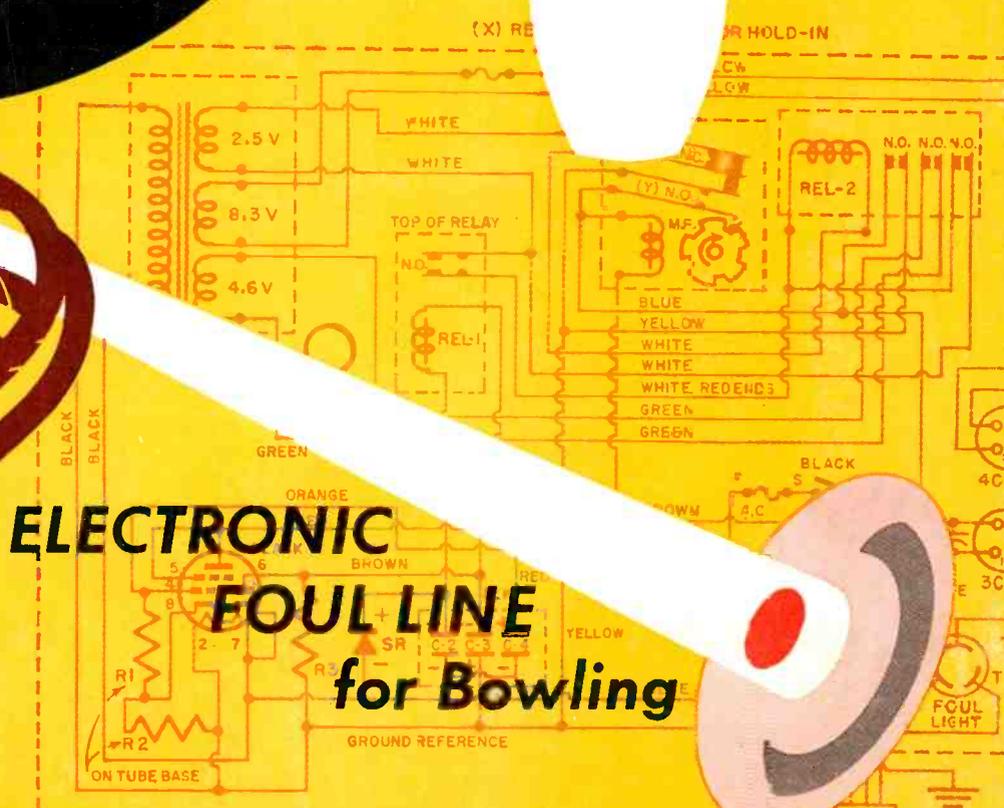
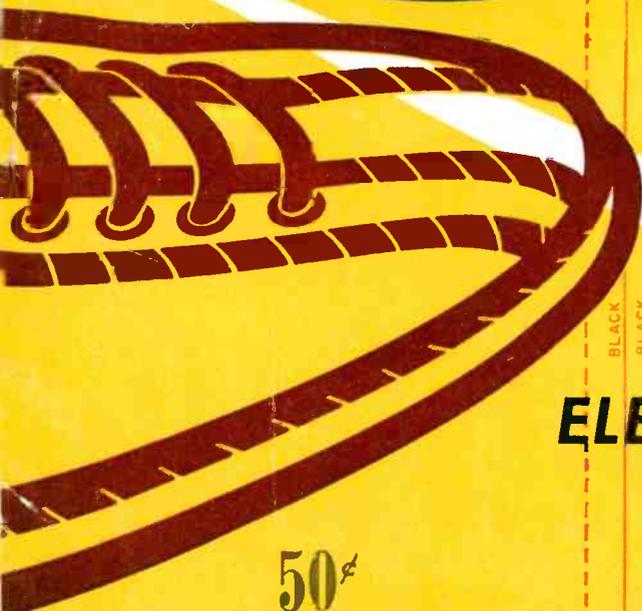


ELECTRONIC TECHNICIAN

Including
SERVICE
Magazine



ELECTRONIC FOUL LINE for Bowling

50¢

November • 1960

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

ELECTRONIC TECHNICIAN

Including
SERVICE
Magazine

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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.

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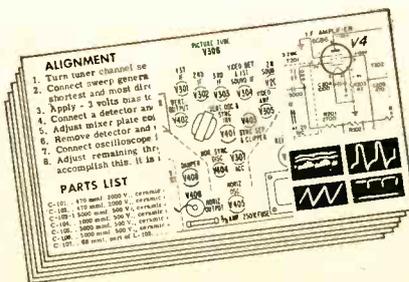
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RCA: Color TV Chassis CTC10 Series

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

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Pak-A-Robe**

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UNMATCHED FOR
RUGGED DURABILITY

Popular triangle style. Moulded of genuine
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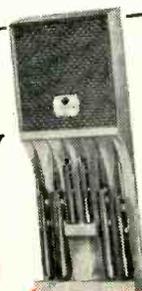
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value



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value

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

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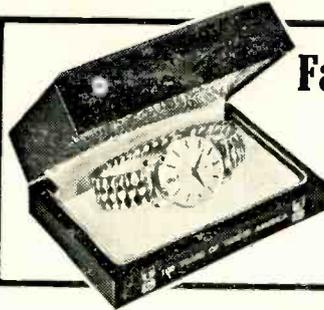
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Set of Table and
Four Chairs
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Choose from these Free Business Aids

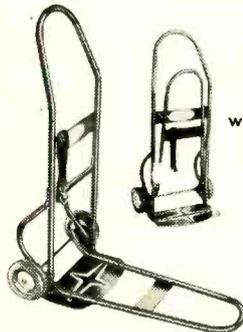
"Big Eight" FOLDING POKER TABLE



Natural Harvest
or Mahogany
frame finish

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

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400 PHILCO TUBES



TV TOTER
FREE

with your purchase of
100
PHILCO TUBES

TUBE CADDY

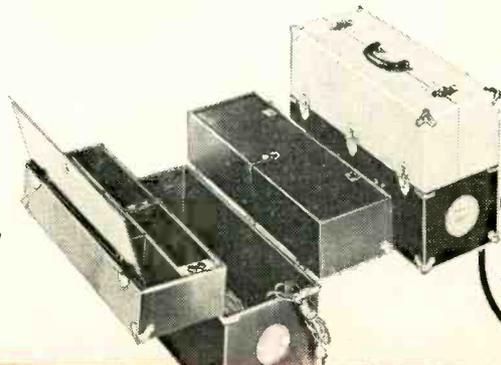
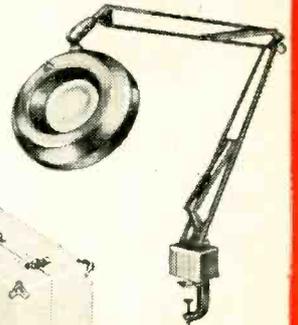
with built-in "Cheater Cord"
and Pin Straightener
Choice of two finishes

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Magnifier-Lamp for
Difficult Service Jobs

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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

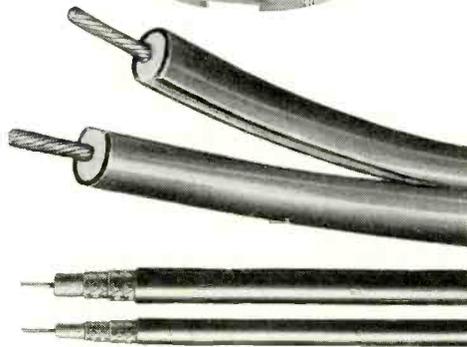
Both receiving and transmitting types are made by AMPHENOL, including the "hottest" twin lead on the market—AMPHENOL MARINE CORE, super low-loss Polyfoam.

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

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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 μf 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

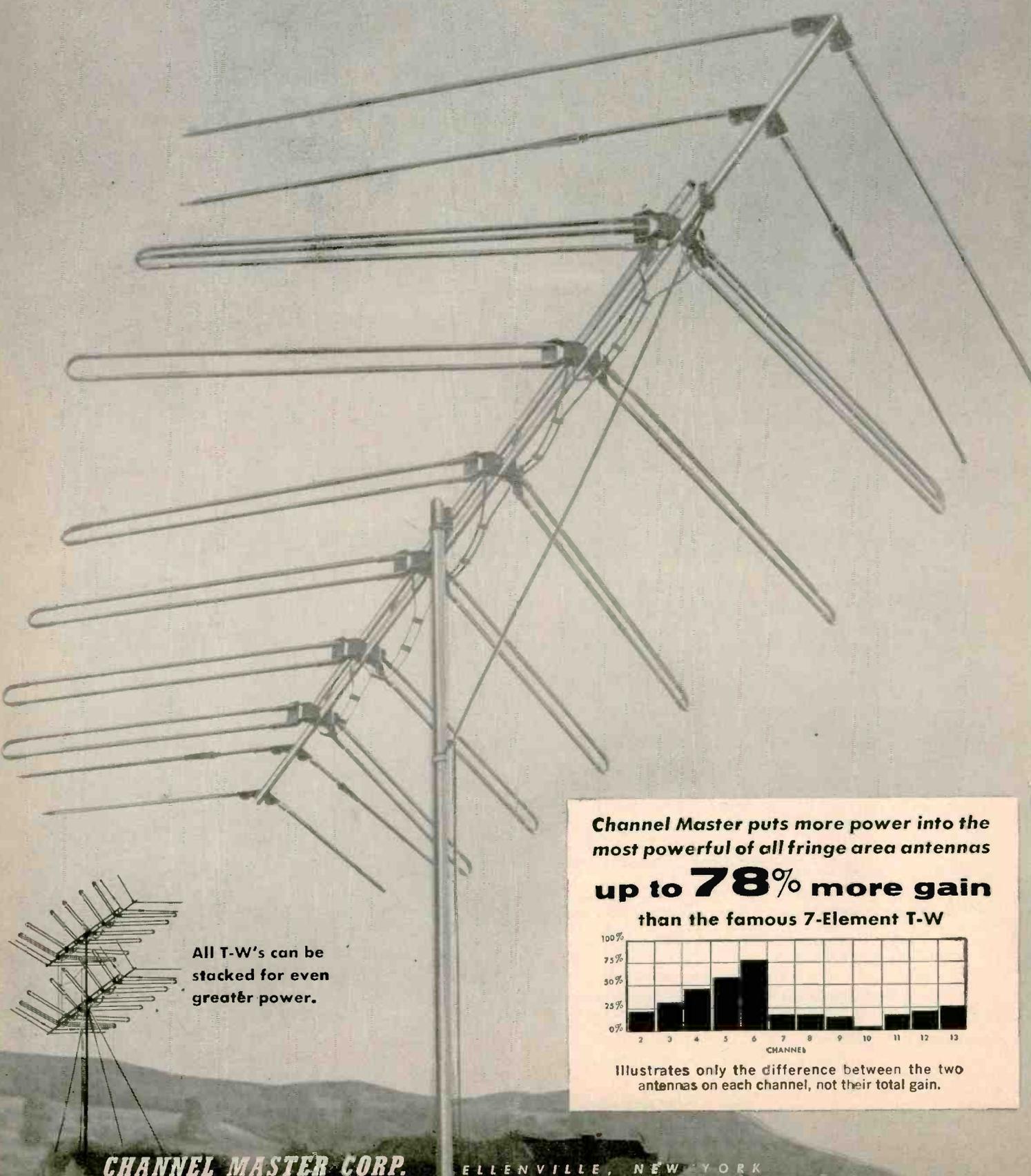
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world's largest capacitor manufacturer

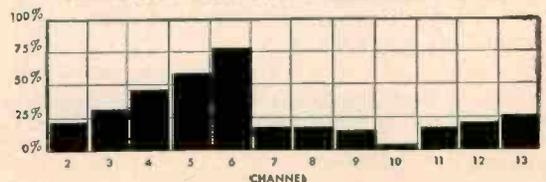
For more data, circle 11-5-1 on coupon, p. 50

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® 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.

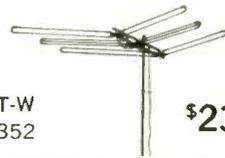
Ruggedized, all-weather construction...Including heavy duty weatherproof harness that won't let rain or salt air impede reception.

There is no substitute for a T-W

Call your Channel Master Distributor today

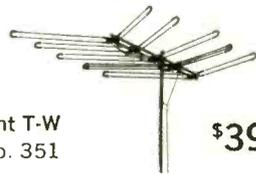
NOW...

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



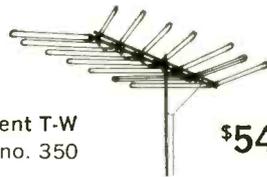
3-Element T-W
model no. 352

\$23⁵⁰
LIST



5-Element T-W
model no. 351

\$39²⁵
LIST



7-Element T-W
model no. 350

\$54⁹⁵
LIST



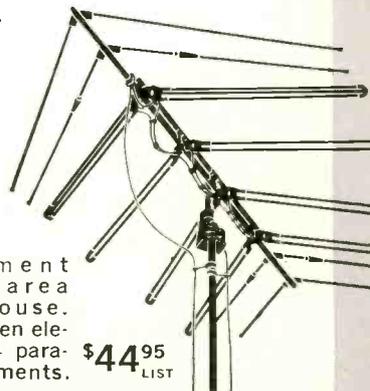
Super 10 T-W
model no. 358

\$59⁹⁵
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.

\$44⁹⁵
LIST

ALL PRICES SLIGHTLY HIGHER IN CANADA

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.

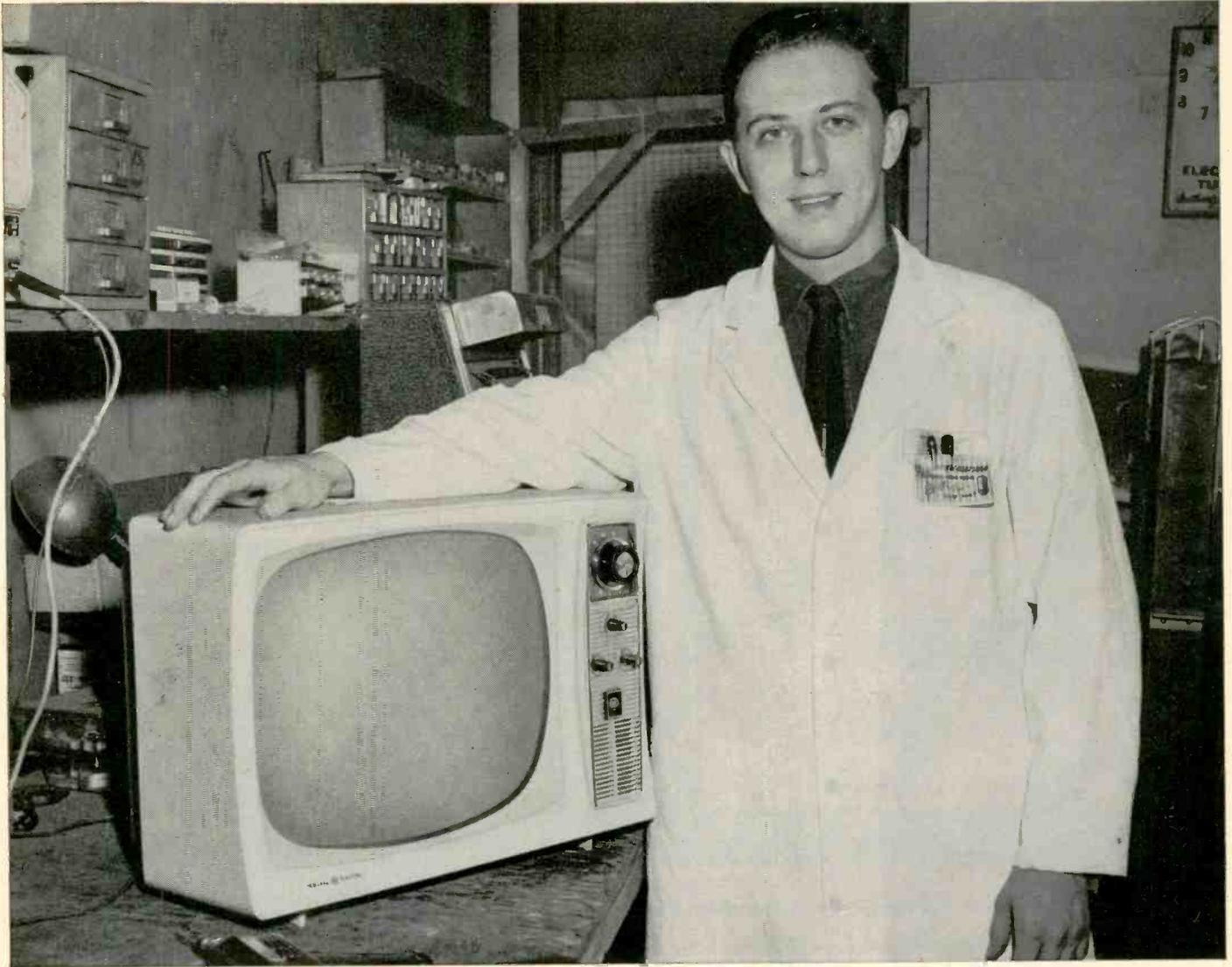
Reps & Distributors

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.

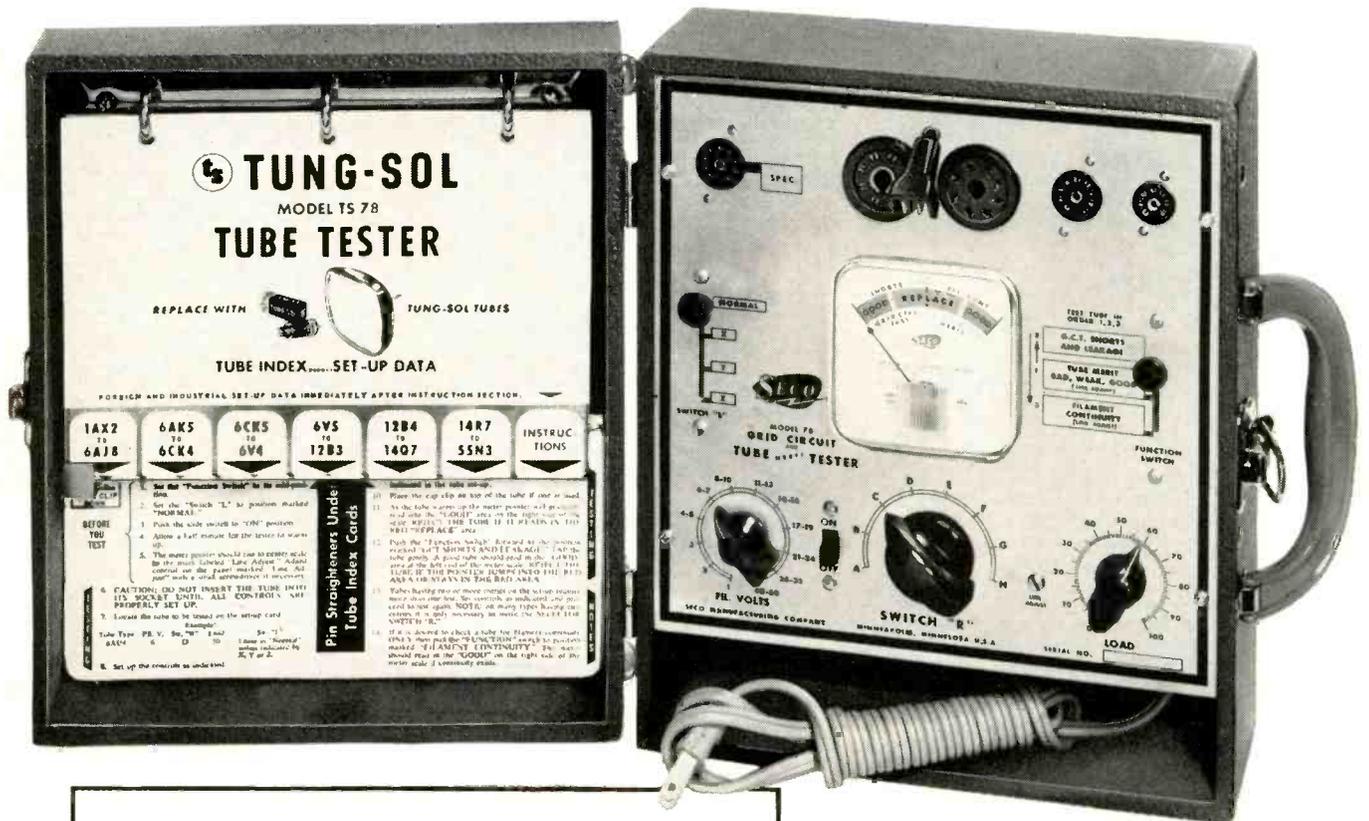
Progress Is Our Most Important Product



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[®]
ELECTRON TUBES • SEMICONDUCTORS

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

how much? \$24⁵⁰

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%.



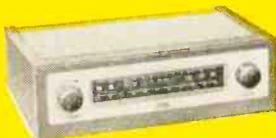
COLOR & Mono DC-5MC
Lab & TV 5" Oscilloscope #460
Kit \$79.95, Wired \$129.50
5" Push-Pull Oscilloscope #425
Kit \$44.95, Wired \$79.95



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.
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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.



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)

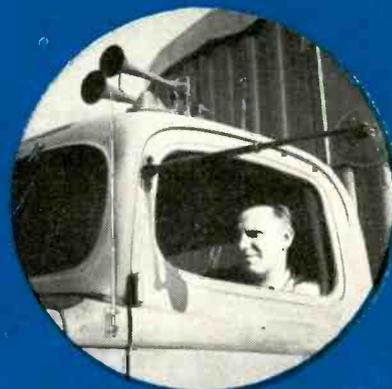
For more data, circle 11-15-1 on coupon, p. 50→
ELECTRONIC TECHNICIAN • November, 1960



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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

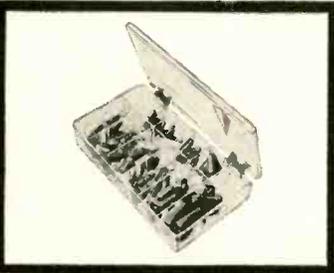
Handsome tan plastic, high impact cabinet with 9 drawers, contains 45 assorted Mylar* paper Gold Dip capacitors, type 151. Practical . . . convenient . . . for storage in your shop, or home. Actual value of the Jewel Box with 45 Gold Dip capacitors—\$19.50, dealer net only \$9.25.



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



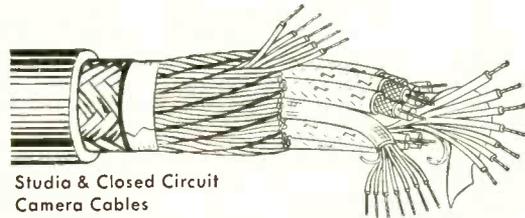
Plastic Microphone Cables



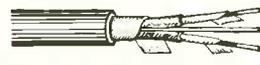
Shielded Interconnecting Cables



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



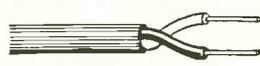
Call System Cables



PA System Cables



Sound & Alarm System Cables



Audio Cables



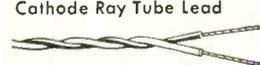
Cathode Ray Tube Lead



Phono Pick-Up Arm Wires



Stereo Wires



Grid Wires



Hi-Fi Connecting Cable



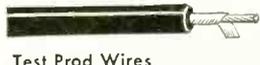
Control Cables



Antenna Roto Cables



Industrial Intercom Cables



Test Prod Wires



Juke Box Control Cables



Unpaired Intercom Cables



PERMOHM® Lead-in



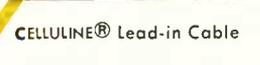
CELLULINE® Lead-in Cable



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



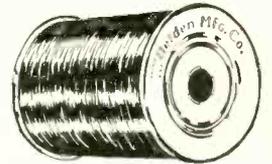
Community TV Antenna Cable



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



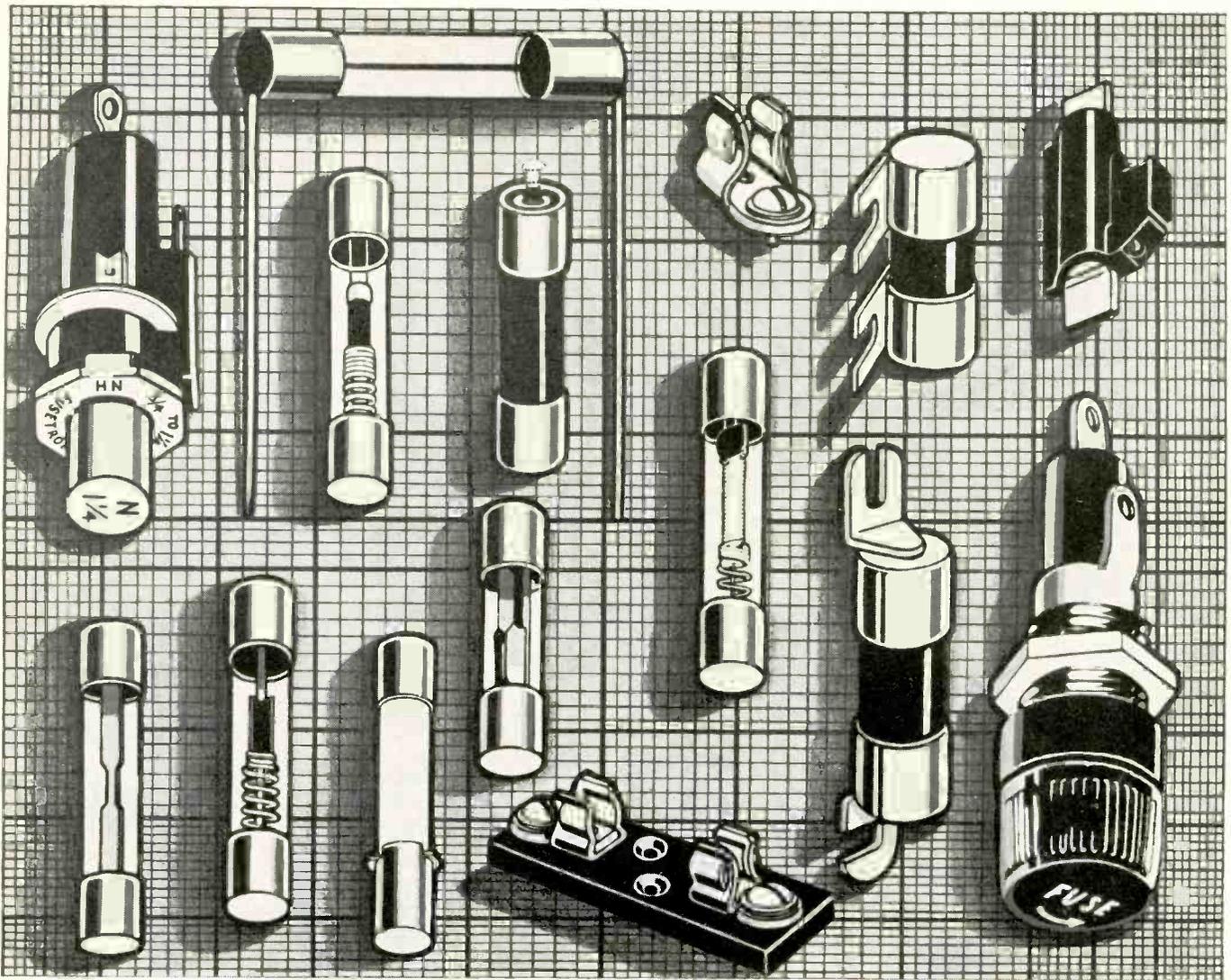
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One Wire Source for Everything Electronic and Electrical

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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.

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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.

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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

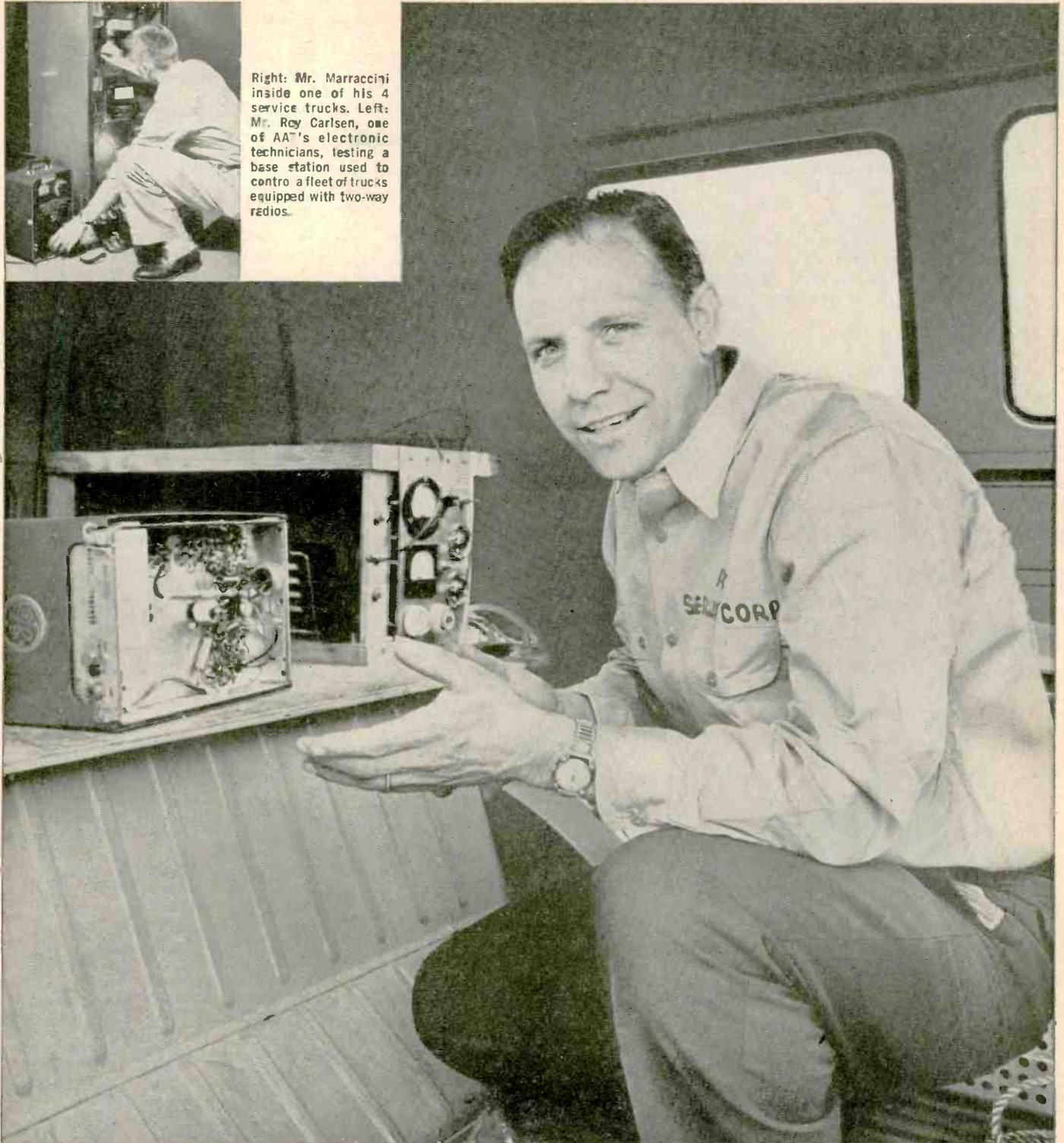
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NOT TO BLOW NEEDLESSLY**



BUSS MAKES A COMPLETE LINE OF FUSES FOR HOME, FARM, COMMERCIAL, ELECTRONIC, ELECTRICAL, 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.

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- U.S. Gov't Licensed Radar & Communications Electronic Devices

ELgin 1-1333

68 WINHAM AVE., S. I. 4

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[®] COMPANY

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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?



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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

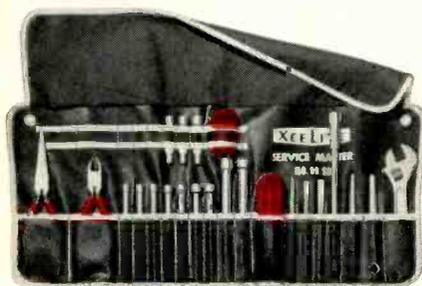


THE BRAND THAT PUTS YOU

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

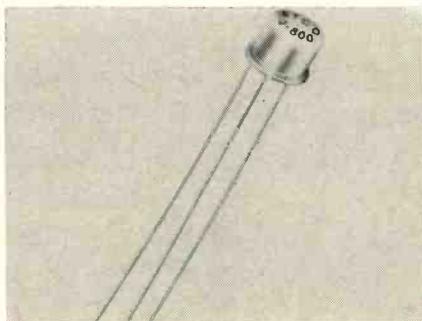
ORGAN TUNING KIT: Literature is available covering the new Autotuner. This pocket-size, stroboscopic, device is easy to use and tunes to an accuracy of 1/100 semitone. Available in completely assembled and tested form, or in simple assemble-it-yourself kit. Schober Organ Corp., 43 W. 61 St., New York 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., Mamaroneck, 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.

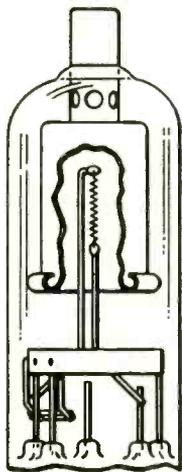
For more data, circle 11-22-2 on coupon, p. 50
ELECTRONIC TECHNICIAN • November, 1960

at my

 expense

 try the
 CBS
 1G3GT/1B3GT

(LET IT CUT YOUR CALL-BACKS)

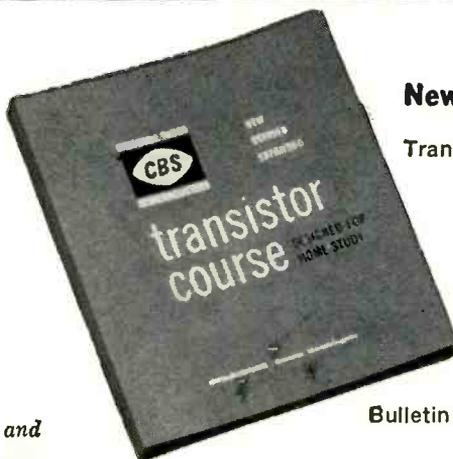


Yes, cut your call-backs four ways:
 1. With the solid four-point suspension of my Bantet stem. 2. With my simplified two-weld filament support. 3. With my *sagproof-flakeproof* stretched filament coil (possible only with my costly cataphoretic coating applied *after* filament weld assembly). 4. With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

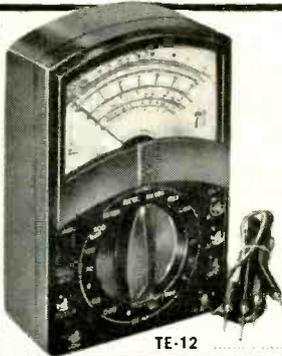
The ideal tube tester for any radio-TV serviceman, technician, experimenter, etc. Sockets provided for 7-pin miniature, 9-pin miniature, octal base, loctal base, noval and sub-miniature types. Alligator clip furnished for testing tubes with top caps. Leakage indicator light glows when inter-element short 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 Ω/v DC Sensitivity
- 10,000 Ω/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".
Shpg. wt., 1 1/4 lbs. Net 17.95

TE-12



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

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

NEW! Lafayette Radio Field Indicator

- Transmitter Output
- Rugged 200 μ 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

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, ± 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 μ 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*

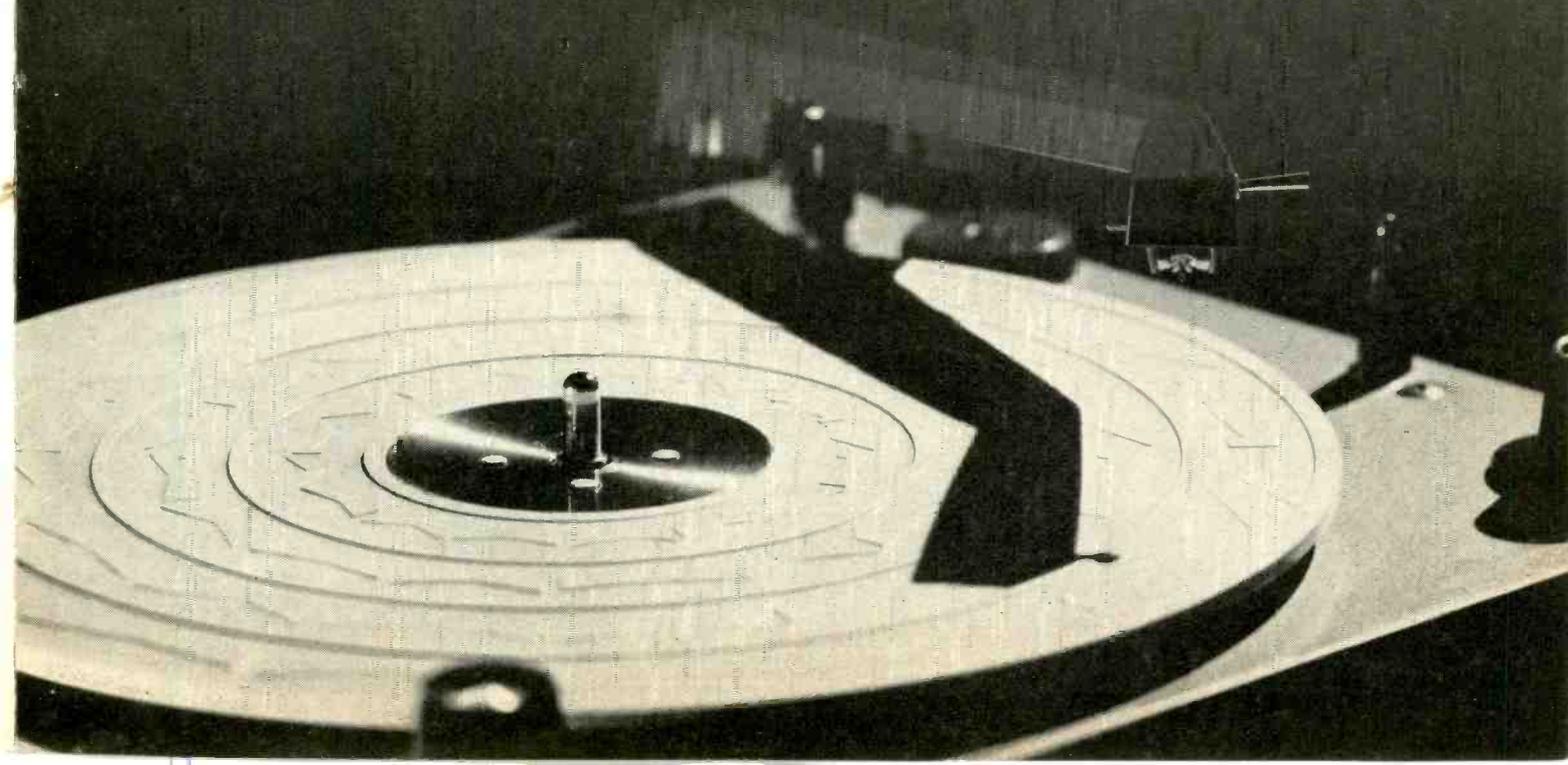
*Slightly Higher West

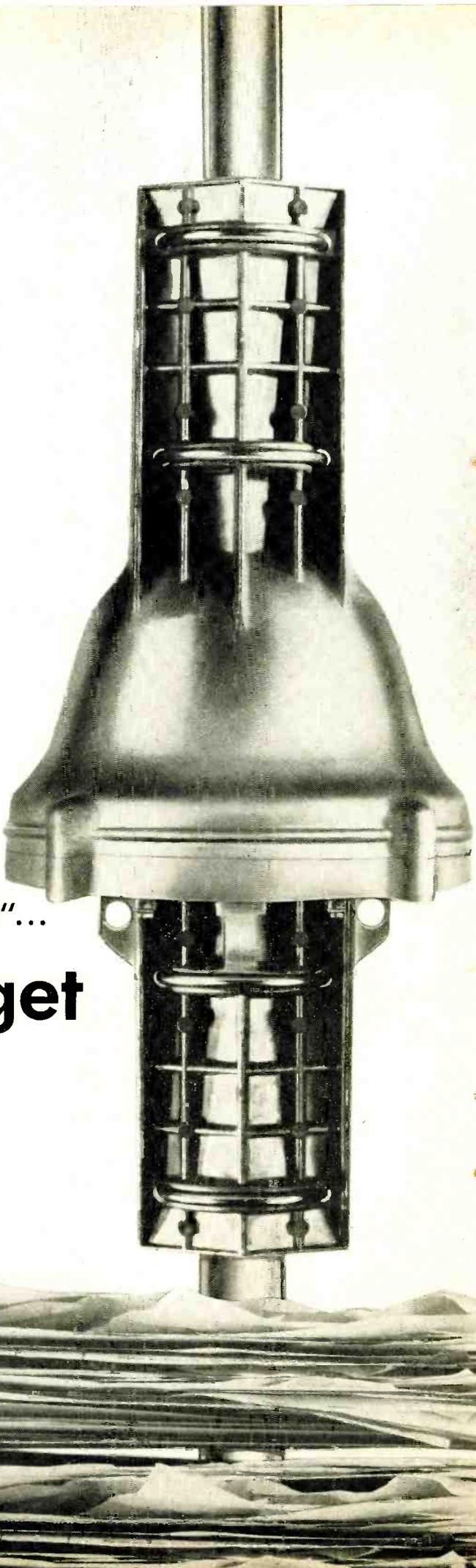


CALL YOUR V-M REPRESENTATIVE NOW!

the  voice  of Music[®]

V-M CORPORATION • BENTON HARBOR, MICHIGAN





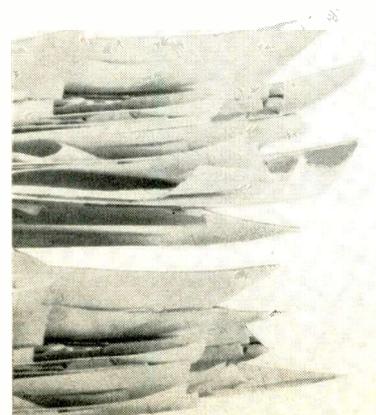
clear
as
a
"bell"...

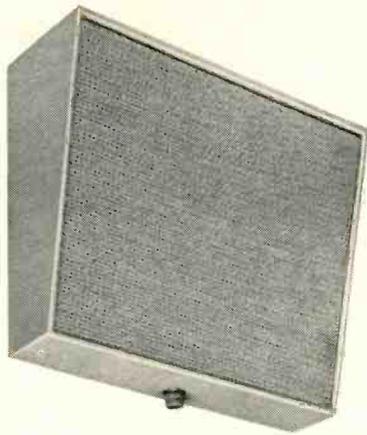
CDE rotors get

the biggest customer reception!

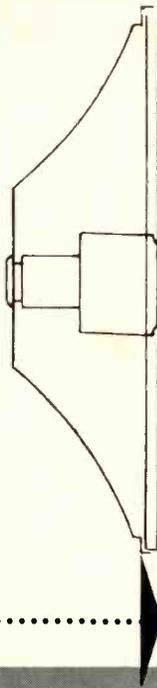
CDE TV antenna rotors are the big-ticket sales that build big customer acceptance for your reputation. Take the AR-22 for example; installed on roof or tower, this heavy-duty beauty weathers the winter like old St. Nick himself. The reason? A sealed, die-cast bell housing which encloses precision *planetary* 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



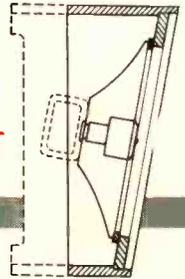


Look! 4 inches thin
because Utah
put the pot inside



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

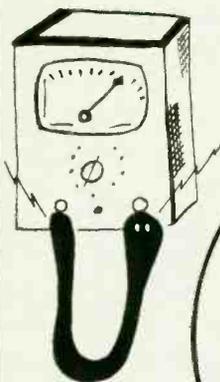
7 OUT OF 8 U.S. HOMES HAVE TV, REPORTS ARE.

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

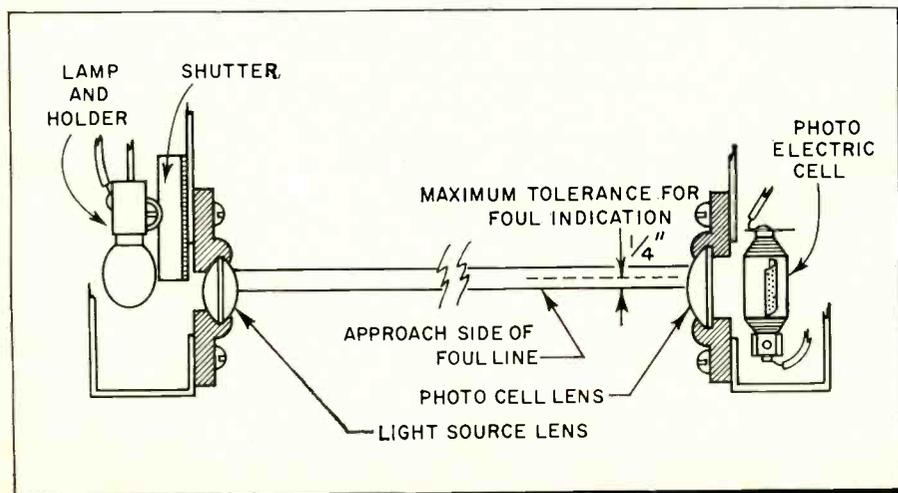
The light source lamp is frequently a double contact, bayonet base, 6-8 volt unit, similar to a standard #1154 automotive tail light. The photo-electric tube is generally a vacuum cartridge type (#922) which fits in a polarized socket. The photo-electric tube's anode is coupled to the grid of a 117L7 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.



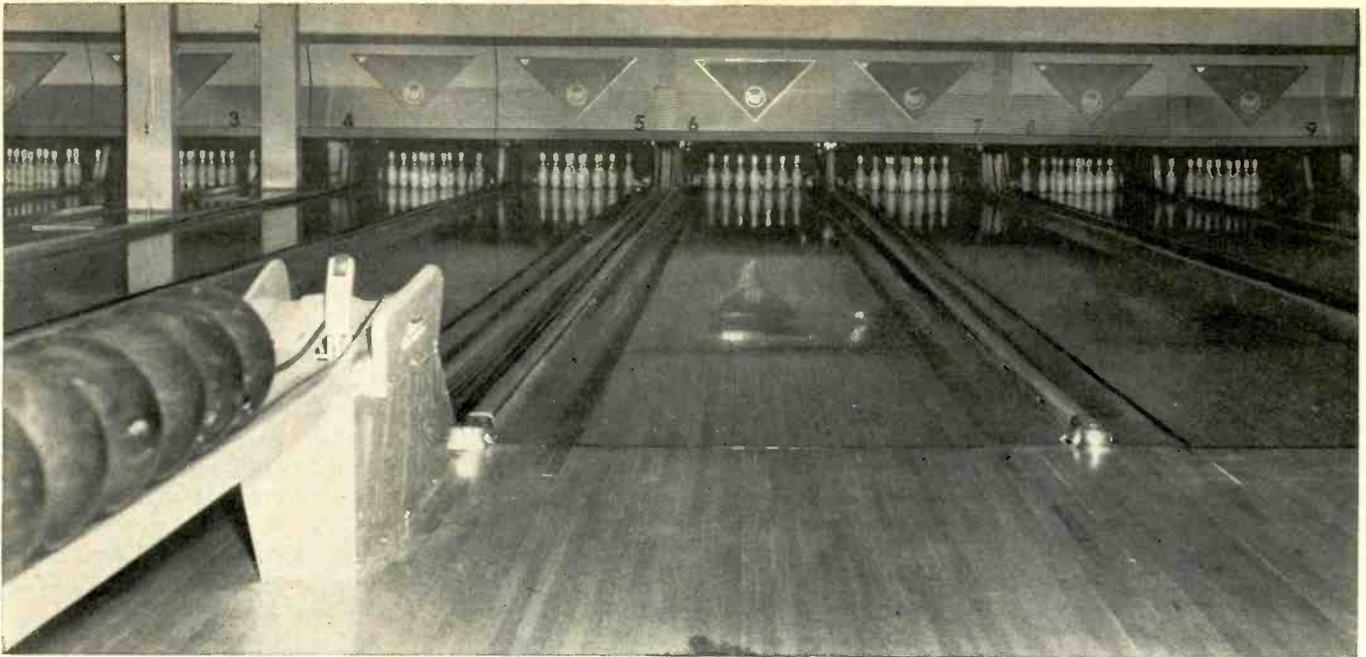


Fig. 1—A small area in a modern automated "bowlarama" where alleys or lanes are equipped with electronic foul detectors. A beam-light and projection lens assembly is mounted at the end of one gutter-rail, and a diffusion lens and photo-electric tube are mounted across the alley

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:

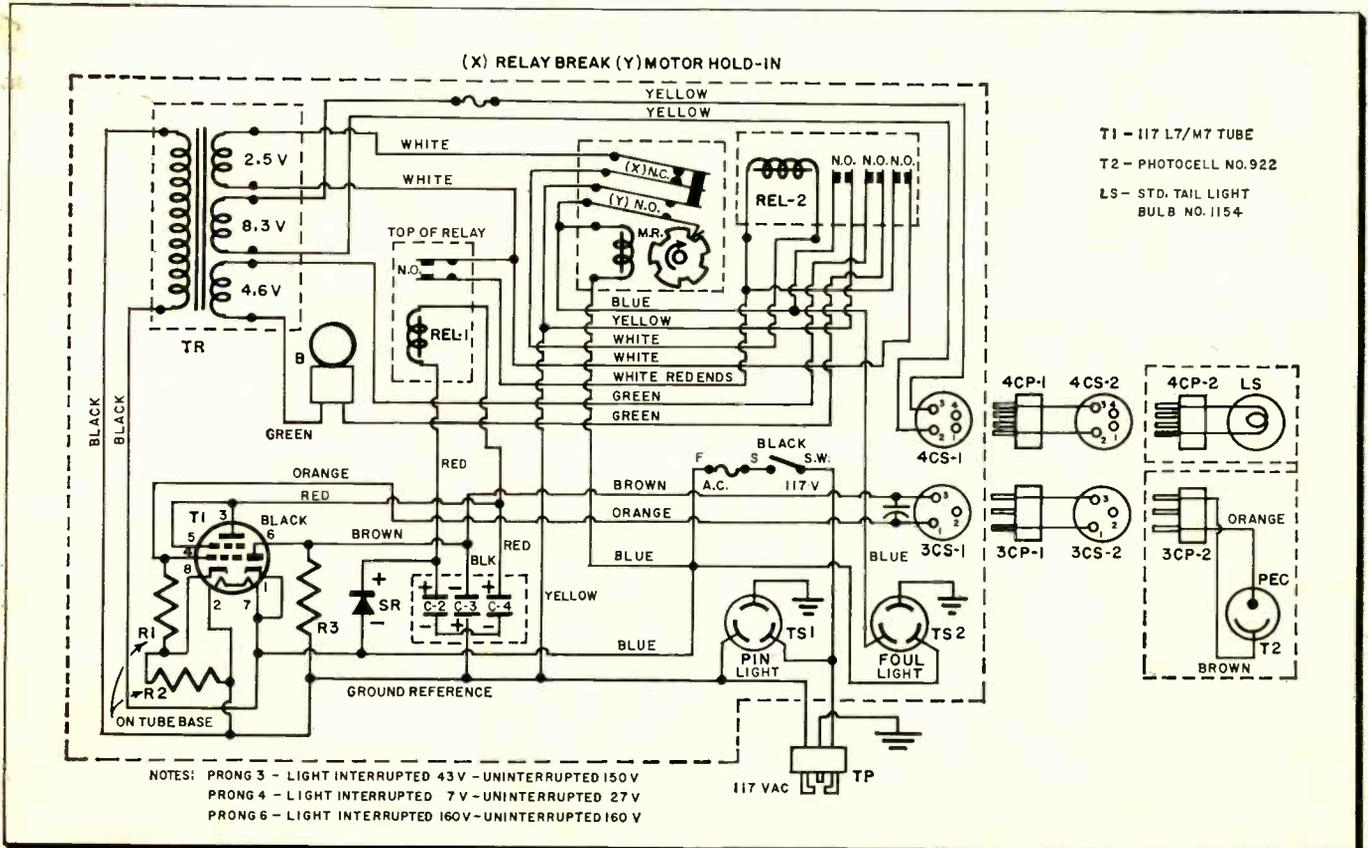
1. Rule a straight pencil line down

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.

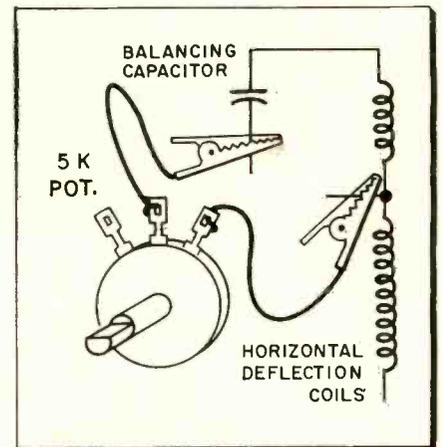
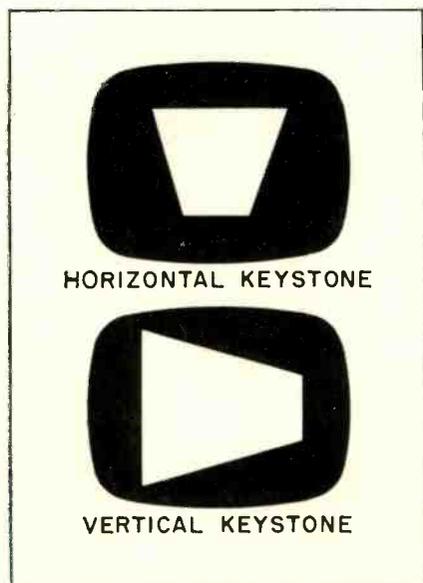


Fig. 2—Balancing the horizontal deflection coils to minimize ringing effect.

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-

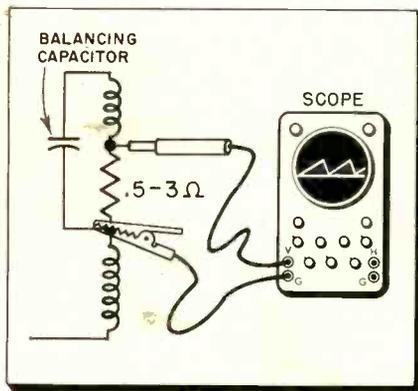


Fig. 3—Inserting resistor in series with horizontal deflection coil enables the technician to observe yoke's current waveform. Procedure is used to detect yoke abnormalities.

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 μf 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-

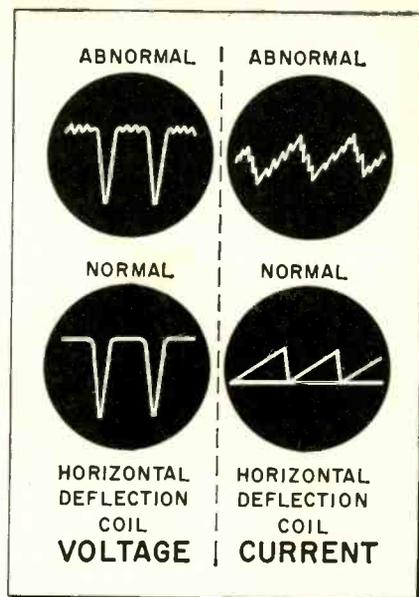
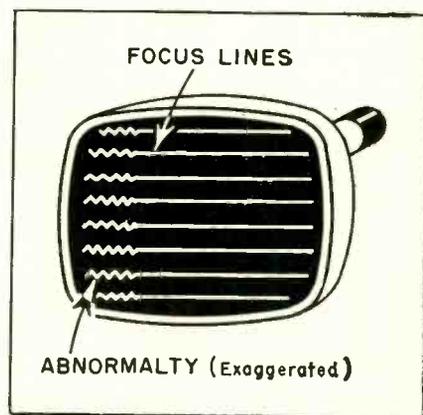


Fig. 4—Waveforms illustrated represent voltage and current traces, both normal and abnormal, as reproduced on an oscilloscope.

ing a wavy accumulation on about 1 to 1½" 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.

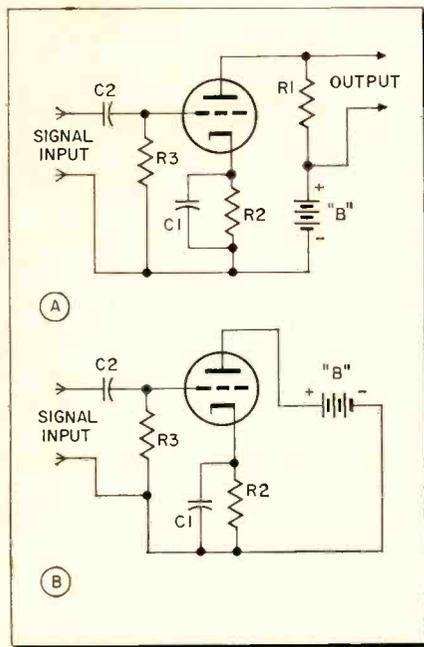
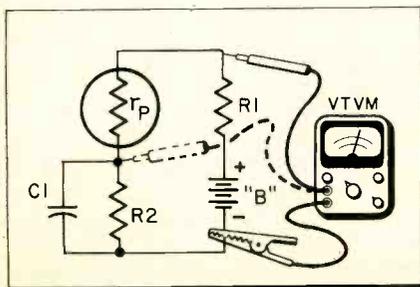


Fig. 1—Two commonly used audio amplifier circuits are shown. (A)—The common cathode amplifier circuit has a high input and output impedance. (B)—The cathode follower has a high input and a low output impedance.

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

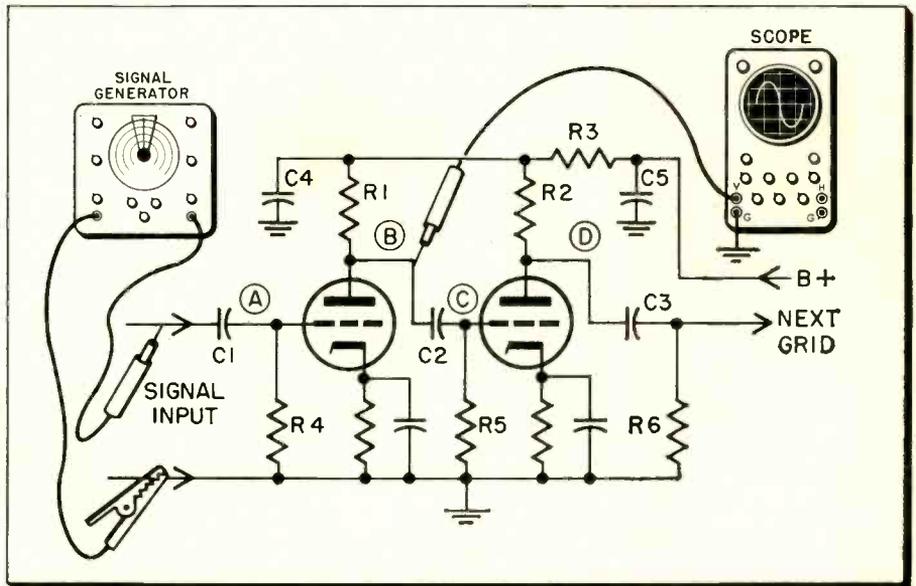


Fig. 3—Low plate voltages in this resistance-capacitance coupled amplifier circuit can be caused by a shorted or leaking grid coupling capacitor. No voltage at a tube's plate is generally caused by an open plate resistor or voltage not being delivered by the power supply.

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.

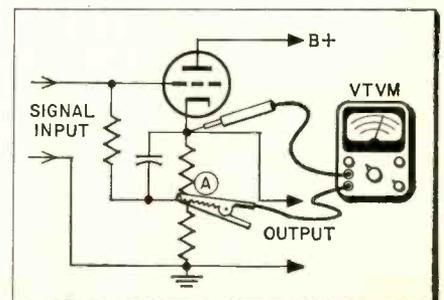
It should be recalled again that a number of tube defects can cause a high plate voltage reading. Poor cathode emission causes an increase in plate resistance and a subsequent decrease in plate current. A shorted or partially shorted

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.



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Component And Transmission Characteristics At UHF

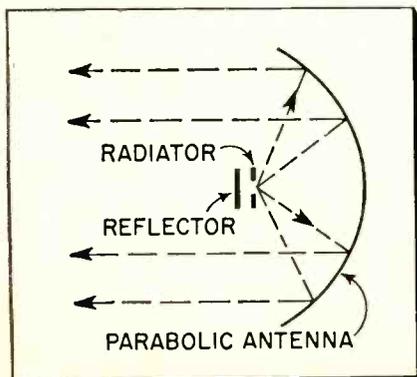
How Industry Is Slowly Licking UHF's Problems

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.

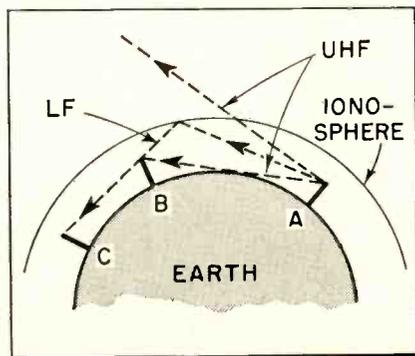
Because of the short propagation range of these radio waves, consistent coverage is usually limited to a line-of-sight distance. Consequently, UHF is well suited for communications covering a restricted range.

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

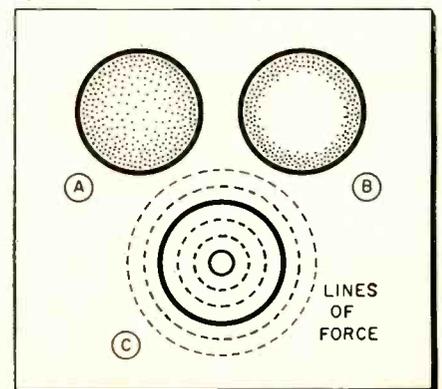
characteristics that were insignificant at lower frequencies. Consequently, the necessity arose for the development of new types of tuned circuits and unconventional components.

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

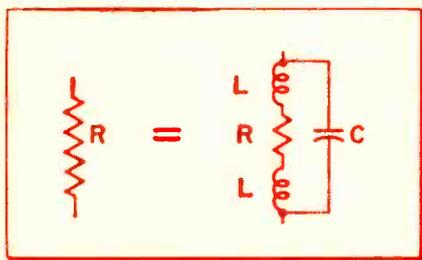


Fig. 4—At UHF frequencies, an ordinary pig-tail lead resistor becomes a circuit having inductance, resistance and capacitance.

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.

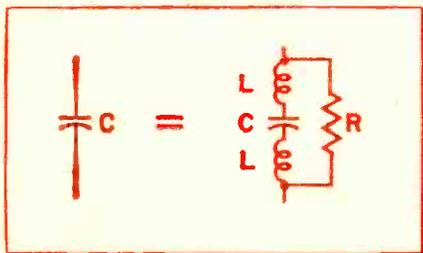
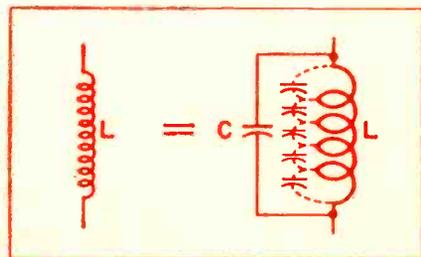


Fig. 6—An in-circuit inductance, with its distributed capacitance, becomes a parallel-tuned circuit at higher UHF frequencies.



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.

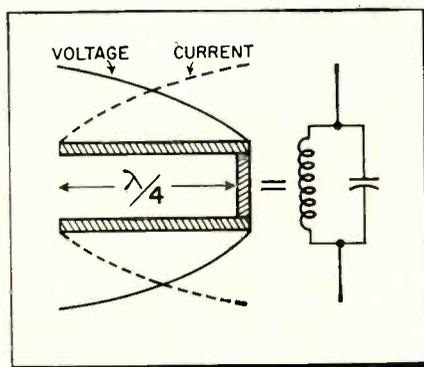


Fig. 7—When cut to exact quarter-wave length of a desired frequency, properly spaced and shorted at one end, two conductors become a parallel-tuned circuit at UHF frequencies.

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. •

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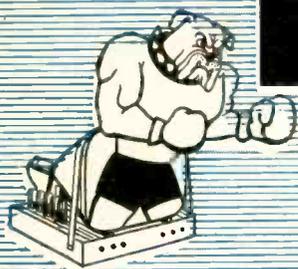
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"Tough Dog"



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

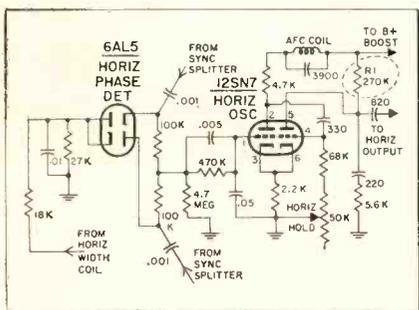


Fig. 1—Horizontal oscillator "take-off" was ultimately traced to the encircled resistor, which had increased in value.

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

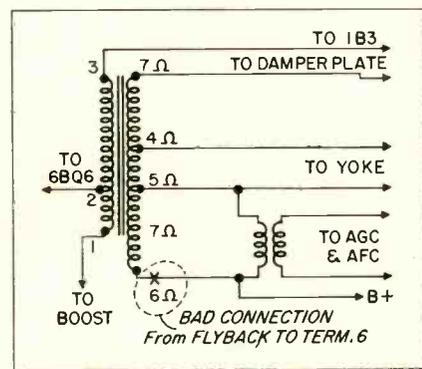


Fig. 2—Poor solder joint at flyback caused the agc pulse to compress and reduced the horizontal width of the set.

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.

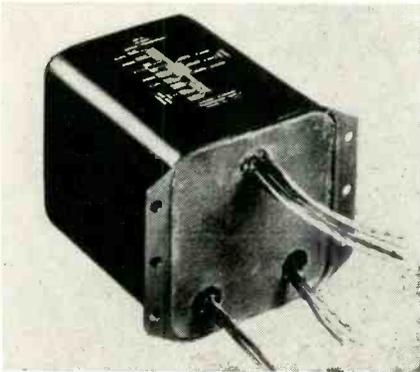
After studying the schematic I decided to check the flyback. Measuring the resistance between terminals 5 & 6 in Fig. 2, revealed a resistance of 500K instead of 0.7 ohm. Close inspection of the flyback revealed the wire coming from the flyback to terminal 6 on the board was poorly soldered. Soldering 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 ± 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

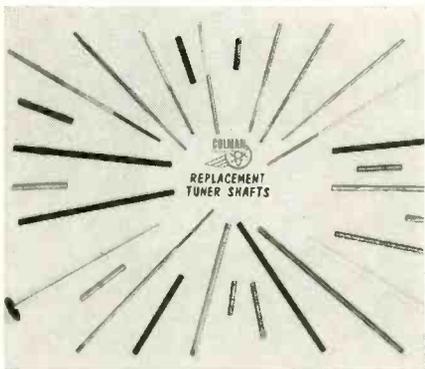
Centralab CONTROLS

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.

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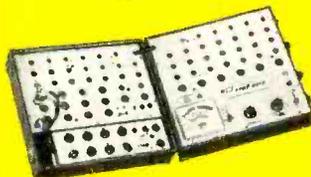
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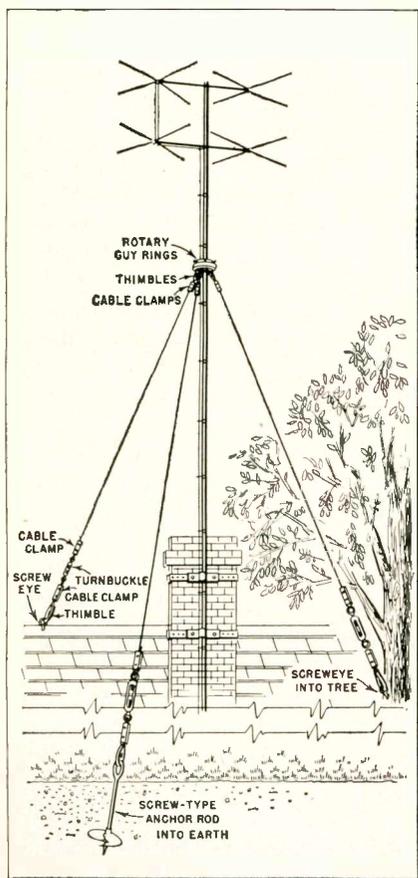
Erecting Fringe-Area TV Antennas

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?"

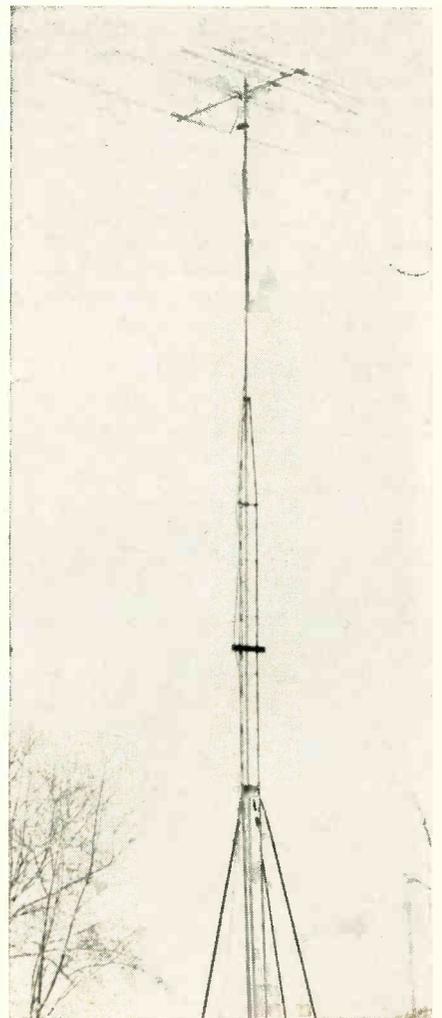
Most fringe-area technicians have been confronted with a customer recently moved from the city to establish neighborly relations with the grass-hoppers, ants and bees. The new suburban arrival just cannot understand why the antenna installation must cost as much as the TV set, or at least, double the 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.



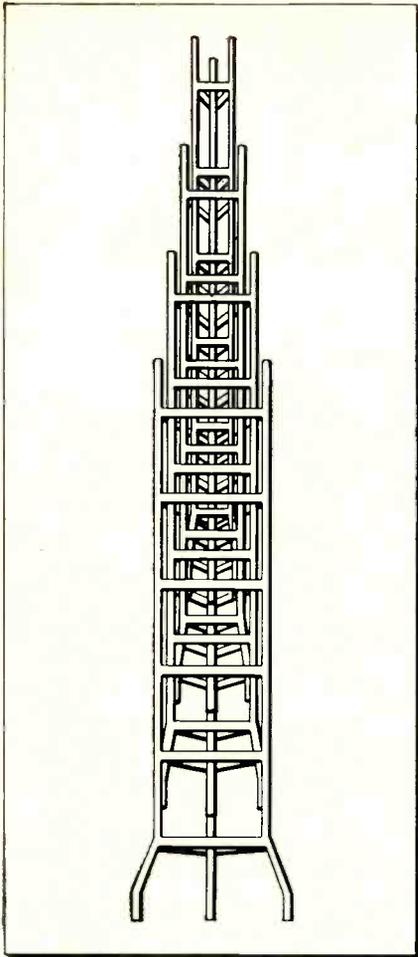


Fig. 3—Telescoping TV antenna towers are quickly and easily installed, and present a minimum of installation hazards.

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.

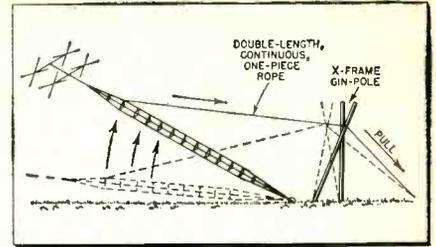
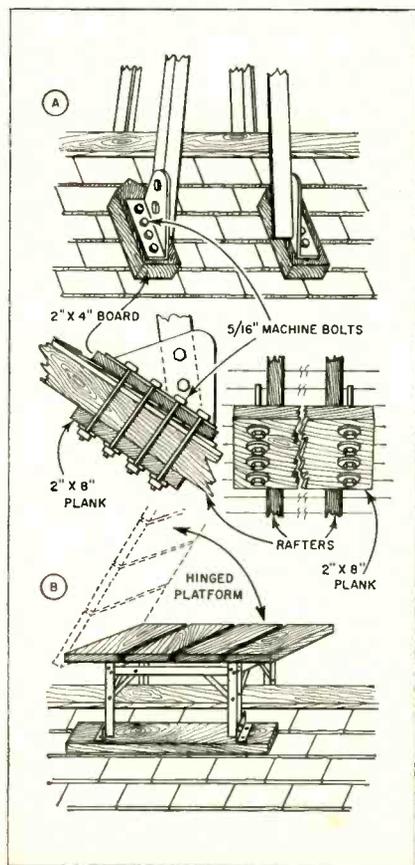


Fig. 5—Sectional type towers mounted at ground level must be assembled and erected with the aid of a gin pole. When mounted on a roof they are generally assembled from the first mounted section upward by climbing the mast.

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

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

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

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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.

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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.

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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.

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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.

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

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

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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.

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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
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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-

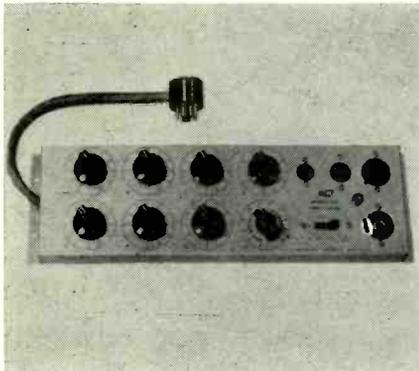


cles to 4.9 mc. Two range vertical sensitivity from 20 mv/inch. Horizontal amplifier response, uniform within 2 db from less than 20 cycles to 200 kc. \$335.00. Jackson Electrical Instrument Co., 124 McDonough St., Dayton, Ohio.

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

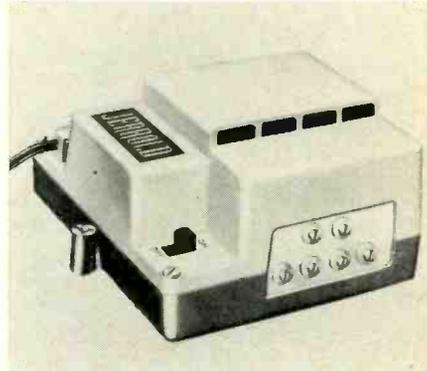


and new tube types used for radio and TV. It also tests thyratrons, voltage regulators, auto radio hybrid tubes, battery radio tubes, European hi-fi tubes, and most industrial tube types. The test panel comes in three types. \$49.95. B&K Mfg. Co., 1801 W. Belle Plaine, Chicago 13, Ill.

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-

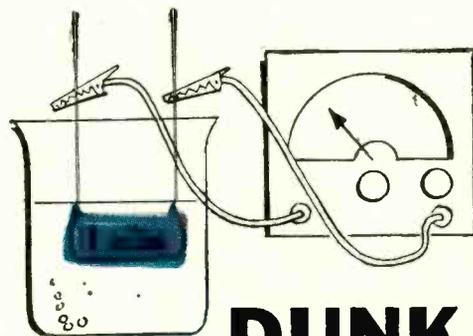


nels from two outputs and unity gain from a third output. Its built-in isolation and match prevent set interaction and ghosting. Input and output impedances of 300 ohms permit the use of twin lead. \$29.95. Jerrold Electronics Corp., 15th & Lehigh Ave., Philadelphia 22, Pa.

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

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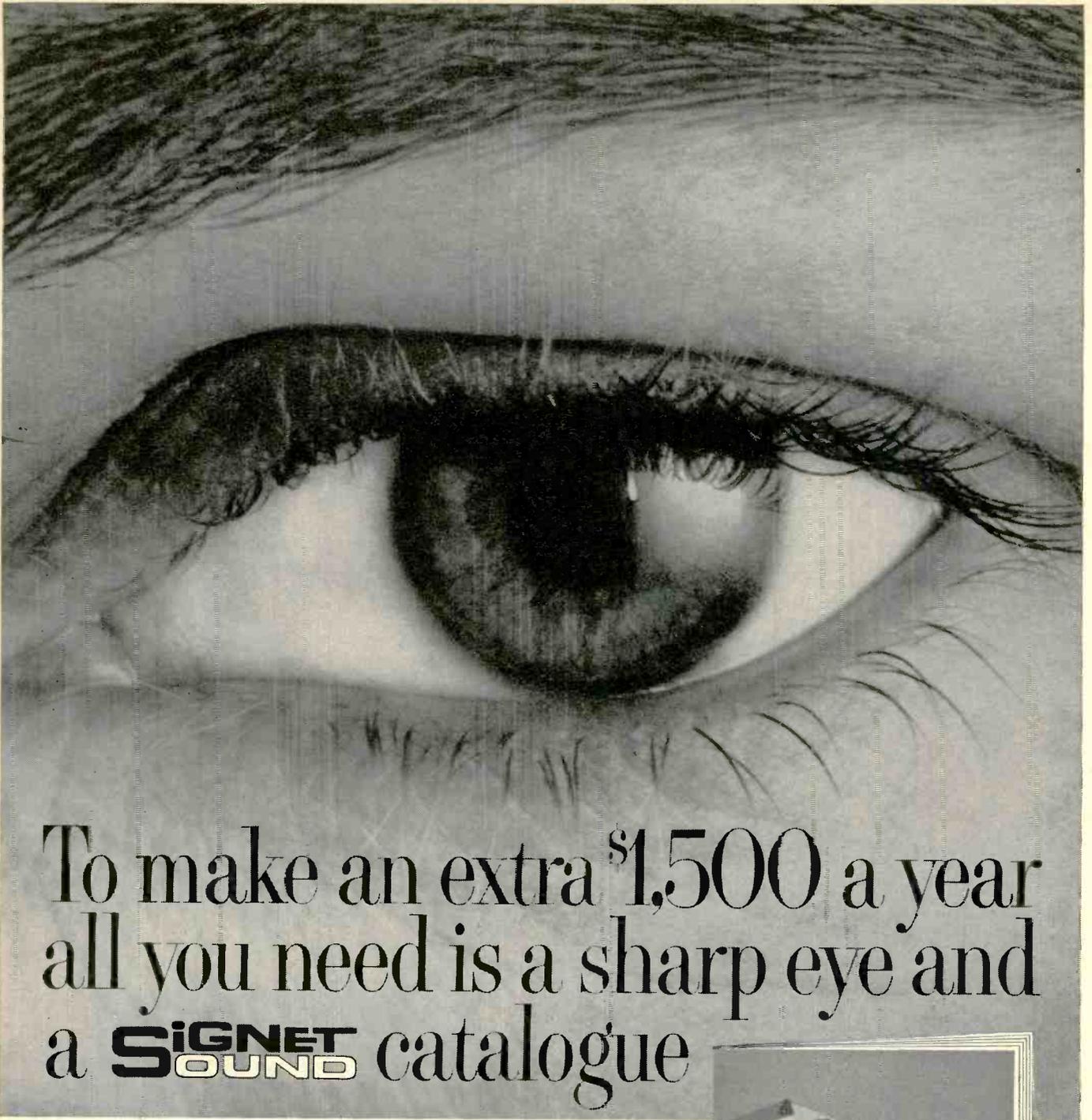
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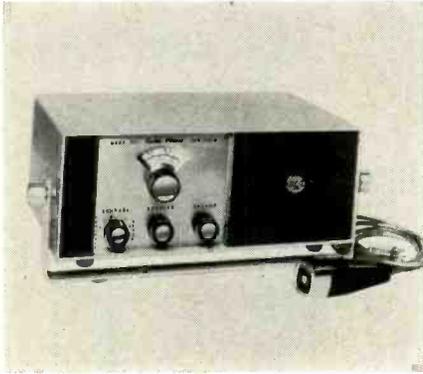


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RCA CB 2-WAY RADIO

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,

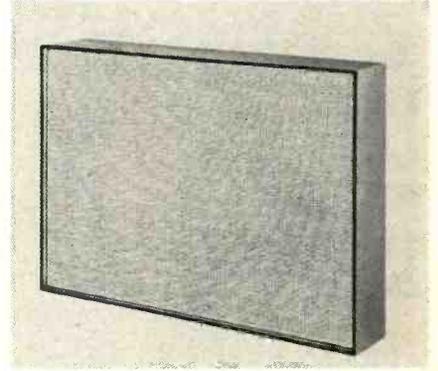


strips wire and crimps solderless terminals. It is also a bolt cutter, shearing five sizes of bolts and machine screws. Length is 8". Handles are covered with plastic insulation grips, ribbed to prevent slipping. Vaco Products Co., 317 E. Ontario St., Chicago 11, Ill.

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

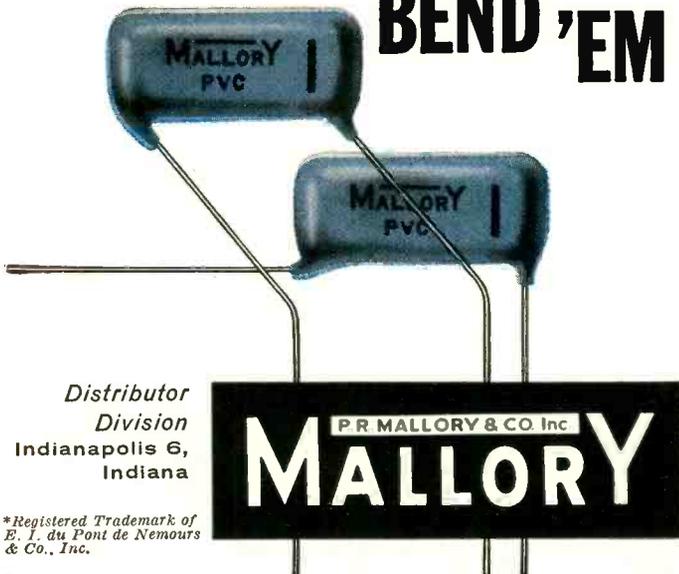


hang with the screw slots and "S" hooks provided. Screw terminals make it easy to connect with no soldering required. Designed for use where space is a problem, it is as thin as the average picture frame. Size, 12"x18"x3". Blonde or mahogany finish. \$32.50. Utah Radio & Electronic Corp., 1124 E. Franklin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

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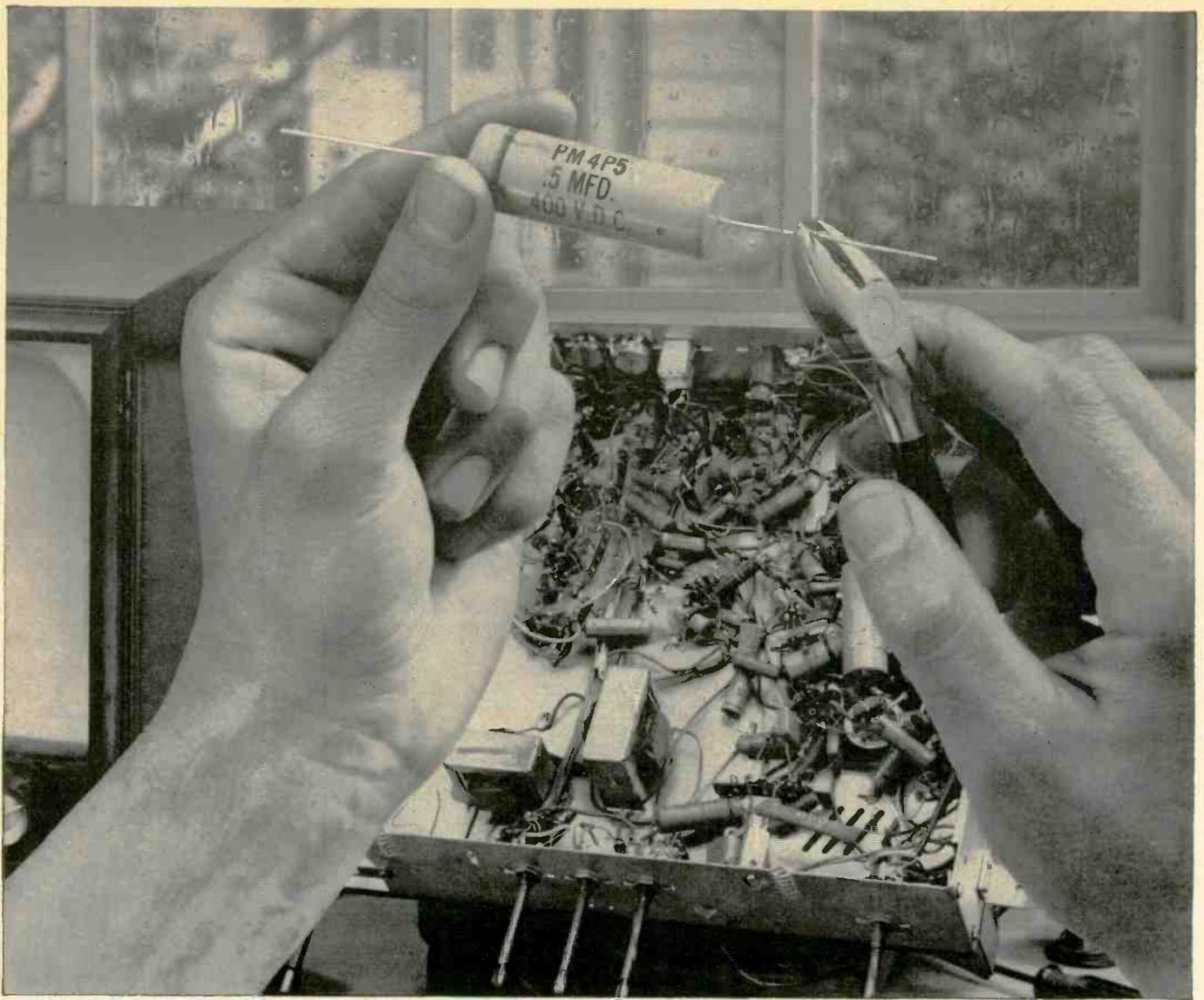
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Ideal for printed circuits, the PVC is test-proved for 105°C operation at double voltage. Popular-priced PVC's are available from Mallory distributors in handy five-packs . . . in a wide range of capacities and ratings of 100, 200, 400 and 600 volts.

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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:

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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.



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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.

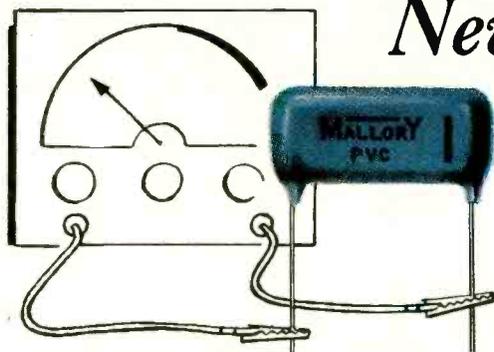
The following is a state-by-state breakdown of TV homes and the percent saturation (TV homes/total homes).

United States		
	Tele- vision Homes	% of all Homes
TOTAL U. S.	45,200,000	87%
NORTH EAST	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
MIDDLE ATLANTIC	9,318,740	92
NEW JERSEY	1,628,530	93
NEW YORK	4,694,940	92
PENNSYLVANIA	2,995,270	92
NORTH CENTRAL	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
NORTH DAKOTA	124,890	73
SOUTH DAKOTA	135,160	68
SOUTH	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)



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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.

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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

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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.

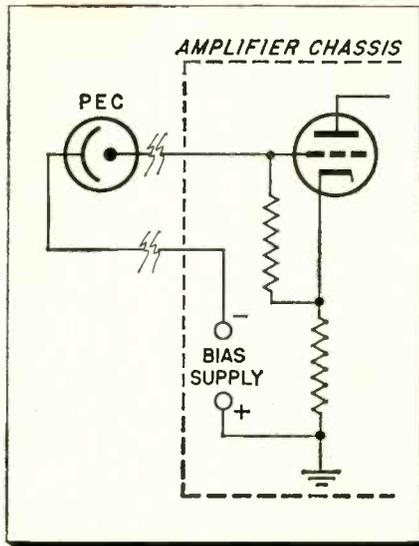


Fig. 4—If a short develops across the paired wiring connecting the PEC to the amplifier, full bias voltage will be placed on the amplifier tube's grid—cutting off the tube.

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

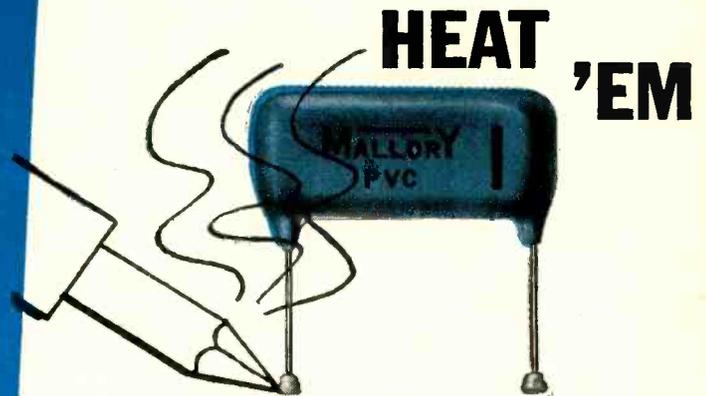
changes at a particular point when erratic operation occurs.

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
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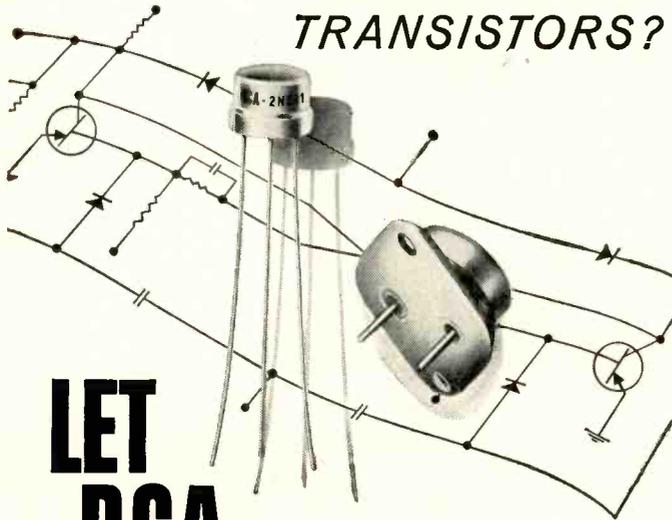
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RCA Victor Company, Ltd., 5581 Royalmount Ave., Montreal 9, Que.

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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
WEST	7,185,860	86
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
CANADA		
(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



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BLONDER-TONGUE TV & FM AMPLIFIERS

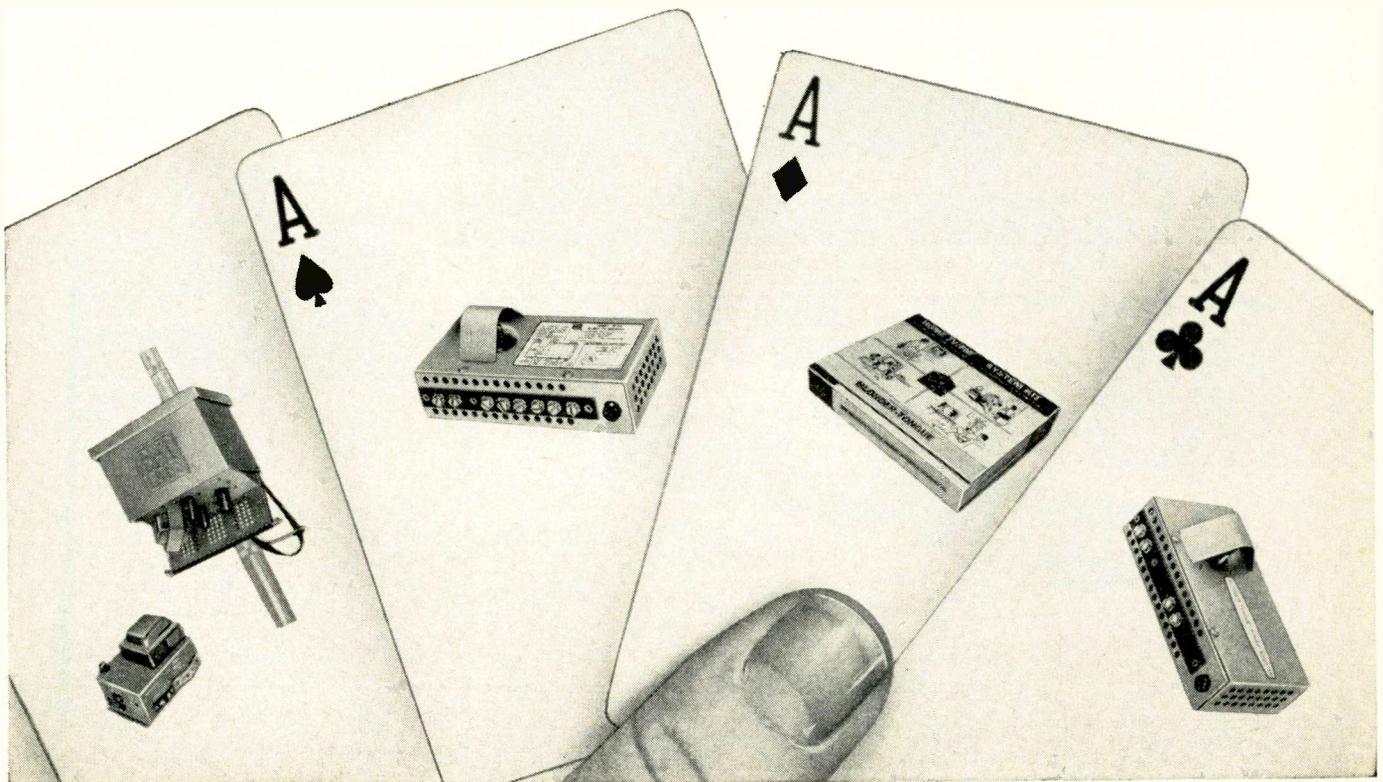
NEW TV/FM ANTENNA AMPLIFIER—MODEL AB-3. No matter how difficult the reception area, this mast-mounted amplifier brings in all TV and FM signals. Provides over 22 db gain on TV and FM band. Simultaneous transmission of TV and FM signals on 75 or 300 ohm cable. Remote operation on either 19 or 117 volts. 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.

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 **BLONDER-TONGUE LABORATORIES, INC., 9 Alling St., Newark 2, New Jersey**
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home TV accessories • UHF converters • master TV systems • industrial TV systems • FM-AM radios



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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.

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The versatile **MULTI-PROBE** Patent Pending
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Can be used with your VTVM, SCOPE or SIGNAL TRACER

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

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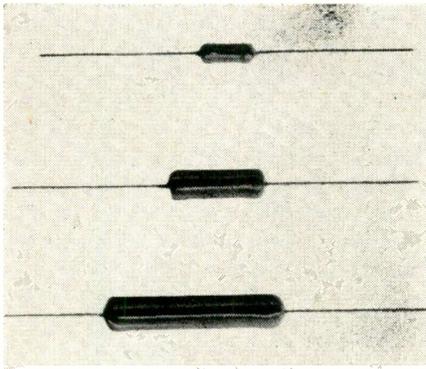
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ClaroStat RESISTORS

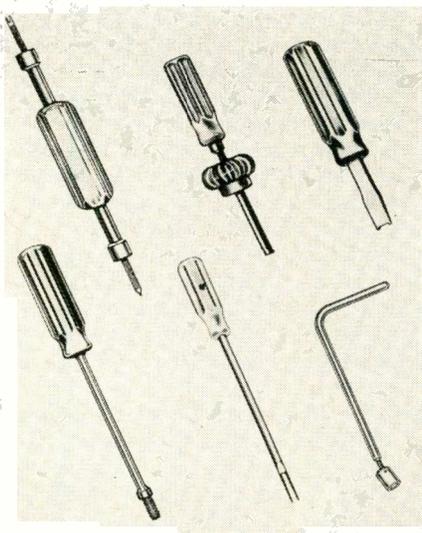
New axial lead vitreous wire-wound resistors, Greenohm "V", are available in three sizes: 3, 5, and 10 watts; and carry type designations of Series VC3D, VC5E and VC10F. The axial lead design is particularly suited to



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.

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Now—24-Hour Tuner Service

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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:

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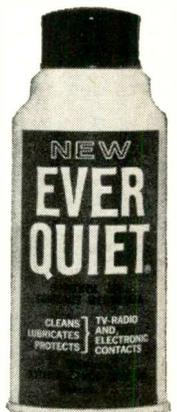
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CHEMICAL ELECTRONIC ENGINEERING, INC. Matawan, New Jersey

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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.

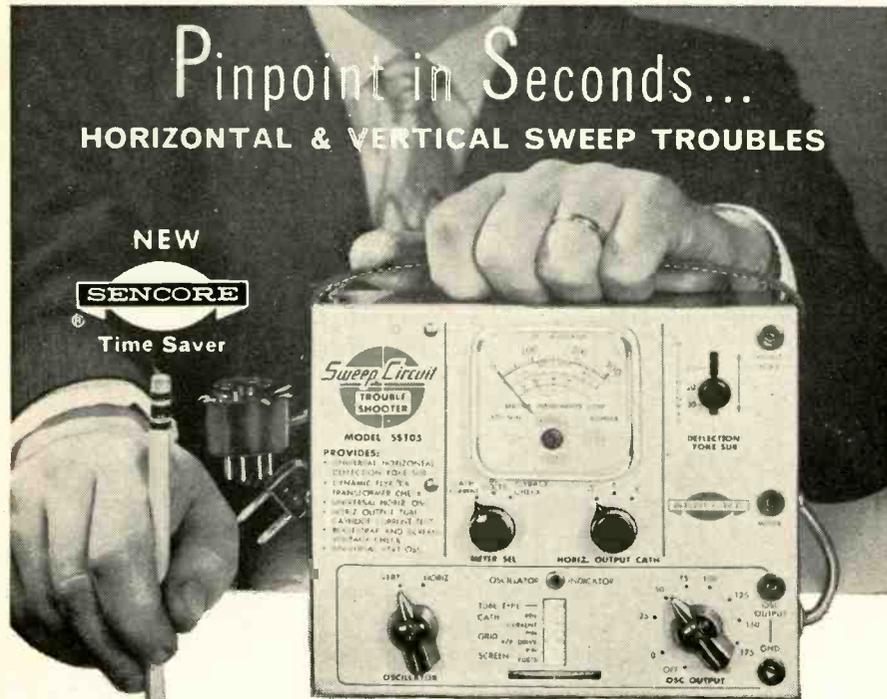
Flutter and/or Wow: Changes in pitch of tones due to relatively small variations in tape speed. Can be caused by faulty mechanism or by "bow-stringing" of tape across heads or tape guides. The only difference between flutter and wow is the rate at which the pitch change takes place. If the rate is below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



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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.

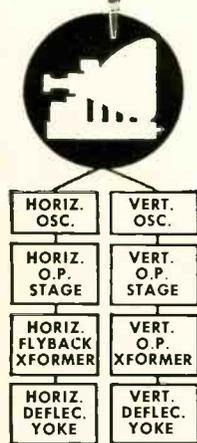
UNIVERSAL DEFLECTION YOKE. A new, simple way to determine yoke failure accurately—without removing yoke from picture tube. Merely disconnect one yoke lead and substitute. If high voltage (also bright vertical line) is restored, TV yoke is defective.

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 42⁹⁵



SENCORE

ADDISON 2, ILLINOIS

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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.

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Check over 1300 tubes for

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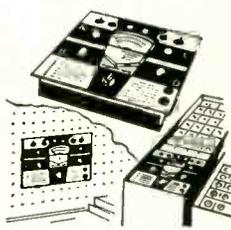
Answers the needs of the fast moving, profit minded serviceman who hates time consuming call backs. A "mite" to carry but a whale of a performer that spots bad tubes missed by large mutual conductance testers.

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 \$59⁵⁰

• 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".

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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.

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Effective Dec. 1, 1960, prices will go up about 8¢ per copy (or less for 2 & 3 year subscribers), which is a modest increase.

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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.

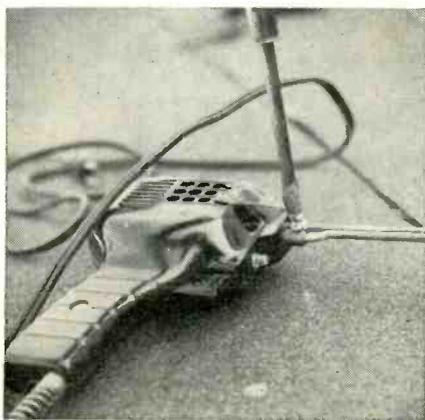


Fig. 1—Keeping screws (or lock nuts) tight will solve most slow and poor-heating tip problems on solder guns.

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

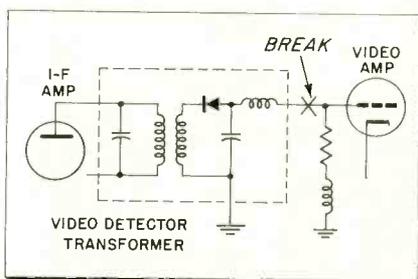


Fig. 2—Front-to-back ratio of video detector diodes can be measured with a VOM without unsoldering the diode. Circuit to video amplifier input is clipped at point "X."

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.

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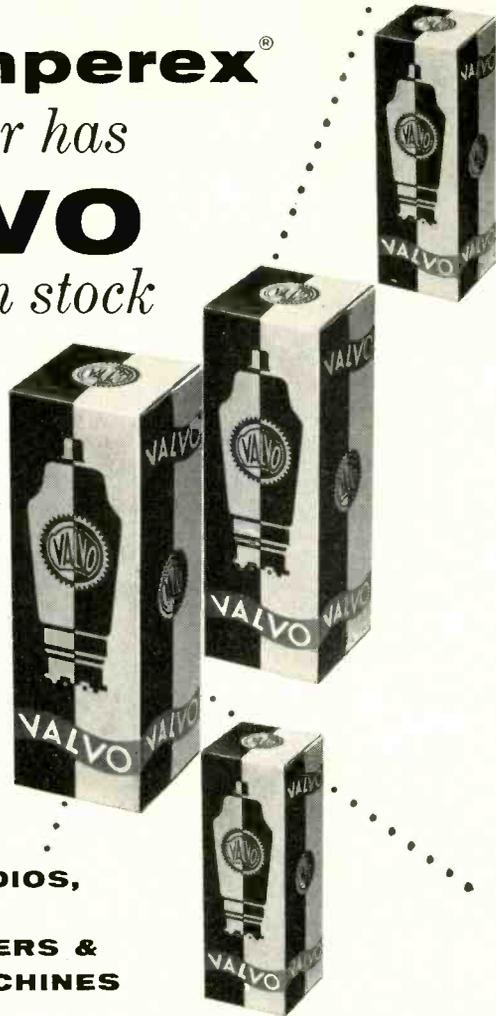
Model MH-1 MULTI-HEAD \$12.45 Net

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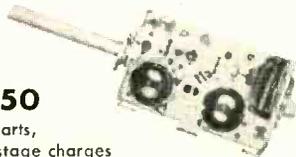
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NRI TESTER

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 μ f to 1500 μ 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

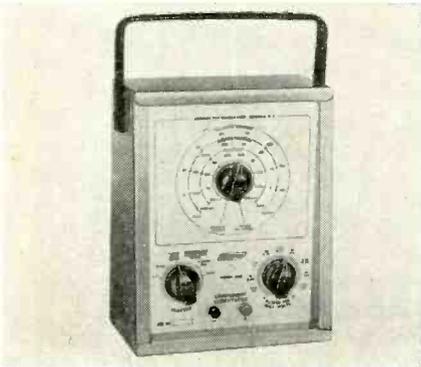


is in checking for defective capacitors in printed circuits. Indicator light tells the story. Unit can be used as bias supply, and in continuity tests. Elgin International, 1410 Broadway, New York, N. Y.

For more data, circle 11-66-4 on coupon, p. 50

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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 μ f to .5 μ f; 10



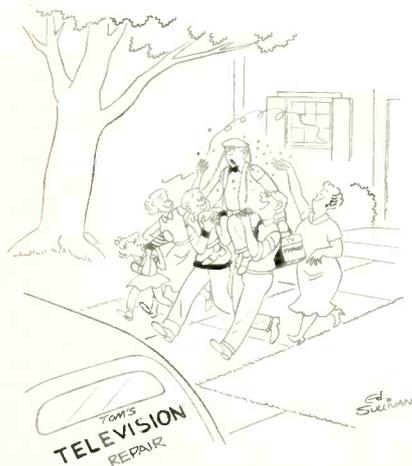
values of electrolytics from 4 μ fd to 330 μ fd; power rectifiers up to 55 ma; crystal diodes; power resistance, continuously variable up to 5000 ohms; and bias voltages, continuously variable up to 15v either polarity. \$29.95. Mercury Electronics Corp., 77 Searing Ave., Mineola, N. Y.

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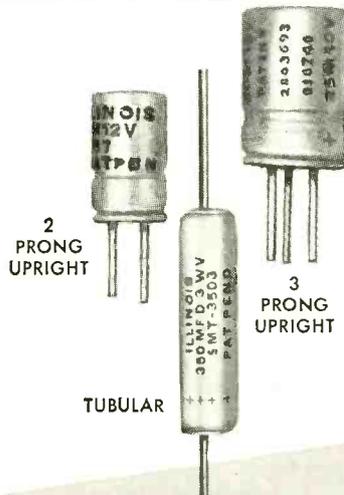
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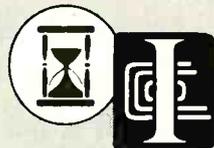
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68

**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.

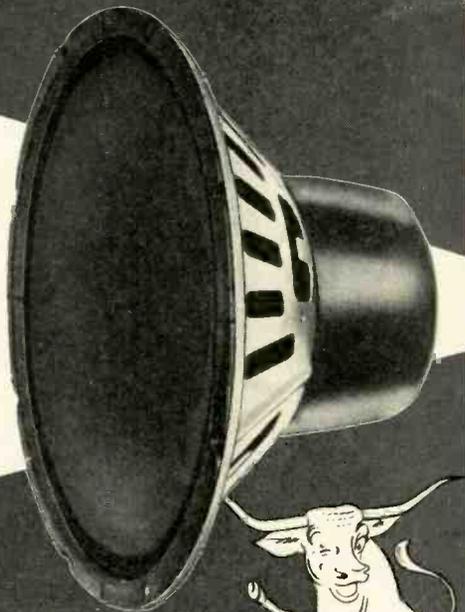
Indiana

ESTA, Henry County, reports their members voted "yes" for affiliation with IESA. The Indiana state organization welcomed ESTA which serves the New Castle area.

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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.



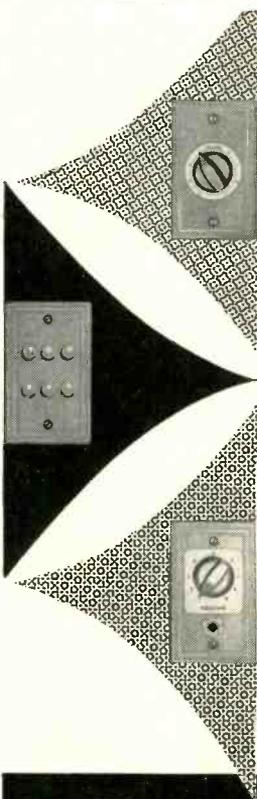
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Audio Amplifier

(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

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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

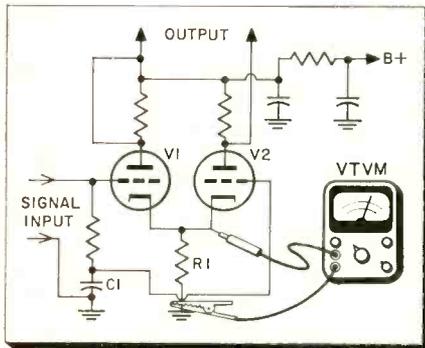


Fig. 5—Accurate voltage measurements are essential in troubleshooting a grounded grid cathode-coupled phase inverter.

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

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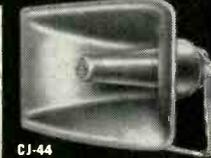
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IMPEDANCE**	8 ohm	8 ohm	8 ohm	8 ohm	8 ohm	16 ohms	8 ohm	8 ohm	8 ohm	8 ohm
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the two cathode resistors multiplied by the grid resistor. An extremely high impedance probe is required to measure or signal 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. •

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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

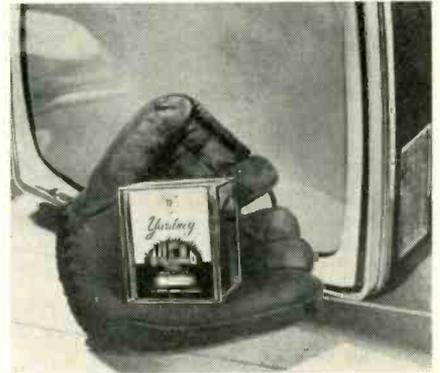


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New Books

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.

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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.

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1T4	5Y3	6BK7	6SQ7	12XZ7
1U4	6AB4	6BL7GT	6SR7	12B4
1U5	6AF4	6BN6	6T4	12BA6
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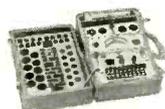
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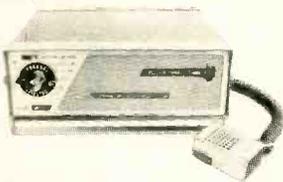
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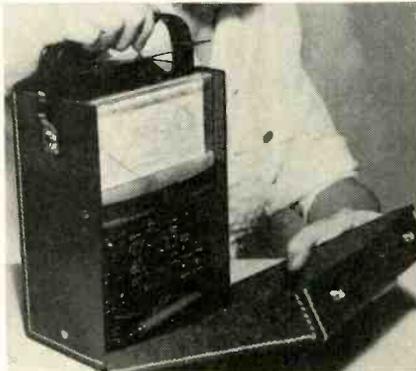
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Model UVS-100 bantam size voltage regulated power supply, for powering solid state equipment, is transistor and zener diode regulated and measures 4.75"x4.5"x6.25". It provides 4v to 36v at 500 ma. Regulation, better than 1%



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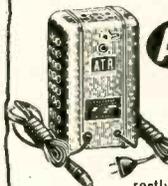
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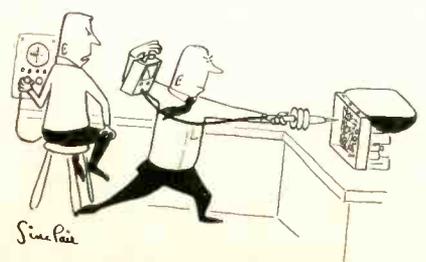
Rembrandt ELIMINATOR

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.

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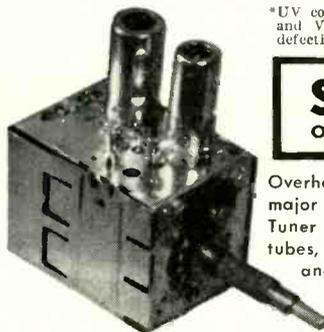
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VHF Tuner
UHF Tuner
UV Combination*

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*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

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WRITE FOR SPECIAL QUANTITY RATES AND DISCOUNTS

Castle TV Tuner Service, Inc.

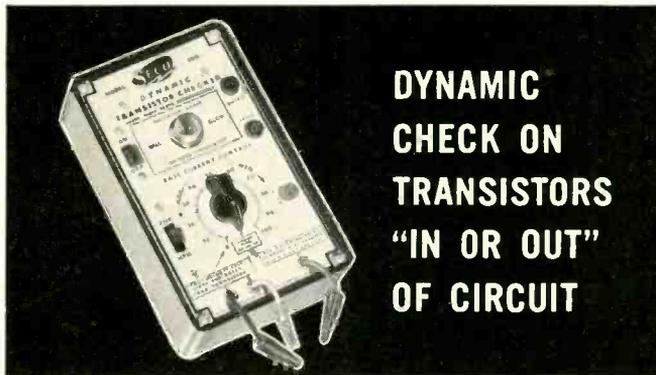
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CHICAGO 45, ILL.

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.

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"IN OR OUT"
OF CIRCUIT**

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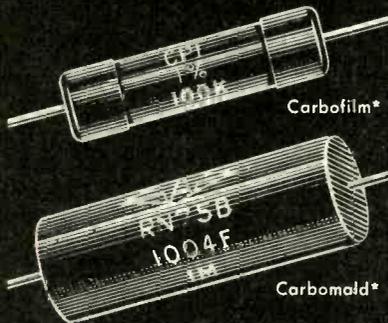


SECO ELECTRONICS, INC.
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EAST CANADA: Daveco Agencies, Ltd., Montreal, Quebec
WEST CANADA: Ron Merritt Co., Vancouver 1, B.C.

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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:

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CP- $\frac{1}{2}$ watt	0.2300 x $\frac{1}{4}$ "L	5,100,000	7.5
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AEROVOX CORPORATION
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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.

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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.

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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
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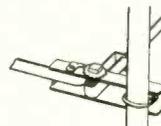
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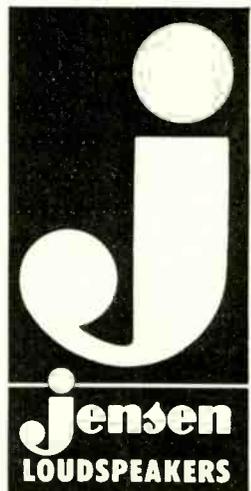
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80 (100 pages in this issue, including Circuit Digests)

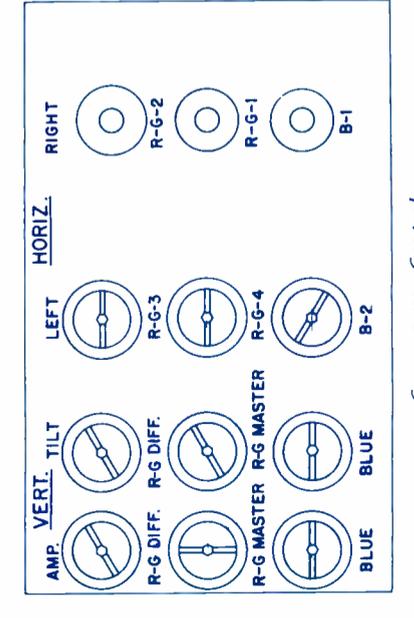
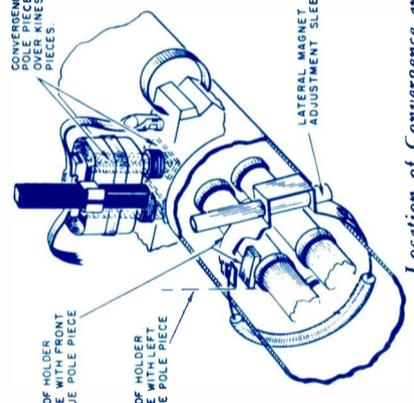
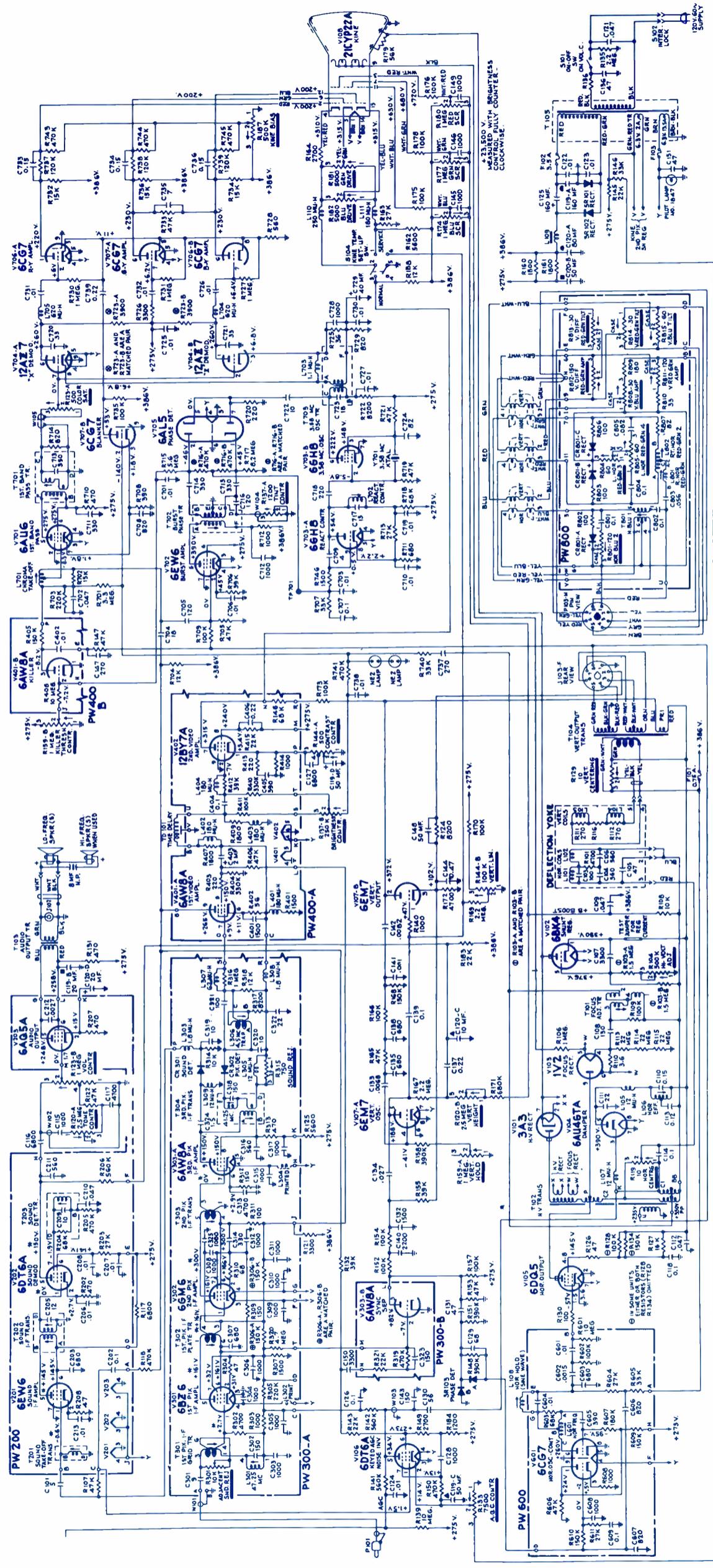
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More Data on Reverse Side

Electronic Technician
CIRCUIT DIGEST 595

Location of Convergence and Lateral Beam Magnets

Convergence Controls

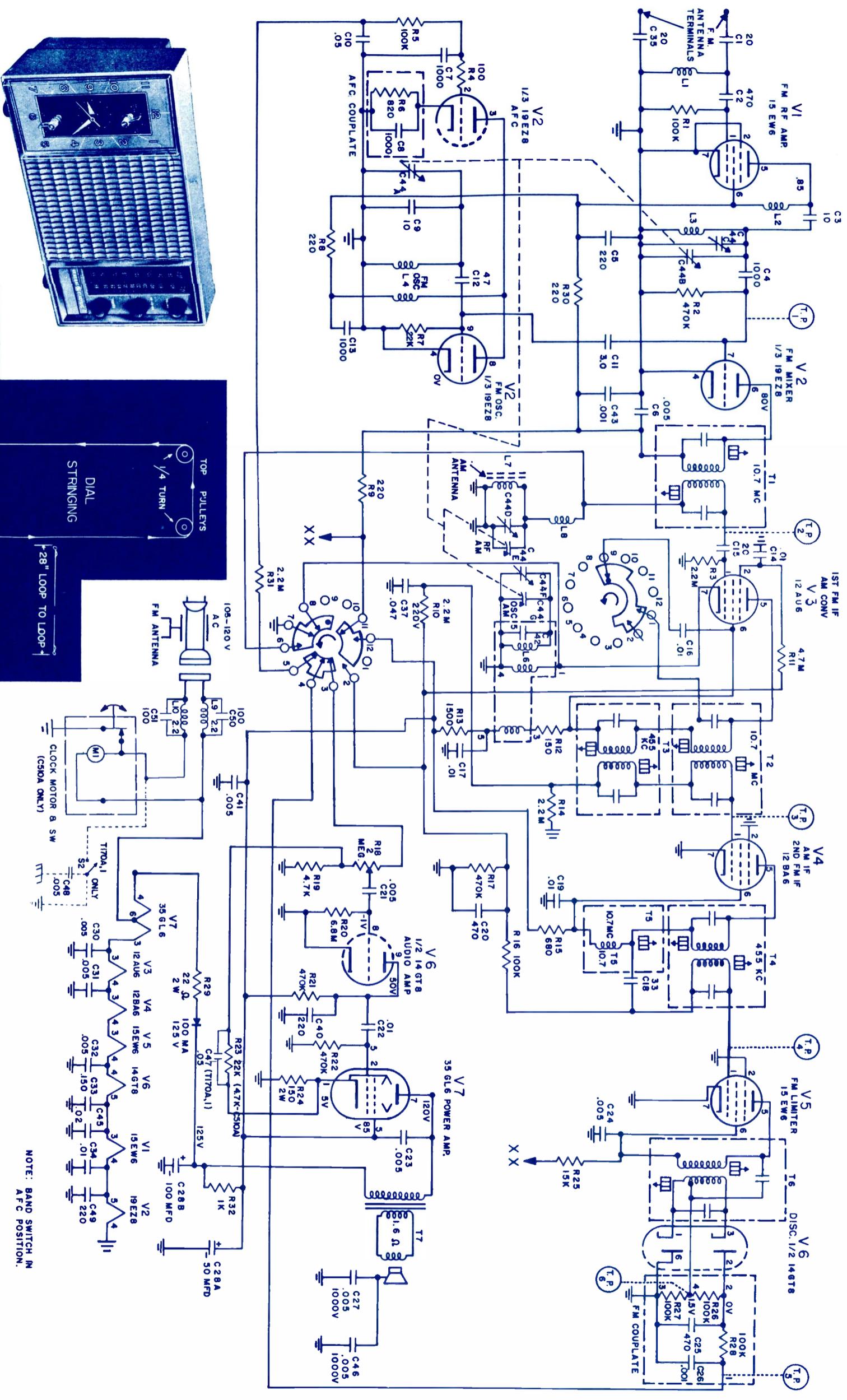
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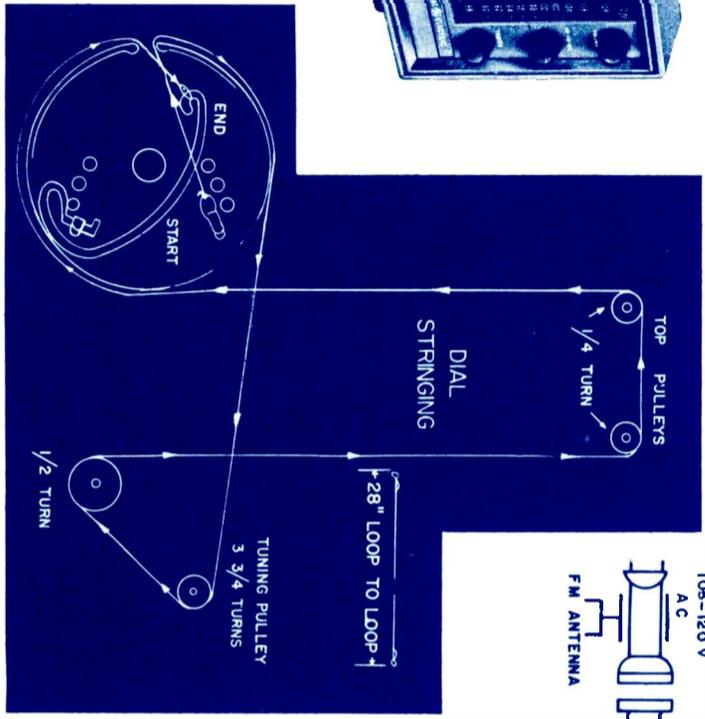
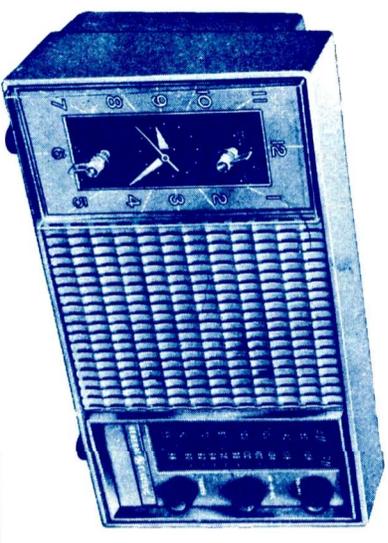
CIRCUIT DIGEST

GENERAL ELECTRIC
AM-FM Radio
Model C510A

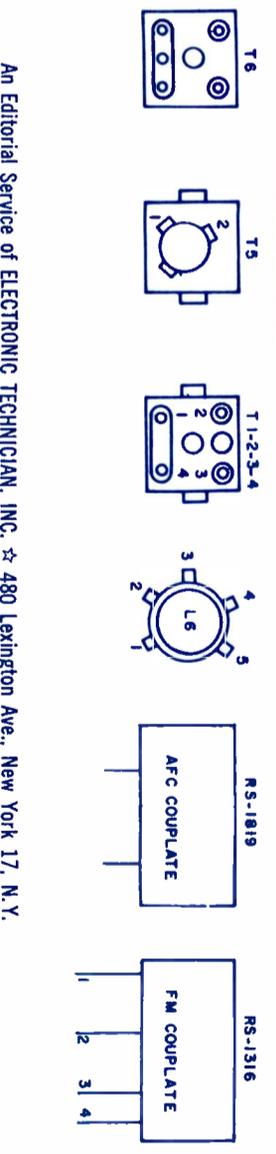
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CIRCUIT 596
DIGEST



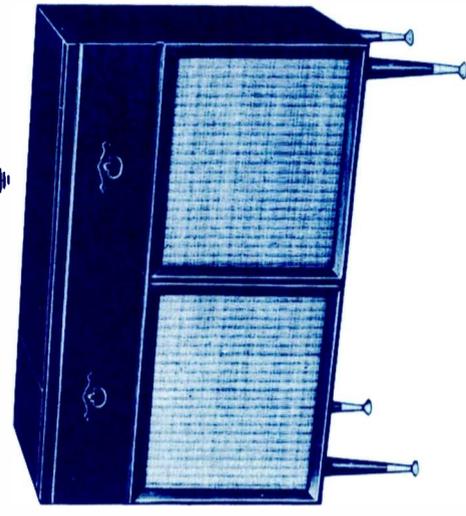
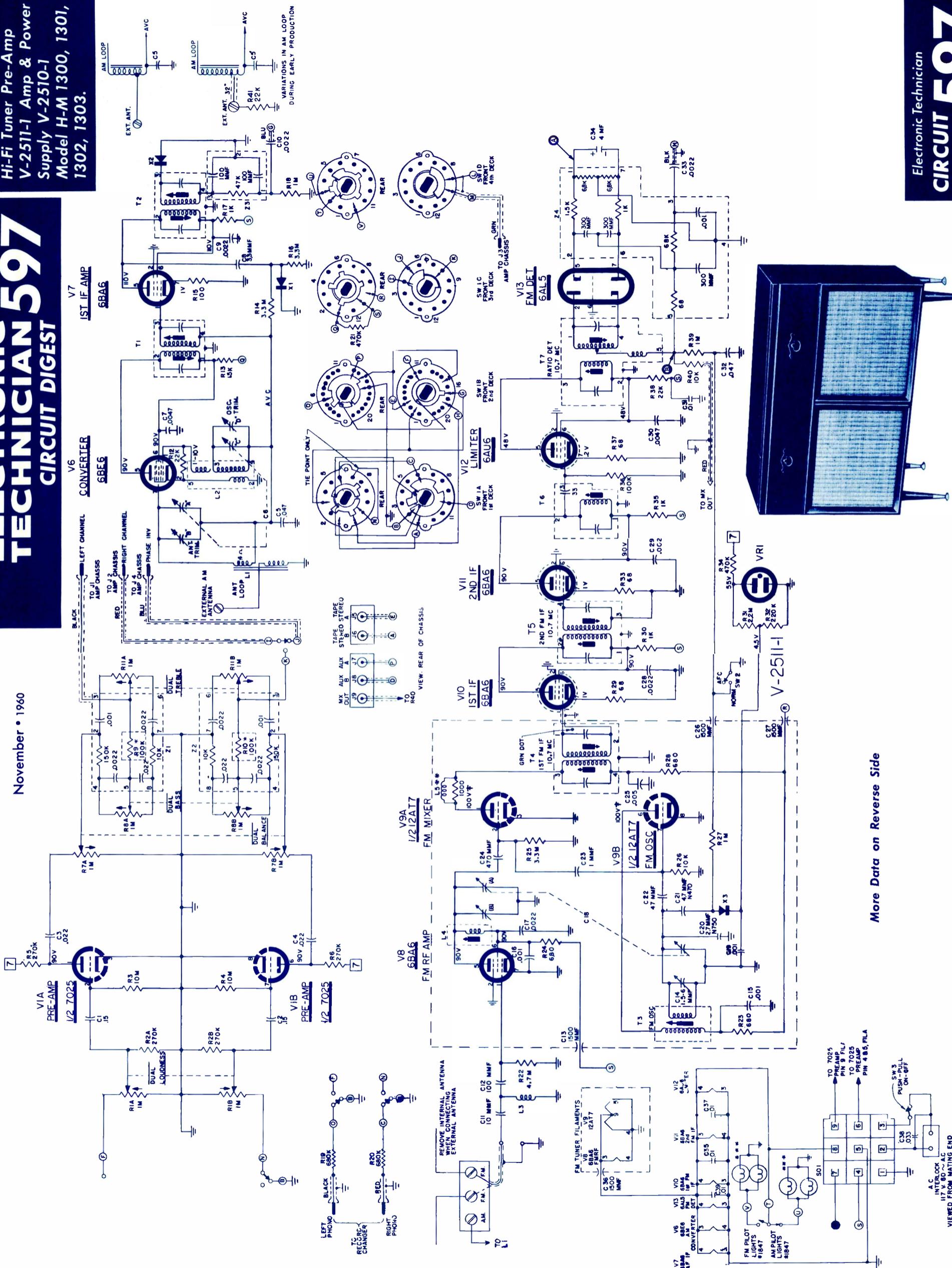
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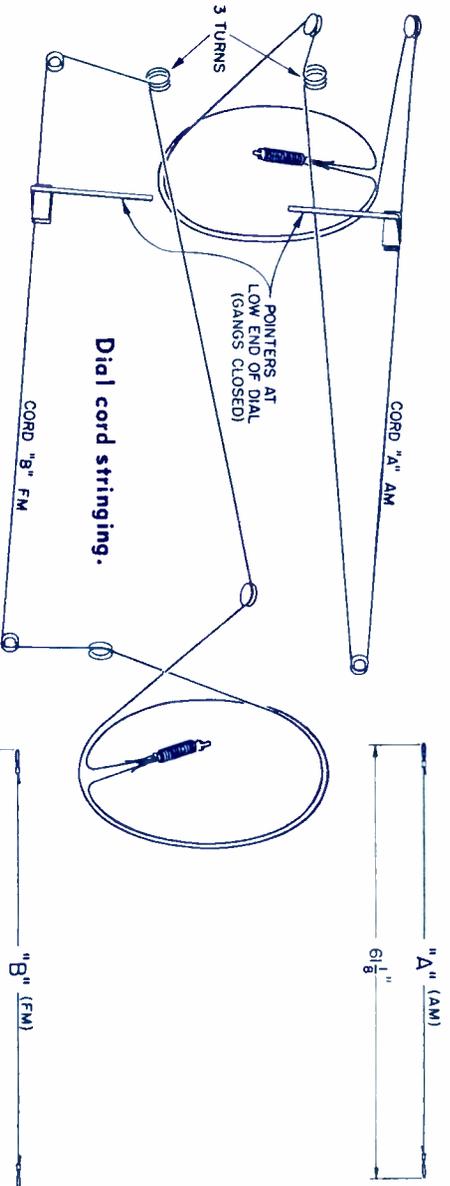
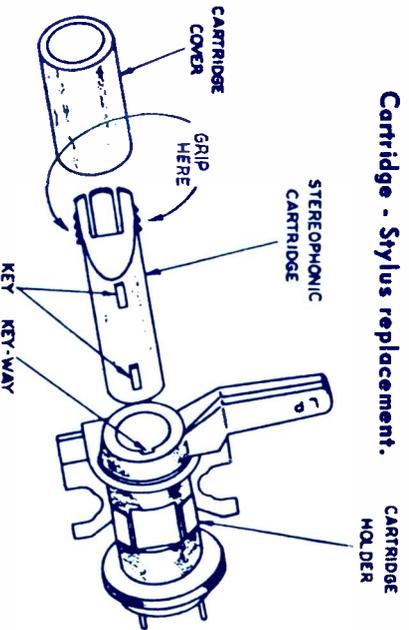
NOTE: BAND SWITCH IN AFC POSITION.

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WESTINGHOUSE
 Hi-Fi Tuner Pre-Amp
 V-2511-1 Amp & Power
 Supply V-2510-1
 Model H-M 1300, 1301,
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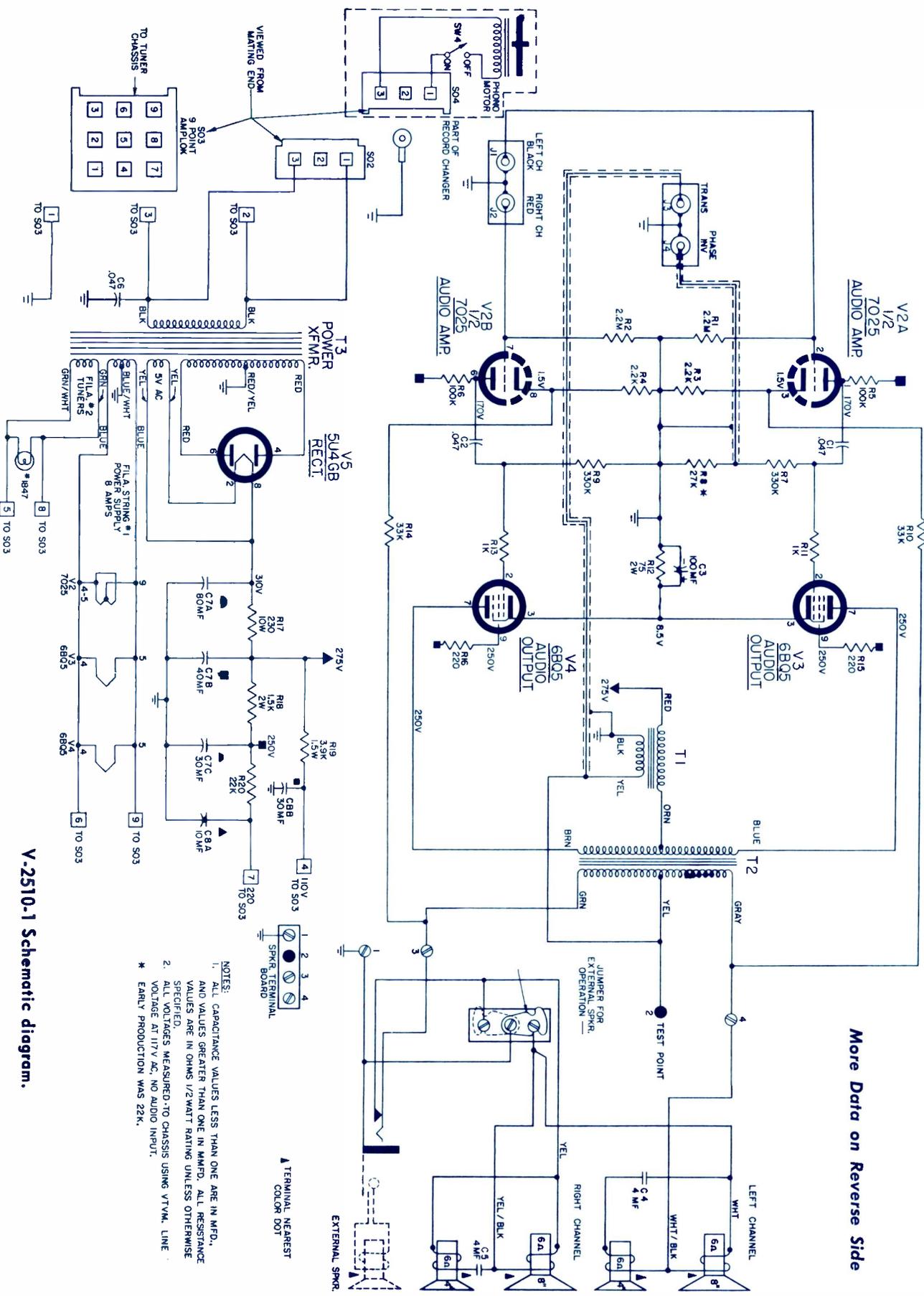
More Data on Reverse Side



Cartridge - Stylus replacement.

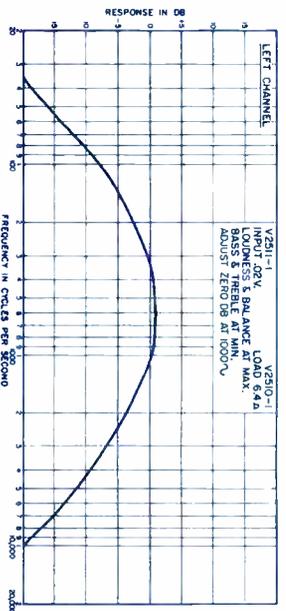
Dial cord stringing.

More Data on Reverse Side

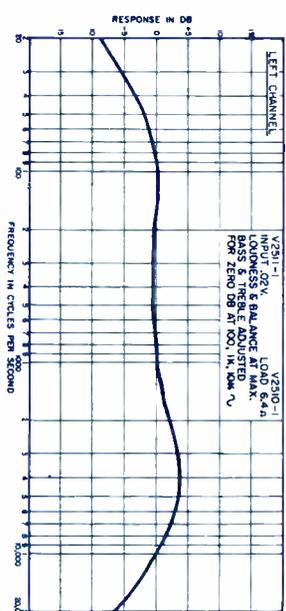


- NOTES:
1. ALL CAPACITANCE VALUES LESS THAN ONE ARE IN MFD., AND VALUES GREATER THAN ONE IN MMFD. ALL RESISTANCE VALUES ARE IN OHMS UNLESS OTHERWISE SPECIFIED.
 2. ALL VOLTAGES MEASURED TO CHASSIS USING VTVM. LINE VOLTAGE AT 117V AC. NO AUDIO INPUT.
- * EARLY PRODUCTION WAS 22K.

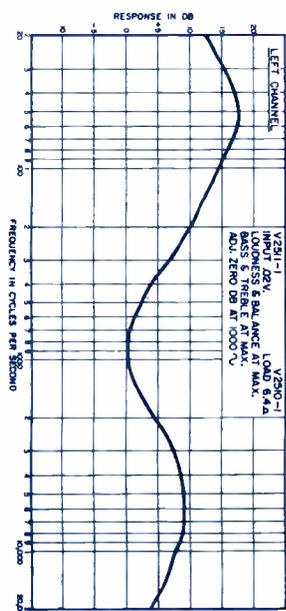
V-2510-1 Schematic diagram.



Frequency response curve.

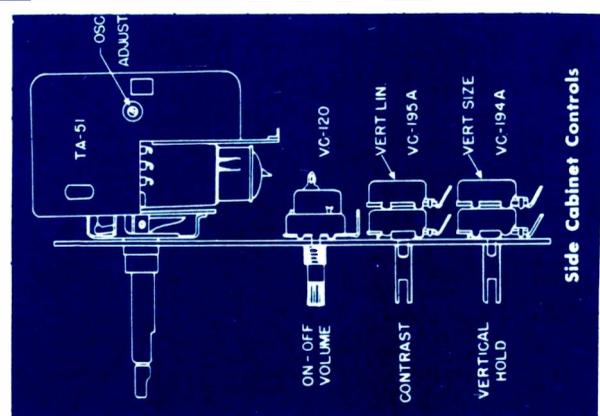
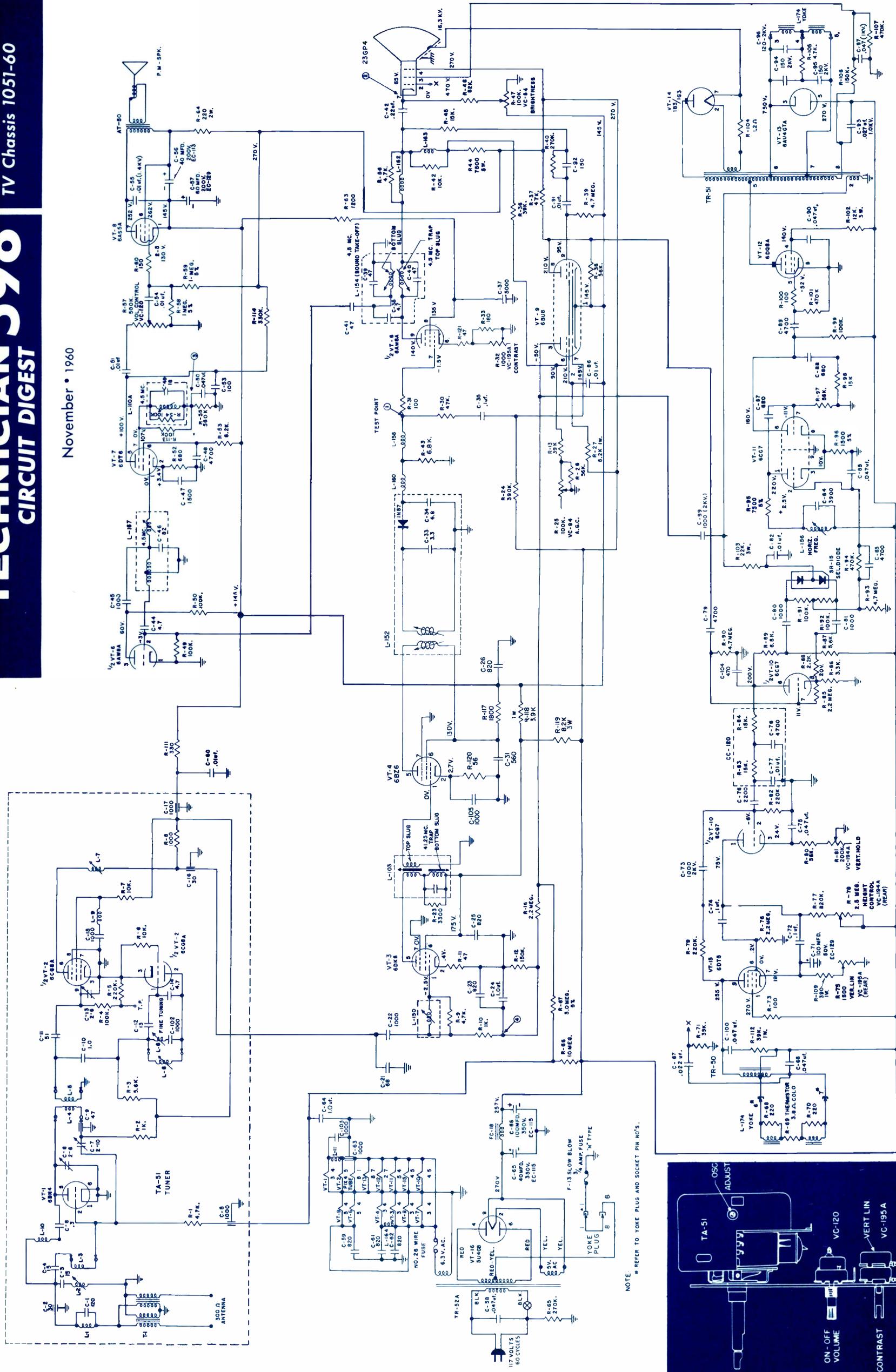


Frequency response curve.



Frequency response curve.

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NOTE: * REFER TO YOKE PLUG AND SOCKET NUMBERS.

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**NEW SYLVANIA 1G3/1B3 HAS
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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.

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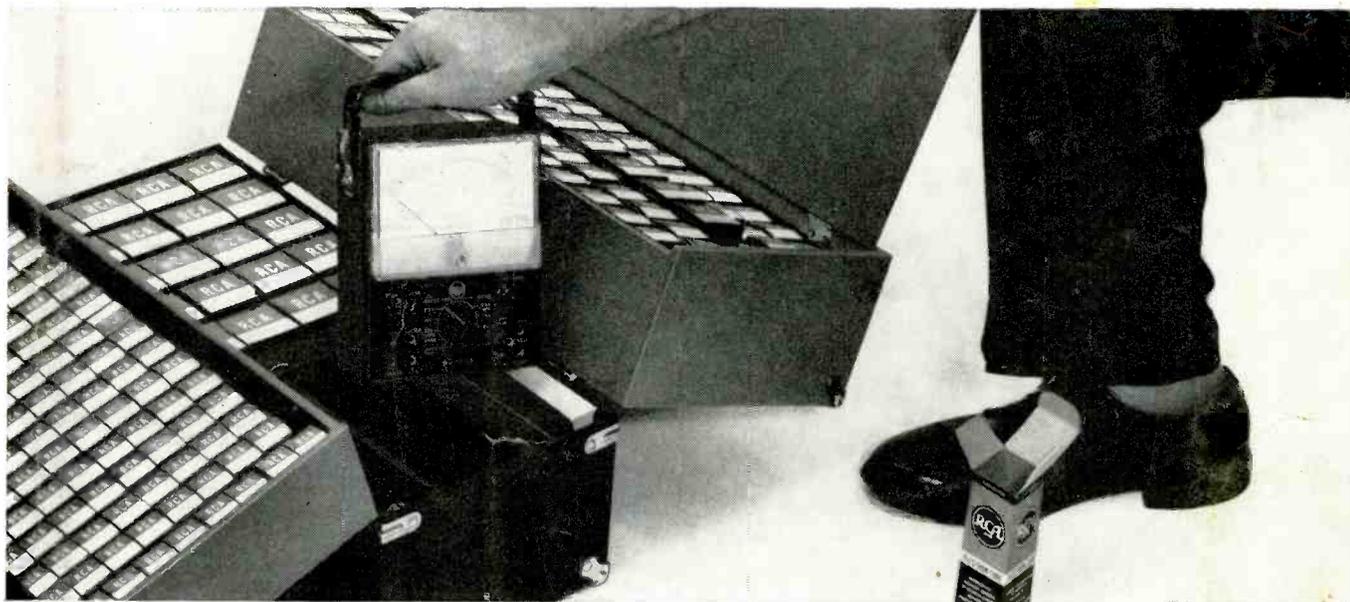




FRONT PAGE NEWS

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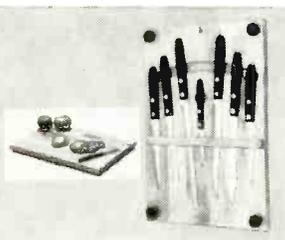
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