION**

3501 ADDISON STREET

CHICAGO 18, ILLINOIS

For more data, circle 11-60-1 on coupon, p. 50

## NEW PRODUCTS

For More Information On  
**NEW PRODUCTS**  
Circle Code Numbers, p. 50

### Lafayette CB TRANSCEIVER

Model HE-20 citizens band transceiver features: built-in 12v power supply; "S" meter with switch; 14-tube performance; 4 crystal-controlled receive positions plus tunable receiver over all 23 channels; 4-crystal-con-



trolled transmit positions. Also included: adjustable squelch control; automatic series gate limiter; push-to-talk ceramic microphone and relay; and illuminated dial. \$99.50. Lafayette Radio Electronics Corp., 165-08 Liberty Ave., Jamaica 33, N. Y.

For more data, circle 11-60-3 on coupon, p. 50

### Heath STEREO TUNER

Special features of the new model AJ-30 stereo tuner include: 3 printed circuit boards; wired, pre-aligned 3-tube tuned cascade FM tuning unit; pre-aligned i-f transformers and coils; balanced 300 ohm FM antenna input



and built-in AM rod antenna; balanced push-pull germanium diode detector; and delayed, amplified AVC. Housed in an all-steel cabinet covered with luggage-tan vinyl, compatible with any room decor. Kit, \$97.50. Wired, \$152.95. Companion unit, not shown: AA-100 stereo amplifier. Kit \$84.95. Wired, \$144.95. Heath Co., Benton Harbor, Mich.

For more data, circle 11-60-4 on coupon, p. 50

## ANOTHER **Mercury** SERVICE AID

The versatile **MULTI-PROBE** Patent Pending  
**DOES THE WORK OF 4 PROBES!**

DC Probe

AC/Ohms Probe

RF Probe

Lo-Cap Probe

Can be used with your VTVM, SCOPE or SIGNAL TRACER

Save the cost of 4 separate probes!

A quarter turn of the head selects either DC, AC/Ohms, Lo-Cap or RF probe positions

See your electronics parts distributor

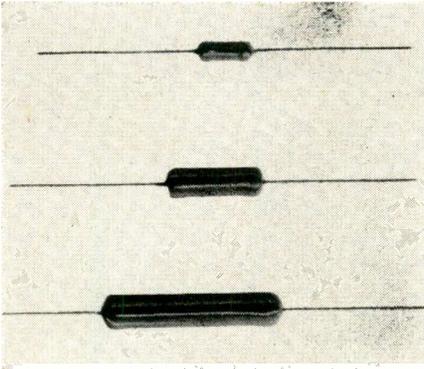
**MERCURY ELECTRONICS CORP.**

77 SEARING AVENUE, MINEOLA, NEW YORK  
West Coast Office: 4306 W. Victory Blvd., Burbank, Calif.

For more data, circle 11-60-2 on coupon, p. 50

### ClaroStat RESISTORS

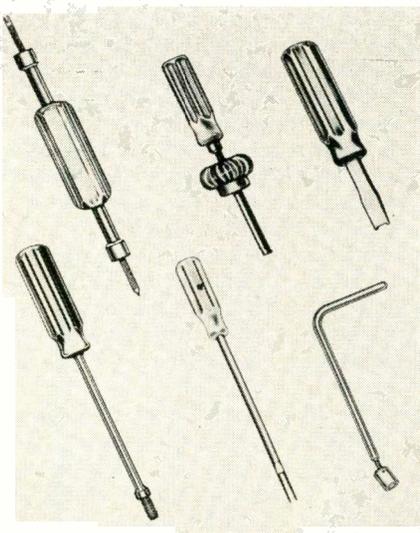
New axial lead vitreous wire-wound resistors, Greenohm "V", are available in three sizes: 3, 5, and 10 watts; and carry type designations of Series VC3D, VC5E and VC10F. The axial lead design is particularly suited to



printed circuit, terminal board, and point-to-point wiring applications. The elimination of terminal lugs permits space savings in assemblies. Standard resistance tolerance,  $\pm 5\%$  for 1 ohm and higher; below 1 ohm,  $\pm 10\%$ . ClaroStat Mfg. Co., Dover, N. H. For more data, circle 11-61-3 on coupon, p. 50

### Xcelite TOOLS

Special purpose hand tools for assembly and service problems include those shown which are: (upper, left to right,) double-ended, bronze-tipped adjusting tool for electronic equipment; combination screwdriver/nutdriver for business machines; special



driver for servo-control tamper-proof screws; (lower, left to right,) insulated bronze thread wrench for electrical equipment; prong-tipped adjusting tool for electronic computers; and offset swiveled nutdriver for typewriter assembly. Xcelite, Inc., Orchard Park, N. Y.

For more data, circle 11-61-4 on coupon, p. 50

# Now—24-Hour Tuner Service

**Tarzian Offers 24-hour Direct Factory Service on TUNER REPAIRS ... \$8.50**



TARZIAN tuners received one day will be repaired and shipped out the next. No increase in price: \$8.50 per unit and \$15 for UV combinations. That includes *all* replacement parts, and a 6-month warranty against defective workmanship and parts failure due to normal usage. Tuners repaired on approved, open accounts. Replacements available at low cost on tuners beyond practical repair.

⊕ Tarzian-made tuners easily identified by this stamping. When inquiring about service on other than Tarzian-made tuners, always give tube complement . . . shaft length . . . filament voltage . . . series or shunt heater . . . IF frequency . . . chassis identification. And, allow a little more time for service on these tuners. Use this address for fast, factory repair service:

SERVICE MANAGER • TUNER DIVISION • DEPT. 28



## SARKES TARZIAN INC

east hillside drive • bloomington, indiana  
edison 2-7251

Mfgs. of Tuners, Semiconductors, Air Trimmers, FM Radios, Audio Tape, and Broadcast Equipment

For more data, circle 11-61-1 on coupon, p. 50

### SERVICEMEN KNOW!

Here they pay less and get the best

**HUSH®**

**Chemically-Electronically, engineered for Tuners and Switching Mechanisms.**

When New HUSH is applied it will wash-away that dirt, leaving clean and positive contacts protected by a lasting lubricant. New HUSH is made from the finest solvents and it contains Electro-Silicone oils.

Also available—2 oz., 8 oz., 32 oz. containers 6 oz. Spray can \$2.25 net

**EVER-QUIET®**

Since 1949

**VOLUME CONTROL AND CONTACT RESTORER**

EVER-QUIET is a free-flowing liquid that leaves no powder residue. Scientifically designed to seep around the shaft and penetrate the control or potentiometer, cleaning the contacts and leaving a safe protecting film. Harmless to metals, wire or carbon.

Also available—32 oz. containers 6 oz. Spray can \$1.59 net  
2 oz. Bottle & dispenser 79c net



**CHEMICAL ELECTRONIC ENGINEERING, INC. Matawan, New Jersey**

For more data, circle 11-61-2 on coupon, p. 50

## Stereo Tape Glossary

The world of stereophonic sound on magnetic tape is developing a language all of its own—and to guide the growing audience of music lovers the Magnetic Recording Industry Association has issued a glossary of tape terms.

**A. B. Test:** Direct comparison of two sounds by playing first one, then the other. This may be done with two tape recorders playing identical tapes (or the same tape), two speakers playing alternately from the same tape recorder, or two

amplifiers playing alternately through one speaker, etc.

**Blank Tape:** Tape on which nothing has been recorded. Also called raw tape or virgin tape.

**Capstan:** The revolving spindle which drives the tape at a constant speed over the recording and playback head.

**Demagnetizer:** A device for removing magnetism which may build up in a recording or play-back head. A magnetized head can cause noise and distortion.

Another type of demagnetizer is used for "bulk erasure" of re-

corded reels of tape.

**Dub or Dupe:** (Noun) A copy of a recording. (Verb) To make a copy of a recording by recording on one machine what another machine is playing. Also called re-recording.

**Fast Forward Control:** A button or lever to cause the tape to move rapidly from the "feed" reel to the take-up reel—often combined with *rewind control*, a button or lever to cause the tape to move rapidly from the take-up reel back to the "feed" reel.

**Four-Track Tape:** Four different recordings on one tape. Two tracks are recorded in each direction. For stereo, two tracks are played simultaneously while the other two tracks are silent. The tape direction is reversed and the two remaining tracks are played. This doubles the amount of stereo music on a given length of one-quarter-inch wide tape.

**Flat Response:** Ability of a sound system to reproduce all tones (from the lowest to the highest) in their proper proportions. (For example, a specification of response within plus or minus one db from 30 to 15,000 c.p.s. would be considered "flat.")

**Db., or Decibel:** A relative measure of sound intensity, or volume, used to express the ratio of one sound intensity to another. One "db" is the smallest change in sound the human ear can detect. Normal ear can seldom detect sound variations under 3 db.

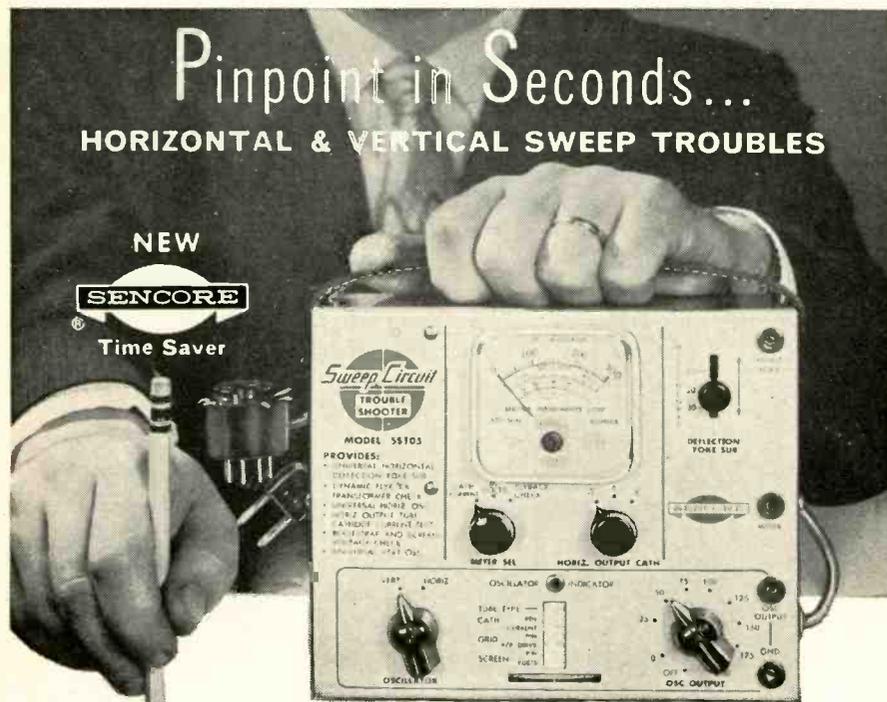
**Flutter and/or Wow:** Changes in pitch of tones due to relatively small variations in tape speed. Can be caused by faulty mechanism or by "bow-stringing" of tape across heads or tape guides. The only difference between flutter and wow is the rate at which the pitch change takes place. If the rate is below 10 c.p.s., the term wow is used; above this rate, flutter.

**Gap:** Distance between the poles of a head, measured in mils (one mil-.001 inch). In a playback head, a smaller gap usually aids in achieving a higher frequency range.

**Head:** Ring-shaped electromagnet which magnetizes the tape's iron oxide coating in a series of patterns. In most machines there is a combination record/playback head, and an erase head.

**Head Alignment:** Positioning so that the head gap is exactly perpendicular to the path of the tape travel. Misalignment causes loss of high frequencies on playback.

**Index Counter:** Odometer type counter for noting location of selections on tape. Most late model



The missing link in TV service ...

## SENCORE SS105 SWEEP CIRCUIT TROUBLE SHOOTER

**IT'S A ... UNIVERSAL HORIZONTAL OSCILLATOR.** For direct substitution. No wires to disconnect in most cases. Traces trouble right down to the defective component. Variable output from 0-200 volts, peak-to-peak. Oscillator will sync to TV sync signal giving check on sync circuits.

**HORIZONTAL OUTPUT CATHODE CURRENT CHECKER.** A proven method that quickly checks the condition of the horizontal output tube and associated components. Adaptor socket prevents breaking wires. Easily replaceable Roll Chart gives all necessary pin, current and voltage data. New Roll Charts are Free.

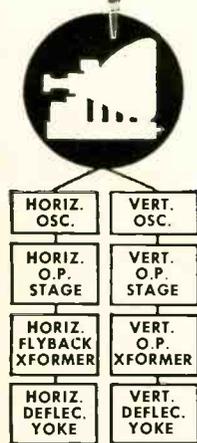
**UNIVERSAL DEFLECTION YOKE.** A new, simple way to determine yoke failure accurately—without removing yoke from picture tube. Merely disconnect one yoke lead and substitute. If high voltage (also bright vertical line) is restored, TV yoke is defective.

**DYNAMIC FLYBACK TRANSFORMER CHECKER.** Merely flip switch to "Flyback Check" and meter will indicate condition of flyback transformer, in degrees of horizontal deflection. Extremely sensitive and accurate; even shows up one shorted turn on flyback.

**VOLTMETER.** For testing bootstrap, screen and other voltages. Direct-reading voltmeter, 0-1000 volts.

**UNIVERSAL VERTICAL OSCILLATOR.** Checks oscillator, output transformer and yoke. Merely touch lead to component and check picture on screen.

**SS105 is completely self-contained, nothing else is needed. New Improved Circuit ... DEALER NET 42<sup>95</sup>**



# SENCORE

ADDISON 2, ILLINOIS

For more data, circle 11-62-1 on coupon, p. 50

recorders have built-in counters.

**I. P. S.:** Speed of tape in inches-per-second.

**Leader and Timing Tape:** Plain non-magnetic tape for splicing to either end of magnetic tape to facilitate threading and preserve recorded material; or, for splicing between recorded tape to separate selections or provide pauses.

**Level Indicator:** Device on recorder to show "level," or volume of sound, at which recording is being made. Uses neon bulb, meter or similar indicator to signal too much or too little recording volume.

**Pressure Pads:** Felt "cushions" on spring arms which keep the magnetic tape in close contact with the heads.

**Signal-To-Noise Ratio:** Ratio (stated in db's) between the loudest undistorted tone recorded and reproduced by the recorder—and the noise produced by the machine itself.

**Tape Cartridge:** "Magazine" or holder, which can be used on a cartridge tape recorder without threading. Available in both recorded and blank tape.

**Tape Deck:** Platform part of re-

recorder, mounted with motor, reels, heads and controls. Does not include amplifier, pre-amp, loudspeaker, etc. Designed primarily for hooking up with existing high fidelity system.

**Tape Speed:** Speed at which tape moves past the recording head. Standard speeds for home use are 3¾ ips and 7½ ips. Most recorders provide these two speeds and most recorded tapes are supplied in these two speeds. (At present, all new 4-Track tapes are 7½ ips; tape cartridges are 3¾ ips.) Other speeds are faster 15 and 50; and slower 7⅞ and 1⅝.

## TV Antenna

(Continued from page 49)

devil technician 50 feet off the ground working from the roof of a house. His partner steadies the initial mounted section while he ascends the side with the additional section. After reaching the top he must secure this section and repeat the performance until the mast is finished and the antenna attached to the top-most section. On a 50 foot building with a 40 foot tower, the technician often works 80 to 90 feet above the ground.

A frequently used sectional type tower is shown in Fig. 5. Again, choice of tower is entirely up to the technician and many prefer to use a sectional tower, while others indicate a preference for the telescoping type. Both provide good masts for high antenna installations.

If the installation is in an area offering two TV stations in different directions, the technician has a choice of installing two antennas with lead-ins terminating at a double pole double throw switch; two antennas with matching bars and one feed line; or finally, one broad-band antenna with a rotor. A rotor installation gives the set owner better control of antenna pick-up.

It should be remembered that all high tower and mast installations are subject to local fire and city ordinances. Make sure you can comply with these before starting an installation. As you can see, these installations are not as easily done as that "ten-foot" job in the city, and labor charges are increased accordingly. •

Illustration credit: Rohn Mfg. Co., Peoria, Ill.

## FIND TUBE TROUBLES OTHERS MISS!



- A New Dynamic Approach**
- Check over 1300 tubes for
- Cathode Emission
  - Grid Emission
  - Leakage
  - Shorts
  - Gas

### SENCORE "MIGHTY MITE" TUBE CHECKER

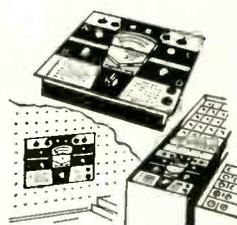
Answers the needs of the fast moving, profit minded serviceman who hates time consuming call backs. A "mite" to carry but a whale of a performer that spots bad tubes missed by large mutual conductance testers.

New unique "stethoscope" approach tests for grid emission and leakage as high as 100 megohms, yet checks cathode current at operating levels. Special short test checks for shorts between all elements. The MIGHTY MITE will test every radio and TV tube that you encounter (over 1300!) plus picture tubes, foreign, five star and auto radio tubes (without damage). As easy to set up as a "speedy tester" from easy to follow tube booklet. New tube charts free of charge.

AND check these added Sencore servicing features: • Meter glows in dark for easy reading behind TV set • Stainless steel mirror in cover for TV adjustments • Rugged, all steel carrying case and easy grip handle • Smallest complete tester made.

Model TC109.....DEALER NET **59<sup>50</sup>**

• Ask your distributor for the "MIGHTY MITE" with the mirror in the cover •



Use it everyday in every way. Especially designed so you can transfer inner chassis to your tube caddy, bench or counter. Only 9" x 8" x 2½".

ALL PARTS

**SENCORE**

MADE IN AMERICA

**SENCORE**

ADDISON 2, ILLINOIS

For more data, circle 11-63-1 on coupon, p. 50

# SAVE \$ BY RENEWING NOW

## PRICE TO BE INCREASED

During the past couple of years, every electronic magazine serving the maintenance industry has raised its subscription price—with one exception—Electronic Technician. Since its inception in 1953, ET has benefited its subscribers by holding the subscription rate down to its original introductory price.

Quite candidly, the economic realities of increasing postage, labor and material costs during the past seven years, coupled with the need for expanded reader services (more editors, more editorial pages, larger inquiry processing staff, etc.), make a price increase necessary.

Effective Dec. 1, 1960, prices will go up about 8¢ per copy (or less for 2 & 3 year subscribers), which is a modest increase.

NEW RATES		CURRENT RATES
\$5	1 year	\$4
\$8	2 years	\$6
\$10	3 years	\$8

The above rates are for U. S., possessions and Canada. New rates for all other locations will be \$9 (1 year), \$14 (2 years), and \$18 (3 years).

## CHRISTMAS GIFT IDEA!

You can buy a subscription for your friend or co-worker if he is engaged in electronic work. Or your wife can buy it for you. It's a practical gift that is "given" 12 times each year.

Just fill in the envelope here, enclose payment, and mark "XMAS GIFT" boldly next to his name at the top. We will send the recipient an attractive Christmas card in your name telling him of your gift. Be sure to print your own name at the bottom of the envelope.

## DEADLINE

December 1, 1960

## LAST CALL!

## MONEY SAVING OPPORTUNITY

The reason for this advance notice to readers is to give you the opportunity to renew your subscription NOW at the lower old rates. Not only will you save money, but you will insure yourself against any interruption in service; you won't miss a single issue.

For example, if your present subscription expires in 1961, you can extend your subscription now for, say, 3 years, thereby assuring continuous service at the current price until 1964. Normally, renewals are not invited until a subscription is about to expire. However, you are being offered the chance to renew well in advance because we believe it to be a publication's obligation to protect its current subscribers as much as possible.

Here is all you need do to renew now. Simply cut out your address label from the cover of your last issue, paste it on the postage-free envelope facing this page, and fill in the appropriate blanks. Of course, be sure to enclose your check or money order.

## ELECTRONIC TECHNICIAN

World's Largest Circulation Electronic Trade Publication  
480 Lexington Avenue, New York 17, N. Y.

# SHOP HINTS



## Tips for Home and Bench Service

### Solder Gun Repair

Quick-heating electric soldering irons are now almost universally used. Occasionally the user may be puzzled by failure of a "gun" to heat properly. Although deep-seated trouble may be suspected, in most cases the difficulty is caused by a loose connection. The soldering tip is not tight and the two screws (or lock nuts) holding the soldering tips need to be tightened, as shown in Fig. 1.

To make the gun heat quickly and at proper temperature, simply tighten the screws or lock nuts.

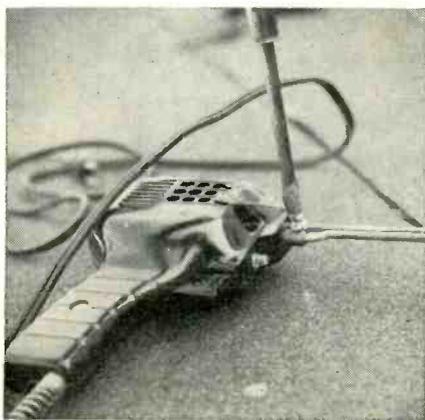


Fig. 1—Keeping screws (or lock nuts) tight will solve most slow and poor-heating tip problems on solder guns.

First check the tips for looseness before making any other adjustment or repairs. On screw type irons, be careful not to over-tighten screws or the screw or tap threads may strip.—Glen F. Stillwell, Manhattan Beach, Calif.

#### SHOP HINTS WANTED!

\$3 to \$10 for acceptable items. Use drawings to illustrate whenever necessary. A rough sketch will do. Photos are desirable. Unacceptable items will be returned if accompanied by a stamped envelope. Send your entries to "Shop Hints" Editor, ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

### Rapid Diode Check

Checking the front-to-back ratio of video crystal diodes frequently poses a problem—except when plug-in types are used. For example, the crystal may be damaged

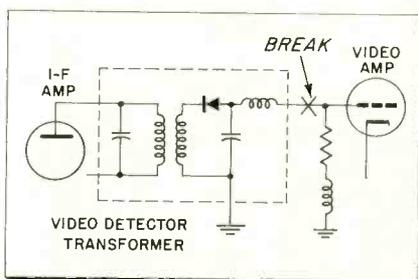


Fig. 2—Front-to-back ratio of video detector diodes can be measured with a VOM without unsoldering the diode. Circuit to video amplifier input is clipped at point "X."

when unsoldering one end. Likewise, in sets where the crystal is soldered inside the transformer-can. In this case the detector transformer must be disassembled to gain access to the diode.

In almost all cases the diode can be checked by an alternate method which does not require unsoldering, or disassembling the detector

transformer. Simply open the circuit at the point indicated in the typical video detector circuit shown in Fig. 2. This will remove all shunt resistance from the crystal and permit quick front-to-back measurements. Low series resistance of the coil, choke, and the infinitely high shunt resistance of the small capacitor, will not affect the readings. Should a series resistor be included within the transformer can, its value can be determined from manufacturers' data and subtracted from both the front and back resistance readings.

This checking method eliminates the possibility of heat damage, and the necessity for disassembling the detector transformer.—Albert J. Krukowski, West Springfield, Mass.

### Self-Holding Templates

Holding paper templates in place while marking holes to be drilled, and cuts to be made for installation of auto radios, antennas, etc., is not easy for one man. If the template is first dunked in water, however, it will stay in place long enough for marking and center-punch operations to be performed.—Harry J. Miller, Sarasota, Florida.

## ANOTHER Mercury SERVICE AID

CONVERT YOUR TUBE TESTER INTO A HIGHLY EFFICIENT PICTURE TUBE TESTER . . .



The MULTI-HEAD incorporates:

- 12-pin socket—for all standard base black and white tubes
- 9-pin socket—for all 110 degree narrow-neck RCA type tubes
- 7-pin socket—for all 110 degree narrow-neck Philco and Sylvania type tubes
- 14-pin socket—for all color TV tubes in use today
- Color gun switch—for checking the red, green and blue color guns separately

See your electronics parts distributor

No other CRT Adapter does as much as the MULTI-HEAD!

- ✓ TEST ALL BLACK AND WHITE PICTURE TUBES
- ✓ TEST ALL COLOR PICTURE TUBES

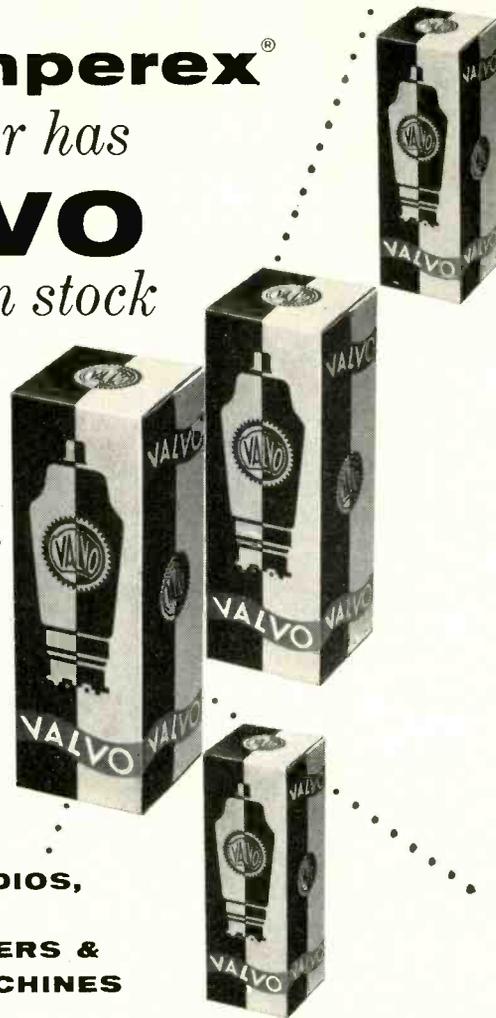
Model MH-1 MULTI-HEAD \$12.45 Net

MERCURY ELECTRONICS CORP.

77 SEARING AVENUE, MINEOLA, NEW YORK  
West Coast Office: 4306 W. Victory Blvd., Burbank, Calif.

For more data, circle 11-65-1 on coupon, p. 50

Your **Amperex**<sup>®</sup>  
Distributor has  
**VALVO**  
TUBES *in stock*



for  
servicing

**IMPORTED RADIOS,  
HI-FI SETS,  
TAPE RECORDERS &  
DICTATING MACHINES**

To help you achieve optimum results in the repair and servicing of imported electronic equipment utilizing European-made VALVO receiving tubes, your franchised Amperex distributor now stocks the entire line of VALVO types.



**ask Amperex**

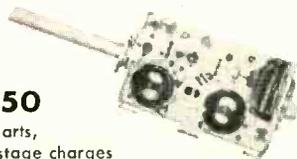
for the name and address of  
your nearest VALVO distributor

**Amperex ELECTRONIC CORP.** 230 Duffy Avenue, Hicksville, L.I., N.Y.  
For more data, circle 11-66-1 on coupon, p. 50

PHONE  
ED 9-9653

**\$7.50**

plus parts,  
C.O.D. and postage charges



**90 DAY  
WARRANTY**

**Precision Tuner Service**

ALL TYPES T.V. TUNERS REPAIRED AND ALIGNED TO FACTORY  
SPECIFICATIONS ON CRYSTAL-CONTROLLED SWEEP GENERATORS  
24-HOUR SERVICE ON MOST TUNERS  
**UHF - VHF COMBINATIONS — \$13.50**

See your local distributor or send to:

P.O. Box 272, 601 N. College  
BLOOMINGTON, INDIANA

State make and model. Send  
all parts, tubes and shields.

For more data, circle 11-66-2 on coupon, p. 50

**NEW PRODUCTS**

For More Information  
Circle Code Numbers on  
Coupon, p. 50

**NRI TESTER**

Model 311 resistor-capacitor tester uses a lab-type bridge circuit for measurement of resistance, capacity, leakage, power factor, opens, and shorts. Features include: 4 capacity ranges from .00001  $\mu$ f to 1500  $\mu$ f; 4



resistance ranges from 1 ohm to 150 megohms; fully variable d-c voltage up to 450v; 1% precision resistors; 5% capacitors and 6E5 null indicator tube. Kit, \$19.75. Assembled, \$28.75. National Radio Institute, 3939 Wisconsin Ave., Washington 16, D. C.  
For more data, circle 11-66-3 on coupon, p. 50

**Watsco CAPACITOR CHECKER**

Announced is the "Cappy," designed to check all values of capacitors and to test the various types for shorts and leakage. In checking, the capacitor must be disconnected from the circuit. A useful application for the unit

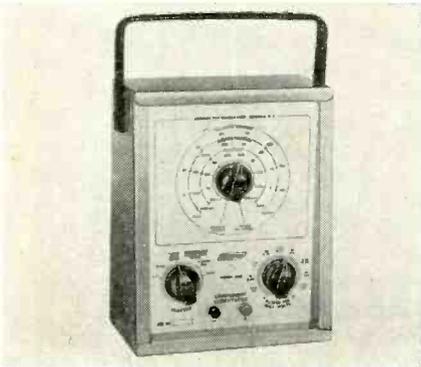


is in checking for defective capacitors in printed circuits. Indicator light tells the story. Unit can be used as bias supply, and in continuity tests. Elgin International, 1410 Broadway, New York, N. Y.

For more data, circle 11-66-4 on coupon, p. 50

**Mercury COMPONENT  
SUBSTITUTOR**

The new, versatile, component substitutor model 500 is reported to substitute: 20 values of resistors from 33 ohms to 10 megohms; 10 values of condensers from .0001  $\mu$ f to .5  $\mu$ f; 10



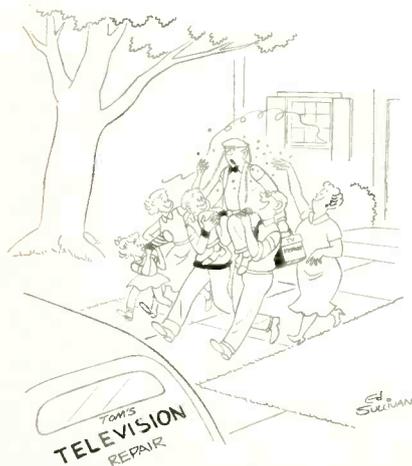
values of electrolytics from 4  $\mu$ fd to 330  $\mu$ fd; power rectifiers up to 55 ma; crystal diodes; power resistance, continuously variable up to 5000 ohms; and bias voltages, continuously variable up to 15v either polarity. \$29.95. Mercury Electronics Corp., 77 Searing Ave., Mineola, N. Y.

For more data, circle 11-67-3 on coupon, p. 50

**Arkay CB TRANSCEIVER**

The Sky-Vox SQ-9 is a new moderately-priced citizens band transceiver that sends and receives messages from car or home. It can be used as an emergency telephone, even when breakdowns occur on the road and can be plugged into a boat from a car in less than three minutes. Light weight. Crystal controlled with crystal reception. Kits have a prewired section that controls the transmitting to guarantee perfect transmission under the most difficult weather conditions. Kit, \$79.95. Wired, \$119.95. Arkay International, 88-06 Van Wyck Expressway, Jamaica, N. Y.

For more data, circle 11-67-4 on coupon, p. 50



"Let's not get sickening about it!"

**COMPUTER  
CUSTOMER SERVICE  
ENGINEERS**

(WASHINGTON AREA)

Attractive assignments now available for senior engineers who have had at least 3 years' experience in installation and maintenance of large scale data processing systems.

Comprehensive training program provided at company expense prior to assignment in Washington, D.C., area.

**FOR INTERVIEW CONTACT**

Mr. John Felos, Professional Emp. Manager

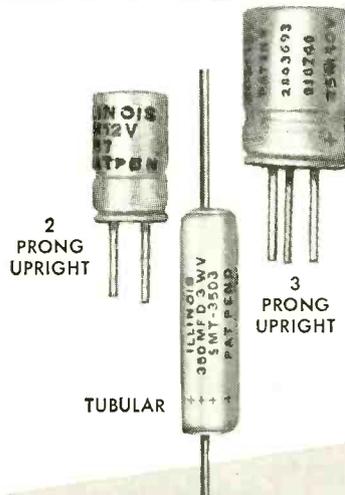
**PHILCO/COMPUTER DIVISION, Willow Grove, Pa.**

**PHILCO**



*Famous for Quality the World Over*

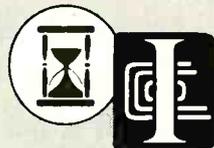
For more data, circle 11-67-1 on coupon, p. 50



**NOW!**  
In stock at your distributor

**SMT**

SUB-MINIATURES



**ILLINOIS**

**CONDENSER COMPANY**  
1616 North Throop  
Chicago 22, Illinois  
Phone EV 4-1300

*For all transistorized electronics*

Unsurpassed where size is essential in countless replacement applications. Available in full range of capacities and voltages . . . SMT, SMTU (up-right), upright common, positive, upright common negative and non-polarized.

Order from your distributor now. Our new SMT catalog is available upon request.

For more data, circle 11-67-2 on coupon, p. 50

**EXPAND YOUR  
CITIZENS BAND  
MARKET**  
With the NEW  
4-Channel  
**GONSET G-12**



**G-12**  
**Citizens Communicator**  
**2-WAY RADIO**

A complete 4-channel station for virtually unlimited business or private use. in car . . . truck . . . tractor . . . office . . . boat . . . plane! Operates on new 11-meter Citizens Band. Easy to obtain station license . . . merely fill out simple FCC form, no exam or special skills required.

**Technician/Dealers . . .**

Gonset G-12 offers you . . . the perfect inexpensive equipment to serve the big, profitable Citizens Band market. Now . . . with 4-channel equipment! Demonstrate . . . sell . . . install . . . maintain.

**Multiple and Repeat Sales . . .**

G-12 units can operate together as a system. Examples—industrials . . . yards, warehouses . . . aviation . . . branch businesses . . . construction. Every industrial and commercial account you have is a hot prospect!

**Full Feature Equipment . . .**

No tuning . . . quartz crystal-controlled channels for highest stability, reliability. Easy, press-to-talk operation . . . has front-panel channel selector, noise limiter, superhet receiver with RF stage, adjustable squelch, transmitter tune indicator. Is fully FCC type accepted.

**Dependable . . .**

Employs latest electronic design techniques. Is rugged, compact. Only 4½" H, 7" W, by 10" D. Weighs 11 lbs. Has gimbal mount, built-in 12V DC/117VAC universal power supply for fixed or mobile service.

**14995**  
per unit

WITH P-T-T MICROPHONE  
AND CRYSTALS FOR ONE CHANNEL.

Send coupon for FREE Citizens Band Booklet . . .

GONSET DIVISION DEPT. ET  
Young Spring & Wire Corp.  
801 South Main Street, Burbank, Calif.

Gentlemen: Rush complete details on your technician dealer plan and free booklet: "11-meter Citizens' Band Radio"

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_

ZONE \_\_\_\_\_

STATE \_\_\_\_\_

**GONSET**

Division of Young Spring & Wire Corporation

801 SOUTH MAIN ST., BURBANK, CALIFORNIA

For more data, circle 11-68-1 on coupon, p. 50  
68

**ASSOCIATION  
NEWS**



**California**

APA, Los Angeles, reports a hearing was granted on AB 2898, dealing with appliance, TV and radio repair shops, among others. The proposed legislation would create a Board, under State rule, to concern itself with licensing and educational requirements for those in the repair and service business.

CSEA, Fresno, service dealers and distributors met to discuss a number of points of mutual interest, including: (1) Captive service problems. (2) Methods for increasing tube sales. (3) Pay TV effects on business. (4) Do-it-yourself plug-in TV modules . . . CSEA also announced a drive for licensing in the state is under way. Ballots are being distributed to the public to learn whether they would support licensing.

**Illinois**

**Training Film Available**

NATESA, Chicago, reports the receipt of a letter from S. R. Michalic, Chairman of the EIA Service Committee, informing Frank J. Moch of an available customer relations training film. Any service group wishing to use the film should contact D. H. Stover, Service Coordinator, Electronic Industries Association, 1721 De Sales St. N.W., Washington, D. C., specifying two or three alternate dates suitable for showing the film. NATESA also reports, at their recent annual convention, members heard Morris L. Finneburgh, of the Finney Antenna Co. and Jack Cattaral, of Raytheon Co. advocate licensing for the Independent Service Industry. Mr. Cattaral proposed federal licensing as the best answer.

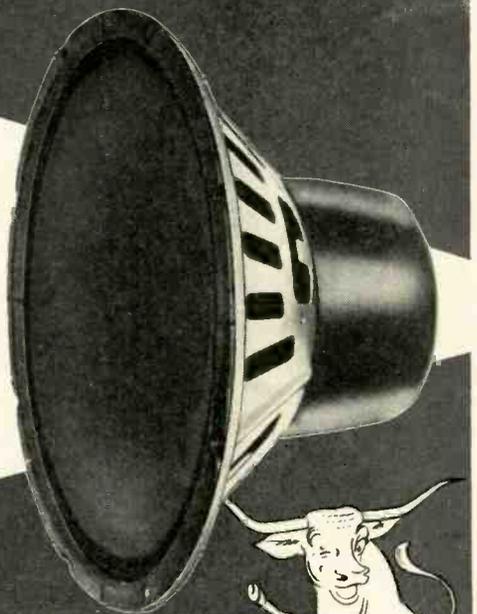
**Indiana**

ESTA, Henry County, reports their members voted "yes" for affiliation with IESA. The Indiana state organization welcomed ESTA which serves the New Castle area.

**OXFORD**  
**the Leader**

**OXFORD SPEAKERS**

- . . . Preferred for  
Original Equipment
- . . . Proven for  
Replacement



**GET IN THE MAJOR LEAGUES!**

Oxford is the major supplier of speakers to original equipment manufacturers throughout the world. Our replacement speakers, too, meet the most exacting design requirements. We have a complete line for any application . . . from 2½" to 15". Order Oxford . . . you'll be glad you did!

Our catalog is available upon request.



**OXFORD Components,**

A Division of Oxford Electric Corp.

556 West Monroe St., Chicago 6, Illinois

Oxford Speakers are available from recognized electronic parts distributors.

For more data, circle 11-68-2 on coupon, p. 50

### Louisiana

TESA, New Iberia, reports the following officers were elected: Pres., Arthur A. Setomer; NATESA Director, H. C. Smith; Sec'y, Roderick J. Rowan.

### Montana

ESA, Butte, has re-elected Raymond G. Tuszynski as President. Eileen Giese was named Corresponding Secretary.

### North Carolina

NCFEA, High Point, reports the following have been elected to office: Pres., Charles McBroom; V.P., Howard Stutts; Treas., Joe Woods; Sec'y., Garland Hoke. Rowan-Cabarrus association has elected the following officers: Pres., Q. A. Fitte, Jr.; V.P., L. B. Mishak; Sec.-Treas., Harold Sherrill. Greensboro has elected the following officers: Pres., Bill Vaughn; V.P., Bob Walker; Sec'y., Nathan Shelton; Treas., Marion Ellis.

### Ohio

ETAT, Toledo, reports TESA, Lake County, has elected the following officers: Pres., George Schlee; V.P., Charles Forsch; Sec'y, Ralph Friend; Treas., Louis Such.

### Oregon

TESA, Portland, has elected the following officers: Pres. and NATESA Dir., Les Quigley; V.P., Bill Parmalee; Treas., Chet Gowen.

### Pennsylvania

TSA, Chester County, reports the following officers have been elected: Pres., Richard Kneib; V.P., Charles Graybeard; Sec'y., Harold Jeavons; Treas., Kenneth Godschell.

### Washington

#### Codes of Ethics Condemned

TSA, Seattle, reported that TESA-King County sponsored a resolution to the NATESA convention condemning codes of ethics sponsored by manufacturers and others which are similar to, or duplicate, those codes already adopted by service associations.

### Wisconsin

TESA, of Wisconsin, reports elections were held and the first officers are: Pres., Jerry Hall; V.P., Harold Juelich; Sec'y., Fred Leonard; Treas., Dave Lewis.



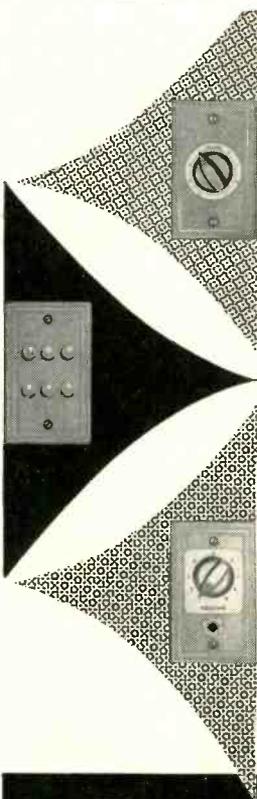
PLANET  
CAPACITORS  
CAPACITORS  
"Engineered for Quality"  
PCT-5030-150

Type "PCT" . . . constructed in strong red cardboard tubes, wax impregnated, one end closed, printed circuit board terminals.  
Type "PCTL" . . . has insulated lead out top providing for low voltage section.  
For 65 C operation . . . recommended for table and clock radios . . . individually packaged . . . guaranteed for one year.

Write today for complete information.

**PLANET SALES CORPORATION**  
225 Belleville Avenue      Bloomfield, New Jersey

For more data, circle 11-69-1 on coupon, p. 50



## NEW! NOW!

### MOSLEY Hi-Fi Accessories

Cash in on Hi-Fi and Stereo accessory sales with Mosley audio accessories. Long identified as the producer of premium quality television antenna accessories, Mosley now offers a full line of speaker switches, attenuator plates and speaker wall outlets.

*A ready-made and profitable market for you through Mosley advertising in leading high fidelity and electronic enthusiast magazines.*

Ask your Mosley Distributor for full details or write

**Mosley Electronics, Inc.**

"The  
Deluxe  
Touch"

4610 N. Lindbergh Blvd. • Bridgeton, Missouri

For more data, circle 11-69-2 on coupon, p. 50



## CITIZEN BAND CLASS "D" CRYSTALS

All 22 Frequencies in Stock  
3rd overtone .005% tolerance—to meet all F C C requirements. Hermetically sealed HC6/U holders. 1/2" pin spacing \$2.95 EACH  
—050 pins. (.093 pins available, add 15c per crystal).

The following Class "D" Citizen Band frequencies in stock (frequencies listed in megacycles): 26.965, 26.975, 26.985, 27.005, 27.015, 27.025, 27.035, 27.055, 27.065, 27.075, 27.085, 27.105, 27.115, 27.125, 27.135, 27.155, 27.165, 27.175, 27.185, 27.205, 27.215, 27.225.

Matched crystal sets for Globe, Conset, Cit-Pone and Hallcrafters Units . . . \$5.90 per set. Specify equipment make.

### RADIO CONTROL CRYSTALS IN HC6/U HOLDERS

Specify frequency. 1/2" pin spacing . . . pin diameter .05 (.093 pin diameter, add 15c) \$2.95 ea.

### FUNDAMENTAL FREQ. SEALED CRYSTALS

In HC6/U holders  
From 1400 KC to 4000 KC .005% Tolerance . . . \$4.95 ea.  
From 4000 KC to 15,000 KC any frequency .005% Tolerance . . . \$3.50 ea.

### SEALED OVERTONE CRYSTALS

Supplied in metal HC6/U holders  
Pin spacing .486, diameter .050  
15 to 30 MC .005 Tolerance . . . \$3.85 ea.  
30 to 45 MC .005 Tolerance . . . \$4.10 ea.  
45 to 60 MC .005 Tolerance . . . \$4.50 ea.



### QUARTZ CRYSTALS FOR EVERY SERVICE

All crystals made from Grade "A" imported quartz—ground and etched to exact frequencies. Unconditionally guaranteed! Supplied in:

FT-243 holders MC-7 holders  
Pin spacing 1/2" Pin spacing  
Pin diameter 3/4" Pin diameter  
.093 .125

DC-34 holders FT-171 holders  
Pin spacing 3/4" Pin spacing  
Pin diameter 3/4" Banana  
.156 pins

### MADE TO ORDER CRYSTALS

1001 KC to 2600 KC:  
.01% tolerance . . . \$2.00 ea.  
.005% tolerance . . . \$2.75 ea.  
2601 KC to 9000 KC:  
.005% tolerance . . . \$2.50 ea.  
9001 KC to 11,000 KC:  
.005% tolerance . . . \$3.00 ea.  
Specify holder wanted

### Amateur, Novice, Technician Band Crystals

.01% Tolerance . . . \$1.50 ea.—80 meters (3701-3749 KC), 30 meters (7152-7198 KC), 15 meters (7034-7082 KC), 6 meters (8335-8650 KC) within 1 KC

FT-241 Lattice Crystals in all frequencies from 370 KC to 510 KC (all except 455 KC and 500 KC) 50c ea.

Pin spacing 1/2" Pin diameter .093

Matched pairs ± 15 cycles \$2.50 per pair

200 KC Crystals, \$2.00 ea.; 455 KC Crystals, \$1.50 ea.; 500 KC Crystals, \$1.50 ea.; 100 KC Frequency Standard Crystals in HC6/U holders \$4.50 ea.; Socket for FT-243 crystal 15c ea.; Dual socket for FT-243 crystals, 15c ea.; Sockets for MC-7 and FT-171 crystals 25c ea.; Ceramic socket for HC6/U crystals 20c ea.

Write for new free catalog #860 complete with oscillator circuits

### ASK YOUR PARTS DEALER FOR TEXAS CRYSTALS

See big red display . . . if he doesn't stock them, send us his name and order direct from our Florida factory.

### RUSH YOUR ORDER TO OUR NEW PLANT

Use coupon below for 1st Class shipment.

### TEXAS CRYSTALS

Dept. T-110, 1000 CRYSTAL DRIVE, FORT MYERS, FLORIDA

For extra fast service, phone WE 8-2100

ATTACH THIS COUPON TO YOUR ORDER FOR SHIPMENT VIA 1ST CLASS MAIL AT NO EXTRA COST

TERMS: All items subject to prior sale and change of price without notice. All crystal orders must be accompanied by check, cash or M.O. with PAYMENT IN FULL. No COD's. Dept. T-110

For more data, circle 11-70-1 on coupon, p. 50 70

## Audio Amplifier

(Continued from page 39)

by high plate current being drawn by the tube.

When  $r_p$  is lowered in value, current is controlled by the only remaining resistors in the circuit, R-1 and R-2, as shown in Fig. 2. Because current is at a maximum, the voltage drop across these two resistors is at a maximum. A VTVM or VOM connected across B— and the tube's plate will naturally indicate a low voltage. Of course, intermediate voltage conditions exist with intermediate plate current conditions.

A lower than normal grid voltage (too positive) with respect to cathode, or a cathode voltage not sufficiently positive with respect to the grid, can cause low plate voltage. Too little voltage at the cathode can be caused by a lowered value cathode resistor (R-2). A shorted or leaky cathode by-pass capacitor (C-1) can also be the culprit.

A tube grid can run positive for several reasons. All tubes have some residual gas. A poorly evacuated tube will cause grid current flow. The grid will be positive with respect to ground. A gassy tube is seldom measurable on an ordinary type tube tester, but is easily located by voltage checks made with a VTVM at the grid of the tube, or with a grid circuit and gas tester. This condition is seldom encountered in preamplifier stages, but is quite common with audio power output tubes.

In the conventional resistance-capacitance coupled circuit, shown in Fig. 3, C-1, C-2 and C-3 are connected to signal sources. If these capacitors leak or become shorted, positive voltage will normally appear at the grid, with corresponding lower than normal plate voltage.

### No Plate Voltage

There can generally be only two causes (direct or indirect) for absence of voltage at a tube's plate. Either the plate resistor is open or no voltage is being delivered by the power supply. In most cases a plate resistor opens because of a greater than normal current surge through

# ALL THE TUBES YOU NEED... SONOTONE HAS!

Now you can simplify your inventory, boost discounts, add higher quality to your tube line . . . with Sonotone's expanded new line of more than 150 top-quality tube types. All Sonotone tubes undergo rigid performance and production tests . . . many reliable tubes are being used right now for rigorous space and military projects. Available for industrial and entertainment uses, as well. For high quality and top profits, you can rely on Sonotone tubes.

## Sonotone

Electronic Applications Division, Dept. T9-110  
ELMSFORD, NEW YORK

Leading makers of rechargeable batteries, phono cartridges, speakers, microphones, tape heads and electronic tubes.

In Canada, contact Atlas Radio Corp., Ltd., Toronto

For more data, circle 11-70-2 on coupon, p. 50  
ELECTRONIC TECHNICIAN • November, 1960

it. This can be caused by a shorted grid coupling capacitor (C-1, C-2 or C-3) shown in Fig. 3. In this case a grid bias resistor (R-4, R-5 or R-6), may also overheat or become damaged. A completely shorted decoupling capacitor (C-4 or C-5) can prevent B+ appearing at

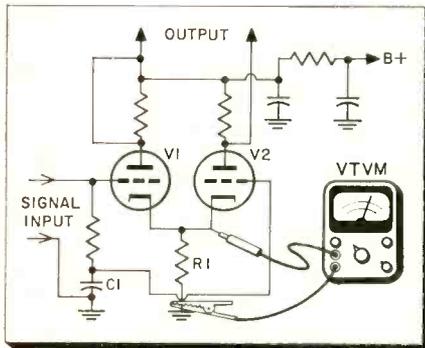


Fig. 5—Accurate voltage measurements are essential in troubleshooting a grounded grid cathode-coupled phase inverter.

a tube's plate—as well as an open decoupling resistor (R-3).

The most difficult case of all is a defective amplifier where all voltages measure correct. The trouble generally, but not always, is in the signal circuits. Using an ohmmeter, check all grid and plate circuits for shorts or lower than normal resistance to ground. Chances are that a grid resistor has been shorted inadvertently to cathode or ground at a solder terminal. Should voltage and resistance checks fail to reveal the fault, the signal should be traced.

A 1000 cycle sine wave voltage is fed to one of the amplifier stage inputs. Using a scope as a signal indicator, check the amplifier stage-by-stage by moving the scope probe from the first grid input, working to the amplifier's output. (See test points from "A" to "D" in Fig. 3.)

#### Other Triode Circuits

Similar methods are employed to troubleshoot the cathode follower circuit shown in Fig. 4. Cathode voltage is the important factor here. Voltage measurements at the tube grid should be made with a VTVM, or invalid readings may be obtained because of the circuit's high input impedance. Actual bias voltage appears between "A" and the cathode. Input impedance is approximately equal to the ratio of

## ATLAS "Job Rated" P. A. SPEAKERS



There is an Atlas Speaker Ideally Suited for Every Job

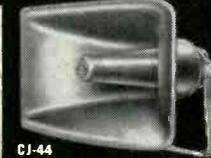
All Atlas P. A. speakers are highly efficient, especially in the voice frequency range, providing the extra "punch" needed to override high level background noise. Most are 100% weatherproof; aluminum and diecast parts are treated with corrosion inhibitors, then finished in "stone hard" baked enamel. The CJ Cobra-Jector horns are constructed of nonresonant, indestructible fiberglass, and HU and TP speaker horns of aluminum, finished in gun-metal grey. The HU and TP speakers are particularly designed for efficient talkback operations. The peaked characteristics within the voice frequencies increase the sensitivity of these speakers as pickup devices.

All HU and CJ speakers are equipped with versatile "Versalock" . . . This rugged, reliable mounting bracket, completely adjustable both horizontally and vertically, provides positive locking in any position.

The DU-12 and DC-5, Atlas' renowned DeCor projectors, are styled to harmonize with any decor, modern or traditional. Send for free catalog to Dept. ET-11

Model	HU-12N	HU-15N	HU-24N	CJ-14N	CJ-30N	CJ-44	TP-15N	TP-24N	DU-12	DC-5
POWER*	7.5 w	25 w	25 w	7.5 w	25 w	60 w	25 w	25 w	7.5 w	6 w
IMPEDANCE**	8 ohm	8 ohm	8 ohm	8 ohm	8 ohm	16 ohms	8 ohm	8 ohm	8 ohm	8 ohm
FREQUENCY C.P.S.	350-10,000	250-10,000	200-10,000	400-10,000	250-10,000	150-9000	250-10,000	200-10,000	400-10,000	120-7000
LENGTH OVERALL	7 1/4 in.	8 3/4 in.	12 in.	8 in.	1 1/4 in.	23" x 13"	16 1/2 in.	23 in.	14 in.	14 in.
BELL DIAMETER	7 1/2 in.	9 3/4 in.	11 1/4 in.	9 1/2" x 5 1/2"	14" x 6"	19 in.	9 3/4 in.	11 1/4 in.	7 in.	7 in.
NET PRICE	\$16.20	\$20.10	\$22.35	\$18.00	\$24.60	\$43.50	\$31.20	\$34.50	\$19.80	\$13.20

\*Input range limited to frequencies above horn cutoff \*\*All models available in 45 ohms at slightly higher prices

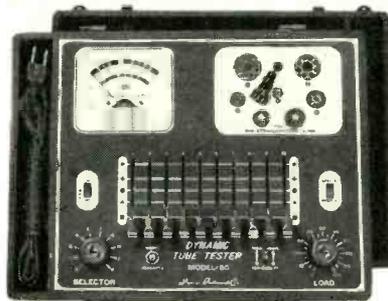


**ATLAS**  
SOUND CORP.  
1449 39th Street  
Brooklyn 16, N. Y.  
In Canada:  
Atlas Radio Corp., Ltd.,  
Toronto, Ontario

For more data, circle 11-71-1 on coupon, p. 50

Superior's New Model 85—a DYNAMIC type

## TRANS-CONDUCTANCE TUBE TESTER



- Employs latest improved TRANS-CONDUCTANCE circuit. Tests tubes under "dynamic" (simulated) operating conditions. An in-phase signal is impressed on the input section of a tube and the resultant plate current change is measured as a function of tube quality. This provides the most suitable method of simulating the manner in which tubes actually operate in radio, TV receivers, amplifiers and other circuits. Amplification factor, plate resistance and cathode emission are all correlated in one meter reading.

- SYMBOL REFERENCES: For the first time ever in a trans-conductance tube tester, Model 85 employs time-saving symbols (★, +, ●, ▲, ■) in place of difficult-to-remember letters previously used. Repeated time studies proved to us that use of these scientifically selected symbols speeded up the element switching step. As the tube manufacturers increase the release of new tube types, this time-saving feature becomes more necessary and advantageous.

- THE "FREE-POINT" LEVER TYPE ELEMENT SWITCH ASSEMBLY marked according to RETMA basing, permits application of test voltages to any of the elements of a tube.

- NEW IMPROVED TYPE METER with sealed air-damping chamber provides accurate, vibrationless readings.

- FREE FIVE (5) YEAR CHART DATA SERVICE. The chart provided with Model 85 includes easy-to-read listings for over 1,000 modern tube types. Revised up-to-date subsequent charts will be mailed to all Model 85 purchasers at no charge for a period of five years after date of purchase.

- SPRING RETURN SAFETY SWITCH guards Model 85 against burn-out if tube under test is "shorted."

- AN ULTRA-SENSITIVE CIRCUIT is used to test for shorts and leakages up to 5 megohms between all tube elements.

Model 85 comes complete, housed in a handsome portable cabinet with slip-on cover. Only . . .

**\$52.50**

**SHIPPED ON APPROVAL  
NO MONEY WITH ORDER — NO C. O. D.**

Try it for 10 days before you buy. If completely satisfied send \$12.50 and pay balance at rate of \$8.00 per month for 5 months. — No Interest or Finance Charges Added. If not completely satisfied, return to us, no explanation necessary.

MOSS ELECTRONIC, INC.  
Dept. D-828, 3849 Tenth Ave., New York 34, N. Y.  
Please rush one Model 85. I agree to pay \$12.50 within 10 days after receipt and \$8.00 per month thereafter. Otherwise I may return, cancelling all further obligation.

NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_  
All prices net, F.O.B., N.Y.C.

For more data, circle 11-71-2 on coupon, p. 50

# IMPROVE Your Present Amplifier by Replacing with Mullard

## EL34/6CA7



Recognized as the finest high power output pentode up to 100 watts in push-pull. Designed specifically for High Fidelity and produced by precision craftsmen with these design features:

- Golden grids
- Linear characteristics
- Low-drive voltage
- Clean crisp output

Replaces 6L5G, 6L6GB, 6L6GC, 5881, EL37, 7027



**OTHER Mullard TUBES** designed specifically for High Fidelity:

EB91/6AL5	Double Diode
ECC81/12A7	Low-noise medium $\mu$ dual triode
ECC82/12AU7	Low-noise low $\mu$ dual triode
ECC83/12AX7	Low-noise high $\mu$ dual triode
ECC85/6AQ8	RF Double triode
ECC88/6AQ8	Frame grid RF Double triode
ECF82/6U8	RF triode pentode
ECL82/6BM8	Triode with Output Pentode
EF86/6Z67	Low-noise input pentode
EF94/6AU6	RF AF pentode
EL37	High-power pentode, 69 W PP
ELB4/6BQ5	Miniature output pentode 20 W PP
EMB4/6FG6	Miniature tuning indicator
EZ80/6V4	Miniature rectifier cathode type, 90 ma.
EZ81/6CA4	Miniature rectifier cathode type, 150 ma.
GZ34/5AR4	Bentam rectifier cathode type, 250 ma.
7189	Miniature output pentode 20W PP
7025	AF Double Triode

Available at all leading distributors.



NOW AVAILABLE: "Mullard Circuits for Audio Amplifiers"—136 pages of Stereophonic and Monophonic Audio Amplifiers, AM Tuners, Preamplifiers—only \$2.50 from your dealer or by mail.

For detailed technical data and application information write:

**INTERNATIONAL ELECTRONICS CORP.**  
81 Spring Street, New York 12, N. Y.

For more data, circle 11-72-1 on coupon, p. 50

the two cathode resistors multiplied by the grid resistor. An extremely high impedance probe is required to measure or signal trace the grid circuit.

A grounded grid circuit used in audio phase inverter circuits—the cathode-coupled phase inverter—is shown in Fig. 5. The grid of V-2 is maintained at signal ground through capacitor C-1. A portion of the output signal from V-1 is developed across the cathode resistor R-1. This voltage is applied to the cathode and grid of V-2. When troubleshooting this type circuit, voltage measurements are important. It is recalled that the d-c voltage at R-1, and consequently the plate voltages, are determined by the combined plate currents of V-1 and V-2.

Signal tracing this circuit can be very confusing. Trouble is usually found in a feedback loop associated with other voltage and power amplifier circuits. The circuit is so well balanced that any defective or out-of-tolerance component upsetting one tube usually upsets the second tube. Thus, relative signal and amplitude measurement tests at the two tube plates will yield very little useful information.

This circuit should be approached first by checking all voltages. Next, with an ohmmeter, the values of all four resistors should be determined. Capacitors are best checked by substitution.

Troubleshooting a pentode is not unlike the process employed for a triode stage. This holds true for the tetrode, beam power output tube, stage amplifier pentode as well as the power output pentode. Only slight variations in approach are required.

Because of additional electrodes, an improper plate voltage can be caused not only by incorrect cathode and grid voltages, but also by incorrect screen and suppressor voltages. Under ordinary conditions, a higher positive screen or suppressor voltage indicates high plate current. Leaky or shorted screen and suppressor by-pass capacitors, as well as changed value screen resistors, will alter the plate current and consequently affect plate voltages. It should be noted that screen voltages have a greater effect on the plate current than does the plate voltage. •

FOR TECHNICIANS, SERVICE MEN,  
HI-FI, STEREO HOBBYISTS

**SWITCHCRAFT**  
Everyday Necessities

### 2 NEW PHONO JAX

- Eliminate rivet mounting.
- Convenient replacement for old style Jacks.

No. 3501FP—Lock Nut back of panel, requires only 1/4" hole.



No. 3501FR—For front of panel mounting, where necessary to assemble Jack through the panel from the back due to lack of space.



### NEW PHONO PLUG

No. 3502—Removable handle—exposed terminals. Nickel plated brass body and handle. Can be used in multiples even where Jacks are on 7/16" centers.



### NEW PHONO EXTENSION JAX

No. 3503—Removable handle. Cable clamp. Shielded. Nickel plated brass.



Send for catalog C-501

**SWITCHCRAFT**® 5583 N. Elston Ave.  
Chicago 30, Illinois

Canadian Rep.: Atlas Radio Corp., Ltd.,  
50 Wingold Avenue, Toronto, Ontario

For more data, circle 11-72-2 on coupon, p. 50

## BINDERS FOR YOUR ELECTRONIC TECHNICIAN

... to keep your copies for  
convenient reference  
\$3.75 each—Postpaid

Canada and Foreign—please add  
50¢ for additional mailing costs

### ELECTRONIC TECHNICIAN

480 Lexington Ave.  
New York 17, N. Y.

Please ship . . . "ELECTRONIC  
TECHNICIAN Magazine Bind-  
ers." I enclose \$ . . . . .

(please print)

Name . . . . .

Street & No. . . . .

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

**Columbia CB ANTENNA KITS**

These citizens band antennas are claimed to be the lowest priced on the market, yet their extended collinear array has a 3 db gain. The extended collinear array kit contains a pre-cut matching stub, a ceramic center insu-



lator, and matches any 52 ohm transceiver. Overall antenna length, when assembled, 44 feet. SWR, 1.1:1. Also, standard half wave dipole kit. Overall length, when assembled, appx. 17 feet. Columbia Wire & Supply Co., 2850 W. Irving Park Rd., Chicago 18, Ill.

For more data, circle 11-73-3 on coupon, p. 50

**Walsco LABELS**

Tek-Titles are customized labels available in sheets of gold or silver foil with a pressure-sensitive backing. These sheets contain names, symbols, standard terms and designs for electronic equipment. There are 24 assortments available and some of the

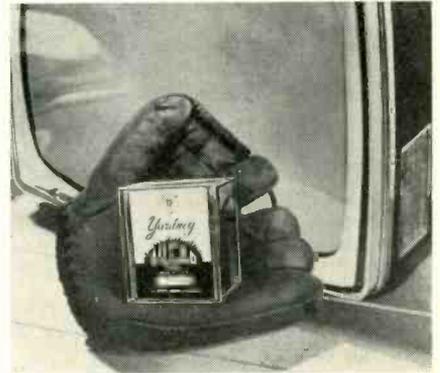


headings are: Stereo and Hi-Fi Systems; Transistors; Intercom Systems; Lubrication; Maintenance and Calibration; and Sound Systems. Also, the alphabet and numerals in large and small size. Attractively packaged, \$1.35. Walsco Electronics Mfg. Co., 100 W. Green St., Rockford, Ill.

For more data, circle 11-73-4 on coupon, p. 50

**Yardney BATTERY**

The compact "Engery Cell" used in the Motorola 19" portable TV set is a Silvercad (silver-cadmium) battery. It is one of a family of high-energy powerpacks, and offers more than 2,500 hours of operation. Rechargeable by



plugging the TV set into an electrical outlet. Gives five to six hours of continuous play before recharge is necessary. Capable of more than 500 complete charge-discharge cycles. It is a 17.5v battery and yields more than 130 watt-hours. Yardney Electric Corp., 40-50 Leonard St., New York, N. Y.

For more data, circle 11-73-5 on coupon, p. 50

TRUST YOUR TV TUNER  
REPAIR and ALIGN to



**24 HR SERVICE**

VHF or UHF—ALL MAKES

VHF Tuners ..... \$950  
UHF Tuners ..... \$950 net  
UHF Converters .....  
UHF-VHF  
Combinations ..... \$17.95



Prices are for service and unutilated units. Missing, broken and damaged parts, defective tubes charged extra at LOW net prices. We ship C.O.D.

**10 STEPS IN OUR GUARANTEED SERVICE**

1. All tuners mechanically and electronically inspected.
2. All necessary parts replaced.
3. Contact surfaces correctly cleaned and lubricated.
4. First test run for intermittents and drift indication.
5. Fine tuning range checked on all channels.
6. Local osc aligned to correct frequency all channels—XTAL controlled.
7. RF alignment—all channels—XTAL controlled.
8. AGC check, all channels—cut off of RF amp checked.
9. Overall response all channels, shield covers in position.
10. Quality control FINAL CHECK ALL UNITS, UHF-VHF.

**IMPORTANT:** Ship complete. Include all broken parts. State model and complaint. Package well to avoid transit damage.

**JW ELECTRONICS** 1540 W. Jarvis Avenue  
CHICAGO 26, ILLINOIS Broadway 4-9757

For more data, circle 11-73-1 on coupon, p. 50

ELECTRONIC TECHNICIAN • November, 1960

GCT-9W

GCT-9S

**NEW!**

Only  
Grid Circuit  
Tube Tester  
with Full TV  
tube coverage!

**SECO GRID CIRCUIT TUBE TESTER**

Introducing the new Seco GCT-9—the first and only Grid Circuit Tester that offers you complete coverage of all TV tube types—including voltage amplifiers, power output and heater-type diodes, hundreds of Foreign and Industrial types as well as types with Grid, Plate or Cathode caps. Quickly lets you test for Grid Emission, Leakage, Shorts and Gas in one operation—indicates results instantly, visually on a 6AF6 "Eye" Indicator. In addition to conventional tests, the GCT-9 also offers two exclusive new testing features not found on any other tester: 1. Cathode Continuity Check; and 2. Complete Inter-Element Short Test, with shorts identified to pin numbers.

The new Seco GCT-9 is available in a sturdy metal case with exposed panel (GCT-9S); or mounted in a compact, portable carrying case (GCT-9W)—complete with easy to read tube set-up data. Equipped with new "Piggy-Back" adapter so you can mount either unit right to your tube caddy—unit may be removed for use in seconds! Wired and factory tested.

MODEL \$3295  
GCT-9S NET

MODEL \$3495  
GCT-9W NET

WRITE TODAY! New literature available on all Seco test equipment.

**SECO ELECTRONICS, INC.**  
5015 Penn Ave. So. • Minneapolis 19, Minn.

EAST CANADA: Daveco Agencies, Ltd., Montreal, Quebec  
WEST CANADA: Ron Merritt Co., Vancouver 1, B.C.

For more data, circle 11-73-2 on coupon, p. 50

Mr. Service Technician:

Want to service transistor radios rapidly  
—accurately? You can with

## REPAIRING TRANSISTOR RADIOS

by S. Libes (Director Technical  
Publications, Bogen-Presto)

The man who wrote this book knows his subject well and provides practical procedures that you can apply to faster troubleshooting and to finding those elusive 'dog troubles'.

Basic theory is presented in a way that you will understand easily, quickly. Operation and service of the latest transistorized circuit designs are covered. All new ideas about transistors as used in current transistor radios are explained. Also included are the latest design practices in transistor portable AM, multi-band, imported, all-transistor, auto-hybrid and FM radio receivers. High power transistorized public address power amplifiers and current high fidelity applications are covered.

Servicing is explained on a step-by-step basis including trouble check points and charts, instruction of handy-to-use test equipment (e.g. signal source, power supply). And, there's another feature—transistor and diode substitution charts. Also included is information on how to select test equipment and tools for repairing transistor radios. #270, \$3.50

### TV SERVICING

**MASTER RECEIVING — PICTURE TUBE SUBSTITUTION GUIDEBOOK, H. A. Middleton, \$7.45**  
**RECEIVING TUBE SUBSTITUTION GUIDEBOOK 4th suppl., H. A. Middleton, \$1.35**  
**TUBE CADDY-TUBE SUBSTITUTION GUIDEBOOK, H. A. Middleton, 90c**  
**HOW TO TROUBLESHOOT TV SYNC CIRCUITS, J. Remer, \$2.90**  
**REPAIRING TELEVISION RECEIVERS, C. Gluckstein, \$4.40**

### AUDIO & HIGH-FIDELITY SERVICING

**HOW TO INSTALL & SERVICE INTERCOMMUNICATION SYSTEMS, J. Darr, \$3.60**  
**HOW TO SERVICE TAPE RECORDERS, C. A. Tuttle, \$2.90**  
**REPAIRING HI-FI SYSTEMS, David Fidelman, \$3.90**

### TEST EQUIPMENT

**HOW TO USE METERS (2nd ed.), J. F. Rider & S. Prensky, \$3.50**  
**HOW TO USE TEST PROBES, A. Ghirardi & R. Middleton, \$2.90**  
**OBTAINING INTERPRETING TEST SCOPE TRACES, J. F. Rider, \$3.00**  
**HOW TO USE SIGNAL & SWEEP GENERATORS, J. Richard Johnson, \$2.40**  
**HOW TO USE GRID-DIP OSCILLATORS, R. P. Turner P. E., K6AI, \$2.50**

### RADIO SERVICING

**RADIO RECEIVER LABORATORY MANUAL, A. W. Levey, M. S., \$2.00**  
**RADIO TROUBLESHOOTING GUIDEBOOK, VOL. 1, Rider & Johnson, \$2.40**  
**HOW TO INSTALL & SERVICE AUTO RADIOS (2nd ed.), J. Darr, \$3.25**  
**REPAIRING PORTABLE & CLOCK RADIOS, B. Crissee & D. Gnessin, \$2.75**

### PROFITABLE SERVICING AREAS

**HOME AIR CONDITIONING, Installation & Repair, J. Derman, M.S., F. Makstein, H. Seaman, \$3.50**  
**BASICS OF FRACTIONAL HORSEPOWER MOTORS & REPAIR, Gerald Schweitzer, soft cover \$3.90; cloth \$4.90**  
**INDUSTRIAL CONTROL CIRCUITS, Sidney Platt, \$3.90**

Prices subject to revision.

At distributors or order direct!  
Write for new catalog.



**JOHN F. RIDER, PUBLISHER, INC.**  
116 West 14th Street, New York 11, N.Y.  
Canada: Chas. W. Pointon, Ltd.,  
66 Racine Rd., Rexdale, Ont.

For more data, circle 11-74-1 on coupon, p. 50

74

## New Books

**APPLICATIONS OF ELECTRONICS.** By Bernard Grob and Milton S. Kiver. Published by McGraw-Hill Book Co., Inc. 628 pages, hard cover. \$10.00.

Written for both technician and student, this introduction to electronics assumes a knowledge of elementary electricity and electronics. The authors discuss subjects in their logical order, beginning with vacuum tubes and transistor theory. Right at the start, theory is intertwined with practical circuitry explanations, simplifying understanding of the subject matter. Progressing to audio amplifiers, oscillators, receiver circuits and transmitter circuits, the illuminating format is maintained. Pulse circuits, industrial electronics, and military electronics make up the latter part of the book; not as a thrown-in "catch-all" chapter, but as separate, clearly written chapters. Math, in this well-illustrated book, is kept to a bare minimum. Recommended for technicians who wish to review or reinforce their electronic knowledge and acquire a non-TV electronic foundation, as presented in 1/3rd of the book.

**DAVE RICE'S OFFICIAL PRICING DIGEST.** Vol. 4. Published by Electronic Publishing Co., Inc., 180 N. Wacker Drive, Chicago, Ill. 292 pages, soft cover. \$2.50.

Here is the latest edition, Vol. 4, No. 1, of a valuable working "tool" for service dealers. More than 63,000 service items, tubes, batteries, antennas, phono needles, etc., are listed alphabetically by manufacturer and products; numerically by part number. All have corresponding resale prices. In addition, a flat rate and hourly labor table for service charges shows regional and national averages. The compact guide fits conveniently into a tube caddy and can serve technicians admirably when billing replacement parts and quoting prices to customers.

**MOTOROLA POWER TRANSISTOR HANDBOOK.** Published by the Technical Information Center, Motorola Semiconductor Products, Inc. 5005 E. McDowell Rd., Phoenix, Arizona. 200 pages, soft cover. \$2.00.

This handbook is devoted entirely to power transistors; their theory, design, and applications. Though a large part of the text is devoted to power transistor design considerations, technicians may appreciate the excellent coverage given to theory and applications. Interesting applications include: high fidelity amplifiers, ignition systems, switching, and power supplies. More than 200 drawings and charts accompany the text.

**SERVICING UNIQUE ELECTRONIC APPARATUS.** By Jack Darr. Published by Howard W. Sams & Co., Inc. 126 pages, soft cover. \$2.50.

This book explains basic operating theory and practical servicing techniques for troubleshooting and repair of a variety of unique electronic devices used primarily for industrial applications. Equipment covered includes ultrasonic cleaners, diathermy, automatic flow control, photo-flash, garage-door openers, movie-projector sound systems, and others. Value of the text material is considerably augmented by schematics, drawings and photographs. The varied electronic applications presented here—all within the service capability of an average TV technician—emphasizes that there's more to the service field than just radio and television.

**THE MOBILE MANUAL FOR RADIO AMATEURS.** Published by the American Radio Relay League, West Hartford 7, Conn. 279 pages, soft cover. \$2.50 in U.S., \$3.00 elsewhere.

This is a revised edition of the manual and includes selected articles on amateur mobile radio which have been published in "QST," official publication of the American Radio Relay League. Essentially a "how-to" text, design and construction details are given for emergency mobile communication equipment, including antennas, power supplies, and test equipment. Approximately 80 articles cover receivers, transmitters, speech equipment, handy-talkies, and vehicle noise suppression. The volume is nicely illustrated with photographs, schematics and drawings. It is a valuable guide for the builder of amateur mobile communications gear.

**PRACTICAL TV TROUBLESHOOTING.** Compiled by Gernsback Library Staff. Published by Gernsback Library. 128 pages, soft cover. \$2.35.

A collection of previously published (in periodical form) television articles is presented here in book form. The material has been selected to present TV service problems beyond the "snap job" stage. In essence, harder-to-fix problems are analyzed, including: intermittents, ghosts, video i-f oscillation, horizontal jitter, halos, etc. Though frequently referred to as "dogs," these problems are really facing technicians every day. These practical, everyday experiences may help TV service specialists increase their repair efficiency. Illustrations are more than adequate.

## Gray TURNTABLE & ARM

Model ST-33 stereo-LP turntable is equipped with an ultra-stable hysteresis-synchronous motor which spins records at a constant 33 $\frac{1}{3}$  rpm. Simultaneous vertical and horizontal isolation of the motor keeps rumble at a



minimum. SAK-12N tone arm, also available in kit form, is rotationally balanced with a system of interchangeable slides and weights which allows a choice of cartridges to be used with the same tone arm without special adjustment. Also, not shown: PK-33 turntable kit; 212, 212TN, 212-TG, SAK-12G tone arms. Gray Mfg. Co., 16 Arbor St., Hartford 1, Conn.

For more data, circle 11-75-3 on coupon, p. 50

## Capcon MYLAR CONDENSERS

New mylar starter condensers (0.006, 0.012, 0.03 and 0.05  $\mu$ f) feature low price, longer starter life, top performance and resistance to humidity, heat and cold. Electrical characteristics of mylar 0.006's are equal to those of paper condensers and exceed those for discs and are interchangeable with present paper or disc condensers. Production tested at 4,000v d-c they will withstand over 5,000v d-c and over 3,400v a-c. They will operate continuously at 250v a-c. Available round or flat. Capcon, Inc., 61 Stanton St., New York 2, N. Y.

For more data, circle 11-75-4 on coupon, p. 50

## Tarzian RECTIFIERS

Three series of modular silicon rectifiers are: S-5536 through S-5541, primarily for use as voltage doubler or center tap; S-5544 through S-5549, for connections into 3 phase half wave, or 2 modules into 3 or 6 phase connections; and S-5462 through S-5467 for use as open bridge for magnetic amplifiers or connected into bridge, and also as half wave sections—individual, series or parallel. Prices range from \$2.05 to \$6.50 in sample quantities. Sarkes Tarzian, Inc., Bloomington, Ind.

For more data, circle 11-75-5 on coupon, p. 50

# TRU-VAC 1-YEAR GUARANTEED RADIO and TV TUBES

35¢ EACH

**\$33**  
Per 100 TUBES

Factory Used or Factory Second Tubes! TRU-VAC will replace FREE any tube that becomes defective in use within 1 year from date of purchase! ALL TUBES INDIVIDUALLY BOXED, CODE DATED & BRANDED "TRU-VAC"

Partial Listing Only... Thousands More Tubes In Stock!

### SPECIAL!

65N7GT.....30¢ 6W4GT.....30¢

0Z4	5T8	6BE6	6SF5	12AT7
1A7GT	5U4	6BF5	6SQ7	12AU6
1B3GT	5U8	6BG6G	6SH7	12AV6
1H5GT	5V4G	6BH6	6SJ7	12AV7
1R5	5V6GT	6BJ6	6SK7	12AX4GT
1S5	5X8	6BK5	6SL7	12AX7
1T4	5Y3	6BK7	6SQ7	12XZ7
1U4	6AB4	6BL7GT	6SR7	12B4
1U5	6AF4	6BN6	6T4	12BA6
1V2	6AH4GT	6BQ6GT	6T8	12BA7
1X2	6AH6	6BQ7	6U5	12BD6
2AF4	6AK5	6BR8	6U8	12BE6
2BN4	6AL5	6BS8	6V6GT	12BH7
2CY5	6AM8	6B15G	6W6GT	12BQ6
3AL5	6AN8	6BZ6	6X4	12BR7
3BC5	6AQ5	6BZ7	6X5GT	12BY7
3BN6	6AQ6	6C4	6X8	12CA5
3BZ6	6AQ7	6CA8	6Y6G	12D4
3CB6	6AR5	6CB6	7A4/XXL	12F8
3S4	6AS5	6CD6G	7A5	12K5
3V4	6AT6	6CF6	7A6	12K7
4BQ7A	6AU6GT	6CG8	7B4	12L6
4B5	6AUSGT	6CH8	7B5	12Q7
4BZ7	6AUB	6CL6	7B6	12R5
4CB6	6AV6GT	6CM6	7B7	12SA7
5AWE	6AV6	6CN7	7B8	12S7
5AN8	6AW8	6CN7	7C5	12SK7
5AT8	6AX5GT	6CQ8	7C6	12SN7GT
5AV8	6BB	6CR6	7C7	12SQ7
5AZ4	6BC5	6CS7	7E5	12V6GT
5CG8	6BC8	6CU5	7E6	12W6GT
5R4	6BD6	6CU6	7E7	12X4
		6D5	7F7	19AU4GT
		6DE5	7F8	19B6G
		6DG6GT	7G7	19T8
		6DQ6	7H7	12E6GT
		6F6	7Q7	35A5
		6H6	7S7	35B5
		6J5	7K5	35C5
		6J6	7X7	35W4
		6J7	7Y4	35Z5
		6K7	7Z4	50A5
		6N7	12A8	50B5
		6Q7	12AB5	50C5
		6S4	12AQ5	50L6
		6SBGT	12AT6	11Z3
		6SD7GT		

SPECIAL! TO READERS OF TECHNICIAN ONLY! 1¢ SALE ON TRU-VAC

1 YR. QUAR. TUBES IN BE.

LOW LIST ONLY

2 TUBES FOR PRICE OF 1

PLUS 1¢

35¢ EACH 33¢ EACH PER 100 TUBES

Buy all you want for 35¢ each

get extra tubes for 1¢ each.

Buy 100 tubes for \$33, get 100 extra tubes for \$1.

Pick Any Types Mix If You Wish!

6AC7 6SA7

6AG5 7AT

6AU6 7C4

6AX4GT 7N7

6BA6 12AU7

6CG7 12BF6

6K6GT 12CN5

1¢ Sale

TRU-VAC

Dept. No. T11

Harrison Avenue • Box 107 • Harrison, N. J. Humboldt 4-9770

For more data, circle 11-75-1 on coupon, p. 50



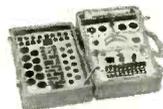
Cut servicing and installation time on crystal-controlled 2-WAY RADIO equipment!

## SECO 2-WAY RADIO TEST SET

Compact, portable, use it anywhere. Designed to assist you in the following applications:

- CHECKS WIDE RANGE OF CRYSTAL TYPES! Checks fundamental types at fundamental frequency—5th and 7th overtone types at fundamental frequency—3rd overtone types in 25-30 mc range in special overtone circuit.
- RF POWER INDICATOR FOR DIRECT OR REMOTE METERING! Simply place next to antenna or use 15 ft. remote metering cable furnished with unit.
- MODULATED RF CRYSTAL-CONTROLLED SIGNAL GENERATOR!
- MODULATION CHECKER! • BEAT FREQUENCY DEMODULATOR!
- PLATE MILLIAMMETER FOR RF TUNING! • AUDIO FREQUENCY SIGNAL GENERATOR!

MODEL 500—Fully transistorized—the perfect "assist" instrument even for the fully equipped shop..... **\$29.95 NET**



Most complete tester available!

Finest, fastest tester at a popular price. Offers every important test you need for a wide range of tube types.

MODEL 107..... **\$139.50 NET**

WRITE TODAY! New literature available on all Seco test equipment.

SECO SECO ELECTRONICS, INC. 5015 Penn Ave. So. • Minneapolis 19, Minn.

EAST CANADA: Daveco Agencies, Ltd., Montreal, Quebec  
WEST CANADA: Ron Merritt Co., Vancouver 1, B.C.

For more data, circle 11-75-2 on coupon, p. 50

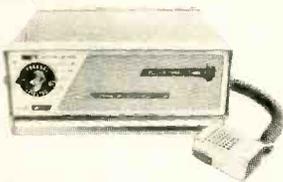
# NOW DELIVERING the "Big 3"

Citizens Band 2-Way Radios

from

**GLOBE ELECTRONICS**

The CB-200 Broadcaster Deluxe has been designed for the consumer who desires more versatility and greater selectivity. Five channels — four crystal controlled for both transmitting and receiving. Fifth position allows tunable channel selection for receiving.



*the Broadcaster Deluxe*

Dual conversion and newly designed squelch circuit eliminates adjacent channel interference and silences normal receiver noise.

Unit is only 4x12x10", with 3x5" oval speaker. Tri-centric tuning dial simplifies control. Microphone has retractable coil cord and removable plug. Pi Network. **\$189.95** each, list.

*the Citizens Broadcaster*

The CB-100 Broadcaster is smartly styled, and weighs only 13 pounds. It measures 3½x10½x13", with a range of 6 to 10 miles. Three channels with lighted color buttons indicate which channel is in use. Can be used in car, boat, office or home. FCC Form 505 included with each unit for station license. Complete with crystals for one channel and push-to-talk microphone. **\$129.95 ea.** list.

*the Pocketphone*

This transistorized 2-way radio is only 1½x2¾x6¼" — actually fits in your pocket. Weighs just 13½ oz. No license required unit to unit. Range is from ½-1 mile. Completely portable with "Power-Pak" rechargeable battery lasting a year or more. Microphone and speaker built in. May be used with other Globe Units for additional range. **\$125.00** each, list.

ET

**GLOBE ELECTRONICS**  
A Division of Textron Electronics, Inc.  
Council Bluffs, Iowa

PLEASE SEND:

BROCHURE ON THE ENTIRE CITIZENS BAND LINE

COMPLETE DEALER INFORMATION

NAME: \_\_\_\_\_

FIRM: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CITY & STATE: \_\_\_\_\_

For more data, circle 11-76-1 on coupon, p. 50

76

## RCA VOM CARRYING CASE

Announced is a new rugged, laminated vinyl, carrying case for RCA's WV-38A volt-ohm-milliammeter. The scuff-proof case has been introduced by "popular demand" for technicians who have purchased the volt-ohm-milliam-



meter in factory-wired or kit form. The case has an optional user price of \$4.95. Features of the WV-38A include a 20,000 ohms-per-volt meter movement and separate 1v and 0.25v d-c range. Radio Corp. of America, 30 Rockefeller Plaza, New York 20, N. Y.

For more data, circle 11-76-3 on coupon, p. 50

## Matthew POWER SUPPLY

Model UVS-100 bantam size voltage regulated power supply, for powering solid state equipment, is transistor and zener diode regulated and measures 4.75"x4.5"x6.25". It provides 4v to 36v at 500 ma. Regulation, better than 1%



against line and load. Ripple, less than 5µv. The output, continuously monitored by a voltmeter and milliammeter, is isolated from input line and chassis ground. Up to three units may be mounted on a 5.25" high rack panel. Cut out panel available. Unit only, **\$99.50**. Matthew Labs., 3344 Fort Independence St., New York 63, N. Y.

For more data, circle 11-76-4 on coupon, p. 50

Want A Christmas  
GIFT IDEA?

See page 64

# ATR PRODUCTS FOR MODERN LIVING



## ATR UNIVERSAL INVERTERS

A. C. Household Electricity Anywhere . . . in your own car!

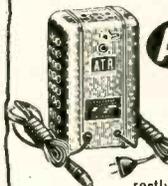
- Tape Recorders • TV Sets
- Dictating Machines • Radios
- Public Address Systems

• Electric Shavers • Record Players • Food Mixers • and Emergency Lighting. NET

6U-RHG (6 V.) 125 to 150 W. Shp. Wt. 27 lbs. **\$66.34**

12U-RHG (12 V.) 150 to 175 W. Shp. Wt. 27 lbs. **\$66.34**

Auto Plug-in Home-type Portable



## ATR BATTERY CHARGERS

NO INSTALLATION . . . PLUG INTO CIGARETTE LIGHTER RECEPTACLE!

Keeps car battery fully charged in your own garage! Needed more now than ever before—makes motor starting easy! Operates directly from standard 110 volts A.C. current.

612CA4 (4 amp.) 6/12 V. Shp. Wt. 6 lbs. NET **\$19.46**

612CA6 (6 amp.) 6/12 V. Shp. Wt. 8 lbs. NET **\$22.46**

612CA10 (10 amp.) 6/12 V. Shp. Wt. 10 lbs. NET **\$27.71**



## ATR SHAV-PAKS

Keep Clean-Shaved! Plugs into Cigarette Lighter Receptacle. Keep in Glove Compartment. Operates Standard A.C.

- ELECTRIC SHAVERS
- Small Timing Devices . . . in CARS, Buses, Trucks, Boats, or Planes.

6-5PB (6 V.) 15 W. Shp. Wt. 2½ lbs. NET **\$7.97**

12-5PB (12 V.) 15 W. Shp. Wt. 2½ lbs. NET **\$7.97**

## ATR ELECTRONIC TUBE PROTECTORS

Will Double or triple the life of all types of electronic tubes, including TV picture tube.

Automatic in operation, for use with any electronic equipment having input wattage of 100 to 300 watts. Fuse protected, enclosed in metal case for rugged construction and long life.



MODEL 250 (Wall Model) 115 V. A. C. Shp. Wt. 1 lb.

DEALER NET **\$2.63**

## ATR MODERN TABLE RADIOS

Trim, modern clock radio in ebony or ivory plastic. Powerful 5 tubes including rectifier. AM radio chassis with built-in "Magna-Plate" antenna. Full-toned 4" PM speaker. Popular features include: Musical Alarm—radio turns on automatically at any pre-set time; Sleep Selector—lulls user to sleep; Automatic Appliance Timer outlet on back of radio; timer any electric appliance automatically (up to 1100 watts). Cabinet 10½ in. wide, 5 in. high, 5½ in. deep. Wt. approx. 8 lbs.

Model T-91

Clock Specifications:

- Genuine Telechron Movement.
- Self-Starting . . . Never Needs Winding, Oiling, or Regulating.
- Simplified Clock Controls for Radio and Sleep Switch.
- 1100 Watt Controlled Outlet.
- Automatic Buzzer Alarm.
- Gold-Plated Bezel and Numerals on Large Bone-White Dial. UL Approved.

## ATR HAND WIRED—NO PRINTED CIRCUITRY "TILT-A-STAND" RADIO

MOUNT ON THE WALL—UNDER A SHELF—OR SET ON A TABLE. PERFECT for every room in YOUR home.

Power-packed 5 tubes including rectifier chassis. Built-in loop antenna. Automatic volume control. Full 4" Alnico 5 speaker. Distinctive Roman numerals on dial. Size: 9½" W x 4" D x 5¾" H. AC/DC. U.L. approved. Beautiful bakelite cabinet—Resists heat. Shipping Weight 5½ lbs.

Model T-87

Model T-91 Clock Radio, Black . . . NET **\$22.45**

Model T-91 Clock Radio, Ivory . . . NET **23.15**

Model T-87 (Tilt-A-Stand), Black . . . NET **17.47**

Model T-87 (Tilt-A-Stand), Red . . . NET **18.10**

SEE YOUR ELECTRONIC PARTS DISTRIBUTOR WRITE FACTORY FOR FREE LITERATURE . . .

**ATR AMERICAN TELEVISION & RADIO CO.**  
Quality Products Since 1931  
SAINT PAUL 1, MINNESOTA—U. S. A.

For more data, circle 11-76-2 on coupon, p. 50

ELECTRONIC TECHNICIAN • November, 1960

**Pyramid CAPACITORS**

Offered is a new package of 45 assorted mylar-paper Gold-Dip capacitors, type 151, in a beige plastic Jewel Box. The practical and decorative boxes have nine drawers for conven-



ient storage use in a serviceman's shop or in his home. The Jewel Box together with the 45 mylar-paper Gold-Dip capacitors are offered together at a special low price. Pyramid Electric Co., Darlington, S. C.

For more data, circle 11-77-3 on coupon, p. 50

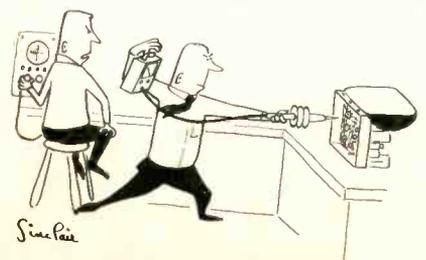
**Rembrandt ELIMINATOR**

The new Rembrandt electric TV ghost eliminator, with built-in picture booster, supercharges any antenna and any TV set. It plugs into any a-c or d-c outlet, and is said to provide movie-clear pictures on every channel in any location.



A flick of the patented control filters out ghosts and interference; amplifies the TV signal; doubles the antenna pick-up power; and directs the antenna to pick-up signals from stations in different directions. \$7.95. All-Channel Products, 47-39 49th St., Woodside 77, N. Y.

For more data, circle 11-77-4 on coupon, p. 50



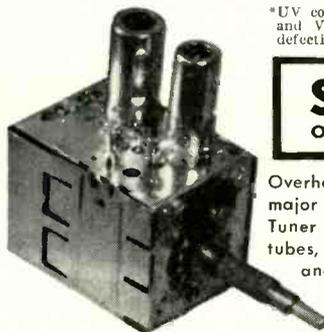
**TV TUNERS OVERHAULED**

ONE PRICE . . . \$9.95  
DEALER NET

VHF Tuner  
UHF Tuner  
UV Combination\*

YES, low overhaul rate of \$9.95 covers ALL makes and models.

\*UV combination tuner must be of one piece construction. Separate UHF and VHF tuners with cord or gear drives must be dismantled and the defective unit only sent for overhaul.



**SAME DAY SERVICE**  
ON POPULAR TYPES—48 HOURS MOST OTHERS

Overhaul charge includes labor and minor parts; tubes and major parts are extra at net prices. Written 90 days warranty. Tuner to be overhauled should be shipped complete; include tubes, shield cover and any damaged parts. Quote model and state complaint. Pack well and insure.

WRITE FOR SPECIAL QUANTITY RATES AND DISCOUNTS

*Castle TV Tuner Service, Inc.*

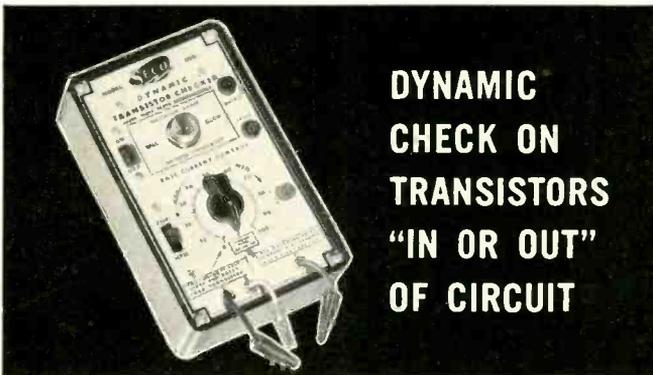
5710 N. WESTERN  
CHICAGO 45, ILL.

U.S.A.

136 MAIN ST.  
TORONTO 13 CANADA

Castle pioneered the first complete TV tuner service almost a decade ago: remember Castle will service ALL makes and our many years of experience in this field assures you of the best service available today.

For more data, circle 11-77-1 on coupon, p. 50



**DYNAMIC  
CHECK ON  
TRANSISTORS  
"IN OR OUT"  
OF CIRCUIT**

**FAST, EASY-TO-USE—NO SET-UP NECESSARY!**

Make money servicing transistorized equipment with this popular, low-cost instrument. Every test you need! Positive check for "opens", shorts and gain—fast GO-NO-GO test—permits matching of similar transistor types. Puts you into the fast-growing transistorized equipment servicing field with a minimum investment.

MODEL 100—Wired and tested . . . . . \$19.95 NET



Service transistorized equipment easier—faster!  
Takes place of battery normally used to operate and service transistorized equipment—output continuously variable 0 to 15 volts.

MODEL PS-2 . . . . . \$13.95 NET

WRITE TODAY! New literature available on all Seco test equipment.

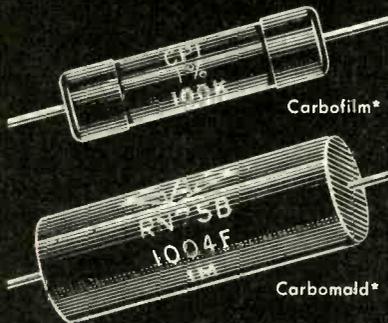


**SECO ELECTRONICS, INC.**  
5015 Penn Ave. So. • Minneapolis 19, Minn.

EAST CANADA: Daveco Agencies, Ltd., Montreal, Quebec  
WEST CANADA: Ron Merritt Co., Vancouver 1, B.C.

For more data, circle 11-77-2 on coupon, p. 50

# PRECISION PERFORMERS



## carbon-deposited RESISTORS

When the application calls for accuracy and stability you'll find Aerovox Precision ( $\pm 1\%$ ) Carbon-Deposited Resistors fill the bill perfectly. Manufactured under exacting quality control specifications to assure excellent performance even under adverse operating conditions.

**CARBOFILM RESISTORS** . . . for wide use in circuits where accuracy and economy are factors. Units are protected by a specially formulated Aerovox coating against environmental conditions. Stocked in 300 values in following ratings:

Type	Sizes	Min. Ohms	Max. Meg-ohms
CPS- $\frac{1}{2}$ watt	0.1620 x $\frac{1}{8}$ "L	7	2
CP- $\frac{1}{2}$ watt	0.2300 x $\frac{1}{8}$ "L	3	5
CP- $\frac{1}{2}$ watt	0.2300 x $\frac{1}{4}$ "L	5,100,000	7.5
CP-1 watt	0.2930 x $\frac{1}{4}$ "L	10	15
CP-2 watt	0.2930 x $\frac{2}{8}$ "L	50	100

**CARBOMOLD RESISTORS** . . . encapsulated in a strong reinforced moisture and heat resistant plastic these units offer new standards of reliability. Over 500 standard values available from stock as follows

Type	Sizes	Std. Min. Ohms	Std. Max. Meg.
CPM- $\frac{1}{2}$	$\frac{1}{2}$ " x .735	10	2.49
CPM-1	$\frac{3}{4}$ " x 1 $\frac{1}{2}$ "	10	5.11
CPM-2	$\frac{1}{2}$ " x 2 $\frac{1}{2}$ "	30	10

All units marked with type number, RN Number, value and tolerance. Available for "off-the-shelf" delivery from your local Aerovox Distributor.

**AEROVOX CORPORATION**  
DISTRIBUTOR DIVISION  
NEW BEDFORD, MASS.

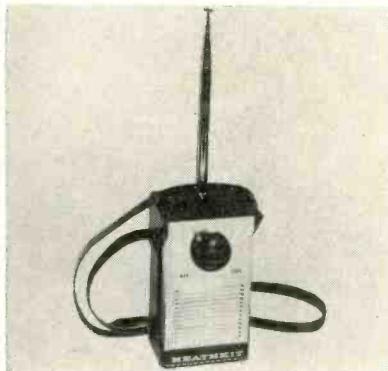
Trademark

For more data, circle 11-78-1 on coupon, p. 50

78

## Heath CB TRANSCEIVER

GW-30 "Handie-Talkie" is a new hand-held citizens band transceiver. The battery-operated 4-transistor circuit features a fixed-tuned super-regenerative receiver. The crystal-con-



trolled transmitter uses maximum FCC-allowable input. Kit, \$32.95 each, \$64.95 a pair. Wired, \$50.95 each, \$99.95 a pair. Also, not shown, model GW-10 for fixed and mobile use: Kit \$62.95, Wired \$99.95. Heath Co., Benton Harbor, Mich.

For more data, circle 11-78-4 on coupon, p. 50

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233) SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION OF ELECTRONIC TECHNICIAN, published monthly at Concord, N. H., for October 1, 1960.

1. The names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Howard A. Reed, 174 Waverly Rd., Scarsdale, N. Y.; Editor, Albert J. Forman, Woodbrook Dr., Stamford, Conn.; Managing Editor, Arthur P. Salsberg, 34-24 82nd St., Jackson Heights 72, N. Y.; Business Manager, none.

2. The owner is (if owned by a corporation its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given.) Electronic Technician, Inc., 480 Lexington Ave., New York 17, N. Y.; Beatrice S. Berger, 109-01 72 Rd., Forest Hills, N. Y.; Charles F. Dreyer, 300 Hayward Ave., Mt. Vernon, N. Y.; Albert J. Forman, Woodbrook Dr., Stamford, Conn.; Nancy M. McGaughan, 83-02 Cornish Ave., Elmhurst, N. Y.; Robert E. Nickerson, 27 Meadowbank Rd., Old Greenwich, Conn.; Howard A. Reed, 174 Waverly Rd., Scarsdale, N. Y.; Morris J. Rubin, 160-54 23rd Ave., Whitestone 57, N. Y.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) M. Clements, 114 Ludlow Ave., Spring Lake, N. J.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required by the act of June 11, 1960 to be included in all statements regardless of frequency of issue.) 81,756.

(Signed) ALBERT J. FORMAN, Editor  
Sworn to and subscribed before me this 26th day of September, 1960.

MORRIS J. RUBIN, Notary Public  
State of New York, No. 41-3389950  
Queens County  
Term expires March 30, 1961



## International Crystal Executive CITIZEN'S BAND \$169.95

Prepaid Deposit on C.O.D.—Terms Arranged

VERSATILE

OPERATES FROM 6, 12, 115 VOLTS

PUSH TO TALK OPERATION

SQUELCH CONTROL

5 $\frac{1}{2}$ " x 8 $\frac{1}{2}$ " x 9 $\frac{1}{2}$ " Weight only 12 lbs.

5 WATT Transmitter, .005% certified

Tuneable receiver tunes all 23 channels

Complete Line of CITIZEN'S BAND  
TRANSCEIVERS & EQUIPMENT

**GREYLOCK Electronics**

438 CENTRAL AVE.  
ALBANY, N. Y. IV 9-5411

For more data, circle 11-78-2 on coupon, p. 50

ask the  
"Man-on-the-Roof"  
why he prefers

*South River*



TWO  
TO A  
SET

**RATCHET TYPE  
CHIMNEY MOUNT**

Model RT (Galv. Banding)

Model RT-ST

(Stainless Banding)

**FASTEST, SIMPLEST, MOST  
CONVENIENT EVER MANU-  
FACTURED** — Mounts in 2  
simple steps. Completely fac-  
tory assembled with no eye-  
bolts, banding clips, nuts, etc.,  
to handle. Furnished with  
flat-lay, non-coiling banding,  
heavy gauge embossed, welded  
steel construction. Forged,  
heat treated Alum. ratchets.

**SOUTH RIVER**  
METAL PRODUCTS CO., INC.  
South River, New Jersey

pioneer &  
outstanding  
producer of  
finest line  
of antenna  
mounts

For more data, circle 11-78-3 on coupon, p. 50

ELECTRONIC TECHNICIAN • November, 1960

# INDEX TO ADVERTISERS

November 1960

Ace Lite Step Company	79	Moss Electronic, Inc.	71
Aerovox Corp.	78	Mullard	72
American Telephone and Telegraph Co.	19	Oxford Components	68
American Television and Radio Co.	76	Perma-Power Co.	20
Amperex Electronic Corp.	66	Philco Computer Division	67
Amphenol-Borg Electronics Corp.	4	Philco Corp.	2, 3
Atlas Sound Corp.	71	Planet Sales Corp.	69
B & K Manufacturing Co.	45, 47	Precision Tuner Service	66
Belden Manufacturing Co.	17	Pyramid Electric Co.	16
Blonder-Tongue Laboratories, Inc.	59	Radio Corporation of America	Cover IV
Bussmann Manufacturing Co.	18	Raytheon Company	15
Castle Television Tuner Service	77	RCA Institutes, Inc.	58
CBS Electronics	23	Remington Rand Univac	22
Centralab Division, Globe-Union Inc.	24	Rider Publisher, Inc., John F.	74
Channel Master Corp.	6, 7, 9	Sarkes Tarzian, Inc.—Tuner Div.	61
Chemical Electronic Engineering Inc.	61	Seco Electronics, Inc.	73, 75, 77
Chicago Standard Transformer Corp.	60	Sencore	62, 63
Cornell Dubilier Electronics Div.	28, 29	Sonotone Corp.	70
DuPont de Nemours & Co. (Mylar)	54	South River Metal Products Co., Inc.	78
EICO	14	Sprague Products Co.	5
Electronic Technician	64, 72	Stromberg-Carlson	52
Electro-Voice, Inc.	13	Switchcraft, Inc.	72
General Electric Co.—TV Receivers	11	Sylvania Div., General Telephone & Electronics	8, Cover III
Globe Electronics	76	Texas Crystals	70
Gonset Division	68	Tru-Vac	75
Graylock Electronics	78	Tung-Sol Electric Inc.	12
Hickok Electrical Instrument Co.	56	Utah Radio & Electronic Corp.	30
Illinois Condenser Co.	67	V-M Corporation	27
International Electronics Corp.	72	Winegard Company	26
Jensen Manufacturing Co.	80	Xcelite, Inc.	22
Jerrold Electronics Corp.	10		
JFD Electronics Corp.	21		
JW Electronics	73		
Lafayette Radio Electronics Corp.	25		
Littelfuse, Inc.	Cover II		
Mallory & Co., Inc., P. R.	51, 53, 55, 57		
Mercury Electronics Corp.	60, 65, 79		
Mosley Electronics, Inc.	69		

While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.



**ACE Lite-Step Korallite Mats Offer these EXCLUSIVE Safety Features:**

- HIGH non-conductivity
- COMPLETELY fire-retardant
- COMPLETELY acid-proof
- COMPLETELY oil-proof
- COMPLETELY shock-absorbent
- Tubes BOUNCE—don't break
- FIGHT foot and leg fatigue

Sensational new helper for service men — a light-weight, sturdy mat for underfoot in the shop or on-location — or for the workbench. Whether you stand on it or place the bulkiest, most awkward chassis on it, Ace Lite-Step cuts fatigue and breakage to a minimum — makes your work easier and safer.

Ace KORALITE mats are made with a resilient working or standing surface and are 3/8" thick overall. The underside is cushiony . . . hugs floor or bench, won't creep, or skid.

For years Lite-Step mats have been used in the plants of America's leading manufacturers like Zenith and Motorola. Now it is being made available to independent technicians, direct from the factory. Order by mail with our positive assurance that you must be delighted or your entire purchase price will be refunded at once and without question.

**ACE**  
**LITE STEP**  
**COMPANY**

1706 S. State St., Chicago 16, Ill.

**PLEASE SEND ME**

Ace Lite Step Co.,  
1706 S. State St., Chicago 16, Ill.  
I want to try Ace KORALITE. Rush me the order checked below:

18x24 . \$6.00 ea.     24x36 . 12.00 ea.  
 24x60 . 20.00 ea.     36x60 . 30.00 ea.  
Runners — 18", 24", 36" wide — up to 100 ft. long — \$2.00 per sq. ft.

TERMS: Prepaid if cash with order. COD, plus Transp. FOB Chicago to rated firms. Refunds guaranteed.

Name \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

**Mercury** offers you **MORE TUBE TESTER** for your money!

**CHECKS ALL RADIO AND TV TUBES FOR:**

- ✓ Cathode emission
- ✓ Shorts and leakage
- ✓ Grid leakage
- ✓ Gas content

Housed in sturdy gray-hammertone steel case with retractable handle

Model 103 TUBE TESTER **\$47<sup>75</sup>** Net



Although low in price the Model 103 has a range of operation that will outperform more expensive tube testers.

Here's how easy it is to test all tubes completely, accurately — IN JUST SECONDS!

- 1 SET 3 CONTROLS
- 2 INSERT TUBE
- 3 PRESS QUALITY BUTTON

- Tests picture tubes with a specially designed built-in CRT socket
- Positively cannot become obsolete . . . circuitry is engineered to accommodate all new tube types
- New tube charts furnished periodically to registered owners

See your electronics parts distributor

**MERCURY ELECTRONICS CORP.,** 77 SEARING AVENUE, MINEOLA, NEW YORK  
West Coast Office: 4306 W. Victory Blvd., Burbank, Calif.

For more data, circle 11-79-1 on coupon, p. 50

For more data, circle 11-79-2 on coupon, p. 50

# ask YOURSELF

\*\*\*\*\*

## THESE FOUR QUESTIONS ABOUT BUYING OFF-BRAND SPEAKERS

### Can I Tell My Customers The Name Of The Speaker I've Installed?

Jensen is a name you can mention with pride and confidence. Jensen Viking and Weathermaster speakers benefit from the tremendous prestige of Jensen's HiFi lines.

\*\*\*\*\*

### Do I Pay More For Jensen?

No. You may find an off-brand "deal" occasionally, but you get consistent competitive year-'round lowest cost and highest quality when you concentrate on Jensen.

\*\*\*\*\*

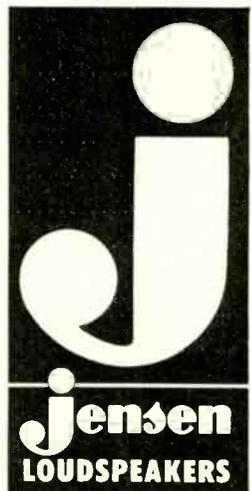
### Can Off-Brands Give Me Proof Of Performance?

Jensen has designed every type of speaker for the military. Jensen speakers have been under the pole... and around the world—*outside* submarines. This know-how is a bonus extra in every Jensen speaker.

\*\*\*\*\*

### How About Availability?

Jensen speakers are stocked by fine jobbers and distributors everywhere. You can depend on replacements being available.



COMPARE OFF-BRAND ANSWERS TO JENSEN ANSWERS . . .

*. . . you'll find once again that there is something better from . . .*

**jensen** / MANUFACTURING COMPANY  
DIVISION OF THE MUTER CO. 6601 S. Laramie Avenue, Chicago 38, Illinois

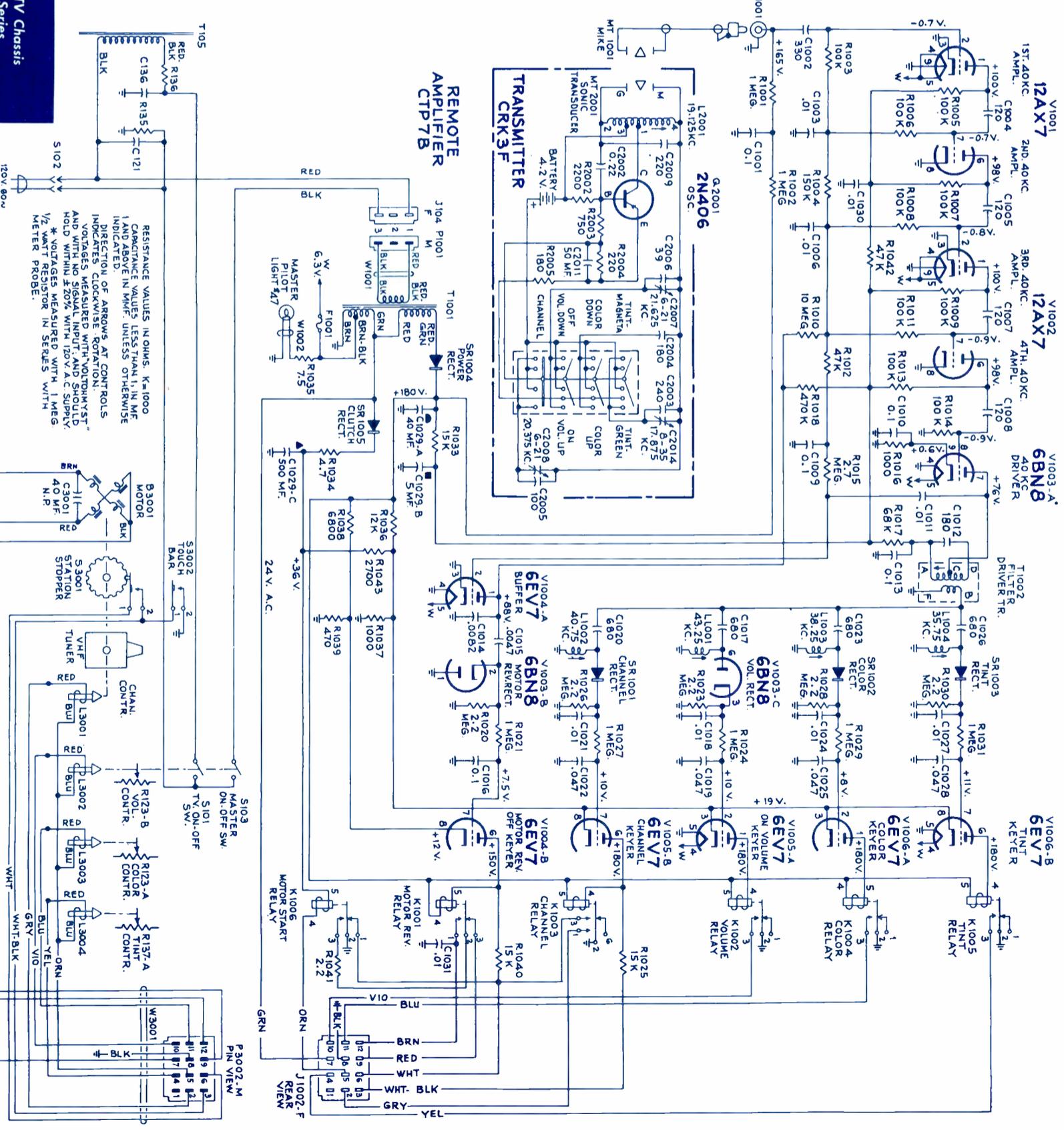
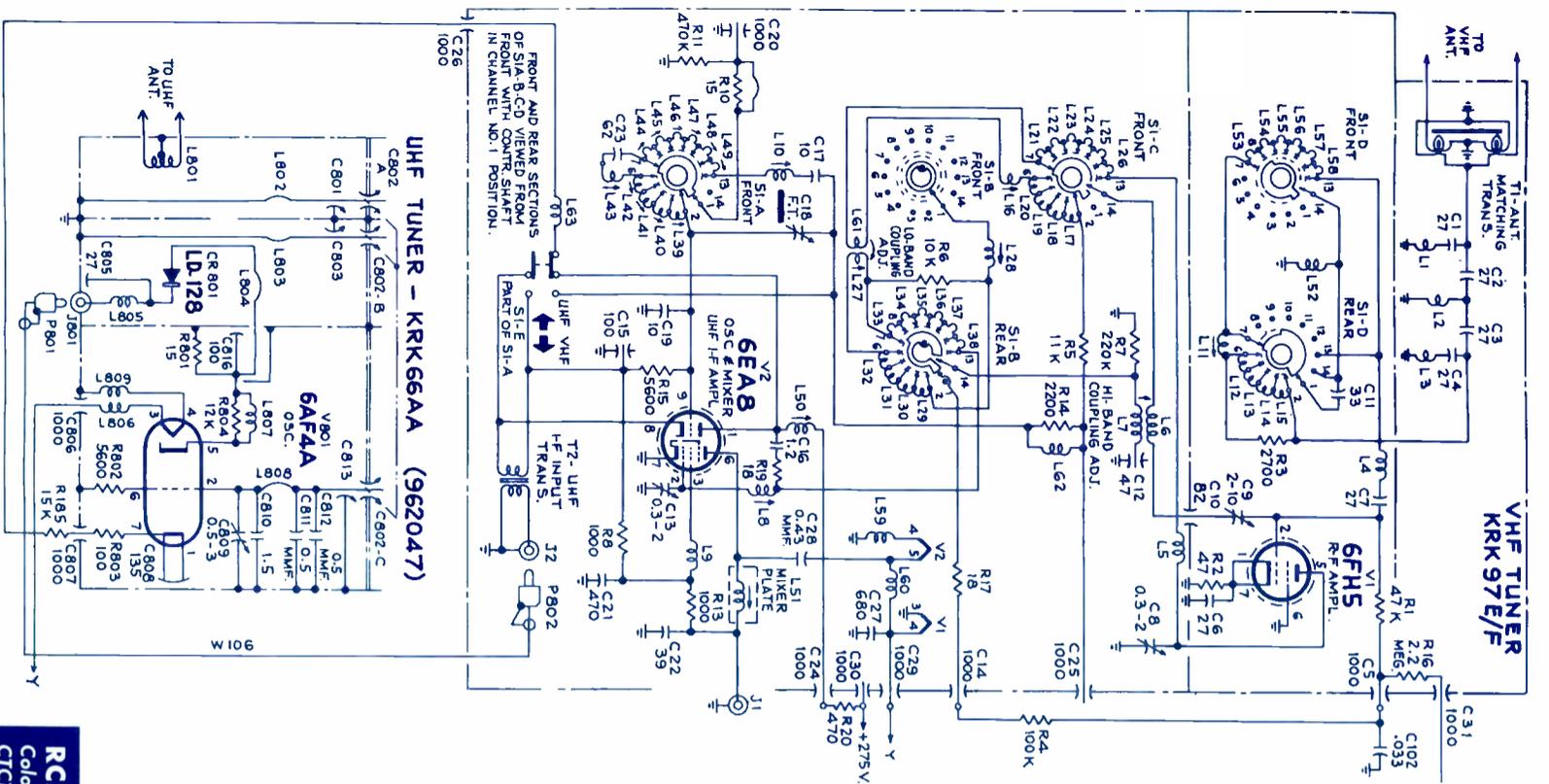
IN CANADA: RENFREW ELECTRIC CO., LTD., TORONTO • IN MEXICO: UNIVERSAL DE MEXICO, S.A., MEXICO D.F.

For more data, circle 11-80-1 on coupon, p. 50

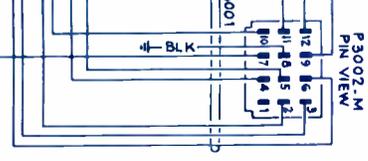
80 (100 pages in this issue, including Circuit Digests)

ELECTRONIC TECHNICIAN • November, 1960





RESISTANCE VALUES IN OHMS, K=1000 CAPACITANCE VALUES LESS THAN 1, IN MF INDICATED ABOVE IN MMF, UNLESS OTHERWISE INDICATED. DIRECTION OF ARROWS AT CONTROLS INDICATES CLOCKWISE ROTATION. VOLTAGES MEASURED WITH VOLT/WHYSTD MOLD WITHIN ±20% WITH 120V A.C. SUPPLY. \* VOLTAGES MEASURED WITH 1/2 METER PROBE.



More Data on Reverse Side

RCA Color TV Chassis CT10 Series Electronic Technician **CIRCUIT DIGEST 595**

More Data on Opposite Page

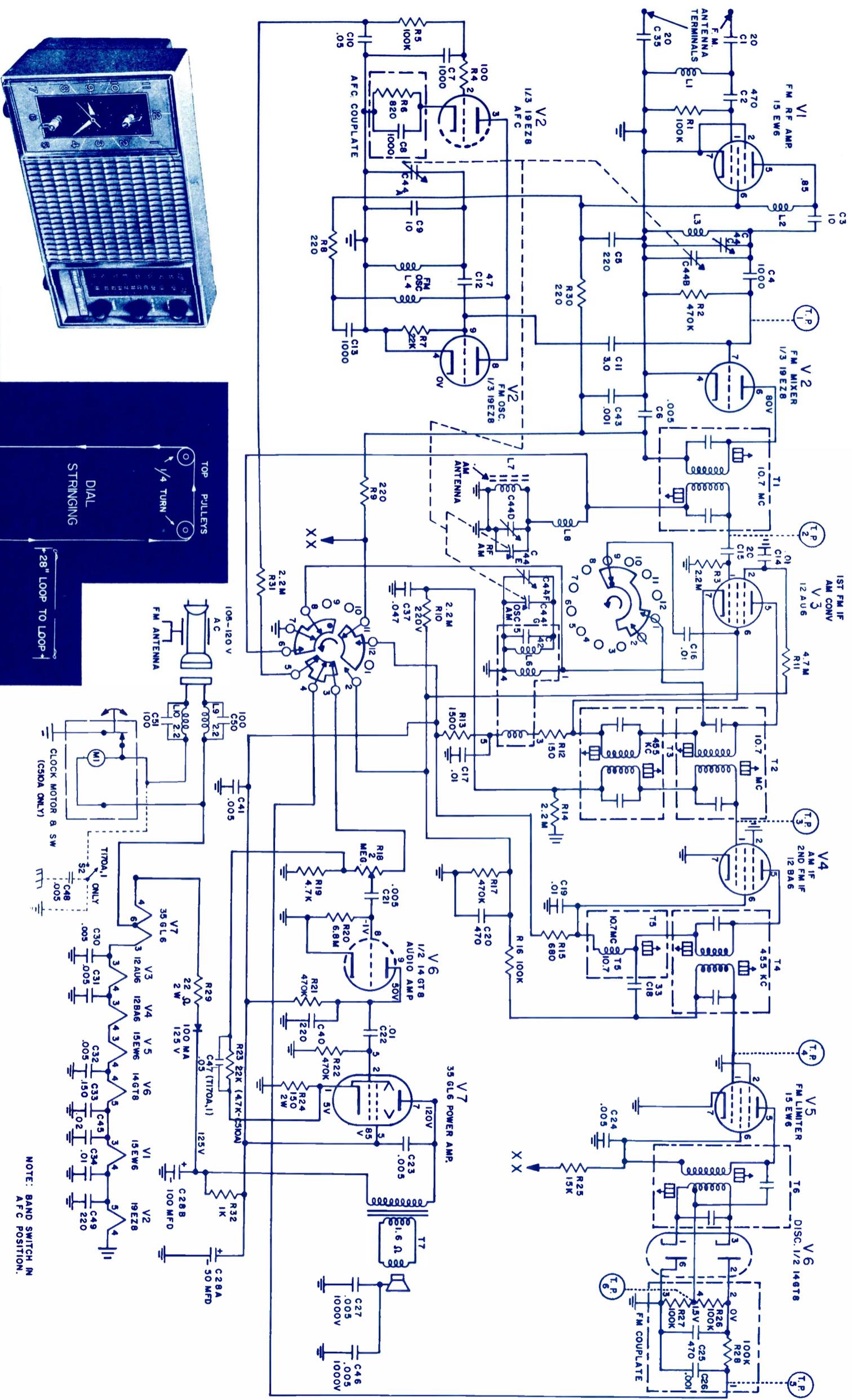


# ELECTRONIC TECHNICIAN 596

## CIRCUIT DIGEST

GENERAL ELECTRIC  
AM-FM Radio  
Model C510A

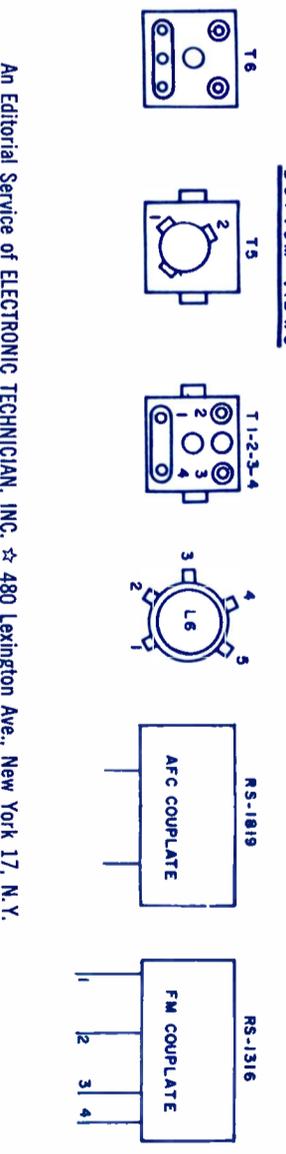
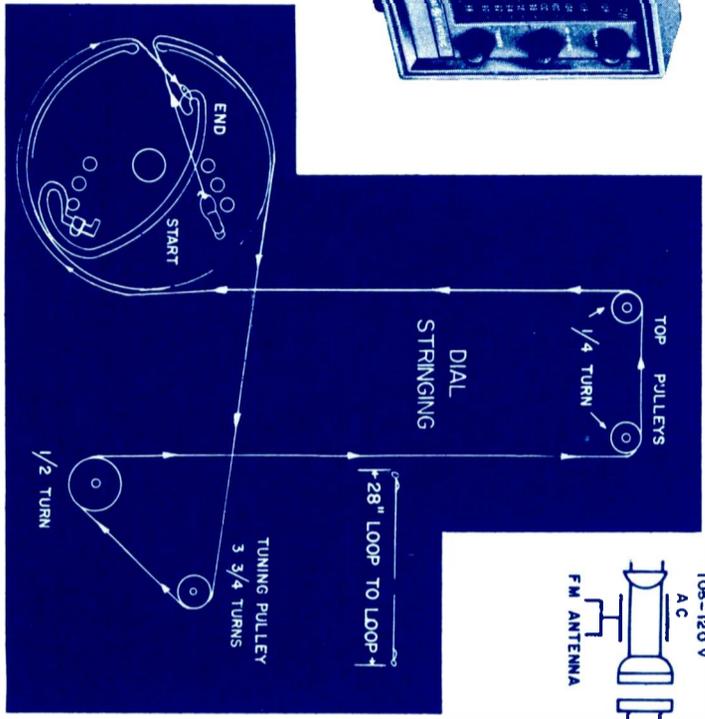
November • 1960



# Electronic Technician

## CIRCUIT 596

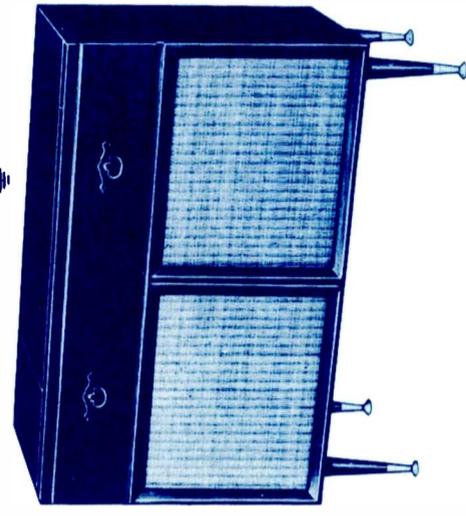
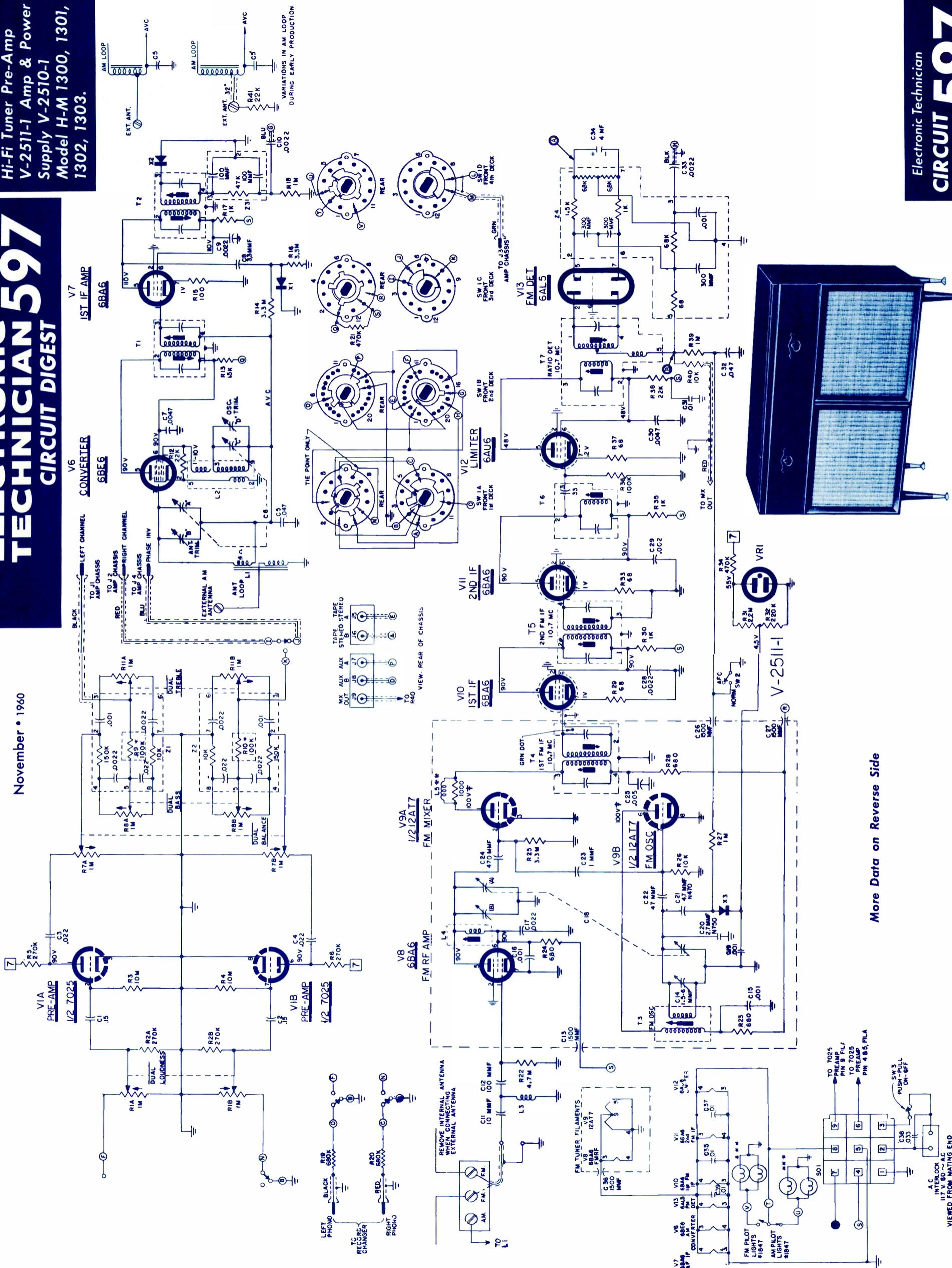
### DIGEST



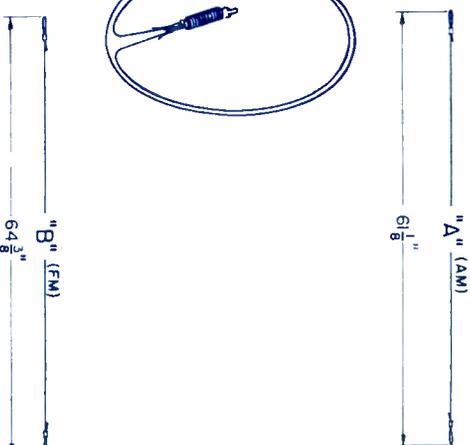
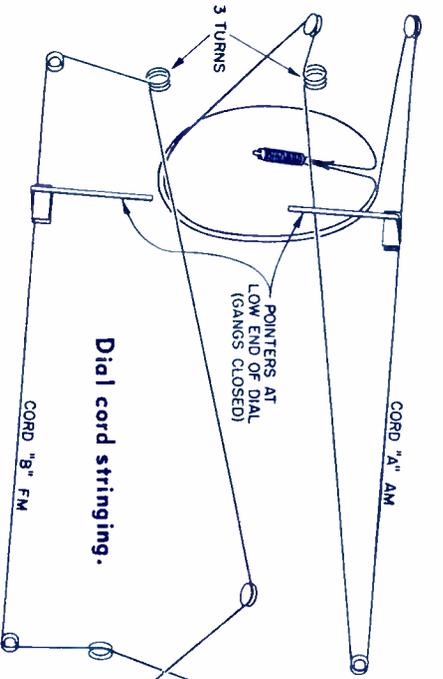
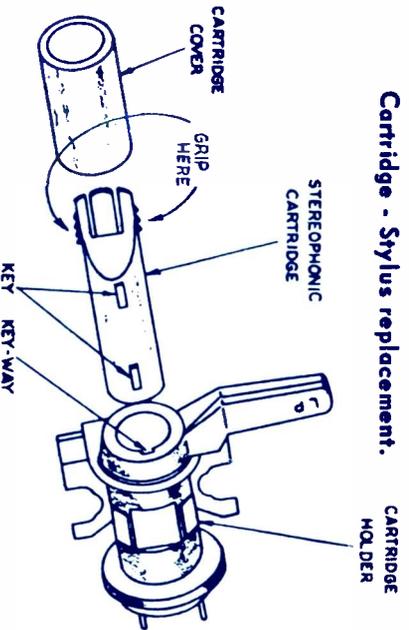
An Editorial Service of ELECTRONIC TECHNICIAN, INC. • 480 Lexington Ave., New York 17, N.Y.

November • 1960

**WESTINGHOUSE**  
 Hi-Fi Tuner Pre-Amp  
 V-2511-1 Amp & Power  
 Supply V-2510-1  
 Model H-M 1300, 1301,  
 1302, 1303.



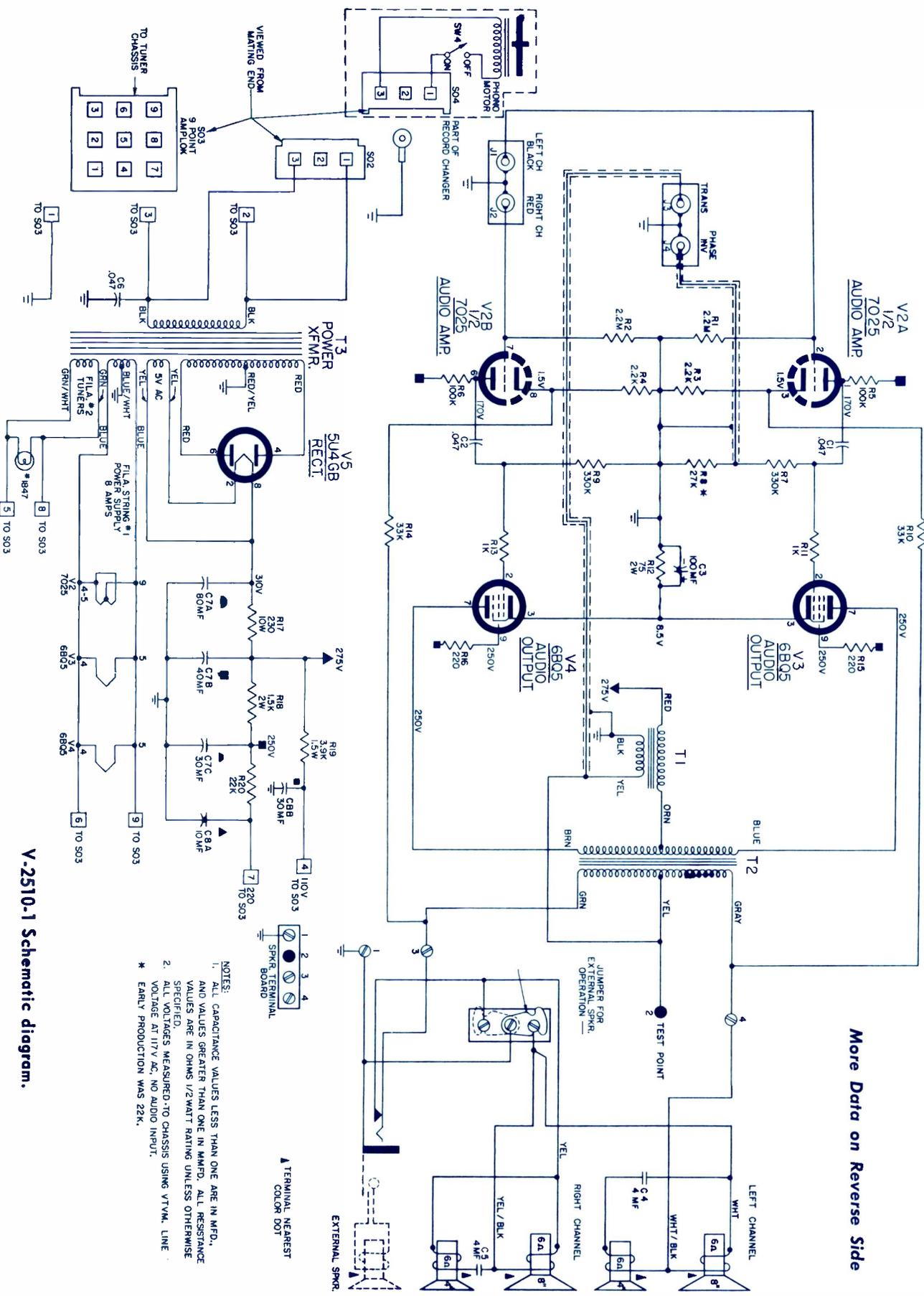
More Data on Reverse Side



Cartridge - Stylus replacement.

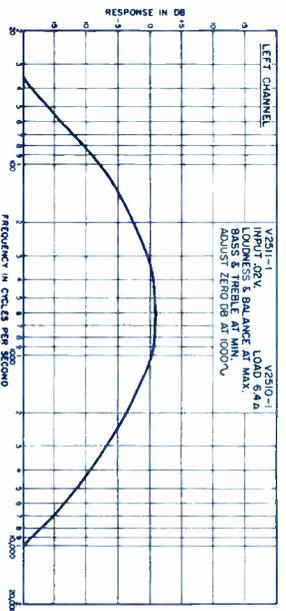
Dial cord stringing.

More Data on Reverse Side

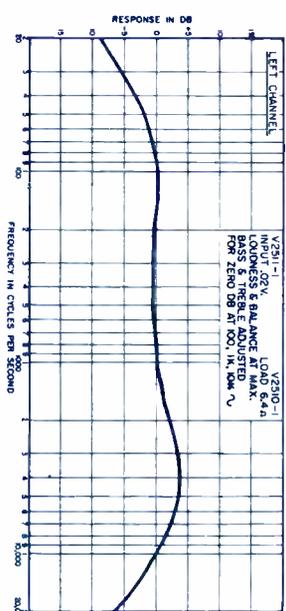


- NOTES:
1. ALL CAPACITANCE VALUES LESS THAN ONE ARE IN MFD., AND VALUES GREATER THAN ONE IN MMFD. ALL RESISTANCE VALUES ARE IN OHMS UNLESS OTHERWISE SPECIFIED.
  2. ALL VOLTAGES MEASURED TO CHASSIS USING VTVM. LINE VOLTAGE AT 117V AC. NO AUDIO INPUT.
- \* EARLY PRODUCTION WAS 22K.

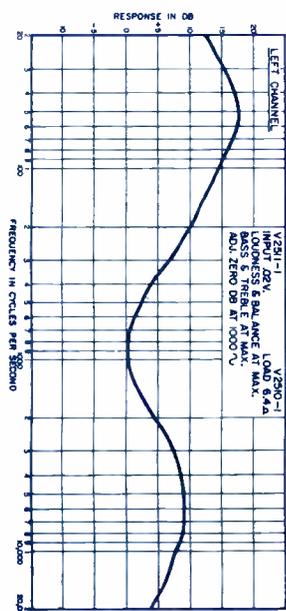
V-2510-1 Schematic diagram.



Frequency response curve.

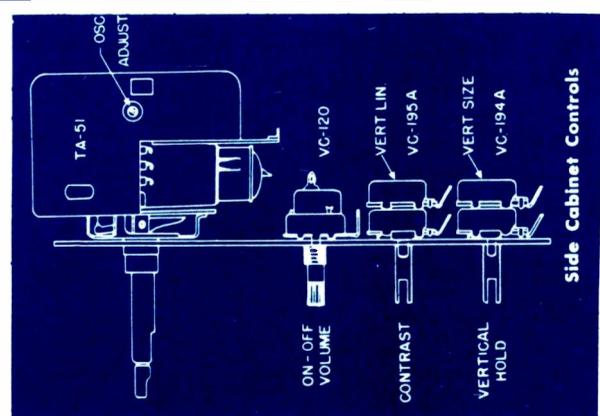
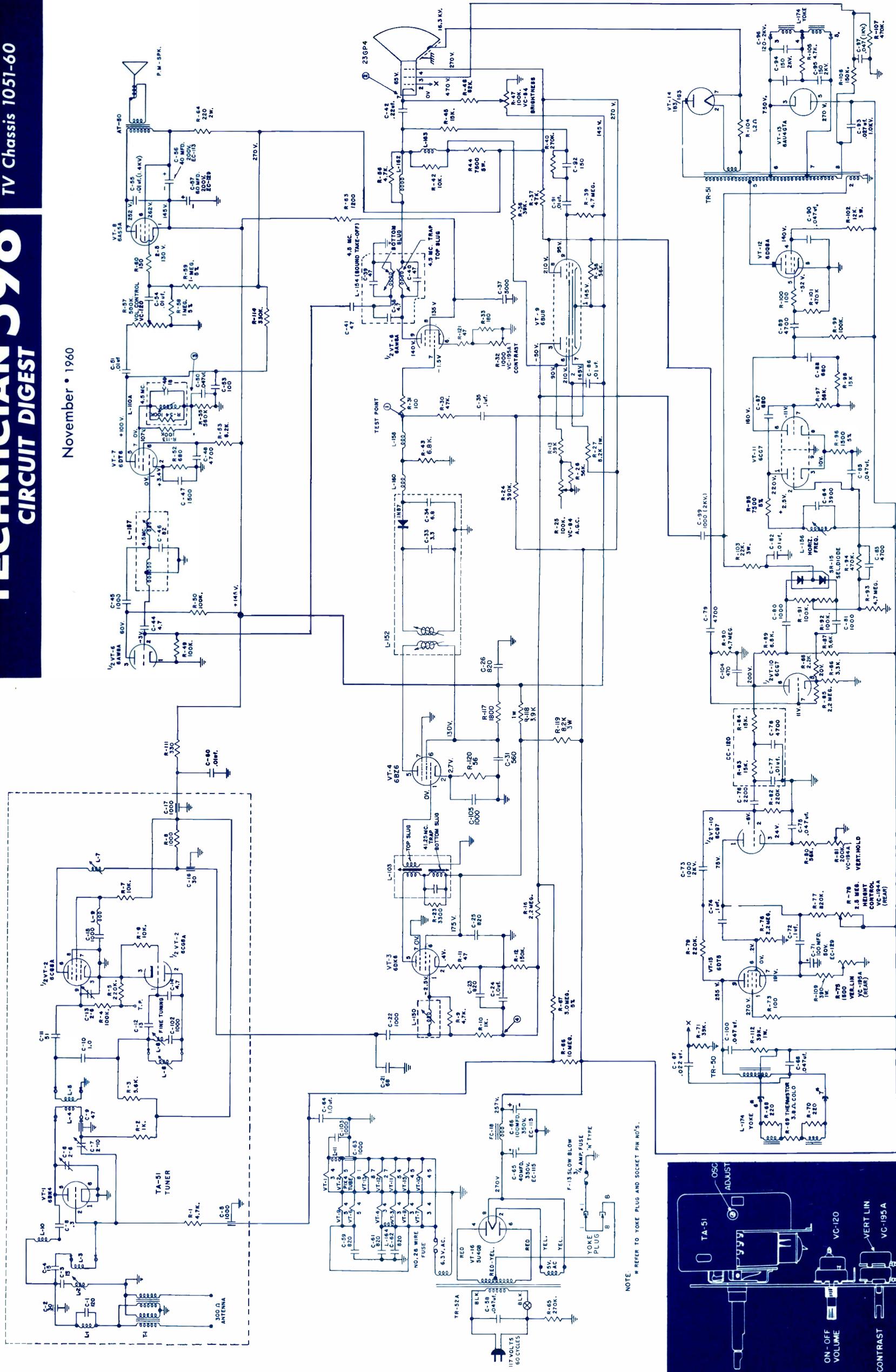


Frequency response curve.



Frequency response curve.

November • 1960



NOTE: \* REFER TO YOKE PLUG AND SOCKET NUMBERS.



# GOING "BROKE" ON FILAMENT "BREAKS"?



**NEW SYLVANIA 1G3/1B3 HAS  
BUILT-IN "PROFIT PROTECTION."**

**I**T'S HARD to make a dollar in this TV service business. And callbacks on tubes make it even tougher. That's why Sylvania concentrates on making tubes that perform better and last longer.

Take the new Sylvania 1G3/1B3, for example. The improved filament has increased life span and operates at reduced temperature. Plate is extra-big. Volume of space between it and the filament is enlarged. (That adds to "cooler" filament operation without lowering emission capabilities, and cuts probability of plate-to-filament arc-over.) Glass envelope has extraordinarily high electrical resistivity. This reduces electrolysis and the development of gas and leakage.

Further, every new Sylvania 1G3/1B3 is tested for emission, for arcing and electrical stability at maximum ratings, and arc-over-proofed at higher-than-rated plate voltages to give extra assurance of long tube life.

So, give yourself a break. Replace defective 1G3/1B3 high-voltage rectifier tubes with the new long-life SYLVANIA 1G3/1B3. Available from your distributor . . . now! Electronic Tubes Division, Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.



# SYLVANIA

Subsidiary of **GENERAL TELEPHONE & ELECTRONICS**

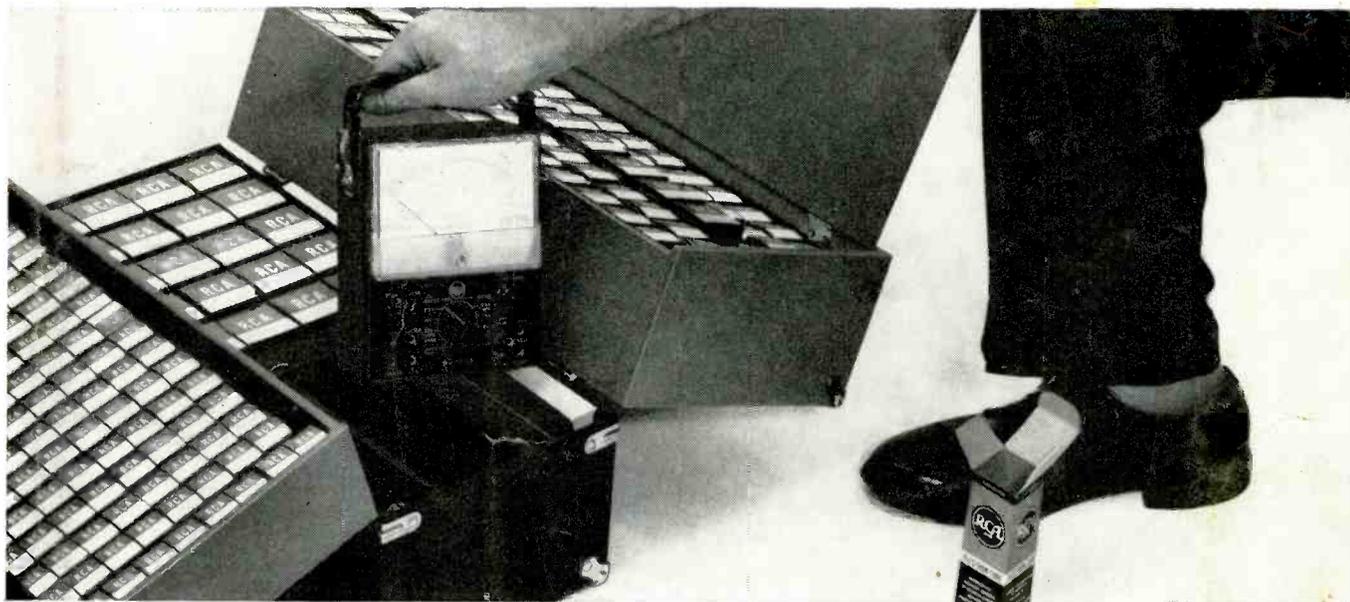




# FRONT PAGE NEWS

## NOW FOR A LIMITED TIME, GET VALUABLE SERVICE AIDS AND GIFTS WHEN YOU BUY RCA TUBES!

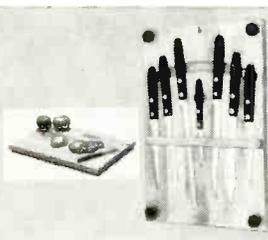
RIGHT NOW'S the best time to stock up on the RCA receiving tubes you'll need through the coming season. Shown here are *just a few* of the exciting gifts and premiums you get FREE with RCA tubes purchased from participating RCA distributors.



**RCA METER-CHEST**—a combination of famous RCA WV-38 VOM and "Treasure Chest" Tube Caddy. 750 tubes!\*



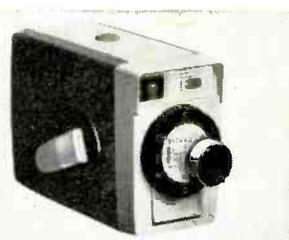
**TV TOTER TABLE**—simplifies moving heavy chassis. 350 tubes.\*



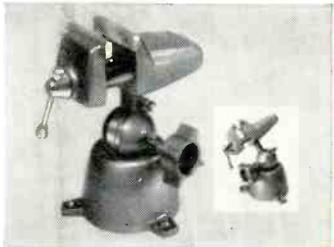
**CUTLERY SET**—7 utensils and cutting board. 325 tubes.\*



**KODAK BROWNIE PHOTO OUT-FIT**—550 tubes.\*



**BROWNIE 8 MOVIE CAMERA**—575 tubes.\*



**PANAVISE**—for easier bench work. 300 tubes.\*



**ELECTRIC TRAIN SET**—350 tubes.\*



**MAN'S WATCH**—precision swiss movement. 475 tubes.\*



**LADY'S WATCH**—precision swiss movement. 475 tubes.\*

For complete selection of gifts and full details, check with your participating RCA distributor.

\*Suggested Value



The Most Trusted Name in Electronics  
RADIO CORPORATION OF AMERICA