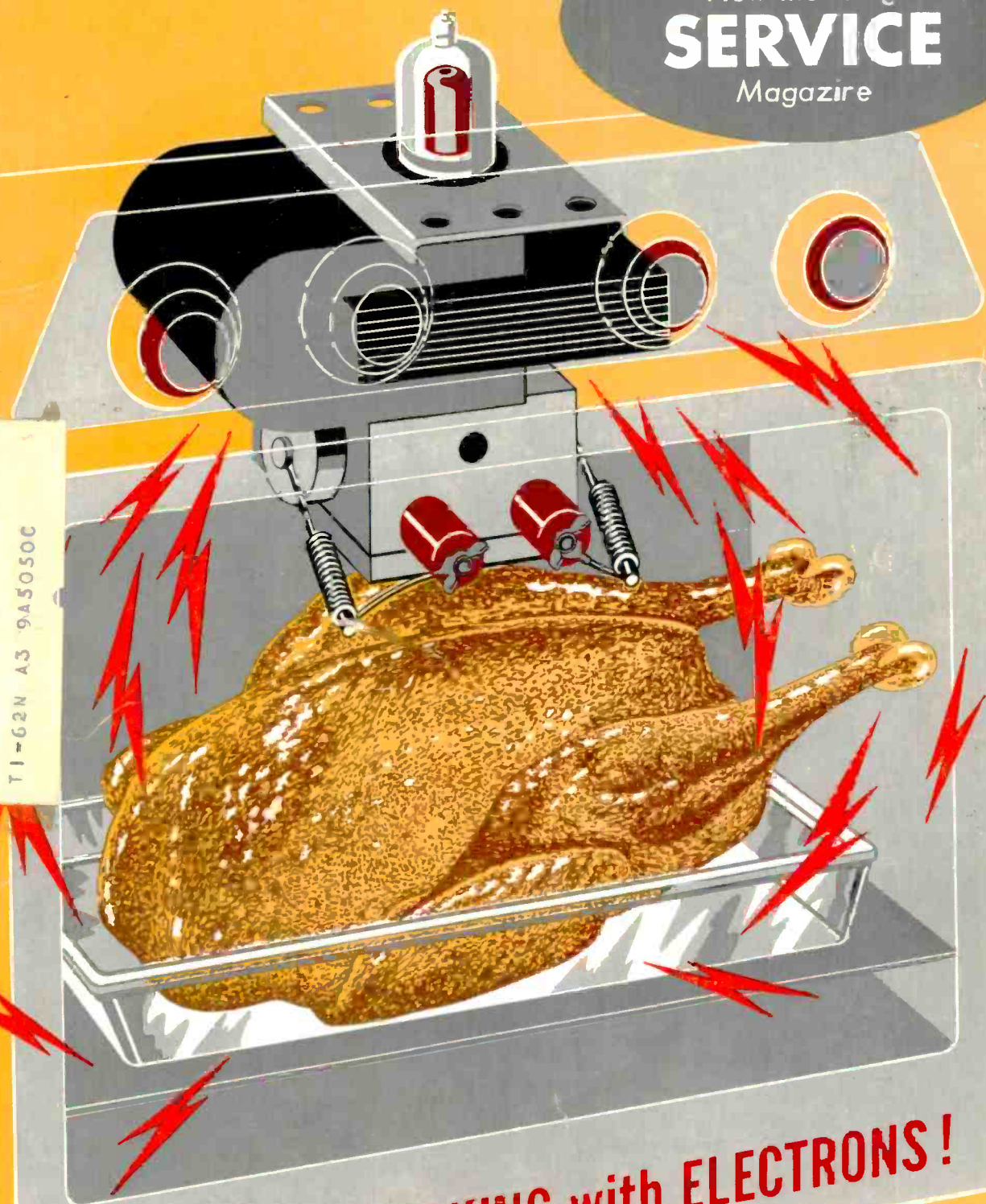


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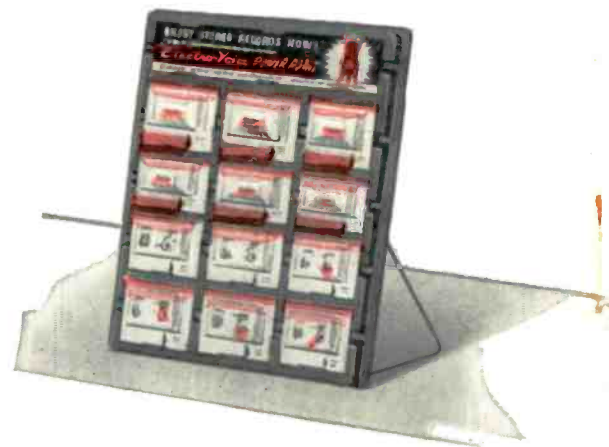
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*Power Point plug-in cartridges are an exclusive development of Electro-Voice, Inc., made under one or more of the following patents: 170,347; 2,793,254; 2,851,541; 2,842,610.



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FRONT COVER

Electronic ovens cook food quickly with microwave energy generated by magnetrons. An estimated 10,000 units are in use in homes, restaurants and mass feeding institutions, and the number is growing rapidly. Servicing electronic ranges and ovens may become a profitable income source for many technicians. See article starting on page 30.

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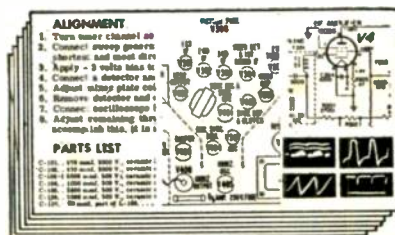
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- MONTGOMERY WARD: TV Models GTM 4202B, C; GTM 4302B, C
- RCA: TV Chassis KCS126A & B
- V-M: Record Changer Model 1201



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value of everything
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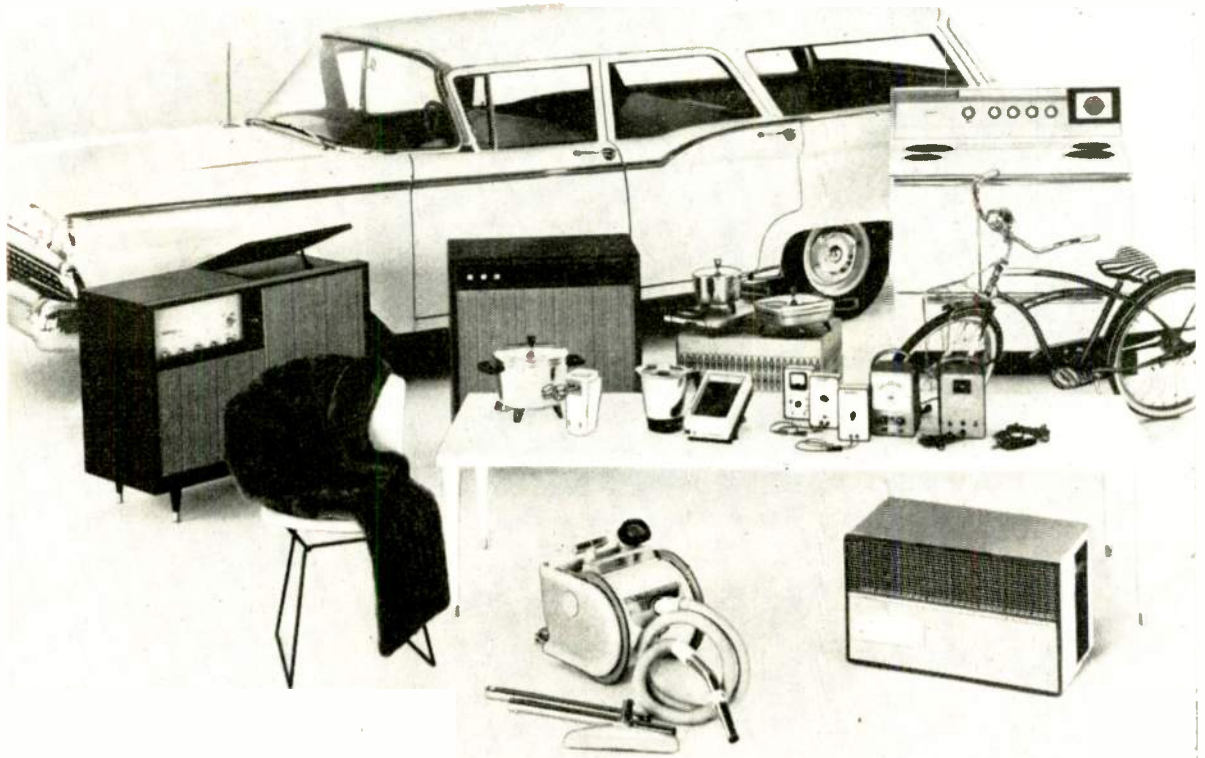
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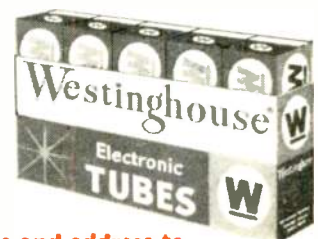
4 third prizes: Your choice of Westinghouse Refrigerator, Freezer, Dryer, Range, Air Conditioner.

48 fourth prizes: Your choice of two Westinghouse Immerse-A-Matic appliances and a control unit.

100 fifth prizes: Your choice of Westinghouse Spoutless Coffee Maker or Portable Mixer.

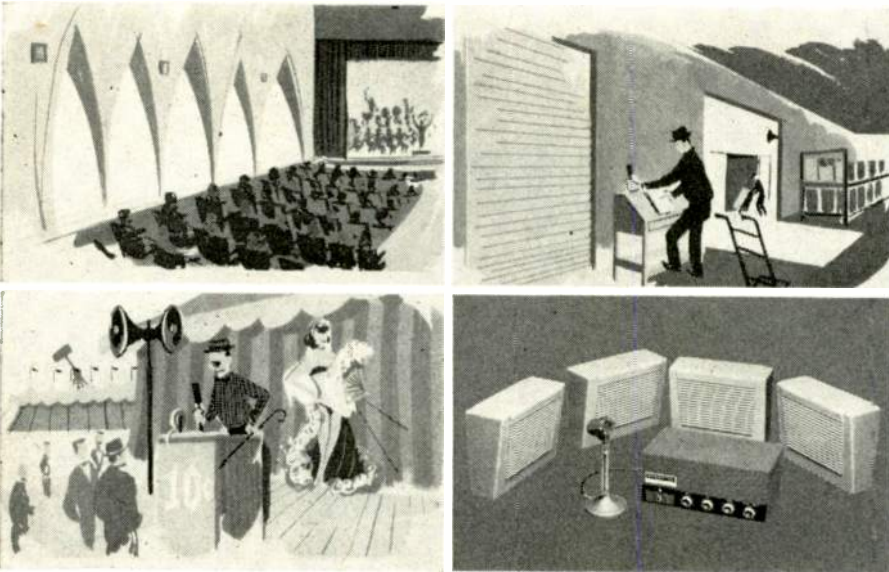
240 runner-up prizes: Westinghouse Dog-O-Matic Hot Dog Cooker.

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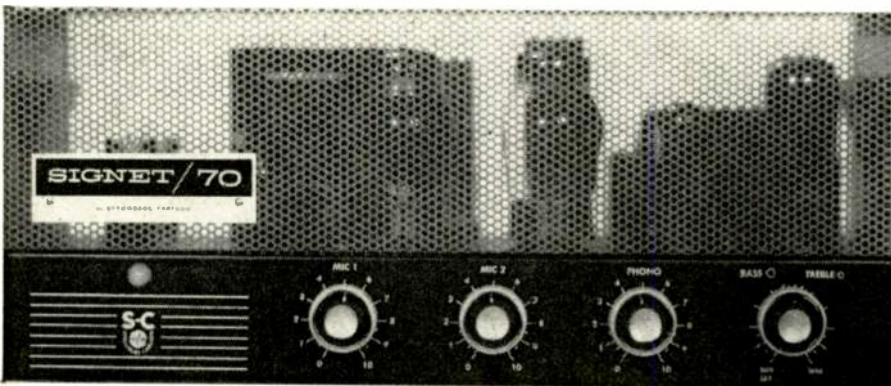
If your distributor does not sell Westinghouse tubes, send his name and address to Westinghouse, Box 284, Elmira, N. Y.

YOU CAN BE SURE...IF IT'S Westinghouse
Electronic Tube Division Elmira, N. Y.



Illustrated: One of many possible component assemblies, and a few typical applications.

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Editor's Memo



Service technicians have won an important, yet unheralded, victory in their little tug-of-war with TV set manufacturers over receiver serviceability. Never before have so many important producers attempted to design easier troubleshooting into their sets.

I say "victory" with tongue in cheek, because the vanquished in this case have more to gain than the victors. Sets designed with service in mind should gain better consumer acceptance.

Electronic manufacturers have done fairly well in their designs, compared to other producers of capital goods, such as automobiles, for example. So many of today's cars—low and sleek looking to be sure—seem to be built for contortionists to ride in and magicians to repair. Perhaps I should have said wealthy contortionists.

By contrast, TV decor has improved without making viewers more uncomfortable. On the contrary, real conveniences have been added.

However, there is one area in which automobile manufacturers have done a much better job than TV makers. Detroit has effectively educated the public on the need for periodic maintenance. Lubrications are needed. Tires and batteries wear out. Oil must be changed. Spark plugs require replacement.

TV producers on the other hand, have generally neglected to inform their customers that electronic products need periodic maintenance. As a matter of fact, a couple have erroneously implied that their sets need practically no servicing.

The focus on those set designs allowing easier servicing gives manufacturers a bonus advantage in gaining favor among technicians. This is truly important, since one of the basic functions of servicing is educating the public. Where else but from the technician can the consumer get an objective and authoritative explanation of the performance capabilities of a particular design?

So it's most welcome to learn that manufacturers have become more aware of the basic need to build greater serviceability into sets.

This fundamental point of overlooking basic concepts recalls the story of the teacher who asked one of her grade school students what the primary use of cowhide was.

"That's easy," he said. "To hold the cow together!"

Al Foman



Important factors in specifying toroidal inductors

The powdered molybdenum permalloy toroidal inductor is finding increasing use in today's complex electronic equipment. Excellent magnetic stability, superior temperature stability, high Q values, and small physical size are but a few of the outstanding features which explain the popularity of molybdenum permalloy toroids. To fully realize the advantages of these inductors, the components application engineer must accurately specify those parameters which are of critical importance in a given application. "Under-specification" may result in a component which fails to give adequate performance in the circuit. "Over-specification", on the other hand, may result in a component of extremely high cost. An understanding of the factors involved in the design and manufacture of toroidal inductors at Sangamo will enable the components application engineer to effectively judge the consequences of his specification in relation to the cost and performance of the final product.

THE EQUIVALENT CIRCUIT of a toroidal inductor is illustrated in figure 1.

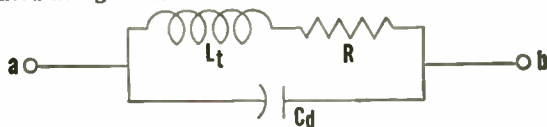


FIGURE 1

L_t is the so-called "true inductance" of the toroid and is assumed to be constant at all frequencies. R represents the sum of copper losses and core losses which increase with frequency. C_d , the distributed capacitance, approximates the capacitance between turns of the winding and between the winding and core. Due to the fact that the dielectric constant of the insulation on the windings and on the core itself is not constant with frequency, the distributed capacity will also vary with frequency. This variation, however, is usually small and may be neglected in the following discussion.

THE APPARENT INDUCTANCE (L_a) is the equivalent inductance between terminals (a) and (b). As might be expected, the apparent inductance varies with frequency. If R is neglected the expression for L_a becomes:

$$L_a = \frac{L_t}{1 - \omega^2 C_d L_t}$$

Inductors for single frequency or resonant circuit applications are usually specified in terms of apparent inductance. The standard tolerance on L_a is 1% or one turn whichever is greater.

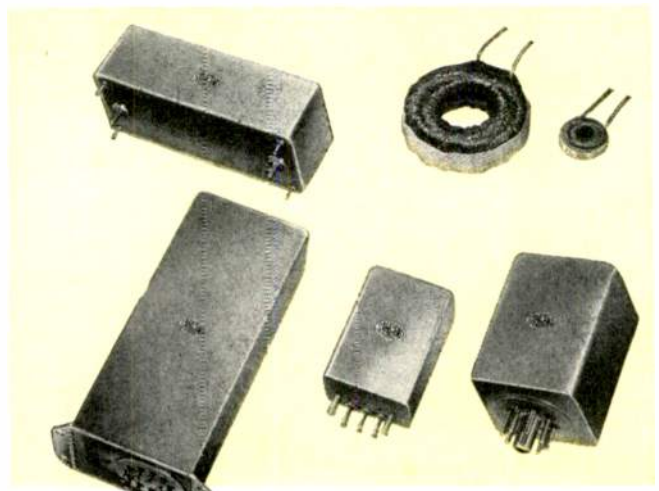
THE Q FACTOR is usually specified in lieu of R since most applications are concerned with the ratio of inductive reactance to equivalent resistance. The accepted method of specifying Q is to set a limit on minimum Q at the operating frequency or over a range of frequencies. Normally, the Q of a given design at a given frequency will vary some 20% between units. Where direct current flows through the inductor it may sometimes be desirable to set a limit on the d-c resistance as well as on Q . Analysis of the equivalent circuit, assuming constant R , shows that:

$$Q_{equiv} = \frac{\omega L_t}{R} - \omega R C_d - \frac{\omega^3 L_t^2 C_d}{R}$$

From the above equation one may deduce that anything which increases the distributed capacitance must necessarily reduce the Q .

DISTRIBUTED CAPACITY becomes most important in wide band or multiple frequency applications, since C_d will determine the variation of L_a with frequency. The majority of users do not find it necessary to specify C_d . Where C_d must be specified, the accepted method is to set a limit on the maximum allowable distributed capacitance. An alternative method of specifying C_d is to set a tolerance on the apparent inductance to be measured at two different frequencies (usually corresponding to the upper and lower frequencies encountered in a given application). The design engineer controls the C_d by varying the method of winding the inductor. In decreasing order of capacity he may choose 1) random continuous windings; 2) progressive winding, or segmented winding. Unfortunately, winding costs increase as distributed capacity decreases. Wax or varnish impregnation will increase the distributed capacity. In applications where it is necessary to insure that L_a be reasonably constant over a wide frequency range, it is also usually desirable that L_a be reasonably constant with temperature and with time. These features are best achieved using a stabilized core, a low capacity winding, and an unfilled hermetically sealed enclosure. In this way, the undesirable effects of impregnation may be avoided.

REQUIREMENTS FOR STABILITY OF INDUCTANCE with temperature, with a-c voltage level, and with direct current are additional factors which will influence the cost and the size of a given inductor. Temperature stabilized cores are available only in certain core sizes and are, of course, more expensive than the standard unstabilized cores. High values of a-c voltage and direct current will lead to larger cores and increased cost.



The Sangamo design engineering department is ready to discuss your inductive components problems. Typical examples of specialty components designed and produced by Sangamo are described in engineering bulletin series IC-260. Address: Sangamo Electric Company, Inductive Components Section, Springfield, Illinois.

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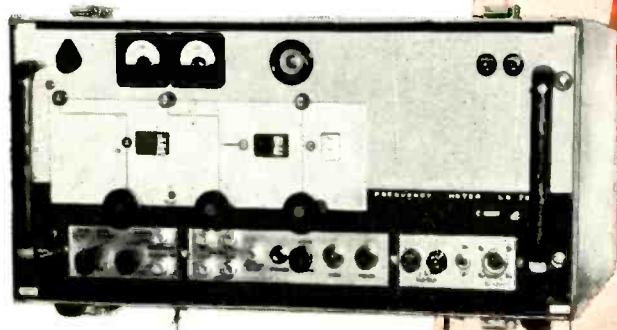
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LETTERS To the Editor

"Estimate" Bulletin

Editor, ELECTRONIC TECHNICIAN

My sincere thanks for the many helpful services you provide. Your bulletin, "Why Can't You Give Me a TV Repair Estimate Right Now?" [May 1959, p. 40] will help remove the last trace of doubt in our customer's minds and will give my technicians an added tool in customer relations. Keep up the good work and send me 300 of the bulletins. Our check is enclosed.

VALENTIN ALVER

Alver Electronics Service
Portland, Oregon

. . . . The article is timely. It has terrific impact, and I would like to have an authorization to reprint it and make it available to the local servicing organizations.

M. GREEN

Almo Radio Co.
Philadelphia, Pennsylvania

. . . . It is a great idea and well written. I would like 300 copies; enclosed is \$2.00.

GLENN H. TOPPING

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M & M Electronics
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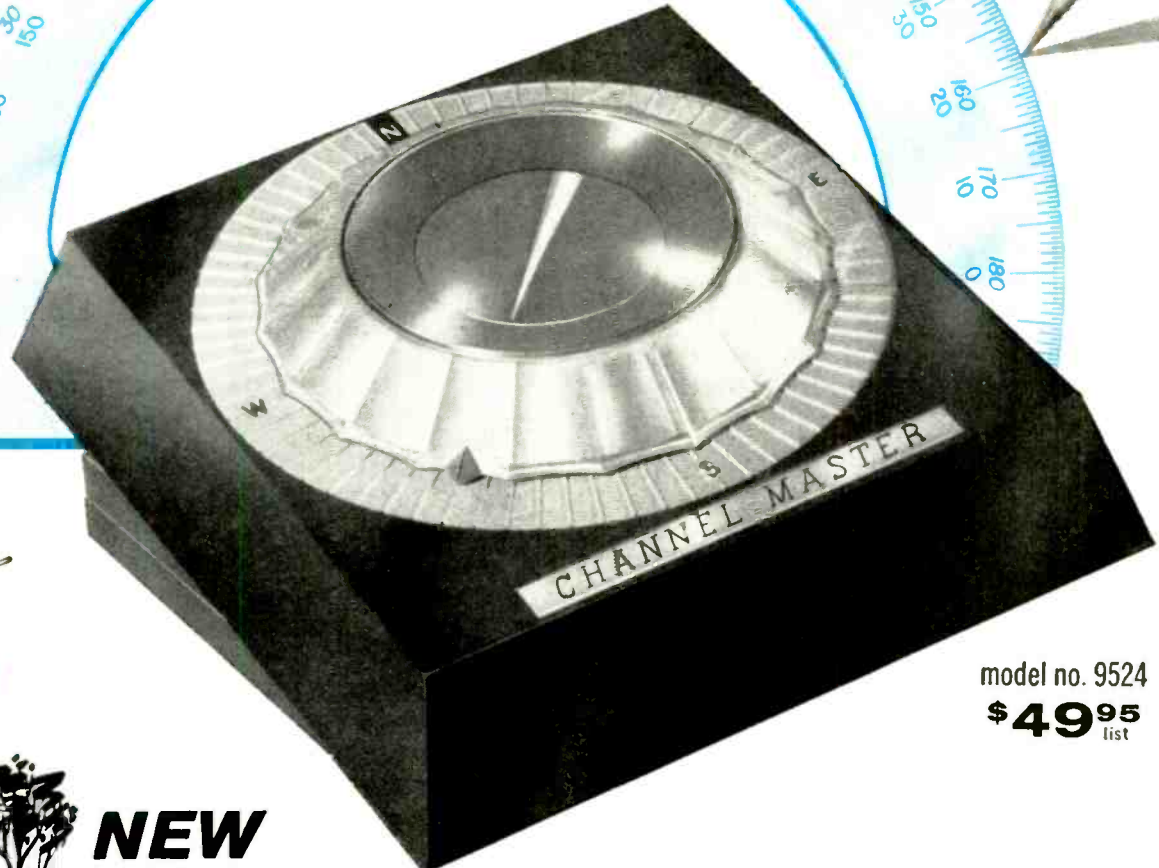
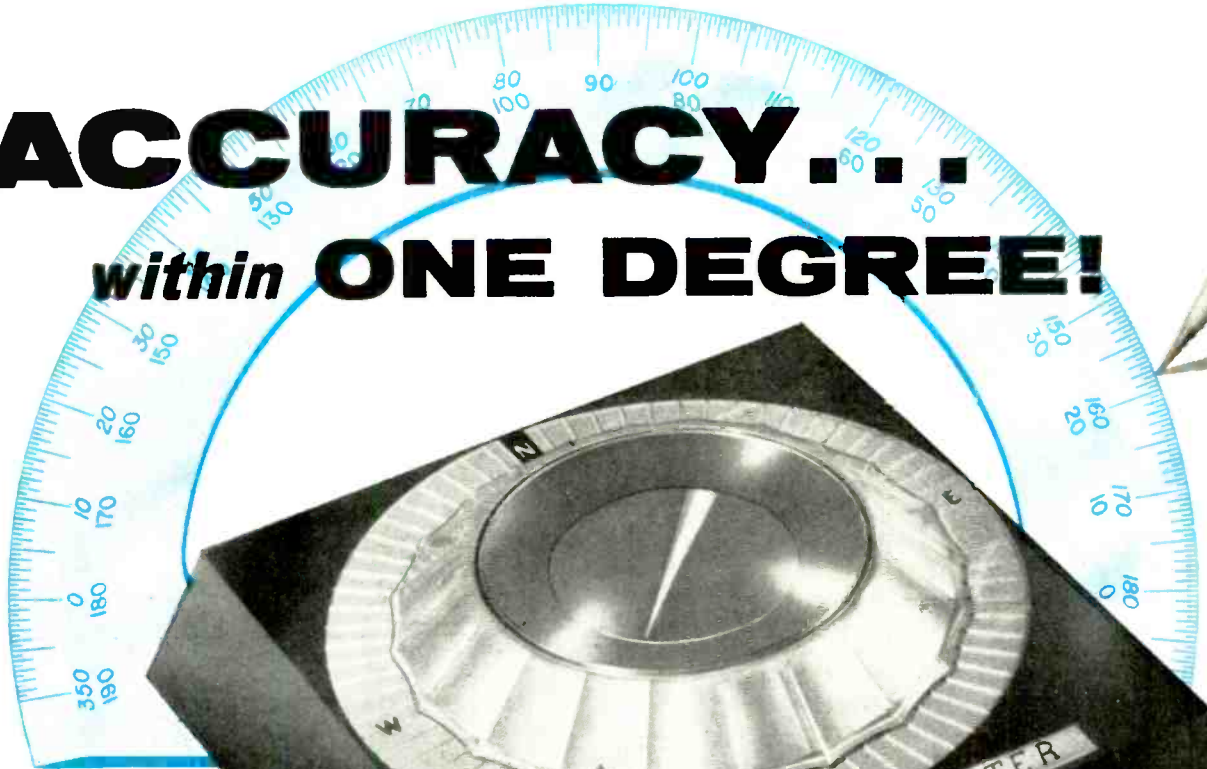
RCA Service Company Policy

Editor, ELECTRONIC TECHNICIAN

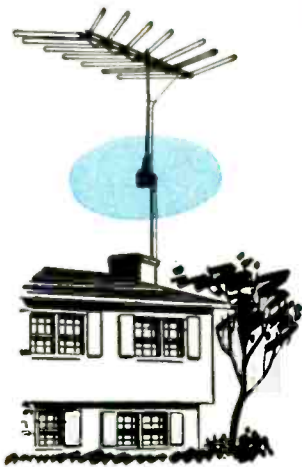
I feel certain practices of the RCA Service Co. constitute unfair competition, and are designed to squeeze out the independent serviceman. They maintain that the Service Co. carries its own load and is not subsidized by the parent organization. There is the question about their giving a complete 90 day guarantee on the entire set for

(Continued on page 12)

ACCURACY...
within **ONE DEGREE!**



model no. 9524
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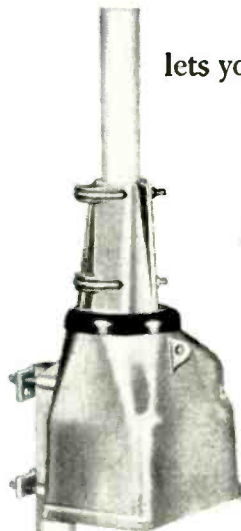
Big Performance Advantage

On runs of 100 feet or more, however, 4 conductor wire is recommended, with the fourth conductor doubled up on the power line. This reduces line loss, brings more voltage to the rotator, and provides higher torque than rotators which must use 4 conductors.
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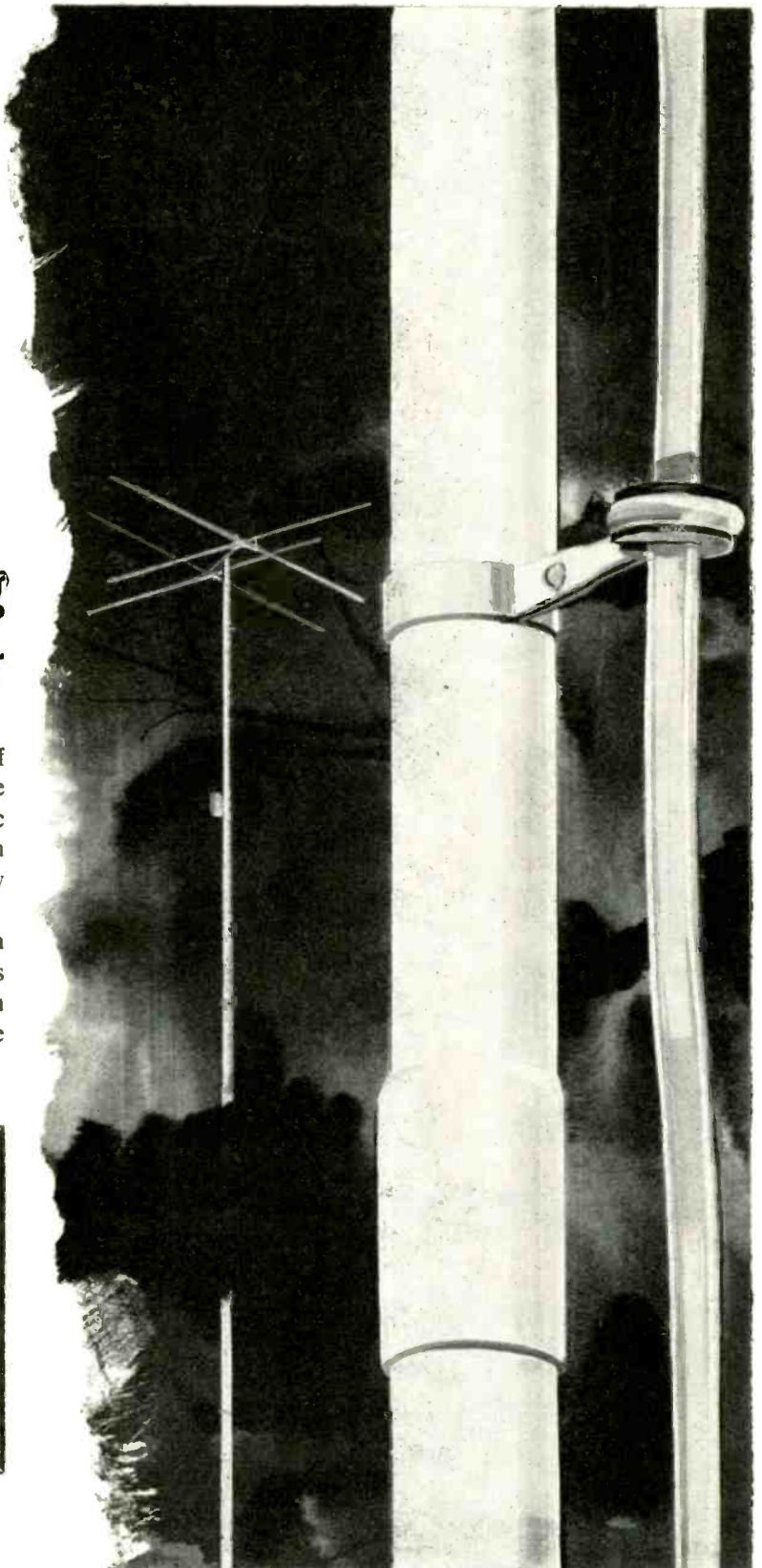
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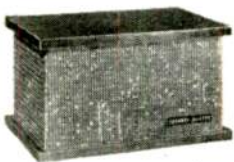
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SERVICE CAPACITORS

(Continued from page 8)

a so-called overhaul. It is customary to guarantee parts and workmanship on a repair for 90 days. I would like to see Mr. Russ Hansen's figures on a repair plus an overhaul, plus unlimited call-backs for 90 days, all being done for \$30.00, and still show a return on the positive side of the ledger. I refer to Mr. Hansen because of the articles he has written for the RCA Service Company on service economics which were published in "The Hoosier Test Probe."

JACOB I. PYENSON

Pyenson Precision Co.
Toms River, New Jersey

•Mr. Hansen has replied in part as follows, to the satisfaction of Mr. Pyenson: ". . . RCA Service Co. does not have such a plan for \$30.00. The obvious reason is that we cannot afford to do the work involved for that price. The flat price for this overhaul is \$64.95. The price includes the overhaul, replacement of parts and tubes (except the picture tube) and a one year service plan. It is under this service plan that parts and tubes are protected—including the picture tube—for a full year, and one service call is made at no extra charge. All additional calls, however, during the one-year period are at the flat rate of \$5.95 per call. This is not only adequate, but I assure you produces a fair profit. The prices of all of our other services are just as realistic. We pay as much for our parts and tubes as anyone else in the service industry. The RCA Service Company is not subsidized in any way."—Ed

Skeptical Customer

Editor, ELECTRONIC TECHNICIAN

Licensing is just another means of adding taxes to present taxes. I believe that consumers know when charges are fair and when they are being gouged. There are some who will pay for more than one service call when they do not have faith in the original call where the technician says a shop job is required. Since there are many of these skeptics, I find that the best procedure is to charge for the initial check-up, and give the customer the name and address of the nearest established company service. I write it on the bill and let them take it from there.

JULIUS COHEN

Modern T.V. Service
Danville, California

Late Literature Request

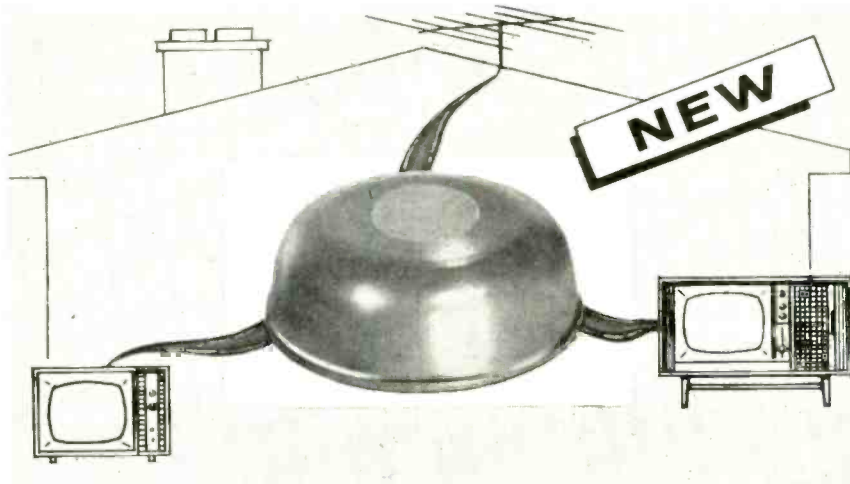
Editor, ELECTRONIC TECHNICIAN

Thank you for your excellent magazine. I enjoy every bit of it. However, I seem to miss out on the Free Literature, because the magazine is received here too late. How can I obtain literature after the deadline?

I. S. JANSZ

T.V. Ronix Services
Victoria, Australia

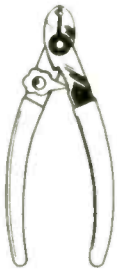
(Continued on page 14)



Walsco 2-Set TV-FM Couplers

A Walsco Exclusive . . . Both these couplers can be mounted on wall or mast before attaching leads. Standard Model for strong signal areas; Low Loss Model for fringe areas.

No. 1600 Standard List \$2.50
1602 Low Loss List 3.50



WALSCO STRIP-ER CLIP

New precision tool with accurate dial for stripping each wire size. Clips all wires from 12 to 26 gauge. Ground cutting edges, insulated grip.
No. 595-X . . . List \$2.30



WALSCO LONG NECK OILER

Reach all those hard-to-get oil cups, etc. All plastic container and nozzle; telescoping extension reaches 7 inches. Contains high quality all-purpose oil.
No. 985 List \$1.50



WALSCO C-RING TOOL

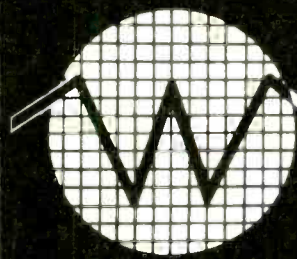
Specially designed to remove and insert "C" washers and retaining rings on tuners, control shafts, etc. High grade steel, nickel plated.
No. 585 . . . List \$3.15



WALSCO STICKLEBABY

The only hand tool that drills and saws in any direction. Excellent for veneer work and fine carpentry. Combination drill, saw and rasp.
No. 586-00 . . . List \$1.63

More For You . . . And The Price Is Right!



WALSCO ELECTRONIC PRODUCTS

Everything You Need For Better Servicing



ROUND

WALSCO CHASSIS PUNCHES



SQUARE

Make better chassis holes faster with Walsco's "Low-Torque" Punches. Specially hardened, precision ground tool steel; easy to use. Complete line of sizes and styles.



KEYED



"D"



WALSCO HEX & SPLINE KIT

Contains 11 of the most popular size hex and spline wrenches in durable plastic snap case. High grade alloy steel.
No. 560 List \$2.25



WALSCO 100-PAK HARDWARE

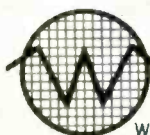
All the quality electronic hardware items you need in convenient 100-in-a-box packages. Look for the Walsco Display at your jobber.



WALSCO PHONO DRIVES

The only complete line of replacement phono and recorder drives and belts on the market. Includes all the new model turntables and changers.

FREE! Write for your Walsco Catalog. Send postcard today.



WALSCO ELECTRONICS MFG. CO.

Division of Textron Inc.

West Plant: Los Angeles 18, California

Main Plant: ROCKFORD, ILLINOIS, U.S.A.

Canada: Atlas Radio Corp., Ltd., Toronto 19

YOU CAN GET WHAT YOU WANT FROM WALSCO!

(Continued from page 12)

•We regret that our handling procedure for Free Literature requests does not allow us to process requests after the deadline stated on the coupon. However, the names and addresses of all the manufacturers are listed in our May Directory Issue, and readers may obtain literature by writing directly.—Ed.

Omitted Associations

Editor, ELECTRONIC TECHNICIAN
This is to advise you that TESA of Middletown, Inc. has been active in the field for some time. We are a member of both the national and state organizations. Marvin Hall is the President. We would like to be included in your Roster of Associations. I have been an avid reader of your magazine for over 5 years and appreciate your support of the independent service men.

O. DALE BURDGE,
Secy.

TESA of Middletown, Inc.
Franklin, Ohio

... Omitted from your 1959 Roster of Associations—Indianhead Radio & TV Servicemen's Association, 414 Talmadge Street, Eau Claire, Wisc.

SHERWOOD STOLP,
Treasurer

Indianhead Radio & TV Servicemen's Assoc.
Eau Claire, Wisc.

... Independent Television Repairmen Assn., 752 Lakewood, Detroit 15, Mich., was not included in your Roster.

M. R. KOWALSKI,
Exec. Secy.

Indep. Television Repairmen Assn.
Detroit, Mich.

News of the Industry

ELECTRONIC COMMUNICATIONS, INC. will construct a new manufacturing plant of 150,000 sq. ft. adjacent to its engineering facility in St. Petersburg, Fla.

BENDIX RADIO has inaugurated a new Dealer Sales Program for mobile radio products utilizing qualified technical service dealer organizations as sales and service outlets. Heading up the new program is BRUCE C. McCALLUM, Mgr. Distributor/Dealer Sales. G. L. ALDRICH, also assigned to the program, has been appointed Distributor/Dealer Sales Administrator for mobile radio. S. J. HOLLAND will take over as S.W. area Sales Engr. for railroad radio products. R. M. PARKS is the new Advertising Mgr. for the Industrial Electronics Products Group.

(Continued on page 16)



RCA...

Biggest name in

POWER TUBES

**for 2-way
radio**



RCA Power Tubes have been faithfully serving commercial radio communications, broadcast and television stations, the military services, and industry for more than a generation. No finer tubes are built. Available at all RCA Industrial Tube Distributors.

For a handy reference on RCA Power Tubes, as well as on thyatron, rectifiers, and ignitrons, form PG-101-D, send 30¢ to RCA Commercial Engineering, Section G-46-T, Harrison, N. J.

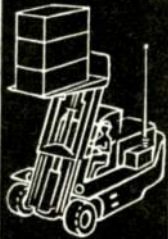


RADIO CORPORATION OF AMERICA

Electron Tube Division

Harrison, N. J.

For the name of your nearest RCA Industrial Tube Distributor, call Western Union by 'phone number and ask for Operator 25.



Miller



* K-TRAN IS A REGISTERED TRADEMARK



THE FAMOUS K-TRAN^{*} I.F. TRANSFORMERS

A complete line of the finest I.F. transformers available anywhere at any price. Both standard and miniature sizes in all of the commonly used I.F. frequencies are stocked for immediate delivery. Conventional as well as printed circuit types are available for both vacuum tube and transistorized applications. Original equipment manufacturers will find the K-Tran the ideal choice for new equipment designs thus saving valuable engineering manhours and being assured of a top quality transformer designed by engineers with over 30 years of manufacturing experience in electronic components. The K-Tran also makes an excellent replacement transformer and will give results equal to or better than the original.

AVAILABLE IN THE FOLLOWING FREQUENCIES

CAT. NO. Printed Circuit Types	CAT. NO. Regular Standard Types	Dimensions: 3/4" square x 2" high	FREQ.	USE
13-PH1	12-H1		262 KC	Input transformer
13-PH2	12-H2		262 KC	Output transformer
13-PH6	12-H6		262 KC	Output transformer with diode filter
13-PC1	12-C1		455 KC	Input transformer
13-PC2	12-C2		455 KC	Output transformer
13-PC6	12-C6		455 KC	Output transformer with diode filter
13-PC7	12-C7		455 KC	Input transformer for battery radios
13-PC8	12-C8		455 KC	Output transformer for battery radios
13-PC9	12-C9		455 KC	Input transformers for AC-DC radios
13-PC10	12-C10		455 KC	Output transformer for AC-DC radios
	12-C11		455 KC	IF transformer (G.E.-RTL 143 and 163)
	12-C12		455 KC	Tapped Pri. I.F. transformer
	12-C45		455 KC	Discriminator
	13-W1		1500 KC	Input and interstage transformer
	13-W2		1500 KC	Output transformer
6203-PC	6203		4.5 MC	Input or interstage transformer
6204-PC	6204		4.5 MC	Discriminator transformer
6205-PC	6205		4.5 MC	Ratio detector transformer
6206-PC			4.5 MC	Ratio Det. (GE-RTD-026)
6207-PC			4.5 MC	Ratio Det. (GE-RTD-025)
6208-PC			4.5 MC	Ratio Det. (GE-RTD-020)
1463-PC	1463		10.7 MC	Input or interstage transformer
1464-PC	1464		10.7 MC	Discriminator transformer
	1464-WB		10.7 MC	Discriminator 900 KC Peak to Peak
1465-PC	1465		10.7 MC	Ratio detector transformer
	1465-WB		10.7 MC	Ratio detector 800 KC Peak to Peak
	6260		21.25 MC	I.F. Transformer
	6261		21.25 MC	Discriminator transformer
	6262		21.25 MC	Ratio detector transformer
6230-PC	6230		44 MC	TV Converter I.F. Transformer
6231-PC	6231		44 MC	TV First I.F. Transformer
6232-PC	6232		42.5 MC	TV second I.F. Transformer
6233-PC	6233		42.5 MC	TV third I.F. Transformer
6234-PC	6234		44 MC	TV fourth I.F. Transformer

Available Through Your Local Distributor
Miller Quality Products are recognized by the entire electronics industry as representing the finest in workmanship, performance, and dependability.

*Manufactured under K-Tran patents of and by Automatic Manufacturing Corp., Division of General Instrument Corporation.

Miniature I.F. Transformers for printed circuit transistorized applications. These miniature I.F. Transformers have tuned primary and untuned secondary windings. Proper impedance match between primary and secondary insures optimum performance.

Dimensions: 1/2" square x 3/4" high

CAT. NO. FREQ. SPECIFICATIONS

2031	455 KC	10K Ohm pri. to 600 Ohm Sec., Input
2032	455 KC	10K Ohm pri. to 1000 Ohm Sec., Output
2041	455 KC	25K Ohm pri. to 600 Ohm Sec., Input
2042	455 KC	25K Ohm pri. to 1000 Ohm Sec., Output
2051	455 KC	100K Ohm pri. to 1000 Ohm Sec., Input

Sub-Miniature I.F. Transformers for printed circuit transistorized applications. To our knowledge the smallest I.F. Transformers in existence. Ferrite cup core construction permits the use of extremely small shields without adversely affecting transformer operation. A high impedance, tapped primary winding coupled to a low impedance secondary provides optimum energy transfer between stages.

Dimensions: 3/8" square x 5/8" high

CAT. NO. FREQ. SPECIFICATIONS

9-C1	455 KC	25K Ohm pri. to 600 Ohm Sec., Input
9-C2	455 KC	25K Ohm pri. to 1000 Ohm Sec., Output

Also a sub-miniature I.F. Transformer for conventional circuitry using vacuum tubes. A 455 KC intermediate frequency transformer which has all the desirable features of the standard size I.F. and is smaller than a MINIATURE tube. Through the use of a ferrite cup core these sub-miniature I.F. Transformers offer the gain and bandwidth characteristics previously obtained only in larger I.F. assemblies. For AC-DC or battery radios.

Dimensions: 1/2" square by 1 1/2" high

CAT. NO.	FREQ.	USE
10-C1	455 KC	Input transformer
10-C2	455 KC	Output transformer

Literature on any of the above I.F. Transformers or our latest general catalog 60 — TV guide 160 — Auto guide 260 — are available on request. Over 2,000 Radio & TV parts distributors to serve you the world over.

BUY WITH CONFIDENCE — BUY MILLER.

J. W. MILLER COMPANY

EXPORT REPRESENTATIVE

Roburn Agencies, Inc.
431-435 Greenwich Street
New York 13, New York
WOrth 6-2130

FACTORY

5917 SOUTH MAIN ST., LOS ANGELES 3, CALIF.
Phone ADams 3-4294
FAX No. XCM

CANADIAN REPRESENTATIVE

Warehouse Stock
Atlas Radio Corporation, Ltd.
50 Wingold Ave.
Toronto 19, Ontario, Canada

(Continued from page 14)

WESTINGHOUSE Electronic Tube Div. has set four "Giant Jackpot" contests for TV-radio dealers and servicemen beginning August 3rd.

CBS-HYTRON has named **GEORGE W. TALLAKSEN, JR.** N.E. Regional Sales Mgr., Distributor Sales. **MICHAEL BALOG** was appointed Plant Mgr. of the receiving tube plant in Newburyport, Mass.

ZENITH RADIO CORP. Executive Vice Pres., **LEONARD C. TRUESDELL**, was named "Sales Executive of the Year" at National Sales Executives International 24th Annual Convention.

JERROLD ELECTRONICS CORP. announced record earnings for the fiscal year ended February 28, 1959 totalling \$7,658,371, a 26% increase over revenues for the previous year. **L. F. WAELTERMAN** has been appointed Western Regional Mgr. for Distributor Sales Div.

ALLEN B. DU MONT LABS., INC. officially introduced the new gold colored carton for the Du Mont renewal-type radio and television receiving tubes promoting the theme "Karat Quality." **GEORGE H. WAGNER** has been appointed Sales Operations Mgr. for the Scientific Instrument Dept.

EITEL-McCULLOUGH, INC. has made the following executive appointments: **JACK A. McCULLOUGH**, Chmn. of the Bd.; **GOULD HUNTER**, Exec. Vice Pres.; **E. E. McClARAN**, Corporate Secy. Bd. of Directors; **RICHARD T. ORTH**, Vice Pres., Planning.

BLONDER-TONGUE LABS. awarded **FERDINAND VEIT** an Audio Baton as first prize for the following suggestion in their contest for new applications: "The Audio Baton could be useful for correcting speech defects of retarded children. For physical therapy of this type, the Baton's colorful front panel will help the children concentrate more easily on their lessons."

WATERS CONLEY CO., INC. has been acquired by a group of Chicago and New York investors organized to carry out development, manufacturing and marketing operations in the consumer, industrial and military electronics fields, headed by **EDGAR N. GREENEBAUM, Jr.**, Chmn. of the Bd. and **JOHN M. RAU**, Pres. and chief executive officer. They will operate under the name **WATERS CONLEY**, with no changes in the present management. The corporation has acquired the assets of **STEREOPHONIC AUTOMATION CORP.** which will continue as the **Fidelivox** and **Fidelipac** Div. of the corporation.


(Continued on page 18)



A high-quality AM-FM circuit in a high-quality black-and-gold package . . . that's the ERIE "PAC" AM-FM Tuner. You'll be confident in recommending it to all your customers . . . and you'll increase your profits on AM-FM installations and conversions.

ERIE circuit designers are years ahead in practical electronic developments. And ERIE production lines are quality-controlled from start to delivery . . . your assurance of perfect tuners every time by ERIE . . . the dependable, progress-leader in military and industrial electronics.

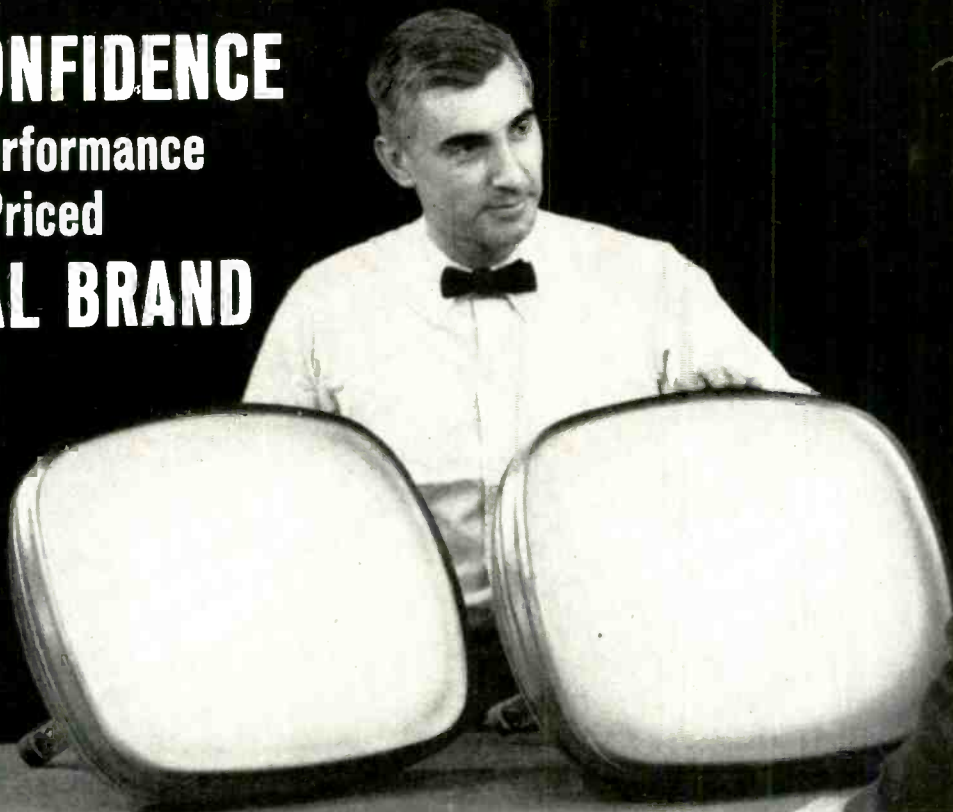
For specs and further information on ERIE AM-FM Tuners and other hi-fi components, write us.

<p>SEND FOR SPEC SHEETS</p> 	<p>FEATURES</p> <ul style="list-style-type: none">Etched Wiring Board2 IF StagesLow Signal/Noise RatioSize: 12½" x 9½" x 3¼"Only 2 Front-panel Dials7-tube CircuitSensitivity: 10 mv. for 30 DB quieting 6 mv. for 20 DB quietingSelectivity: 170 KC at 2X down
<p>ERIE Electronics Distributor Division ERIE RESISTOR CORPORATION Erie, Pennsylvania</p>	

SELL WITH CONFIDENCE

Premium-Performance
or Budget-Priced

NATIONAL BRAND PICTURE TUBES



PREMIUM-PERFORMANCE



Silver Vision

- Brighter silver-activated AG-905 screen
- Sharper pin-point focus electron gun
- Nationally advertised brand
- Meets performance specifications of all leading TV set manufacturers

BUDGET-PRICED



PALOMAR

- All-new electron gun
- All-new phosphor screen
- Full 12 months warranty
- Backed by CBS Electronics, a Division of Columbia Broadcasting System, Inc.

For over a year, the combined sales appeal of CBS Silver Vision and CBS Palomar picture tubes has been field-tested on the West Coast. Now this proven sales approach originated by an independent tube manufacturer is available to all independent service-dealers.

Does your customer demand the finest in performance, or is he budget-minded? You can make the sale with CBS

Silver Vision . . . or with CBS Palomar. Either is easy to sell because of top brand prestige. Either stays sold because of top performance in its field.

And their dependable CBS national brand assures you of profit without callbacks. Play safe. Sell premium-performance CBS Silver Vision or budget-priced CBS Palomar with confidence.

THE CBS FAMILY • CBS ELECTRONICS • CBS INTERNATIONAL • CBS TELEVISION NETWORK • CBS LABORATORIES • CBS NEWS • CBS RADIO • CBS TELEVISION STATIONS • COLUMBIA RECORDS • LEADERS IN ELECTRONIC COMMUNICATIONS

ELECTRON TUBES



SEMICONDUCTORS

CBS ELECTRONICS formerly CBS-HYTRON
Danvers, Massachusetts
A Division of Columbia Broadcasting System, Inc.

(Continued from page 16)



Multiple Set Installations are Fast...Simple...Profitable...

NOW OPERATE 2 to 20 or More TV/FM Sets

Without Amplification
From One Antenna
In Normal Signal Areas

ACTUAL SIZE

\$1.95
LIST PRICE

WIZARD 300*

Electro-Magnetic Coupler For
300 ohm TV Flat Line
Multiple Set Installations

*Pat. Pend.

PROVEN EFFICIENCY

The high electrical efficiency of the Wizard is proven in many installations where more than thirty sets are being operated from a single antenna without amplification.

EASY TO INSTALL

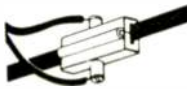
The Wizard slides apart



Place two halves on line and slide together



No cutting — splicing — or puncturing of line.



CONNECT TO SET



Mr. Wendell Niles, Veteran TV Personality: "I use the Wizard set couplers and have seven TV/FM outlets in my home...all operated from one antenna without amplification."



Partners Ray Kirkhart and Joe Kopin of Picture Tube Center: "We are operating 38 sets from one antenna without amplification and have the finest reception we've ever seen."



Mr. J. A. Morris, Owner of the De Ville Motel: "We operate 31 TV sets from one Antenna without amplification...and reception is excellent."

THE NEW WIZARD 300 TECHNICAL BROCHURE EXPLAINS EXACTLY HOW THE WIZARD MAY BE USED FOR ALL MULTIPLE SET INSTALLATIONS, AND IT EXPLAINS WHERE AND HOW TO DEVELOP THIS VERY PROFITABLE BUSINESS.

WRITE TODAY AND ASK FOR: BROCHURE ET-79

CHARLES ENGINEERING, INC.
6053 Melrose Avenue • Los Angeles, California

GENERAL INSTRUMENT CORP. announces the appointment of A. A. SEIBEL as Sales Mgr. of the Automatic Mfg. Div.

ELECTRONIC MEASUREMENTS CO., INC. has been joined by SIDNEY NORINSKY as Advg. Mgr.

INTERNATIONAL TEL. & TEL. CORP. has elected HAROLD S. GEN- EEN Pres. of the company.

COMMUNICATIONS CO., INC. has appointed FREDERICK R. MACKLIN as Sales & Advg. Mgr.

AEROVOX CORP. has appointed CYRUS STONEHILL as Sales Mgr. for the Manufacturers Sales Dept. of the New Bedford Div.

GENERAL TRANSISTOR CORP. has named SMITH, WINTERS, MABUCHI, INC. as its new marketing-advertising-public relations agency.

RAYTHEON CO. is the new name of the former RAYTHEON MFG. CO. Construction has begun on a new 60,000 sq. ft. headquarters building for the Distributor Products Div. in Westwood, Mass., which will incorporate automated distribution.

INTERNATIONAL RESISTANCE CO. and **G-C ELECTRONICS MFG. CO.** have reached agreement whereby the auto radio replacement control business of G-C is transferred to IRC. JOHN M. ZIMMERMANN has been named Mgr. of the Burlington, Ia. plant and CARL L. SMITH, Plant Mgr. of the Boone, N. C. plant.

WELLER ELECTRIC CORP. is establishing a nation-wide field sales organization headed as follows: JOHN HAND, western region, San Francisco headquarters; ROY SIEGER, assisted by JIM COLEMAN, central region, headquarters in Chicago; and Ray COMPTON, eastern region, headquarters in Easton, Pa.

RCA's Electron Tube Div. made the following appointments: HAROLD F. BERSCHE, Mgr. Distributor Products Dept.; FRANK X. BANKO, Mgr. Advertising & Sales Prom. Coordination; JAMES P. JANNUZZO, Mgr. Advertising & Sales Prom.—Industrial Market; GERALD E. RYAN, Administrator, Shows & Exhibits; and AUREL G. PETRASEK, Mgr. Advanced Market Planning, Industrial Tube Products Dept. JOHN H. RIDDEL was appointed to the newly-created position of Mgr., Market Research & Services, Semiconductor & Materials Div. RCA VICTOR DISTRIBUTING CORP. has elected WALTER M. NORTON, Chmn. of the Bd. and L. F. HOLLERAN, Pres.

(Continued on page 20)

VACUUM TUBE VOLTMETER

WITH NEW 6" FULL-VIEW METER



Compare it to any peak-to-peak V. T. V. M. made by any other manufacturer at any price!

- Uses new improved SICO printed circuitry.
- Employs a 12AU7 as D.C. amplifier and two 9006's as peak-to-peak voltage rectifiers to assure maximum stability.
- Meter is isolated from the measuring circuit by a balanced push-pull amplifier.
- Uses selected 1% zero temperature coefficient resistors as multipliers.

AS A DC VOLTMETER: The Model 77 is indispensable in Hi-Fi Amplifier servicing and a must for Black and White and color TV Receiver servicing where circuit loading cannot be tolerated.

AS AN ELECTRONIC OHMMETER: Because of its wide range of measurement leaky capacitors show up glaringly. Because of its sensitivity and low loading, Intermittents are easily found, isolated and repaired.

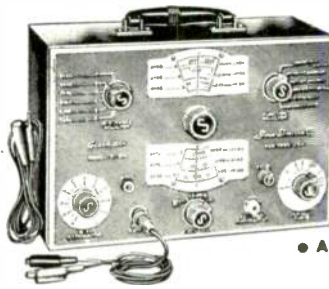
AS AN AC VOLTMETER: Measures RMS value if sine wave, and peak-to-peak value if complex wave. Pedestal voltages that determine the "black" level in TV receivers are easily read.

Comes complete with operating instructions, probe, leads, and steamlined carrying case. Operates on 110-120 volt 60 cycle. Only **\$42.50**

SPECIFICATIONS
 • DC VOLTS — 0 to 3/15/75/150/300/750/1,500 volts at 11 megohms input resistance. • AC VOLTS (RMS) — 0 to 3/15/75/150/300/750/1,500 volts. • AC VOLTS (Peak to Peak) — 0 to 3/40/200/400/800/2,000 volts. • ELECTRONIC OHMMETER — 0 to 1,000 ohms/10,000 ohms/100,000 ohms/1 megohm/10 megohms/100 megohms/1,000 megohms. • DECIBELS — 10 db to + 18 db, + 10 db to + 38 db, + 30 db to + 58 db. All based on 0 db = .006 watts (6 mw) into a 500 ohm line (1.73v). • ZERO CENTER METER — For discriminator alignment with full scale range of 0 to 1.5/2.5/37.5/150/375/750 volts at 11 megohms input resistance.

GENOMETER

7 Signal Generators in One!



- ✓ R.F. Signal Generator for A.M.
- ✓ R.F. Signal Generator for F.M.
- ✓ Audio Frequency Generator
- ✓ Marker Generator
- ✓ Bar Generator
- ✓ Color Dot Pattern Generator
- ✓ Cross Hatch Generator

This Versatile All-Inclusive GEN-ERATOR Provides ALL the Outputs for Servicing:

- A.M. RADIO • F.M. RADIO • AMPLIFIERS
- BLACK AND WHITE TV • COLOR TV

R. F. SIGNAL GENERATOR: 100 Kilocycles to 60 Megacycles on fundamentals and from 60 Megacycles to 180 Megacycles on powerful harmonics.

VARIABLE AUDIO FREQUENCY GENERATOR: Provides a variable 300 cycle to 20,000 cycle peaked wave audio signal.

MARKER GENERATOR: The following markers are provided: 189 Kc., 262.5 Kc., 456 Kc., 600 Kc., 1000 Kc., 1400 Kc., 1600 Kc., 2000 Kc., 2500 Kc., 3579 Kc., 4.5 Mc., 5 Mc., 10.7 Mc., (3579 Kc. is the color burst frequency.)

BAR GENERATOR: Pattern consists of 4 to 16 horizontal bars or 7 to 20 vertical bars.

DOT PATTERN GENERATOR (FOR COLOR TV): The Dot Pattern projected on any color TV Receiver tube by the Model TV-50A will enable you to adjust for proper color convergence.

CROSS HATCH GENERATOR: The pattern consists of non-shifting horizontal and vertical lines interlaced to provide a stable cross-hatch effect.

The Model TV-50A comes complete with shielded leads and operating instructions. Only **\$47.50**

C.R.T. TESTER

Tests and Rejuvenates ALL PICTURE TUBES



ALL BLACK AND WHITE TUBES

From 50 degree to 110 degree types — from 8" to 30" types.

ALL COLOR TUBES

Test ALL picture tubes—in the carton—out of the carton—in the set!

• Model 83 is not simply a rehashed black and white C.R.T. Tester with a color adapter added. Model 83 employs a new improved circuit designed specifically to test the older type black and white tubes, the newer type black and white tubes and all color picture tubes.

- Model 83 provides separate filament operating voltages for the older 6.3 types and the newer 8.4 types.
- Model 83 employs a 4" air-damped meter with quality and calibrated scales.
- Model 83 properly tests the red, green and blue sections of color tubes individually—for each section of a color tube contains its own filament, plate, grid and cathode.
- Model 83 will detect tubes which are apparently good but require rejuvenation. Such tubes will provide a picture seemingly good but lacking in proper definition, contrast and focus. To test for such malfunction, you simply press the rej. switch of Model 83. If the tube is weakening, the meter reading will indicate the condition.
- Rejuvenation of picture tubes is not simply a matter of applying a high voltage to the filament. Such voltages improperly applied can strip the cathode of the oxide coating essential for proper emission. The Model 83 applies a selective low voltage uniformly to assure increased life with no danger of cathode damage.

Model 83 comes housed in handsome portable Saddle Stitched Texon case—complete with sockets for all black and white tubes and all color tubes. Only **\$38.50**

TUBE TESTER

Multi-Socket Type

TEST ANY TUBE IN 10 SECONDS FLAT!



- 1 Turn the filament selector switch to position specified.
- 2 Insert tube into a numbered socket as designated on our chart (over 600 types included).
- 3 Press down the quality button—

THAT'S ALL! Read emission quality direct on bad-good meter scale.

SPECIFICATIONS

- Tests over 600 tube types
- Tests OZ4 and other gas-filled tubes
- Employs new 4" meter with sealed air-damping chamber resulting in accurate vibrationless readings
- Use of 22 sockets permits testing all popular tube types and prevents possible obsolescence
- Dual Scale meter permits testing of low current tubes
- 7 and 9 pin straighteners mounted on panel
- All sections of multi-element tubes tested simultaneously
- Ultra-sensitive leakage test circuit will indicate leakage up to 5 megohms

Model 82A comes housed in handsome, portable Saddle-Stitched Texon case. Only **\$36.50**

SHIPPED ON APPROVAL

NO MONEY WITH ORDER — NO C. O. D.

Try any of the above instruments for 10 days before you buy. If completely satisfied then send down payment and pay balance as indicated on coupon. **No Interest or Finance Charges Added!** If not completely satisfied return unit to us, no explanation necessary.

MOSS ELECTRONIC, INC.
 Dept. D-646 3849 Tenth Ave., New York 34, N. Y.

Please send me the units checked on approval. If completely satisfied I will pay on the terms specified with no interest or finance charges added. Otherwise, I will return after a 10 day trial positively cancelling all further obligations.

Model 77... Total Price \$42.50
 \$12.50 within 10 days. Balance \$6.00 monthly for 5 months.

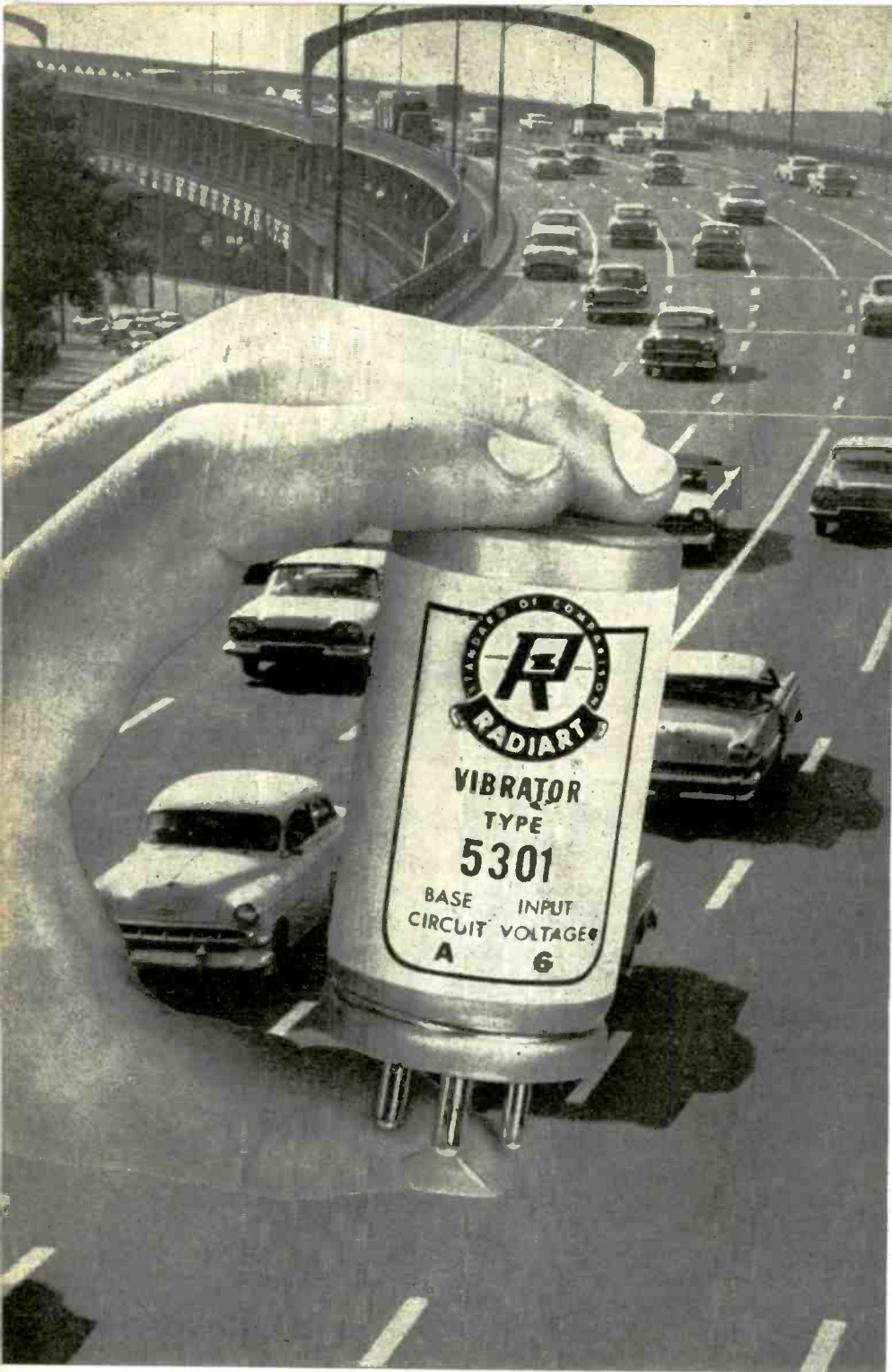
Model TV-50A... Total Price \$47.50
 \$11.50 within 10 days. Balance \$6.00 monthly for 6 months.

Model 83... Total Price \$38.50
 \$8.50 within 10 days. Balance \$6.00 monthly for 5 months.

Model 82A... Total Price \$36.50
 \$6.50 within 10 days. Balance \$6.00 monthly for 5 months.

Name
 Address
 City Zone State

All prices net, F.O.B., N. Y. C.



The Greater Vibrator

Radiart Vibrators are unaffected by bounce, jounce, heat, cold, moisture. There's a replacement type for every 6- and 12-volt application. Ask your Radiart Distributor for a free Radiart Vibrator Replacement Guide or write The Radiart Corporation, 2900 Columbia Avenue, Indianapolis 5, Indiana.



RADIART TOBE Vibrators

(Continued from page 18)

CLAROSTAT MFG. CO., INC. announces the promotion of **JOHN P. DILLON** to Asst. Gen. Sales Mgr., and **JAMES F. SMITH** to Distributor Sales Mgr.

AMERICAN TELEVISION & RADIO CO. is offering a new issue of 100,000 shares of Common Stock publicly at \$3.00 per share.

ROHN MFG. CO. has acquired additional manufacturing facilities of approximately 20,000 sq. ft. next to the main plant at Bellevue, Ill.

CLEVITE "WALCO" will give dealers their new Accessory Browser Panel free with the purchase of a sufficient number of accessories to fill the 17" x 24" display rack.

MOTOROLA, INC. Semiconductor Products Div. announces two appointments: **JOHN P. VAJDA**, District Sales Mgr., Western Region; and **AL B. DALL**, Special Accounts Sales Mgr., Eastern Region.

ENTRON, INC. has released their film concerning CATV Systems, "Light for the TV Shadowlands," for use by actual or prospective CATV operators, upon payment of \$100 deposit and assumption of all shipping and insurance charges. Address requests to **H. M. Diambra**, Entron, Inc., P.O. Box 287, Bladensburg, Md.

ELECTRONIC INDUSTRY SHOW CORP. has designated the following eight new directors to represent their sponsoring trade associations on the Bd. of Directors: **HUGH MOORE** (WEMA); **ROBERT E. SVOBODA** (EP & EM); **ROBERT FERREE** (PACE); **NORM TRIPLETT** (EIA); **SAM PONCHER**, **WILLIAM GREEN**, **JOSEPH S. FORTI** and **C. T. KIERULFF** (NEDA).

PHILCO CORP. held Service Open House in cooperation with their distributors throughout the country to inform servicemen of Philco's service programs and furnish them with literature and information on 1960 products. The **LANSDALE TUBE CO.** div. is completing a new \$3,500,000 facility for transistor production in Lansdale, Pa.

GENERAL ELECTRIC has named three new Mgrs. of Product Sales Planning for specific product lines in their Power Tube Dept.: **ARDELL C. ROWE**, beam tubes; **KEITH E. WILSON**, ignitrons, thyratrons and special purpose tubes; and **WILBUR F. McKEEHAN**, magnetrons, space charge and camera tubes. **ALBERT C. GABLE** has been named Mgr. of Mkt. Research & Product Planning practices. "The Teacher Wore White," a 40 minute educational motion picture based on the design and manufacture of receiving tubes is being made available.

(Continued on page 22)

dealer-serviceman's fuse rack . . .

. . .for wall mounting

most
needed

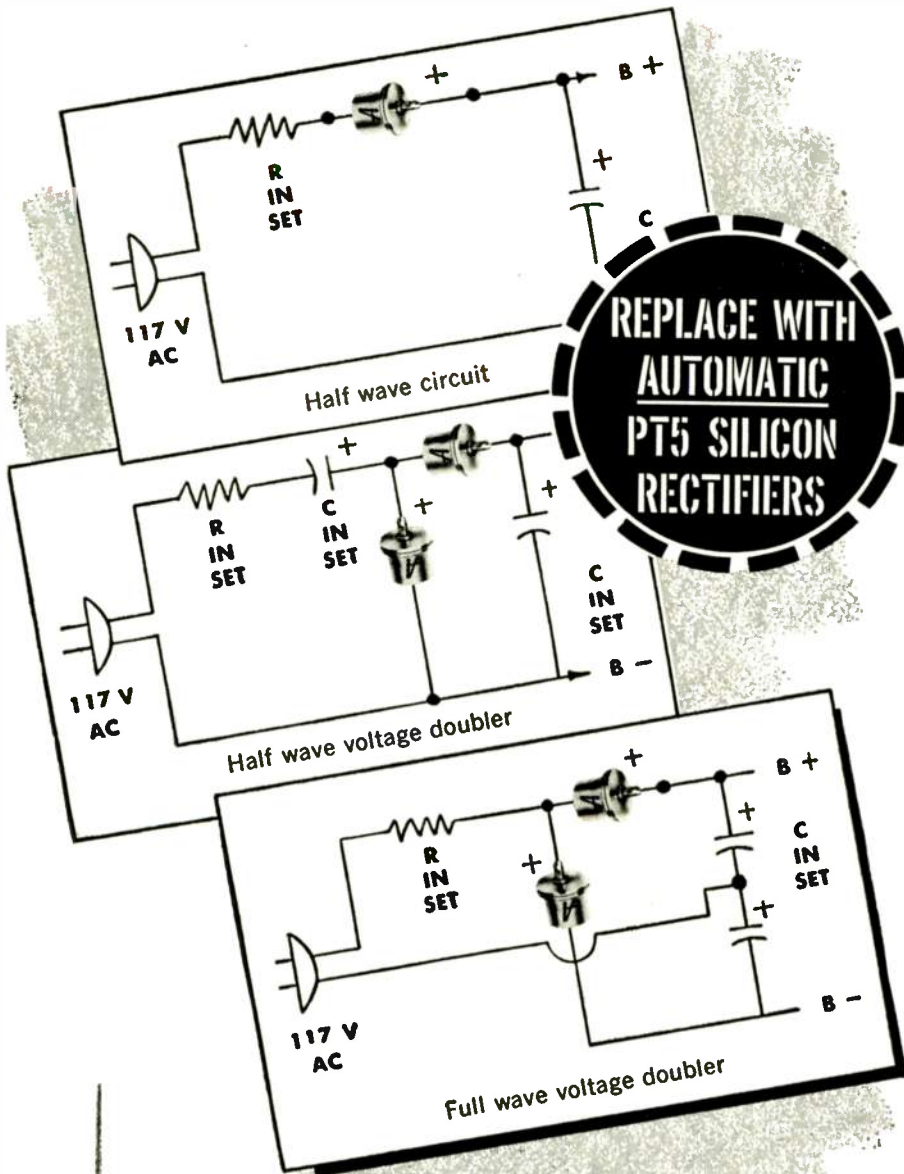


most
wanted

. . .the **FUSEMASTER!**



dealer-serviceman's fuse
requirements at a glance



Every TV circuit works better with

AUTOMATIC

PT5 SILICON RECTIFIERS

the universal replacement preferred by TV set manufacturers

Cut down expensive inventory, eliminate intricate installations — install the Automatic PT5 for top performance and maximum picture brightness!

GENERAL INSTRUMENT DISTRIBUTOR DIVISION
240 Wythe Avenue, Brooklyn 11, N. Y., EVergreen 8-6000



(Continued from page 20)

SILICON TRANSISTOR CORP. reports the appointment of **LAURENCE LE BOW** as Sales Mgr.

TRU-OHM PRODUCTS announces the appointment of **TOM WRIGHT** as Chief Engr.

KRAEUTER & CO., INC. reports the appointment of **JOSEPH E. BUHLER** to Vice Pres., Sales.

HUGHES AIRCRAFT CO. reports the appointment of **HENRY M. WALES** as Mgr. of Mktg. for the industrial systems div. of Hughes Products Group.

VIS-U-ALL PRODUCTS CO. has moved the firm's sales and administrative offices to 640 Eastern Ave., S. E., Grand Rapids 6, Mich.

PERMA-POWER CO. "Flight to Las Vegas" contest winner is technician **WILLIAM M. RYAN** and his distributor, **P. I. BURKS CO.**, both of Louisville, Ky.

STROMBERG-CARLSON Electronics Div. has named **JAMES VRUNGOS** Mgr. of Industrial Mktg. The Telecommunication Div. named **CHARLES F. CHENEY** Mgr. Mktg. Research.

TUNG-SOL ELECTRIC, INC. has made the following promotions: **ROBERT M. ANDREWS**, Electronics Planning Mgr, distributor sales; **T. D. STEPHENS**, Mgr. Distributor Sales, Atlanta office; and **GERALD E. TUCKER**, Mgr. Distributor Sales, Melrose Park office.

Reps & Distributors

FISCHER ELECTRIC CO. is being represented by **MILES C. MC KEARNEY**, Chagrin Falls, O.

JERROLD ELECTRONICS CORP. presented **HARRY ESTERSOHN** and **HERBERT DIENES** of **HARRY ESTERSOHN CO.** with "Rep of the Year" Award.

DAVID MUIR has formed a new electronics manufacturers rep organization to operate under his name with headquarters at 612 E. Colman St., Alhambra, Calif.

DUTREX INDUSTRIES, INC. reports appointment of five rep firms to handle the **DU MONT** renewal picture and receiving tube lines: **CLEMENSON-LARRABEE CO.**, Mo., Kan., Ia., Neb.; **PAUL HAYDEN ASSOC.**, Ala., Fla., Ga., Miss., N.C., S.C., Tenn.; **HANK LIEBERMAN & ASSOC., INC.**, Tex., Okla., La., Ark.; **RUDAT & EWING**, N. Calif., Nev., Hawaii; **STINSON-MUSTICO CO.**, E. Pa., Del., D.C., Md. and Va.

(Continued on page 24)

Shell

TEST-O-MATIC Self-Service Tube Testers Outsell All Other Brands 5 to 1



Table Model
TM-18

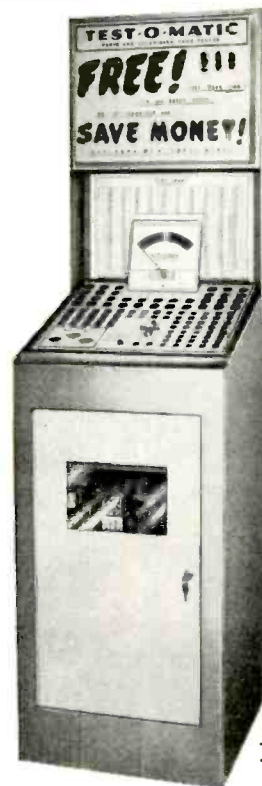
(also available with attachable legs as L-18)



P-18



S-18



102

DELUXE 102

- Engineered to accommodate new type tubes as they are produced • Largest selective tube chart available, lists and checks more tubes than any other self-service tube tester • Complete emission tester • Vibrator tester, checks 6 and 12 volt vibrators • 102 sockets, one knob control • Stores over 400 tubes • Checks each side of multi-purpose tubes

DEALER NET PRICE **\$199.95**

S-18

- 18 sockets test over 800 tube types • Test each side of multi-purpose tubes • Tests 6 and 12 volt vibrators • Three controls • Full emission test • Only 15" x 19" of floor space • Stores over 400 tubes in sliding drawers

DEALER NET PRICE **\$149.95**

TM-18

The TM-18 has the same panel and performing qualities as the S-18. Can be utilized profitably in a service shop. (attachable leg unit available)

DEALER NET PRICE **\$91.85**

P-18

The P-18 has the same panel and performing qualities as the S-18. This handsome, lightweight (12 lbs.) portable tester available in black grained finish attache case. Operates 110 V. AC.

DEALER NET PRICE **\$79.95**

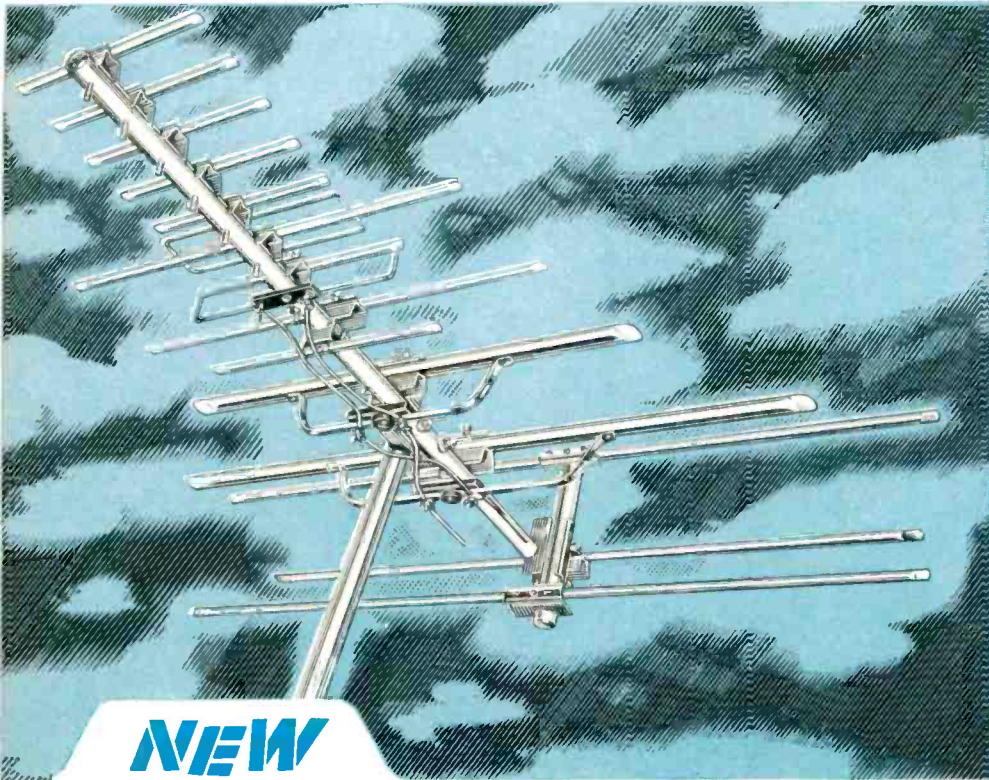
Free! WITH ALL TEST-O-MATIC
TUBE TESTING EQUIPMENT



3'x4' DAY-GLO WINDOW BANNER IN
3 ATTENTION CATCHING COLORS

Shell ELECTRONICS MFG. CORP.
112 State Street, Westbury, N. Y.

THE GREATEST BREAK-THRU IN PICTURE RECEPTION SINCE THE INCEPTION OF THE FIRST YAGI ANTENNA!



NEW

MIRACLE TV ANTENNAS by TENNA Give you the exclusive and Vastly Superior **MIRACLE REFLECTOR SYSTEM**

It's new, it's different and decidedly better! In the Miracle System the reflectors are "tuned" to produce highest directive results, providing the finest possible front to back ratio across the maximum number of channels.

HERE ARE
ACTUAL FACTS...
ACTUAL PROOF
OF MIRACLE
SUPERIORITY!

As an example, the front to back ratio on channel 3 of the Miracle TM-78 is 40 to 1. No other antenna of any manufacturer has ever achieved such a high ratio.

The Miracle Reflector when installed on competitive antennas invariably increased the gain by at least 25% and more than doubled the front to back ratio on the channel being tested.

GET ON THE MIRACLE BANDWAGON!

All America has long awaited the Miracle with its miraculous record of performance. Write, wire or phone collect today... the day of the Miracle is here!

THE TENNA MANUFACTURING CO. • CLEVELAND 25, OHIO

(Continued from page 22)

RADIO PARTS CO., INC. has moved to larger quarters at 1314 N. 7th St., Milwaukee 5, Wisc.

ROGERS ELECTRONIC CORP. reports appointment of **STANLEY L. MOSHER CO.** for N. Calif. and Nev.

TRIAD TRANSFORMER CORP. announces the appointment of **PASTON-HUNTER CO.** as rep for upper N.Y. state.

SILICON TRANSISTOR CORP. has added **HAROLD GRAY ASSOC.** as sales rep to cover N. N.J. and metropolitan N.Y.

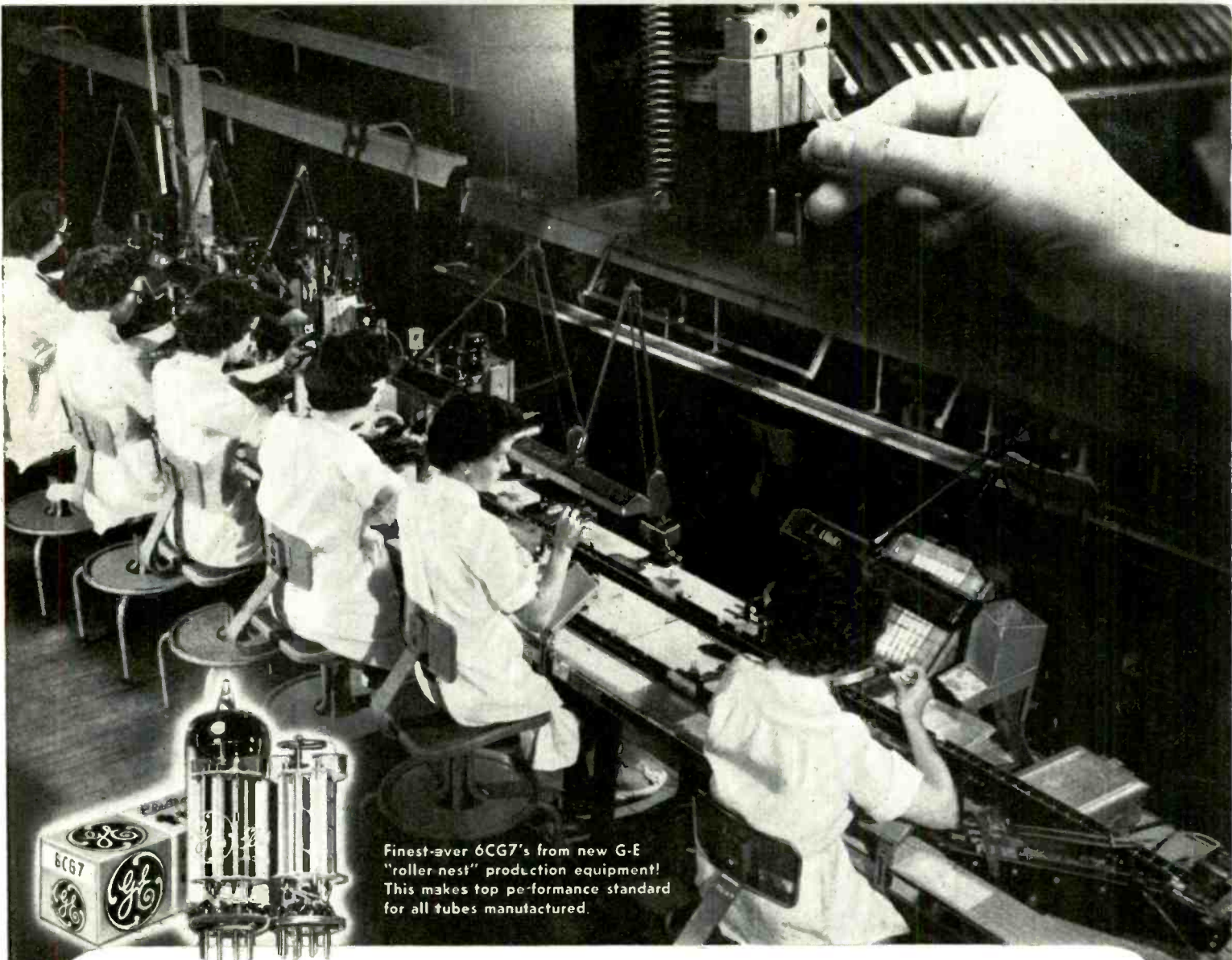
MILWAUKEE RESISTOR CO. announced appointment of **UNGER SALES ASSOC.** as their rep for S. Calif.

VIS-U-ALL PRODUCTS CO. reports the following rep appointments: **VINES & CO., Colo.,** SE Idaho, Utah, Wyo.; **TECHNICAL SALES ASSOC., N. Calif., N. Nev.;** and **DAVID A. FILLMORE CO., S. Calif., N. Nev.** **LORNE J. MC TAGGART** rep for upper N.Y. area was winner of the Vis-U-All sales award for the most dollar volume in the months of March and April.

GRANCO PRODUCTS, INC. has appointed the following new distributors: **BOYD DISTRIBUTORS,** FM units in the Colo. market; in Florida, **BROOKES DISTRIBUTORS,** phonos for Miami, Orlando, Tampa and **PEARL ELECTRONICS,** stereo and hi-fi, N. Fla.; **CORWIN HALL,** FM and stereo for S. Calif.; in Texas, **STERLING RADIO** to cover the SE section and the **APPLEBAUM CO.** for San Antonio and S. Tex. region.

ELECTRONIC REPRESENTATIVES ASSOC. meeting of Nat'l. Bd. of Governors re-elected **BURT C. PORTER** Pres. **JOHN O. OLSEN** was again named Chmn. of the Bd.; **R. EDWARD STEMM** and **HARRY HALINTON** were re-elected Secy. and Treas. respectively. Named as regional Vice Presidents were: **WALLY SHULAN,** Eastern Dist.; **CHARLES HOEMIG,** Central Dist.; **ALLEN I. WILLIAMS, JR.** Western Dist. **WILLIAM C. WEBER, JR.** was retained as principal administrative officer and given newly created title of Executive Dir. The new **KEYSTONE-MOUNTAIN CHAPTER** of the Pittsburgh area was welcomed.





Finest-ever 6CG7's from new G-E
"roller nest" production equipment!
This makes top performance standard
for all tubes manufactured.

MOST WANTED TUBE NOW BUILT STILL BETTER!

G-E 6CG7—your Service-Designed profit leader—given uniform high quality by new General Electric automated techniques!

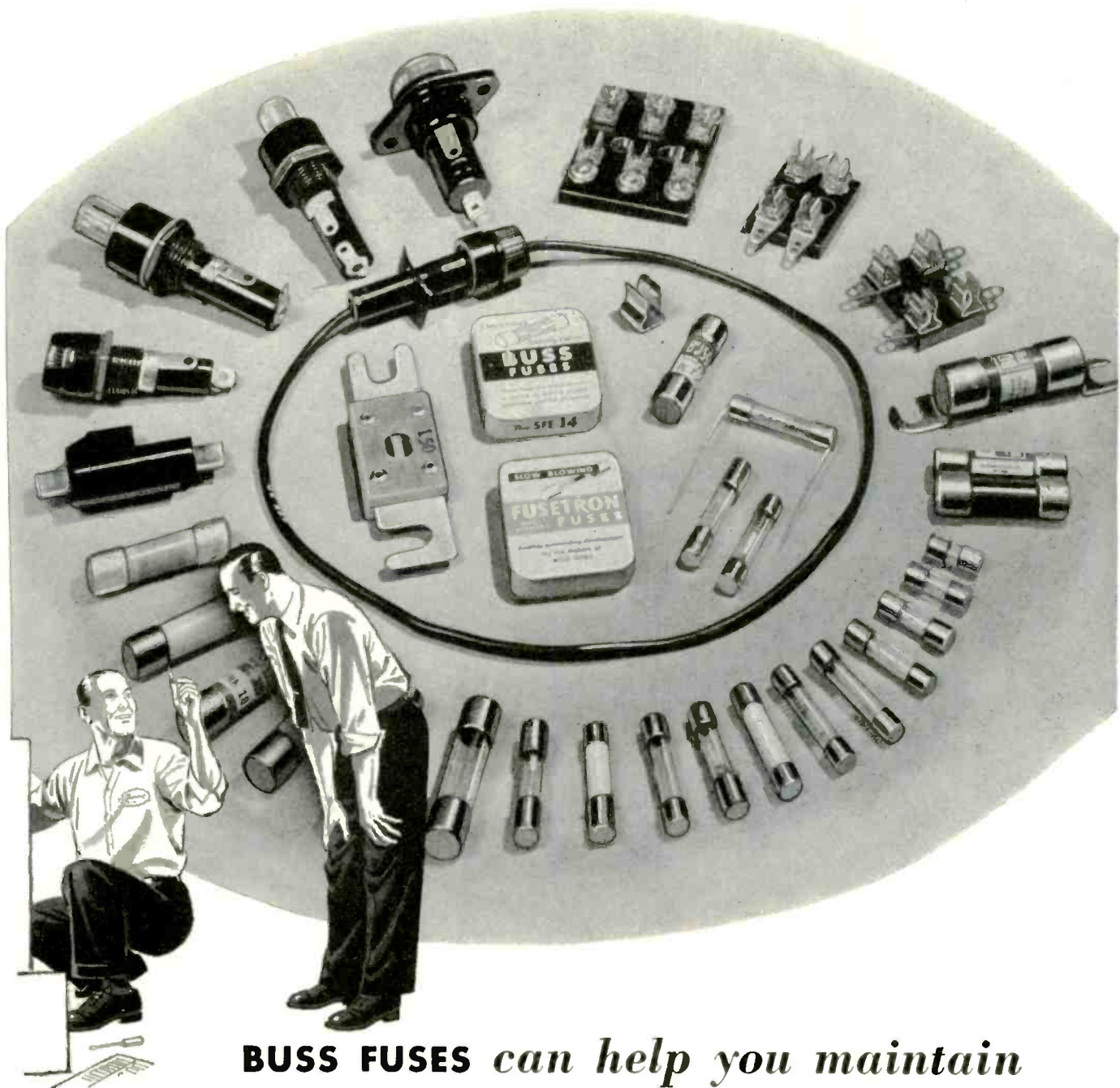
The infallibility of machines . . . the craftsmanship of skilled human hands . . . General Electric combines the two in brand-new production equipment for Service-Designed 6CG7's. Tight cages, snug-fitting micas, precision-built mounts—*every tube* now has these, for uniform characteristics and low microphonics. Means minimum circuit adjustments when you install 6CG7's!

Means far less chance, too, of trouble later. This is your big-demand Service-Designed Tube, with waiting TV sockets in the millions. Cut your callbacks 'way down—make your tube sales and profits climb! Order Service-Designed 6CG7's now from your G-E tube distributor. *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.*

Progress Is Our Most Important Product

GENERAL  ELECTRIC

2-111-205



BUSS FUSES *can help you maintain customer good-will!*

Your customers stay satisfied with BUSS fuses because . . . BUSS fuses provide, dependable, 'trouble-free' electrical protection under all service conditions.

Every BUSS fuse you sell or install is tested in a sensitive electronic device. Any fuse not correctly calibrated, properly constructed and right in all physical dimensions is automatically rejected.

BUSS fuse dependability helps you gain satisfied customers — and BUSS fuses help you avoid adjustments or call-backs that cut into your profits.

BUSS fuses can further help you maintain your reputation for quality and service because BUSS is the KNOWN brand of fuses. The universal acceptance of BUSS fuses as the finest available is built on the millions upon millions of BUSS

fuses used in home, on farm and in industry over the past 43 years.

For more information on the complete line of BUSS and FUSETRON Small Dimension Fuses and Fuse-holders, write for bulletin SFB.

Bussmann Mfg. Division McGraw-Edison Co. University at Jefferson, St. Louis 7, Mo.

BUSS fuses are made to protect — not to blow, needlessly



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

759

ELECTRONIC TECHNICIAN

Now Including
SERVICE
Magazine

Needed: A Critical Look at the Spectrum

Many people do not realize that the Federal Communications Commission does not administer all the frequencies in the radio spectrum. That part of the spectrum which comes under the authority of the FCC includes the many broadcasting and communications services familiar to all of us. With only a few exceptions, the FCC does an extraordinarily fine job in getting maximum utilization of the spectrum.

The government has for its own use a very sizeable portion of the spectrum which does not come under the jurisdiction of the FCC. As a matter of fact, under the Communications Act, the President is authorized to take over any portion of the spectrum without even declaring any emergency or showing that the government needs the space. A number of qualified engineers have charged that the government is not making maximum use of its frequencies.

Coming back to the FCC, we believe that this agency should place greater stress on the need for privately

operated communications systems. Some industry authorities believe that the FCC has relied too heavily on common carrier utilities to provide the extensive communications needed by American business and industry.

The Electronic Industries Association has proposed that Congress set up a Federal Spectrum Authority to resolve several conflicting views of what should be done to bring about more efficient use of the spectrum. The FCC and the Office of Civil and Defense Mobilization would continue to assign frequencies within the FSA allocations to civilian and government users, respectively.

Every electronic technician has an important stake in the allocation of this important national resource—the radio spectrum. Its effective utilization means greater electronic services to consumers and industry, with their accompanying opportunities for maintenance and installation.

Cooking With Electrons

We have often spoken of the desirability of diversifying horizontally in electronic servicing: that is, learning the techniques of maintaining electronic equipment for business and industry in addition to devices for the home.

There are, however, growing opportunities in vertical diversification. By this, we refer to the new electronic developments finding their way into the home. One of the most interesting of these devices is the

electronic range and oven which is now cooking meals quickly and deliciously for homes and industries.

The cover story for this issue gives you the low-down on the benefits and potential of these units.

In years to come, we can look forward to other home electronic advancements such as electronic refrigerators, electronic lighting, video tape recorders and a host of other products designed to bring the creature comforts to the American public.

Electronic Speed Cooking For

Increased Food Preparation Efficiency By Microwave

● A new era in speed cooking for the home and restaurant is upon us. Imagine a 5-pound roast of beef, ready in 30 minutes, a baked potato in 4 minutes, or a jar of baby food in 45 seconds. Speed is not the only benefit derived from electronic cooking. Heat is generated in the food itself and not in the utensils or oven. This is due to the fact that the mole-

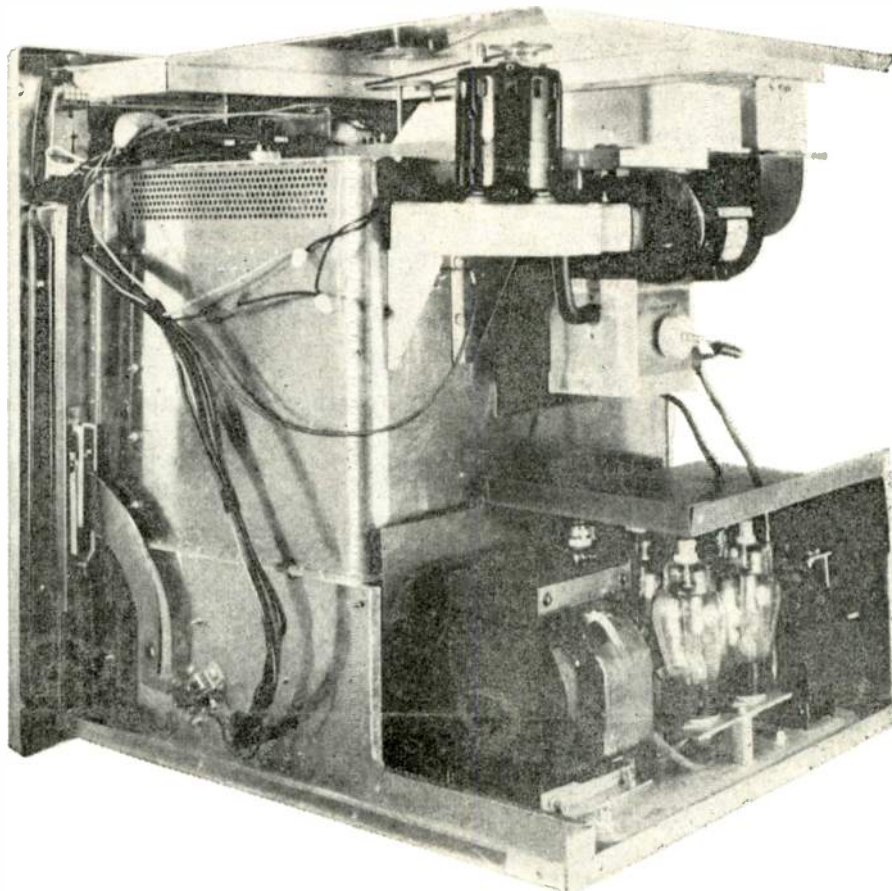
cules of some materials are more easily set in motion. Materials of low moisture content do not respond to this heat effect in the time required to cook the food. Therefore, paper plates may be used to hold the food while it is cooking. Foods that spatter can be covered with a paper towel, thus reducing the amount of utensil and oven cleaning to a minimum.

Speed cooking retains most of the natural moisture and flavor of foods.

Prices for home units are \$900 to \$1000, but this will decrease with greater production. Commercial units sell for about \$2600. These prices are 13 to 20% under models of the year before. There are some 10,000 electronic ranges now in use.

Outwardly the electronic range re-

Fig. 1—Radar range cover removed exposes power supply, magnetron blowers, motors, switches, relays, tubes, and other electronic components.



The Home Is Here

Cooking Promises The Technician A Growing Service Field

sembles a conventional built-in oven, but when the cabinet is removed, tubes, relays, transformers and other electronic components may be seen, as shown in Fig. 1. In addition, there are time delay circuits, timer motors, blowers, magnetrons, interlock switches, high voltage circuits, etc.

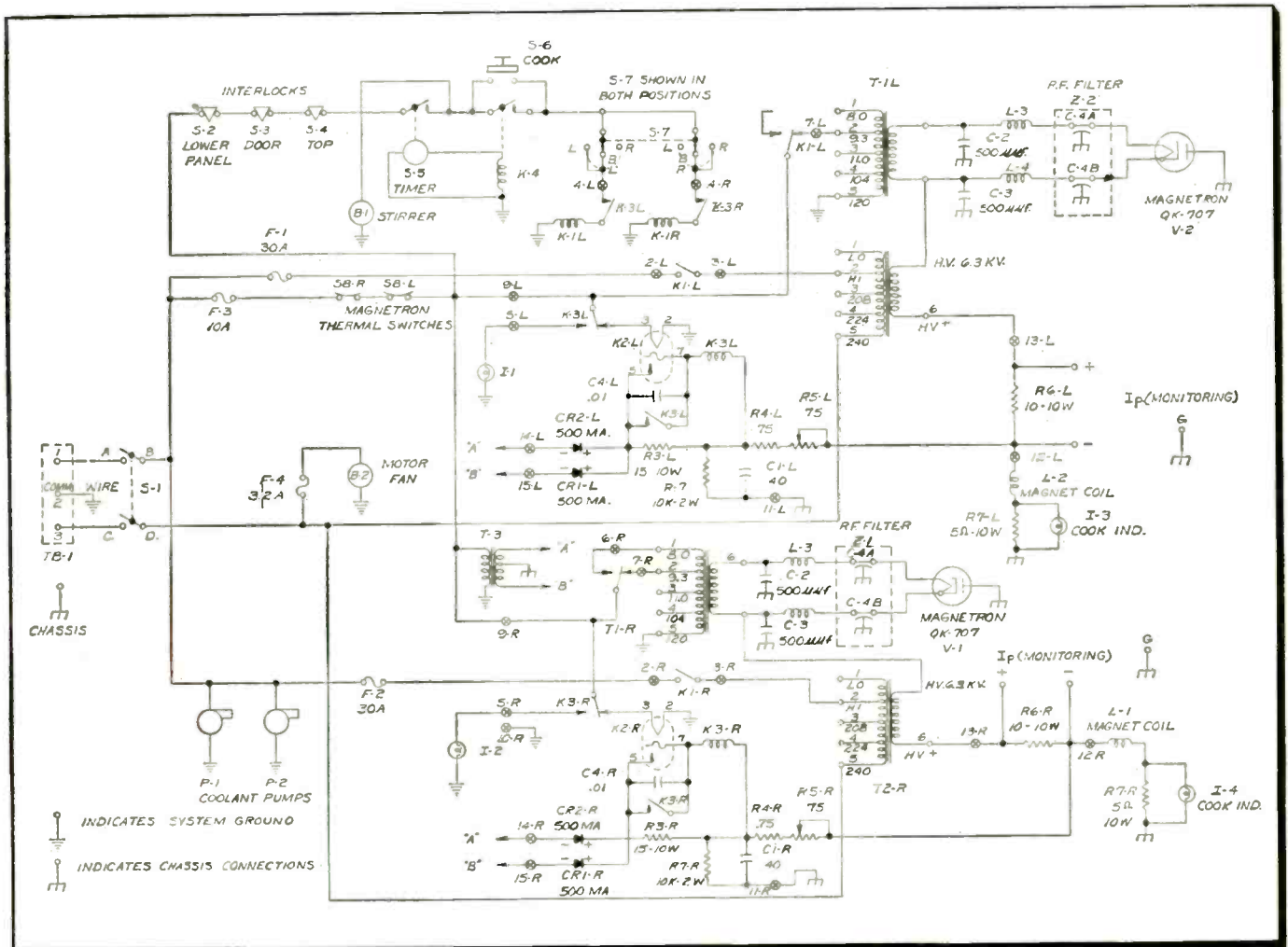
Operation of the electronic oven is fairly simple. Microwaves at a fre-

quency of 2,450 mc are generated by the magnetron shown in Fig. 3 and fed into the cooking area, either by a waveguide, or directly. These microwave radiations are capable of penetrating most foods to a depth of about 3 inches and cause heat to be generated therein. Interlocking door switches interrupt current to the power pack when the door is opened.

Therefore, the user never comes in contact with the waves. The entire cross section of the food (roast, cake, etc.) including the center, is cooked at the same time. In ordinary cooking, heat penetrates from the outside and the center portion is the last to be done. Because microwave cooking takes place from within the food, as well as on the surface, frozen foods

Fig. 2. Radarange Model #1161 uses type QK-707 a-c magnetron tubes for power generation of high frequency waves. Service

to magnetron or power pack should be performed with power "off" at the service entrance box to eliminate high voltage hazard.



present no problem. They can be placed in the oven directly from the freezer. Some foods cook too quickly to become brown on the outside. A high speed browning element, which is nothing more than a conventional heating device, is used during the last few minutes of electronic cooking to brown these foods.

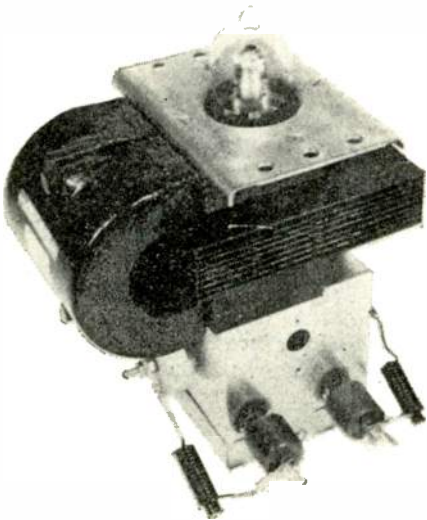


Fig. 3—Magnetron generates a 2,450 mc microwave signal which is delivered to the oven through a waveguide. Foods are cooked rapidly, even though the oven remains cool.

The power supply shown in Fig. 4 requires an input of about 220 volts a-c. It develops an output of 4,800 volts pulsating d-c at 320 ma. No filters are used because the magnetrons are more stable with a pulsating voltage than with pure d-c. The 220 volt input is also split up to furnish power to the 110 volt components which include: cooling and exhaust blowers, time delay circuits, oven light, indicators, magnetron filament transformer, rectifier tube filament transformer, high voltage primary relay, electronic cooking timer motor, and the browning timer motor. There are other methods of heating foods which include induction and dielectric techniques, but they should not be confused with microwave cooking.

Cooking Power

The amount of microwave energy generated can be determined by measuring the temperature rise in a given amount of water, during a given period of time. The amount of energy generated by the magnetron can be regulated by varying the magnetron plate current. As magnetrons age, it may become necessary to increase the plate current in order to maintain a given output power.

As in any type of electron tube, variations exist even among new

TROUBLESHOOTING CHART

Problem	Possible Cause	Cure
Oven fails to cook. Make a complete operational check first	<ol style="list-style-type: none"> 1. Defective 30 ampere tubular fuse in range indicated by no current on meter reading. 2. Defective 866-A rectifier tube or tubes indicated by very low current meter reading. 3. Defective oven timer or timer wiring. No current on meter reading. 4. Defective oven door interlock switch or wiring. No current on meter reading. 5. Loose magnetron connections. (If arcing occurs there will be spurts of high current.) 6. Defective magnetron. Low current, arcing, or excessive current. 7. Defective power supply pack. Low current or arcing. 	<ol style="list-style-type: none"> 1. Replace. 2. Caution: Disconnect range from power and with insulated screw driver, ground tube caps to chassis. Then replace defective tube. 3. Replace or repair. 4. Replace or repair. 5. Clean and tighten all magnetron connections. 6. To check: <ol style="list-style-type: none"> a. Disconnect range from source of power at service entrance. b. Disconnect magnetron leads from filament transformer. c. Make continuity check of magnetron filaments. d. if open, replace magnetron assembly. 7. Replace.
Arcing (magnetron or power pack)	<ol style="list-style-type: none"> 1. Non-starting magnetron due to: <ol style="list-style-type: none"> a. Loose filament connections. b. Improperly timed delay tube. c. Failure of either relay to open. d. Defective magnetron. 	<ol style="list-style-type: none"> a. Fasten securely. b. First check 75 second timing of time delay tube. (Wait approximately 5 minutes for magnetron and power supply to cook sufficiently to make this check.) If check discloses 60 to 90 second delay tube is O.K. c. Disconnect power at source, ground rectifier tubes to chassis and manually check relay contacts, replace power pack if necessary. d. Replace.
<p>Note: If arcing resulted in power supply due to the magnetron, a visual inspection of power supply components should be made to assure no permanent damage to power supply has occurred.</p> <p>If arcing resulted in magnetron filter assembly due to power pack, a visual inspection of filter assembly should be made.</p>		
<p>Arcing in Oven</p> <p>May be caused by looseness of any metallic oven component or improper door seal.</p> <p>All door assembly screws exposed to inside of oven should be securely fastened, screws fastening broiler element to sides and back of oven should be tight, and welds connecting broiler element to mounting rod should be secure.</p>		
*Range continues to cook with door open	1. Defective interlock switch.	1. Replace switch.
*Range continues to cook after timer has returned to zero	1. Defective timer.	1. Repair or replace.
<p>*Note: If both conditions exist, relay is defective and power pack must be replaced.</p>		
<p>Milliamp check of "Hi-Lo" Selector</p> <p>If milliammeter reads between 310 and 320 in both Hi and Lo positions on selector switch, replace switch.</p> <p>If milliammeter reads approximately 280 in both Hi and Lo positions on selector switch, replace switch.</p> <p>If milliammeter reads between 310 and 320 in Hi position on selector switch and reads below 100 milliamps on Lo position, replace resistor (100 ohms and 25 watts) which is mounted beside Hi-Lo switch.</p>		

TROUBLESHOOTING CHART

Problem	Possible Cause	Cure
Broiler element indicator light fails to come on	<ol style="list-style-type: none"> 1. Range "Off-On" switch in "Off" position or defective. 2. Defective bulb assembly. 3. Loose wire. 4. Defective broiler timer. 	<ol style="list-style-type: none"> 1. Turn on or replace. 2. Replace. 3. Repair. 4. Replace.
Broiler element fails to heat with indicator light on	<ol style="list-style-type: none"> 1. Element over-heated and safety limit switch open. 2. Defective safety switch. 3. Loose or broken connections. 4. Defective broiler unit. 5. Defective broiler timer. 	<ol style="list-style-type: none"> 1. Allow 10 to 15 minutes for unit to reset timer. 2. Check for continuity when cool. If defective, replace. 3. Repair. 4. Replace. 5. Repair or replace.

Fuses continue to blow

A. 30 amp

Insert milliammeter lead into monitoring jack and replace blown fuse before turning on oven timer. Observe meter reading at instant timer is turned on.

CAUTION: If current is excessive, meter may read above 500 milliamps and timer should be turned off immediately to avoid damage to milliammeter or range. Magnetron current should not exceed 320 ma.

First, exchange magnetron. If condition still exists, replace magnetron with original and exchange power pack with a replacement.

B. 0.6 or 3.2 amp.

If either the 0.6 amp or 3.2 amp fuses continue to blow, check to see that the range is properly connected to single phase 3 wire 220 volts. If wiring is correct, check for a short circuit in the power supply.

Power check shows very low temperature rise of water.

Check for possible arcing in oven or at magnetron or waveguide. If arcing is between magnetron and matching section, or on magnetron, change magnetron.

magnetrons. The amount of power will vary from magnetron-to-magnetron. To check the power output, place a quart of water, in a non-metallic container, in the oven. Turn on the magnetrons and observe the total temperature rise in a two-minute period. Multiply this temperature rise by 33 for Centigrade, and by 183 for Fahrenheit readings. The answer obtained indicates the number of watts of power output. 1,600 watts ± 50 is desirable. However, magnetron current should never exceed 275 ma. (These figures may vary from model-to-model and from company-to-company, and are presented here for general informational purpose.) As in any electronic device, where the specifications and operating conditions are not specifically known, refer to the manufacturer's service notes.

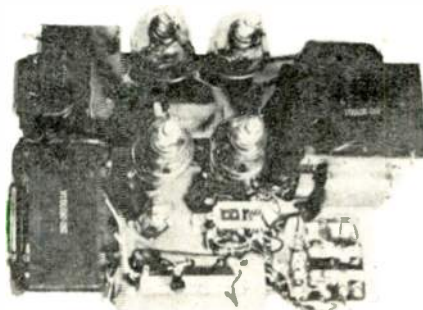
The Magnetron

The QK-707 magnetron is essentially a two-element cavity oscillator, having a heater, cathode and plate. The cavity is located between the cathode and plate. Electrons, flowing from cathode-to-plate, become excited in the cavity because of an ap-

plied magnetic field and the plate voltage. The size of the cavity and the antenna take-off point determine the frequency.

Magnetron fields for the magnetron may be generated by permanent or electromagnets. The QK-707 fits into a separate electromagnet structure. This tube is also equipped with a water jacket and water pipes for

Fig. 4—Power supply working from a 220 volt a-c power line delivers 4,800 volts at 320 ma, pulsating d-c. Rectified voltage is applied directly to magnetron without filtering. The magnetron is more stable with this supply than with pure d-c.



cooling purposes. Another feature of this tube is that the r-f filter box is attached to the coil housing rather than to the magnetron as in some other types, and is reusable from magnetron-to-magnetron. Fig. 2 is a partial schematic of the Model 1162 Tappan Radarange. Note that there are essentially two identical circuits. This fact is the secret to a foolproof troubleshooting technique. It would be quite unusual for the same trouble to develop in both circuits, at the same time. All the servicing technician need do, once the troublesome circuit has been identified, is to compare one circuit with the other. Another very encouraging fact, in spite of the lethal voltages and high frequencies—circuit complexities are on a par, if not simpler, than those found in TV receivers.

Some companies have introduced a new design using raw 60-cycle current at 6,000 volts which is applied to the plate of the magnetron, instead of the 120-cycle pulsating d-c found in earlier models. Continued circuit simplification and lower prices may be expected from year to year. ●

INFORMATION CREDITS: General Electric Co., Appliance Park, Louisville 1, Ky., Raytheon Co., 103 River St., Waltham 54, Mass., The Tappan Stove Co., 250 Wayne St., Mansfield, Ohio, Westinghouse Electric Co., 246 E. 4th St., Mansfield, Ohio.

Coming in
September

STEREO 1960

Your comprehensive reference
for hi-fi technical data, products
and manufacturers directory

Practical Transistor Testing

Evaluate Transistors With Simple Instrument Setups

ROBERT G. MIDDLETON

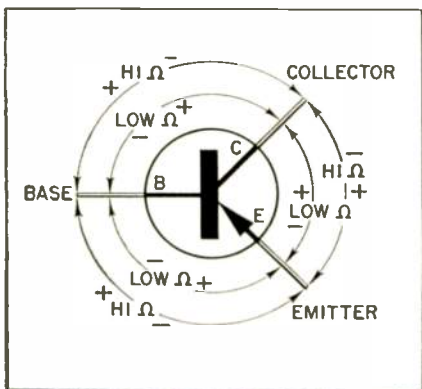
• Numerous transistor testers are now available. Some give limited indication of transistor merit, but have the advantage of low cost and ease of operation. Others provide more complete data, at higher cost and somewhat greater complexity of set-up and operation.

The technician, concerned with practical and economical transistor tests will find the conventional 20,000 ohms-per-volt meter to be a useful instrument in making preliminary tests of transistors. The ohmmeter section of the VOM can provide the following data:

1. Identification of emitter, collector, and base terminals.
2. Determination of NPN or PNP type.
3. Identification of junction or point-contact type.
4. Indication of the transistor's general quality.

Transistor tests with an ohmmeter require knowing the polarity of the battery voltage in the instrument.

Fig. 1—PNP transistor, indicating ohmmeter polarity for forward (low) and back (high) resistance measurements. Reverse ohmmeter polarity when testing NPN transistors.



Transistor Identification

Ohmmeter tests are made on the basis of front-to-back ratios between the various pairs of terminals as indicated in Fig. 1. If a transistor is not defective, a substantial front-to-back ratio will be measured between any two terminals. Proceed as follows:

1. Choose any two terminals (of a three-terminal transistor). Measure the front-to-back ratio, and note the value of the forward (low) resistance. Repeat the test for the other

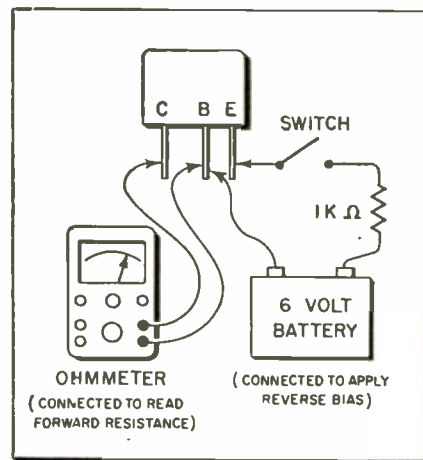


Fig. 2—Ohmmeter test set-up to identify point-contact and junction transistors.

two pairs of terminals. In a "good" transistor, the highest forward resistance occurs between emitter and collector. The third terminal, of course, is the base.

2. Connect the negative ohmmeter lead to the base terminal. Connect the positive ohmmeter lead to one of the two terminals, and then transfer the positive lead to the remaining terminal. Note the values, and check with the (1) data to see if these are forward (low), or back (high) re-

TRANSISTOR TESTS

Identification
Elements
Type

Tests

Front-to-Back Ratio
Short and Opens
Gain
Quality

Test Equipment
VOM

sistances. A PNP transistor shows forward resistances in this test, while a NPN transistor shows back resistances. The transistor can now be identified as a PNP or NPN type.

3. To distinguish the emitter terminal from the collector terminal, disconnect the ohmmeter from the base terminal and connect the test leads to the other two terminals. When the ohmmeter indicates forward resistance, the positive lead is connected to the emitter terminal in a PNP transistor and the collector terminal in an NPN transistor.

4. Most present-day transistors are junction types. However, to distinguish between a junction and a point-contact type, make the following test: Use the test set-up shown in Fig. 2. Connect the ohmmeter leads to base and emitter terminals, with polarity to read forward resistance. The 6-volt battery and the 1,000-ohm resistor are connected to apply reverse bias between base and collector. Reverse bias causes small current flow. Consequently, the battery polarity depends on whether you are testing an NPN or a PNP transistor. The test indication is obtained by closing the switch momentarily to

TYPICAL TRANSISTOR DATA CHART

TYPE	TYPICAL APPLICATION	BASING OR LEAD ARRANGEMENT	MAXIMUM RATINGS					CHARACTERISTICS				
			Collector-to-Base Volts	Collector Ma	Transistor Dissipation at 25° C mw	DC Collector Volts	DC Collector Ma	Current Transfer Ratio at 1 Kc	Alpha-Cutoff Frequency Mc	Power Gain		
										at Frequency Mc	Maximum db	Useful db
2N140	Converter	3-Pin Base	-16	-15	80	-9	-0.6	75	10	1	---	■ 32
2N219	Converter	3 Flexible Leads	-16	-15	80	-9	-0.6	75	10	1	---	■ 32
2N371	Oscillator	• 4 Flexible Leads	-20	-10	80	-12	-1	60	30	---	---	---
2N372	Mixer	• 4 Flexible Leads	-20	-10	80	-12	-1	60	30	20	17	12.5
2N374	Converter	• 4 Flexible Leads	-25	-10	80	-12	-1	60	30	1	---	■ 40
2N411	Converter	3-Pin Base	-13	-15	80	-9	-0.6	75	10	1	---	■ 32
2N412	Converter	3 Flexible Leads	-13	-15	80	-9	-0.6	75	10	1	---	■ 32
2N139	455-Kc Amplifier	3-Pin Base	-16	-15	80	-9	-1	48	6.8	0.455	38	32
2N218	455-Kc Amplifier	3 Flexible Leads	-16	-15	80	-9	-1	48	6.8	0.455	38	32
2N247	RF Amplifier	• 4 Flexible Leads	-35	-10	80	-9	-1	60	30	1.5	45	30
2N274	RF Amplifier	• 4 Flexible Leads	-35	-10	80	-9	-1	60	30	1.5	45	30
2N370	RF Amplifier	• 4 Flexible Leads	-20	-10	80	-12	-1	60	30	20	17	12.5
2N373	455-Kc Amplifier	• 4 Flexible Leads	-25	-10	80	-12	-1	60	30	0.455	54.5	40
2N384	RF Amplifier	• 4 Flexible Leads	-30	-10	120	-12	-1.5	60	100	50	---	15♦
2N409	455-Kc Amplifier	3-Pin Base	-12	-15	80	-9	-1	48	6.8	0.455	38	32
2N410	455-Kc Amplifier	3 Flexible Leads	-12	-15	80	-9	-1	48	6.8	0.455	38	32
2N544	535-1640 Kc Amplifier	• 4 Flexible Leads	-18	-10	80	-12	-0.5	60	30	1.5	47.3	30.4

apply the reverse bias. The ohmmeter reading drops to about one-half for a junction transistor. If the ohmmeter reading drops below zero, this would indicate a point-contact transistor.

Quality Tests

The practical technician is primarily concerned whether transistors are open, shorted or partially shorted, and with an indication of relative gain. For these tests, the simple instrument shown in Fig. 3 will suffice.

B and C are closed-circuit jacks, for plugging in a d-c ammeter. S is an SPST switch mounted on a 2-meg potentiometer (linear taper). The resistors are half-watt units. For general use, a standard inline socket can be used to accommodate the base, emitter, and collector terminals of the transistor. Connect S to the potentiometer so that it has maximum resistance when the switch is opened. A 2 ma meter is suitable.

Note that a PNP transistor is shown in Fig. 3. If an NPN transistor is to be tested, the 6-volt battery polarity must be reversed. Additional switch facilities can be provided for this purpose, if desired. The tests are made as follows:

1. Collector current is indicated with the switch open and meter plugged in C. With a good transistor, this current is very low. A reading greater than 1 ma shows a leaky transistor which should be rejected. A shorted transistor causes a full-scale reading, and should be rejected. When making leakage tests,

the meter will sometimes jump or creep. "Creepers" should be rejected.

2. Next, close the switch, and increase the bias by reducing the amount of resistance in the circuit, adjust R₁, the 2-meg potentiometer. The collector current should now go up. If the meter reads zero in both

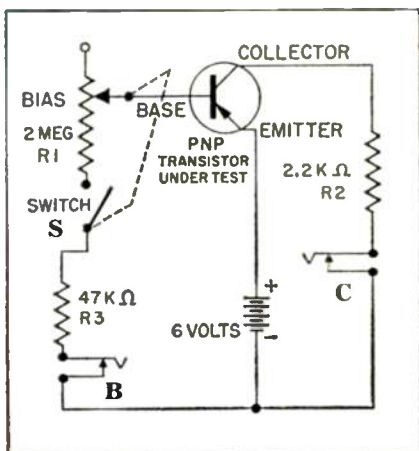


Fig. 3—Transistor tester provides open, short, and gain tests. Reverse battery and ohmmeter polarity when testing NPN transistors.

(1) and (2), or if there is no change in collector current with bias variation, the transistor is open and should be rejected.

3. An approximate gain check is made next. Plug the meter into the B jack, to read base-bias current. Adjust the bias pot for a current reading between 20 and 50 ma. Then, plug the meter back into the C jack. The ratio of the readings in B and C jacks gives the current gain (beta) of the transistor. The value of beta

obtained is sufficiently accurate for practical purposes and ratios of 30 and 40 are not unusual.

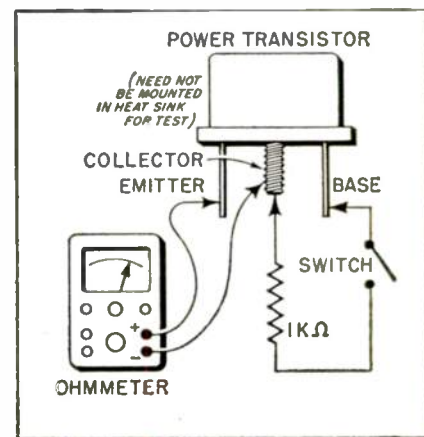
An ohmmeter can be used to check a power transistor, as shown in Fig. 4. With switch open, a moderately high reading should be obtained. A low resistance indicates leakage.

Closing the switch, the ohmmeter reading should now be less than 50 ohms. Higher readings indicate that the transistor's gain is too low or that it is open and should therefore be rejected.

Transistor Characteristics

Transistors, being current operated devices have their gain checked in terms of current ratios. The current amplification factor (alpha) is the ratio of a change in collector current to a change in base current. (Continued on page 60)

Fig. 4—Using an ohmmeter to check a power transistor. Collector terminal is also the mounting stud and aids dissipation of heat.



New Developments

In 1960 TV Lines

Manufacturers Announce TV Design Advances And Refinements

• The 1960 TV receiver lineup to date indicates the industry's increased concern regarding the serviceability of their products. Constructive design innovations in printed circuitry will enable technicians to tackle their servicing with less hesitation.

Printed Circuits

Admiral's etched circuitry is maintained in their new sets and is now covered by a 5 year warranty.

G.E. is using their etched circuitry with both sides exposed for easier servicing.

Motorola has developed a plated circuit chassis that is claimed to be "... the most easily serviced TV set ever built." All components can be easily reached and tested by simply removing the back cover of the set. Removal of the plated chassis board is accomplished with ease as depicted in Fig. 1. Furthermore, lead length has been extended to facilitate servicing the removed chassis with the receiver operating

The chassis board plated circuit in a metal mounting frame is color-coded, following EIA standards. Consequently, the complete schematic may be traced right on the board. In addition, the top diagram has been transposed to the bottom of the chassis and the bottom transposed to the top (transposed circuits are indicated by a black color-code) to allow circuit tracing without reversing the board.

Other refinements include the use of modules, allowing section defect analysis rather than individual component checks. Diagrams and labels are contained in every set, including schematic, wiring layout, tube loca-

tion, test points, modules and connectors.

This chassis, a 17 inch portable TV, will be used in only one model of the company's 1960 line, *Motorola 17P6*.

Philco announces introduction of their new *Perma-Circuit* panels with the entire circuitry painted on top of the panel. Component lead-ins are accessible to the technician and can be readily replaced from the top of the panel without need for under-panel soldering. Troubleshooting or parts replacement can be performed without completely removing the chassis from the cabinet. Service adjustments can be performed by inserting a screwdriver directly into decorative control knobs. *Philco* has been holding open houses at their

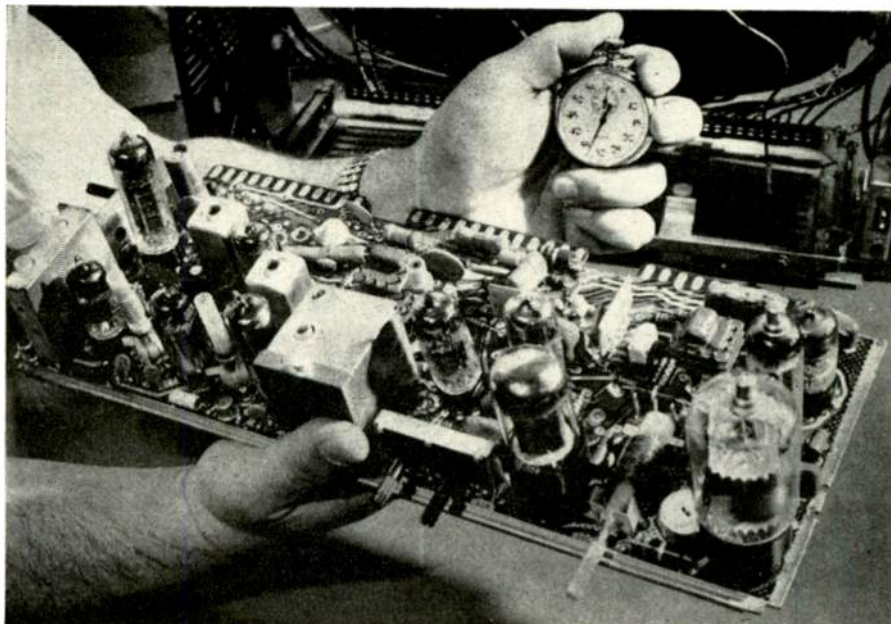
set distributors across the county, inviting technicians to see the 1960 line.

RCA features *Security Sealed Circuits* and states that "... these new sets will be a cinch to service." Almost all components are mounted on the same side of the panel with a "roadmap" of the circuit diagram and component location.

Transistor TV

Philco announces quantity production is set for a portable transistor TV set. The portable TV incorporates 21 transistors and weighs only 15 pounds. In addition, it may be powered by ac or a rechargeable battery to be produced by the *Eveready Company*. The ac/battery

Fig. 1—With only the power supply and some associated receiver parts separate, the new single plated circuit board contains almost all the TV set's components. The chassis board can be removed in minimum time without unsoldering or cutting leads.



portable TV contains a two inch CRT that is projected by a magnifying lens, resulting in a viewing area of approximately 80 square inches or comparable to a 14 inch screen. See Fig. 2.

Admiral demonstrated a completely transistorized 17 inch portable TV receiver using 25 transistors. The demonstration model made use of the company's etched circuits which are used in their other TV sets. However, production of transistorized sets was not announced.

Color TV

Ten color models by *RCA* should provide a tremendous impact on the industry. A major advancement for color TV is the introduction of a pre-set fine-tuning system. Upon delivery of the set to the owner, the service technician adjusts the fine tuning of individual channels to their best quality. Thereafter, the channel is automatically fine-tuned for optimum quality as originally set. This improvement is available on all the new color receivers except the lowest price table and console models.

The basic chassis of the new color receivers is only slightly modified from last year's models, however, brightness is said to be increased by up to 40% and greater contrast is achieved.

As evidence of color set reliability, service contract prices were reduced by *RCA* from \$89.50 to \$69.50 for a full year contract.

Admiral plans to distribute 14 color TV models this year and will include a one year parts warranty, including the color CRT.

Remote Controls

Wireless remote controls seem to have captured public imagination, as evidenced by the large number of manufacturers offering this feature.

Admiral is featuring two Son-R wireless remote control units; a two button control for three 21 inch models and a four button control for three of their newly developed 23 inch models. Both units will turn the set on or off, change channels in either direction and adjust the sound to respectively three or four different levels.

G.E.'s new line has an unusual system of wireless remote control. It employs electromagnetic waves of

radio frequency rather than a supersonic system. The transmitter contains a transistor and two transmitting antennas, among other parts. Power is derived from a 9 volt mercury battery reputed to have a 70 hour continuous operation life. Its normal operating range is about 35 feet. The volume control is continu-

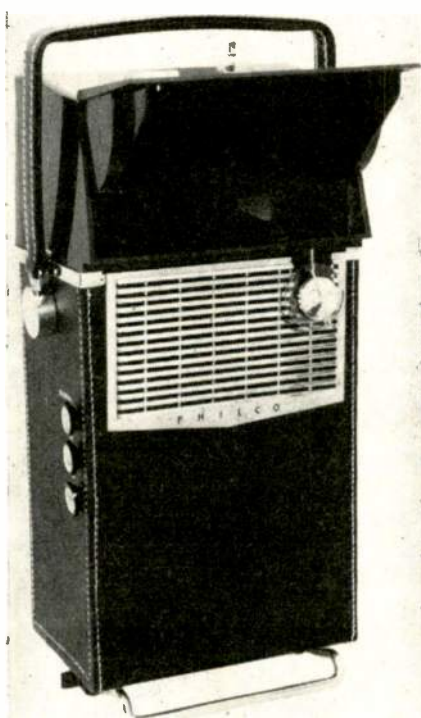


Fig. 2—Transistorized portable TV operates on a-c or rechargeable battery and has a viewing area approximately 80 square inches.

ous, being operated by a small ac motor which moves the volume up or down.

The wireless receiver, inside the cabinet, uses two tubes. The unit requires 8 watts standby power and may be turned off by a switch should the TV set be unused over an extended period of time. It is equipped with its own power transformer and for added reliability, the two remote receiver tube filament voltages are reduced to 5.5 volts.

The wireless remote transmitter will turn the set on or off, change channels and provide continuous control of volume.

Three new Wireless Wizard TV remote controls are introduced by *RCA* as follows:

A three function control, slightly larger than a cigarette lighter, changes channels and turns off the picture using a high frequency sig-

nal. A five function electronic remote control unit features all-level volume control, channel selection and permits turning off all power. Color TV is given a boost by the addition of an improved seven function Wireless Wizard that enables the viewer to control the color and tint as well as the functions enumerated for the five function control.

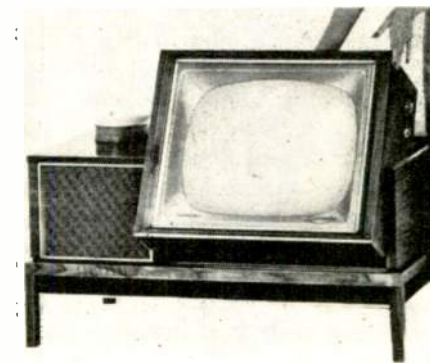
Zenith offers the convenience of either their Space Command "400" or the new Space Command "300" remote TV tuning system.

CRT'S

The first new CRT size in several years, 23 inches, has been introduced by *Admiral* in its 1960 TV line. Offered in 12 models, the 23 inch, 110² CRT provides a 282 square inch picture. *Admiral*'s 21 inch line of TV receivers is transformer powered with 20,000 second anode voltage. *Sylvania* also announces introduction of sets with a 23 inch CRT.

New wide screen "Pan-O-Vision" is featured on more than two-thirds of the consoles in *Hoffman*'s expanded TV line. The new rectangular CRT offers 280 square inches of viewing area, 20 more than comparably sized 21 inch tubes. *Hoffman* claims a viewing angle 30 percent greater than conventional tubes and elimination of most of the reflection on the tube's surface. Another advancement is the bonding of the safety glass panel directly to the tubes face plate, eliminating the necessity of removing the front glass to clean the CRT face. 18,000 second
(Continued on page 55)

Fig. 3—The console TV can be converted into a handsome living room table by folding the set into a recessed portion of the cabinet.



23 Ways to Win Friends

How To Hold Customers

Even When The Competitions' Prices,

Quality And Service Are Equal

ERNEST W. FAIR

• When prices, quality and service are equal, customers usually will do business with the service shop whose employees they like the best. Presented here are 23 ways to win friends and influence customers:

1. Give the customer your full attention while serving him.

2. Smile and be cheerful. This may be difficult at the end of a hard day, but it is just as important then as any time. Good nature usually disarms a customer, and makes it a bit more difficult for them to become upset.

3. Refrain from smoking while waiting on customers, unless invited to do so. Ashtrays should be made available. A tense moment can sometimes be circumvented by getting the customer to relax.

4. Be neat at all times. It is not easy to keep that way during busy periods, but a nice appearance is important enough to warrant an occasional look in the mirror to check your hair and clothes. Keep the shop clean and fresh. No one likes to see his radio or TV set next to a pile of junk parts.

5. Make up privately. It may be embarrassing to others.

6. Keep your distance. Too close an approach is seldom warranted; so keep a respectable distance, particularly from women customers.

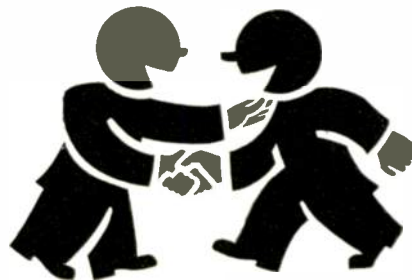
7. Avoid an appraising look. It is bad manners to make a head-to-toe inspection of any customer, or to imply by word or glance that you are trying to estimate how much money he is willing to spend.

8. Save gossip for the store room.

Although many of us indulge in this habit, it should never be done with a customer. If we gossip about Sam while waiting on Harry, Harry will assume that we gossip about him when we are talking to Sam.

9. Assist the customer any way you can. People often appreciate any extra help. Offering them help is a sure way to make friends.

10. Avoid over-dressing. Wear clothing appropriate for the job.



11. Avoid "talking down" to your customers. Nothing is more insulting than to be treated as though you were slow to catch on, or to have something explained in unnecessary detail.

12. Keep fingernails clean. Many people are careful in every detail of appearance except fingernails.

13. Be glad to see people, and be friendly. Nothing pays like an honest ring of friendliness in one's voice. To be effective, this bit of good manners has to be genuine.

14. Practice common courtesy. A simple thank you, excuse me, I beg your pardon, and similar polite phrases, said in the right tone of voice, help build respect.

15. Merchandise on display should be neat and attractive. No customer likes to look at a jumbled or dusty mess.

16. Cull out soiled money. Customers, particularly women, dislike receiving crumpled, worn or dirty bills. They should be deposited in the bank.

17. Watch your temper, no matter how trying the situation. Other customers nearby may also be upset by a scene.

18. Answer questions frankly and clearly. An evasive reply is not only a demonstration of poor manners; it shows lack of intelligence. When the question concerns something with which we are not acquainted, an honest admission is better than an evasive reply.

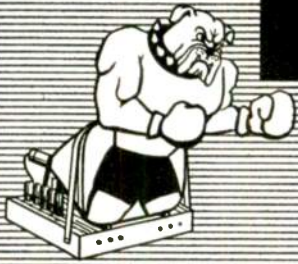
19. Avoid chewing gum while on duty. If you must chew, keep your mouth closed.

20. Confine the bull sessions to off-duty hours. Idle chatter is not only non-productive, but it is distracting to other customers and employees.

21. Count change carefully. Don't dump a handful of bills and coins into the customer's hand. Count it out bill-by-bill and coin-by-coin. It is a good idea to start counting with the final purchase price, and work up to the total amount of money submitted by the customer.

22. Give the customer what he asks for. Use common sense and integrity when suggesting a substitute. It is good salesmanship to recommend related merchandise, but avoid calling off a whole list of items.

23. Try to put yourself in the customer's place and evaluate what type of service and product you would expect to receive from the shop. •



"Tough Dog" TV



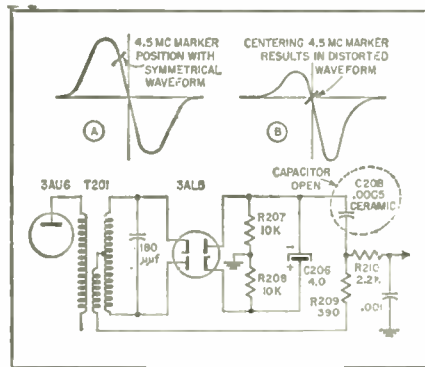
Corner

Difficult Service Jobs Described by Readers

Sound Buzz Due To Open Capacitor

A 17XP3 Admiral Chassis appeared to have had the i-f cans adjusted and since the customer complaint was poor pix and sound synchronization, it was decided to go through a complete i-f and sound alignment procedure. Tubes were first checked and two of them were replaced. While the set was warming up, the alignment equipment was connected and made ready for use. The i-f video amplifier was first aligned and, as suspected, was considerably off. Each adjustment had the correct effect on the overall alignment curve and when completed, the curve looked exactly like the one in the manual. Next, the sound i-f and ratio detector circuit were tackled, using the signal generator and VTVM. Again, adjustments of each alignment screw seemed to have the proper effect on the meter readings, except, while a zero reading between "a positive and negative maximum" could be obtained, the positive and negative maximums were not equal. Making a mental note of this discrepancy, the equipment was disconnected and a station tuned in. Picture quality was good, but buzz content was considerable in the sound output and difficult to tune out with the fine tuner; at one end of the fine tuner range the tone was extremely distorted. The VTVM and signal generator were again connected and the alignment procedure repeated with the same results. A sweep generator and scope were then connected and the ratio detector curve appeared with the 4.5 mc marker riding well up on one side of the center. Regardless of adjustments made, I couldn't move the marker to the center and still produce a good "S" curve. When the marker was in the center, the curve indicated a condi-

tion sometimes obtained when the detector tube (3AL5) was either open or low on one side. Although the tube tested good, a new one was tried anyway. Without any apparent improvement, the old one was re-installed. The transformer was suspected, but temporarily set aside as a possibility because the adjustment screws had too much effect for a bad transformer to be the real culprit.



Ratio detector circuit defect causes improper waveform and misplaced 4.5 mc marker.

Since this was on a printed wiring panel, I did not wish to replace it, unless absolutely necessary, so continued my search elsewhere. R207, R208 and R209 were checked and found to be good. C206 was shunted with a good capacitor without any effect. I noticed that with the sweep generator and scope connected, hand capacity near parts of the printed circuit had more than the usual effect on the curve, especially near C208. As a last resort, before replacing the transformer, I shunted C208 with a new capacitor and the marker popped almost exactly into place on the curve. C208 was wide open! I cut the capacitor through the center and cleaned away the old material leaving only the leads on the panel and soldered in a new capacitor. A final touchup of the transformer and

the "S" curve showed up perfectly with the marker right in the center. This is the only time one of these small capacitors had ever acted up this way for me.—M. G. Goldberg, St. Paul, Minn.

Visual High Voltage Arc Misleading

I was recently called to service an Admiral TV Model 19CIX, with sound O.K., no raster condition. I observed that the CRT heater was lit, and checking for high voltage, found that there was lots of it going to the picture tube (long healthy arc). Voltages at the base of the CRT, the first anode, cathode and grid voltages measured O.K. So, I informed the customer that it may need a new CRT, however, the set should be brought to the shop in the event that the loss of raster was due to another defect.

With the set on the bench, I removed the CRT and installed our universal 5AXP4 test CRT to check the condition of the set for a final estimate. To my surprise, only a very faint raster came on; very dark in the center; somewhat brighter towards the edges. Another quick check of high voltage revealed a sufficient amount, as indicated by a long healthy arc.

Then, using the scope, I observed a complex waveform with high amplitude and a horizontal sweep frequency at the plate of the video
(Continued on page 70)

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. Send your entries to "Tough Dogs" Editor, ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

Sweep Alignment For AM Radio

Solving AM Alignment Problems Through Visual Means

SWEEP ALIGNMENT

I-F Section

Broadbanding
Sensitivity
Hunt unknown i-f's

RF Section

Tracking

Troubles

Oscillation

Test Equipment

Sweep Generator
Oscilloscope

By JACK DARR

• A sweep generator and oscilloscope may be a decided advantage when a common AM receiver defies optimum alignment. The visual alignment technique can produce efficient results on many occasions. For example, it may be advisable to change the manufacturer's stated i-f frequency to avoid interference noise; or, when stagger tuning the i-f's, it's easier to select the transformer that operates better on the high or low end of the i-f frequency. Incipient oscillation is another instance when the visual alignment technique will prove fruitful in rectifying a difficulty, whereby, aural alignment will not be as positive and efficient. Troubles like tracking and loss of sensitivity can also be isolated quite easily with this equipment.

Standard i-f transformers used in radio usually have a bandpass of 10 kc. A typical response curve for a two-stage i-f amplifier is shown in Fig. 1. In this case, we're concerned

with the shape of the trace rather than its overall amplitude. Obviously, the steeper the sides and the broader the "nose" we can get on this curve, the better the response of the radio. If selectivity is the major problem, as it is in many of the smaller sets, we must forego the broad "nose," (which would give us

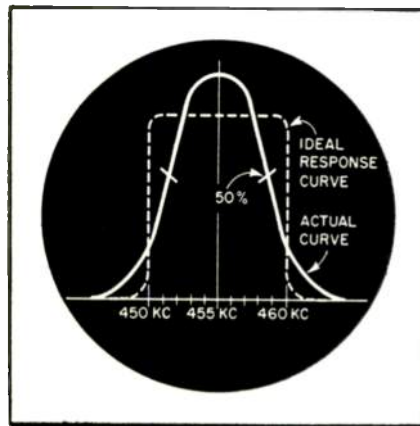


Fig. 1—Response curve of radio i-f stages.

very good fidelity in the audio response) and concentrate on obtaining the steepest, narrowest curve possible. Because of the inherent broadness of the loop antennas used with all common radios, whatever selectivity they possess must be obtained in the i-f amplifier. Modern iron-cored i-f transformers with their amazingly high Q can be used to obtain very good selectivity curves, even with the two transformers commonly contained in commercial radios.

In addition to the i-f response, the overall response of the set may be checked, the r-f trimmers peaked for maximum selectivity and loop antennas easily tracked by this method.

FM Sweeps For AM Radio

To derive these curves, the signal generator must be able to furnish the proper kind of sweep signal, at the desired frequency, sweeping at least 30 kc; 15 kc on each side of the center frequency. This will cover the response band of all commercial i-f transformers, r-f amplifier stages, loop antennas, etc. (Reference to "sweep" in this article refers to the aforementioned 30 kc sweep signal rather than the 3 or 4 mc sweep used in TV). The sweep rate is always 60 cycles. Most signal generators provide a phasable 60 cycle horizontal sweep voltage which may be applied to the scope, assuring locking of the curve.

The actual dial calibration of the FM generator is not too important. In FM-scope alignment, the instrument is not tuned to the exact dial reading, but to the point which shows the best pattern on the scope. In general, if preliminary alignment has been properly done, this will not be too far from the correct dial reading.

Fig. 2—Improperly phased response curve. Adjust phasing control of sweep generator or scope to bring two curves to maximum overlap.



Preliminary Alignment

Before attempting sweep alignment of any radio, the set must first be placed in good working condition. All tubes and voltages must be satisfactory and all tuning adjustments completed using conventional AM alignment procedures. Actually, the FM alignment is the "finishing-touch" to the completed service job that makes it perfect, instead of "just ordinary" and is the difference between an average repair and a thorough overhaul of the set.

Sweep Alignment

To sweep align a radio, connect the signal generator to the mixer grid. If this point is not accessible, hook the generator to the 'hot' lead on the loop. Many small sets haven't an r-f amplifier stage, and the hot lead of the loop is connected directly to the mixer grid. A small blocking capacitor, about 50-100 μf , should be connected in series with the output lead of the signal generator. The input lead of the scope should be connected to the detector output. A very handy place for this is at the top of the volume control. Incidentally, as the majority of the radios encountered will be of the a-c/d-c type, this would be a good time to remind you that the chassis is not ground on these sets, so always connect the ground returns for both scope and signal generator to a common ground point such as the switch terminal of the volume control. Using a common ground connection between the two instruments will necessitate only a single ground lead to the set.

We're assuming that the correct i-f frequency has been used in making the preliminary alignment on AM, as obtained from the service data, and that the location of the tuning adjustments have been checked from the same source. The signal generator has been set up according to its instructions, to produce a signal at this i-f frequency, swept at 60 cycles. Using the phasable sweep voltage from the signal generator, connect a lead from generator to scope, and set the "sweep selector" to "External."

With the equipment set up and turned on, tune in the generator until a pattern is seen on the scope.

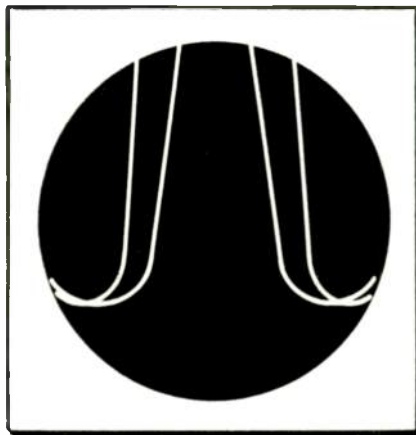


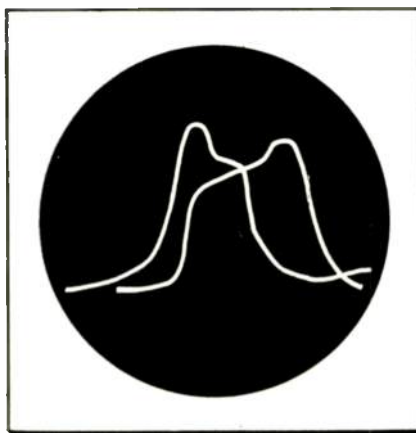
Fig. 3—Pattern showing excessive height due to too much output from signal generator, or vertical gain of oscilloscope is too high.

It may initially look something like Fig. 2. This is due to incorrect phasing of the sweep. Adjust the phasing control to bring the two curves (trace and retrace) to the maximum overlap. If the pattern looks like Fig. 3, reduce either the vertical gain of the scope or the output of the signal generator. It is best to advance the output of the generator at first, to locate the pattern quickly, then reduce it to bring the curve entirely onto the screen.

With the gain lowered, a pattern similar to Fig. 4 may be seen. This shows inequalities in trace and retrace and is due to incorrect tuning of the set, not the scope or generator. Center the pattern on the screen by moving the tuning dial of the generator; this will cause the cause to "walk" from side to side. You may find several "humps" in the curve as the dial is moved. Choose the largest hump; the others are beats, etc., and may be disregarded now.

The vertical gain of the scope

Fig. 4—Curve distortion caused by improper radio tuning, rather than generator or scope.



should be set about half-way up. It is not advisable to use too much gain on the scope, as this can cause flattening of the trace from overloading of the vertical amplifier. Also, be certain not to exceed the radio's input signal voltage with the signal generator to avoid activating AVC voltage. If the pattern shape varies as the scope gain control is raised, reduce the vertical gain, and increase signal generator output to bring the pattern back to the desired size. Excessive signal generator output can cause overloading in the radio, with similar results. You want a flat-topped curve, but not from this cause!

Now, tune the i-f adjustments for the most symmetrical curve, with maximum amplitude. The end result should look something like Fig. 5. This is a composite curve, taken from an average of many radio sets aligned

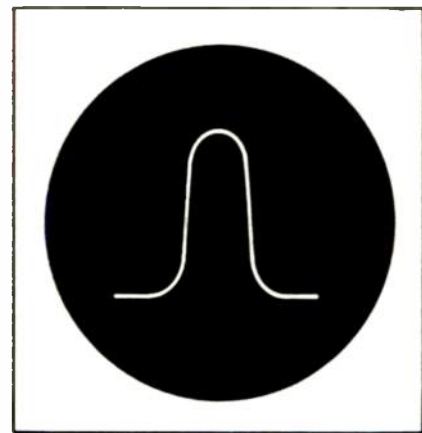


Fig. 5—Good i-f response curve for small radio. This is typical of many home AM sets.

by this method. As a rule, you'll find that most of the adjustments change the curve shape and the height. In some sets, the first i-f tuning adjustment will 'walk' the pattern. The only thing that can cause walking of the curve is a change in frequency: you'll notice as the pattern moves sidewise on the screen that the amplitude changes, as the signal is moved across the bandpass of the i-f stages. If the transformers are aligned at the correct frequency, maximum height will be found near the center of the screen, when both curves overlap. The height should decrease as the curves are moved to either side. This is shown in Fig. 6a. If the height increases as the pattern is moved to one side, then the transformer has a greater response at that

(Continued on page 62)

In The Swim With Sound

Underwater Music, A Natural Summer Time Servicing Activity

UNDERWATER SOUND

Equipment

Audio Amplifier
Submergence-Proof Speaker

Types of Installation

Permanent
Temporary

Characteristics

Acoustical Coupling
Water Pressure
PH Factor

Installation

Mounting
Waterproofing

• Underwater sound—music to dive by—is making a big hit with pool owners. And it can be profitable for the service technician. Audible only underwater, music adds a new dimension to pool fun. Most of the equipment required is standard and readily available. The speaker may be housed in a wall-cut niche for a permanent installation, or suspended from the coping just a few inches below the water's surface. In the latter case, when swimming is finished, the speaker is removed and allowed to dry. This method is the simpler and less expensive, especially for those pools where niche-cutting might be a problem.

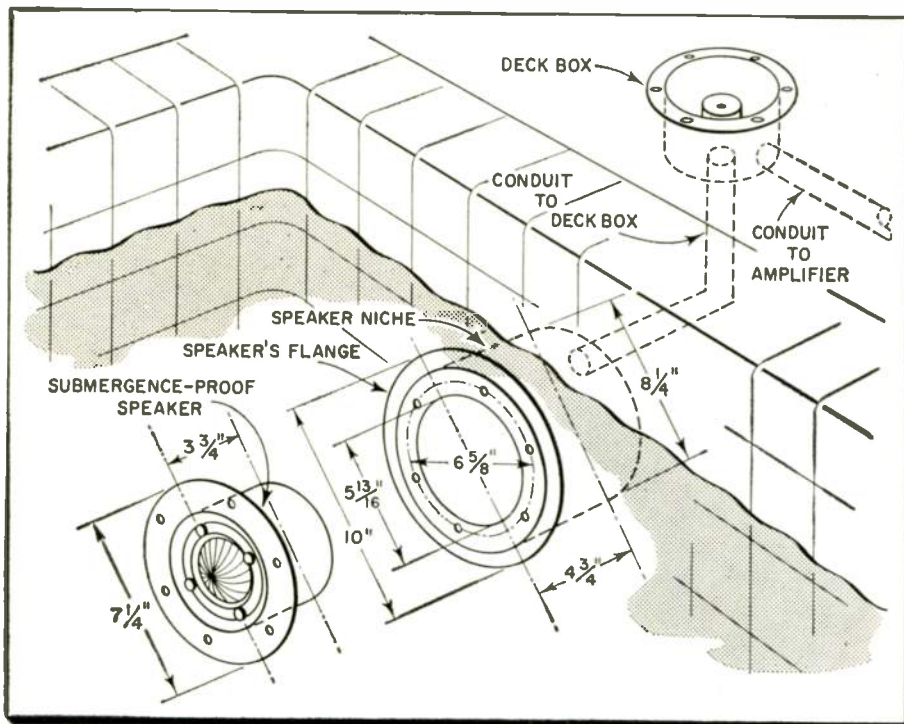
Perhaps the largest underwater sound installation is in the olympic-sized pool at the swank Tropicana



Fig. 1—Measuring PH factor with a water test kit to avoid damage to a submerged speaker.

JAMES JOSEPH

Fig. 2—The swim pool speaker niche is approximately 6 inches below the water line, and should be 1 inch larger than the speaker's outside diameter. A 1/2 inch diameter conduit is installed from the rear of the niche to a waterproof deckbox above the water.



Hotel in Las Vegas. Believed to be the first big-pool sound job, it was designed and installed in 1956 by audio engineer Frank O'Brien, of Van Nuys, California.

Underwater sound isn't new. Hollywood, some 20 years ago, poked a speaker underwater so that swimmers rehearsing for a water ballet, would keep to rhythm. Speakers at that time, were not submergence-proof; usually only a few minutes of dunking would ruin them. Today, there is practically no limit to the life of the speaker, providing it is properly installed and a few precautions are taken. In the permanent installation, a flush-mounted, submergence-proof speaker is fitted into a recess, similar to an underwater-light niche, in the pool's wall. The speaker's waterproof leads may be run through a conduit to a high fidelity type of audio amplifier.

(Continued on page 58)

SHOP HINTS



Tips for Home and Bench Service

Control Replacement

I recently had a Silvertone 21" TV receiver in the shop with vertical chassis and printed circuit boards facing front. The vertical linearity control was burnt out. Normal replacement would have meant pulling the chassis and possibly the vertical horizontal sync board as well. These controls were the reversed type with the shafts through the control cover.

In an effort to avoid removing the chassis, I proceeded as follows: Remove the metal cover, the shaft and all the innards from the old control, leaving only the fiber base mounted on the board. Then, take the metal cover and sweat it back to back on a standard control, which in this instance was 5000 ohms at $\frac{1}{2}$ watt. Install the original control to the fiber base of the control still mounted to the printed board. Then, bend the tabs and, if necessary, solder on each side. Jump the lugs and a new control is installed without pulling the chassis from the cabinet or disturbing the printed circuit board. This procedure saves me immeasurable time.—Robert E. Maroney, Glenside, Pa.

Pilot Light Opens Filament

Recently called to service a Westinghouse chassis #V2371, I thought it would be a routine call since none of the tubes were lit. Sure enough, the 6AN8 had an open filament! A new 6AN8 brought the set to life and I thought the repair was completed.

The next day I received a call advising that the set had failed to operate that morning, so back I went. Again, none of the tubes were lit, and after a little checking, found that the 6AN8 filament had opened again. Thinking that the tube I had used before had a defect, I replaced it and the set worked fine.

Two days later, I received another call notifying me that the set was dead. This time, the chassis was pulled into the shop. Once again, the 6AN8 had an open filament. After checking the filament string the trouble was soon apparent. This tube had the set's pilot light wired across

its filament. Checking the tube manual, I noted that the 6AN8 filament was rated at 450 ma and it was being used in a 600 ma string. The pilot light was supposed to carry the additional current. Replacing the tube and pilot light cleared up the trouble.

Another Westinghouse chassis, #V2382, could pose a similar problem since the pilot light shunts the 6AQ5 filament.—A. J. Krukowski, W. Springfield, Mass.

Supply Voltage Polarity

A customer brought in a dead transistorized auto radio that had been removed from his car. He returned a few days later and was told that the radio played perfectly on the bench for two days and all the usual routine checks had been made. Suggesting that the speaker or antenna may be defective, the customer brought in the speaker. The speaker checked out good and with radio and speaker installed in the car, the antenna also proved to be good; however, the radio still didn't play. Again, one of our servicemen removed the set from the dashboard and connected it on the test bench. To our amazement, the radio immediately played again. The next step was connecting it under the dash of the car where some measurements could be taken. The first voltage reading gave a clue to the dead auto radio. The minus lead of the meter was connected to the chassis and since the 12 volt battery supply voltage was being checked, the 50 volt range on the meter was switched on. The meter needle hit the peg in the opposite direction! The schematic indicated that the polarity of the supply voltage was negative ground. A further check was then made of the car battery. The hot lead and post was plainly marked POS and the NEG post went to the frame. Here again, the voltmeter indicated opposite polarity.

Confronting the customer, I learned that he had recently serviced the car and battery, and shortly thereafter, his radio stopped playing. Evidently, one of the station attend-

ants reverse-charged the battery. A dead battery can take a charge of reversed polarity and the car's electrical system will work properly, including the generator, since the field voltage will then be reversed and continue to maintain the battery's new polarity.

Fortunately, the transistors were not damaged and the customer was referred to a gas station to correct the wrong battery polarity.—G. M. Frieders, Aurora, Ill.

Quick Testing Phototubes

A quick way to test photo-electric tubes, especially the emission type is to place it approximately 1 foot away from an unshaded 75-watt incandescent lamp. Position the tube so that the cathode is exposed to the light. Place the positive test lead of an ohmmeter on the anode and the negative lead on the cathode of the tube. Set the ohmmeter scale to R X 10K. The readings may be somewhere in the region of 150,000 to 800,000 ohms. Next shield the tube, and the reading should rise to about 10 megohms. Another check is to reverse the test leads on the tube, an extremely high reading should be obtained. Some typical values are

Tube	Type	Age	Resistance
918	Gas	New	145,000
923	Gas	New	220,000
868	Gas	New	800,000
929	Vacuum	Used	145,000

A good idea is to check each new phototube type in this manner, and record the readings for future reference. While this type of test is not the most scientific one, it is simple, quick and does seem to work out well. Similar tests can be set up for the photo-voltaic and the photo-conductive cells.—Dorsel H. Sparks, Paintsville, Ky.

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. Send your entries to "Shop Hints" Editor, ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N. Y.

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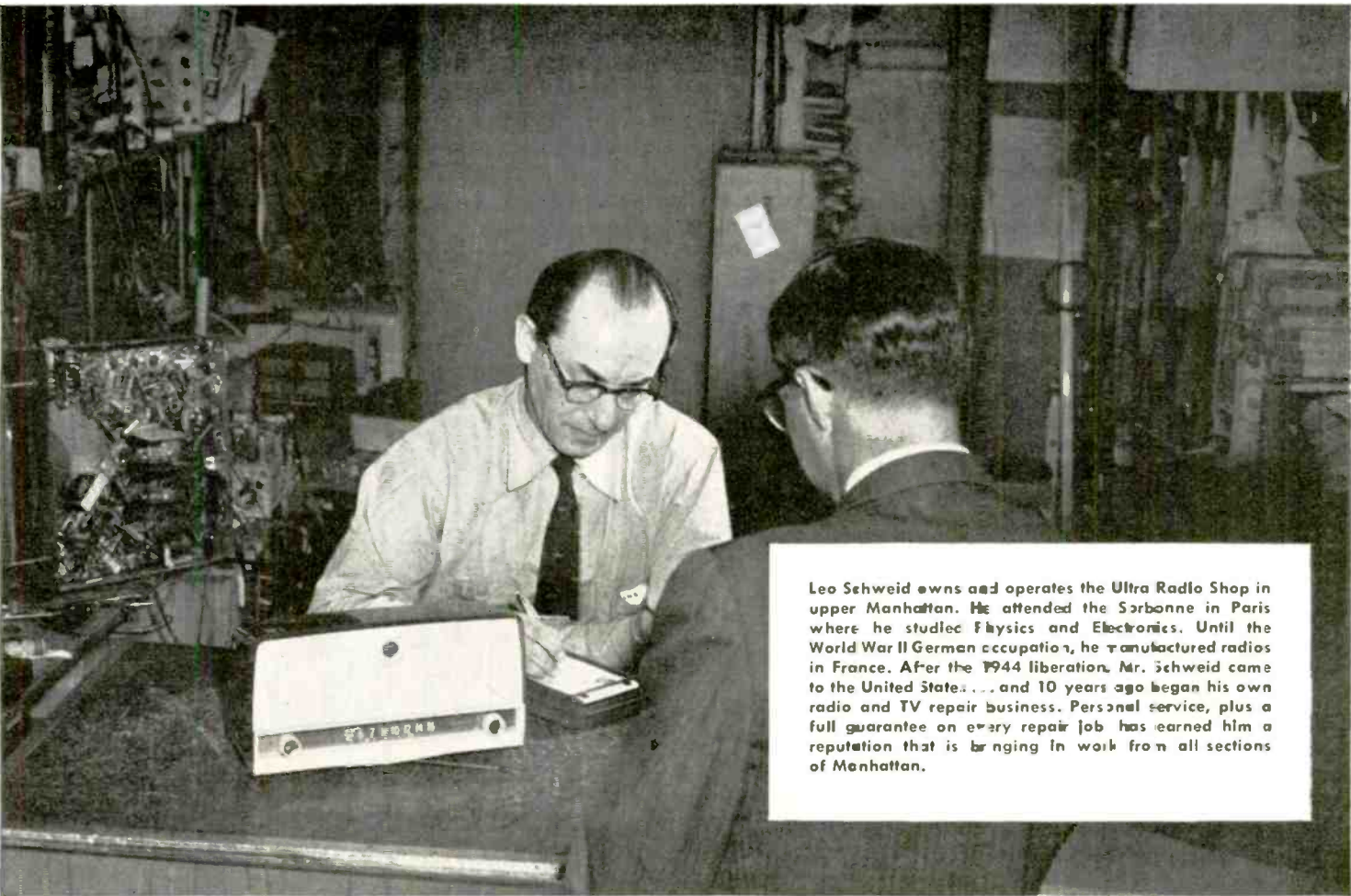
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Leo Schweid owns and operates the Ultra Radio Shop in upper Manhattan. He attended the Sorbonne in Paris where he studied Physics and Electronics. Until the World War II German occupation, he manufactured radios in France. After the 1944 liberation, Mr. Schweid came to the United States... and 10 years ago began his own radio and TV repair business. Personal service, plus a full guarantee on every repair job has earned him a reputation that is bringing in work from all sections of Manhattan.



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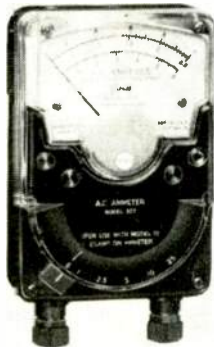
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Latest Test Equipment

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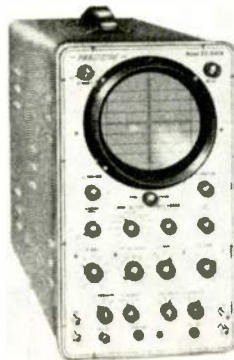
Triplet AMMETER →

Model 307, a general purpose AC ammeter with built-in transformer for use on 60 cycles, is included in a new series of matched hand size instruments. One of its many uses is measuring current drawn by radios, electric appliances, motors, heating elements, etc. Ranges are ac amperes 0-1, 0-2.5, 0-10, 0-25. By using model 10 clamp-on ammeter, ranges can be extended to 0-6, 0-12, 0-30, 0-60, 0-120, 0-300. Molded case, measures 2 $\frac{3}{4}$ " x 4 $\frac{1}{4}$ " x 1 $\frac{3}{16}$ ". Triplet Electrical Instrument Co., Bluffton, Ohio (ELECTRONIC TECHNICIAN 7-9)



Precision OSCILLOSCOPE →

Model ES-550B 5" oscilloscope's frequency response extends from 10 cycles to 5 mc. Features include push-pull, wide-band vertical amplifier, 10 mV per inch vertical sensitivity, cathode follower input, 2 megs and 22 μ f, response 1 db from 10 cps to 3.5 mc, 3 db at 5 mc; direct reading peak-to-peak voltage calibrator; vertical pattern reversing switch; push-pull, wide-range horizontal amplifier, 100 mV per inch sensitivity, response 1 db from 10 cps to 1 mc and 3 db at 2 mc; and "Z" axis input terminal for blanking, timing and marking. Precision Apparatus Co., 70-31 84 St., Glendale 27, N. Y. (ELECTRONIC TECHNICIAN 7-10)



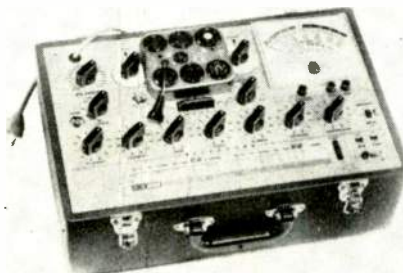
RCA VOM →

Model WV-38A, available in kit or wired form, contains a new 1-volt scale and a 0.25-volt scale for transistor circuit measurements. It has a 5 $\frac{1}{4}$ " meter. Input resistance is 20,000-ohms-per-volt for dc and 5,000 ohms-per-volt for ac measurements. It is capable of measuring from: 0 to 5,000 volts dc in 8 ranges; 0 to 5,000 volts ac in 6 ranges; currents from 50 ma full scale to 10 amperes full scale in 6 ranges; and resistance from 0 to 20 megohms in 3 ranges. RCA Electron Tube Div., Harrison, N. J. (ELECTRONIC TECHNICIAN 7-11)



Hickok TUBE & TRANSISTOR CHECKER →

Features of the new model 6000, priced under \$200, include: a snap-in master socket panel; 11-pin socket for new special tubes; 5 lights to indicate shorts or leakage between elements and to identify shorted elements; push-button to measure grid current; filament continuity button to check for open filaments and 5" meter with large easy-to-read multicolor scales. Tube quality evaluations appear on the 3-range micromho scales (0 to 3,000, 6,000, 15,000). Hickok Electrical Instrument Co., 10523 Dupont Ave., Cleveland, Ohio (ELECTRONIC TECHNICIAN 7-12)



H-P VOLTMETER →

Model 412A voltmeter measures dc voltage between 100 μ v and 100 v. Maximum full scale sensitivity is 1 millivolt. Accuracy is 1% of full scale. It measures current from 0.1 μ a to 1 amp. Maximum full scale sensitivity is 1 μ a. Accuracy is 2% of full scale. As an ohmmeter, it



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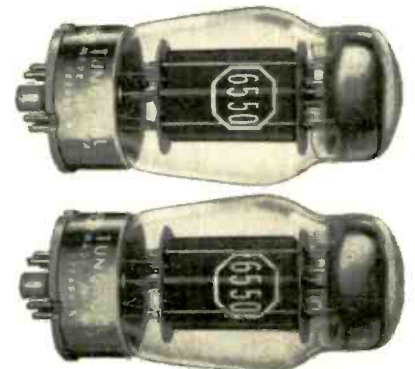
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2 Sound Equipment: A new 16-page, two-color illustrated, catalog #559, describes an assortment of speakers and sound equipment for regular and special application. Included are speakers, transformers, driver units, speaker and microphone mounting accessories, and hi-fi all-weather projectors. (2B7: Atlas Sound Corp.)

3 Resistors: Catalog #59, just released, provides information on resistors, controls and resistive devices. Several new products and additional listings are included, such as tab-mount controls and miniaturized wire-wound potentiometers. (3B7: Clarostat Mfg. Co.)

4 Stereo: "How to Choose and Place Stereo Sound Equipment for the Home" is an informative 20-page brochure. Fully illustrated and in color, it supplies detailed descriptions of the equipment needed and most effective installation. Also includes specifications and prices of stereo components. (4B7: Electro-Voice, Inc.)

5 Tube-Transistor Tester: A colorful, 4-page, circular describes Model 820 Tube Caddy-Pal, a combination tube-transistor tester and true vacuum tube voltmeter-ohmmeter. Illustrations, specifications and price are included. (5B7: Hickok Electrical Instrument Co.)

6 Hi-Fi Stereo Speaker System: Brochure GY covers the new Galaxy II hi-fi stereo speaker system, which achieves wide panoramic stereo sound with two tiny satellites and a single small bookshelf size unit. Full data on installation, operation, specifications and prices are included. (6B7: Jensen Mfg. Co.)

7 Frequency Meter: A catalog sheet is available covering the new VHF frequency meter LA-70A. Designed for a wide range of applications, this unit is particularly helpful in mobile radio service. The catalog sheet provides full information on features, applications and performance. (7B7: Lavoie Laboratories.)

8 Sound Equipment: A 12-page brochure covers the new "Signet" line of ready-to-use sound equipment assemblies. Features, specifications and applications, with illustrations, are provided for 5 different assemblies. The brochure also covers "Signet" components and accessories. (11B7: Stromberg-Carlson.)

9 Hi-Fi Test Instrument: The Audio System Analyzer "800," designed to function as six different instruments, is described in new literature. Other literature covers the following: "820" dynamic sweep Circuit Analyzer; "825" dynamic AGC Circuit Analyzer; "828" intermittent Condition Analyzer; and "850" induced Waveform Analyzer. (14B7: Winston Electronics.)

10 Adapters: A new line of adapters, named "Add-A-Testers" is described in a catalog sheet. By the use of these units, Model 260 VOM can be converted into 7 different testers. The catalog sheet gives model numbers, specifications and prices. (10B7: Simpson Electric Co.)

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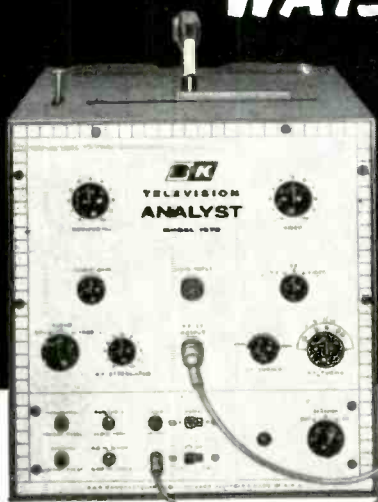
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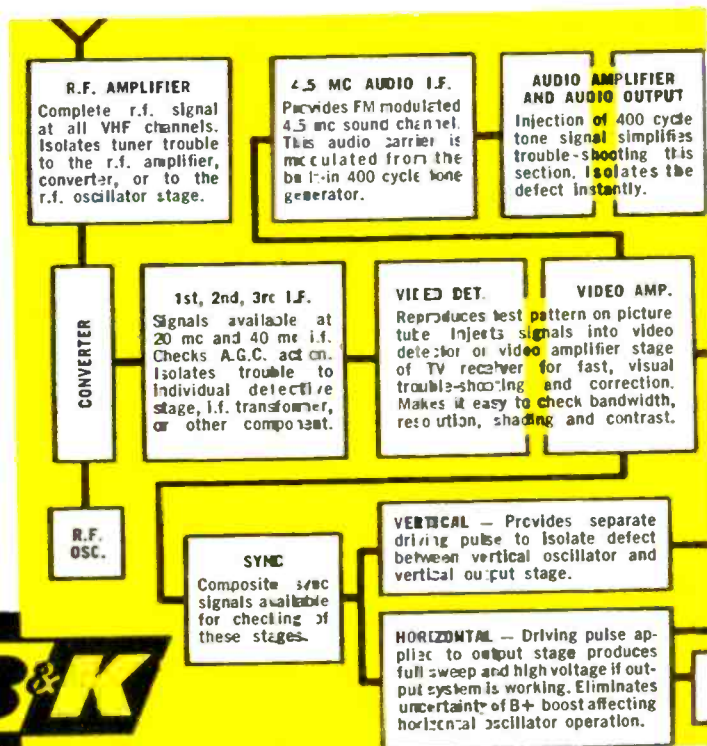
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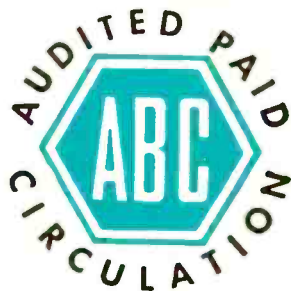
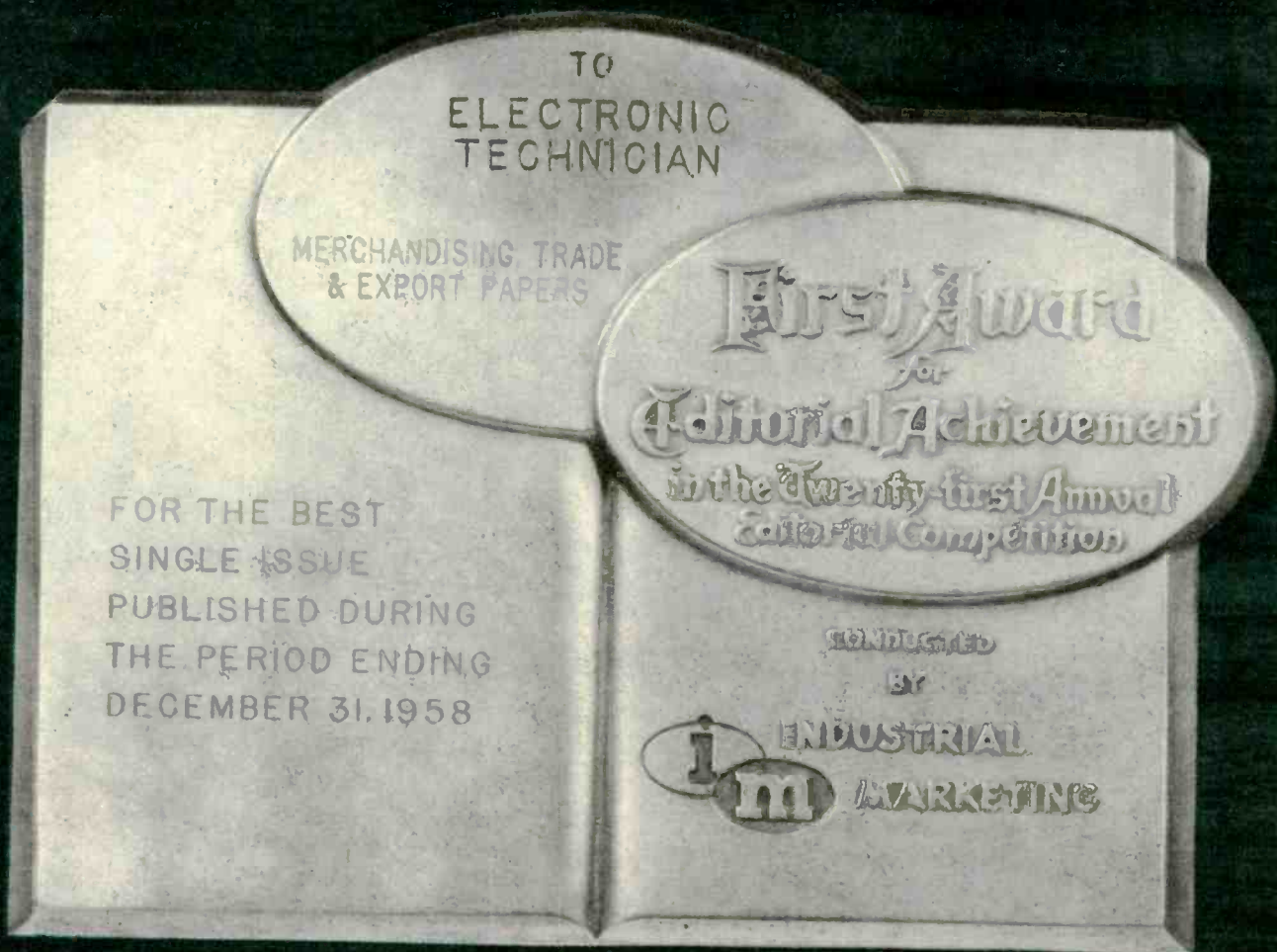
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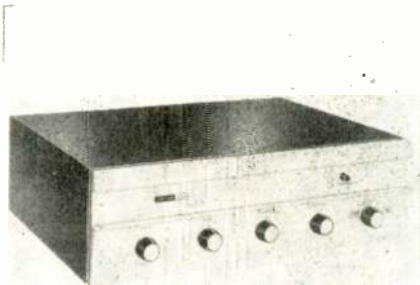
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Harman-Kardon STEREO AMPLIFIER



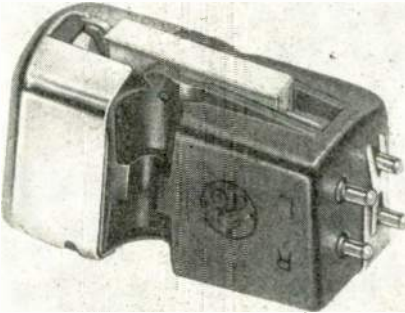
The Lute, model A220, is a 20 watt stereo amplifier with dual preamps and two 10 watt channels on one chassis, complete with cage. The frequency response at normal listening levels is said to be 20 to 20,000 cps. The amplifier, using four #7408 output tubes, includes a full range balance control, separate ganged tone and loudness control. In addition, a separate, illuminated, push-button on/off switch simplifies operation. \$79.95. Harman-Kardon, 520 Main St., Westbury, N. Y. (ELECTRONIC TECHNICIAN 7-32)



GE CARTRIDGE



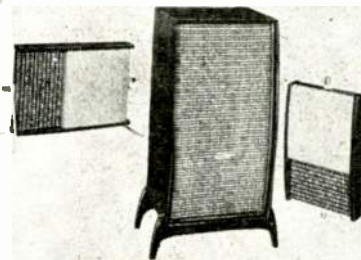
Two new stereo-magnetic cartridges are the VR-225 for professional turntables, and VR-227 for record changers and turntables. VR-225 response is 20-20,000 cps \pm 3 db; tracking 2-5 grams; compliance lateral 4, vertical 2.5. Newly designed replacement styli are also available, however, they are not interchangeable with previous GE stereo cartridges. Suggested consumer prices are \$27.95 for the VR-225 with a .5 mil diamond stylus, and \$24.95 for the VR-227 with a .7 mil diamond stylus. General Electric Co., Auburn, N. Y. (ELECTRONIC TECHNICIAN 7-34)



Jensen STEREO SPEAKERS



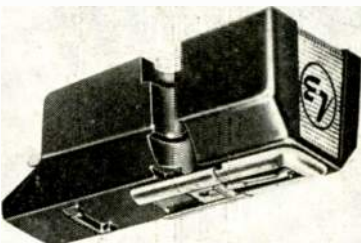
A versatile stereo speaker system, Galaxy II, consists of two Satellite speakers and a bookshelf size unit. The Satellite speakers, incorporating mid-range and tweeter, include a yoke that allows the units to swivel for best sound direction and be used as a wall "pin-up." The bookshelf unit handles all bass and center-fill middle frequencies. 10 watts power drives the system to full room volume. Net price is \$169.50. Floor base accessory is \$7.50. Jensen Mfg. Co., 6601 S. Laramie Ave., Chicago, Ill. (ELECTRONIC TECHNICIAN 7-36)



Electro-Voice CARTRIDGE



A completely new ceramic stereo cartridge, the Magneramic 31, claims a frequency response of 20-20,000 cps, \pm 2 db. Isolation is 28 db at 1 kc. Both vertical and lateral compliance is 3.5. It is designed for direct use in magnetic phono inputs. The 31 is available with either a .5 mil or .7 mil diamond stylus. The former is recommended for use in transcription arms, with 2 to 4 grams tracking force. Audiophile net price is \$24.00. The cartridge with ceramic phono inputs is \$22.50. Electro-Voice, Inc., Buchanan, Mich. (ELECTRONIC TECHNICIAN 7-35)



Bogen STEREO RECEIVER

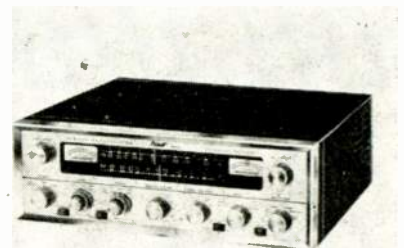
A stereophonic receiver, model SRB-20, combines an FM-AM stereo tuner and 20 watt stereo amplifier and audio control unit on a single chassis. It features simultaneous or individual volume and tone control operation. Frequency response is reported to be 20 to 20,000 cps, \pm 1 db. It has 16 tubes plus 3 crystal diodes. The receiver has built-in FM and AM antennas and provision for external antenna. An AM multiplex switch is provided. Price is \$199.50 in Zone 1, \$201.25 in Zone 2. Bogen-Presto Co., P. O. Box 500, Paramus, N.J. (ELECTRONIC TECHNICIAN 7-33)

True Phonic STEREO CONVERTER

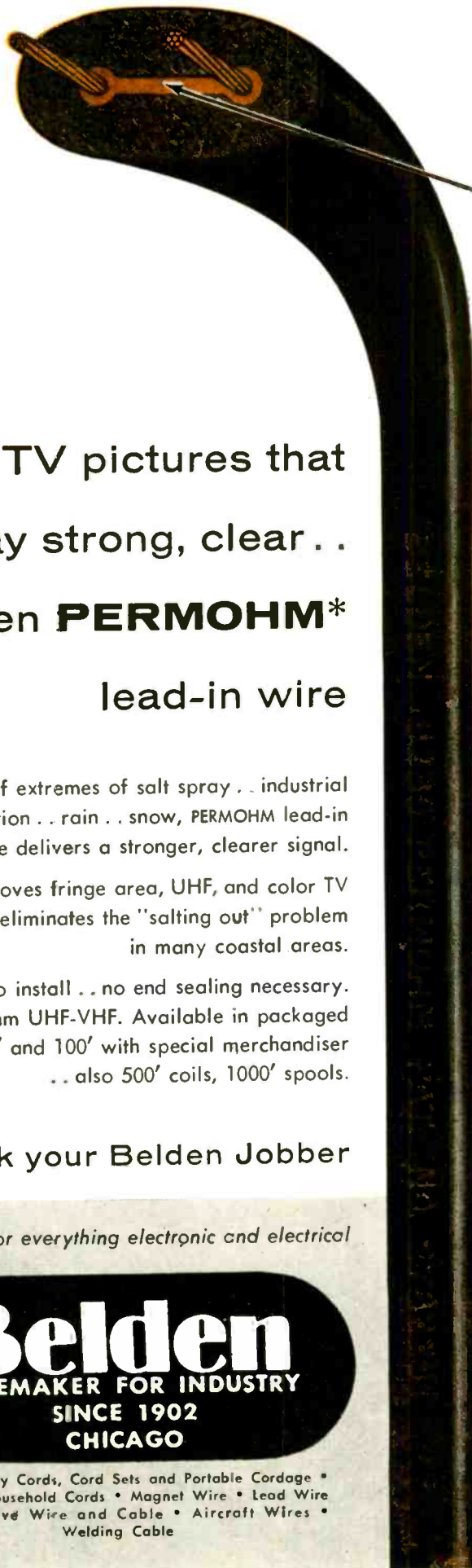
Model SC-7 is a complete stereo channel that features a 7 watt straight a-c amplifier, 2 speakers and crossover, dual tone controls and loudness control. Frequency response is said to be 40 to 15,000 cps. The compact cabinet is available in genuine mahogany, walnut or blonde mahogany. The unit comes complete with stereo cartridge and cables and is priced at \$59.95, less cartridge. Affiliated TV Labs., Inc., 112-07 Francis Lewis Blvd., Queens Village 29, N. Y. (ELECTRONIC TECHNICIAN 7-37)

Pilot STEREO AMPLIFIER

The model 240 stereophonic preamplifier, to retail for \$129.50, including enclosure, features 30 watt power output, 15 watts per channel, harmonic distortion less than 1%, hum and noise 80 db below full output and frequency response \pm 1 db from 20 to 20,000 cps. It



also offers automatic shutoff, tone controls that permit separate or simultaneous adjustments, a speaker selector control that allows the addition of an extension speaker system and a loudness switch. Pilot Radio Corp., 37-06 36 St., Long Island City, N. Y. (ELECTRONIC TECHNICIAN 7-38)



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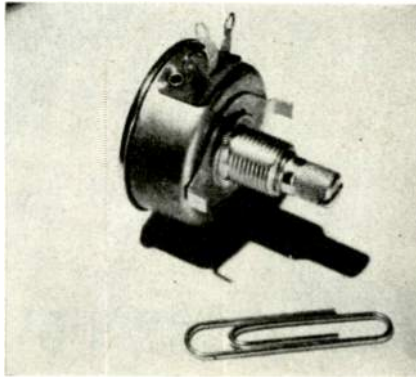
8-1-9

New Components

For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon, on page 48.

Centralab RESISTORS →

The new WW and WN Series Radi-ohms are claimed to be the industry's first 5-watt miniature wirewound variable resistors with resistance ratings above 25K ohms. Available in long or short shaft style, they now range in value from 1 ohm to 100K ohms, linear taper, and have a minimum rotational life of 10,000 cycles and have passed 25,000 cycle test. Dimensions are $1\frac{3}{8}$ " in diameter and $\frac{9}{16}$ " in depth. Centralab, 900 E. Keefe Ave., Milwaukee 1, Wisc. (ELECTRONIC TECHNICIAN 7-1)



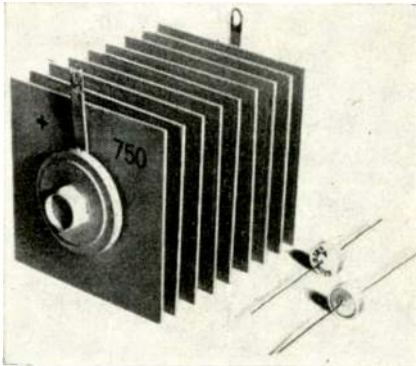
Elmenco CAPACITORS →

DP Dipped Mylar-Paper Miniature Capacitors are now available in "5Pak" bags, each containing 5 DP capacitors in values from 0.001 to 0.25 μ f in 600 volts and from 0.001 to 0.05 in 1600 volts. They are coated with phenolic resin to withstand 4 times more humidity than molded capacitors used in the past. High reliability is maintained in constant operation at 110° C at full rated voltage. All values are $\pm 10\%$ tolerance. Arco Electronics, Inc., 64 White St., New York 13, N. Y. (ELECTRONIC TECHNICIAN 7-2)



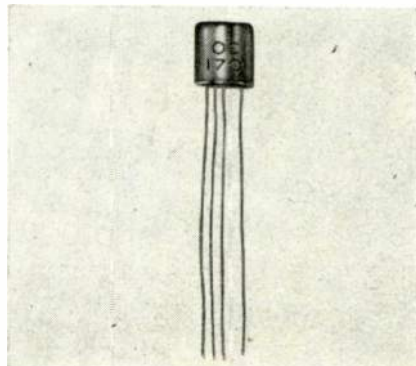
Audio Devices SILICON RECTIFIER →

#40E5 is a new epoxy ceramic encapsulated silicon diode, not much larger than an aspirin tablet, which features low cost, high current, an ability to withstand high temperatures, and easy service replacement. It is rated to handle 750 ma with a resistive load, has a rating of 500 ma with a capacitive load and peak inverse rating of 400 volts, and replaces selenium types in TV, radios, phonos, tape recorders, etc. Audio Devices Inc., 620 E. Dyer Rd., Santa Ana, Calif. (ELECTRONIC TECHNICIAN 7-3)



Amperex TRANSISTORS →

Model OC170 P-N-P germanium transistor, shown, has a high cut-off frequency of 70 mc and a high gain. Designed for use in the VFH band as a mixer oscillator for mobile and short-wave receivers; and as an RF and IF amplifier for FM. Collector-to-base capacitance is 1.8 μ mf, at V_{cb} of -6V. Feedback base resistance is appx. 40 ohms, at 3 mc. OC171 is for use as a local oscillator and preamp in FM receivers. OC169 is for lower frequency applications. Amperex Electronic Corp., 230 Duffy Ave., Hicksville N. Y. (ELECTRONIC TECHNICIAN 7-4)



Clarostat RESISTOR

Model P25K-41 ohm fixed resistor is an exact replacement for GE Part RRW-148. It is designed as a replacement for voltage-dropping in the filament of some TV sets, particularly portables, and is a stock item available from all Clarostat distributors. Clarostat Mfg. Co., Dover, N. H. (ELECTRONIC TECHNICIAN 7-7)

CBS NPN POWER TRANSISTORS

A new line for complimentary push-pull and cascade circuits, covered in bulletin E-332, are types 2N326, LT-5163, LT-5164 and LT-5165 for resistive loads; and LT-5163L, LT-5164L, and LT-5165L for inductive loads. Features are: high collector voltages up to 80 volts; a maximum collector current of 2 amperes; a minimum cutoff frequency of 150 kc and they meet the MIL-19500A specification. CBS-Hytron, Parker St., Newburyport, Mass. (ELECTRONIC TECHNICIAN 7-5)

Int'l Rectifier CONTROLLED RECTIFIER

Series X10RC20, through 10RC20, covered in Bulletin SR-350, is a completely new miniature control device combining some of the characteristics of the rectifier and the power transistor. It is rated for average currents up to 10 amperes and is available with peak inverse voltage ratings of 20, 30, 50, 70, 100, 150 and 200 volts. Leakage currents in both the forward and reverse directions are in the order of 12 ma. Forward voltage drop in the conducting state is appx. 1.5 volts at 25°C. Switching time is in the order of microseconds. All units are hermetically sealed, and have an overall height of 1.625". International Rectifier Corp., 1521 E. Grand Ave., El Segundo, Calif. (ELECTRONIC TECHNICIAN 7-8)

RCA SILICON RECTIFIERS

13 new silicon rectifiers of the diffused-junction type are: 1N536, 1N537, 1N538, 1N539, 1N540, 1N547, and 1N1095 intended especially for use in power supplies and dc blocking circuits of industrial and military equipment; 1N440-B, 1N441-B, 1N442-B, 1N443-B, 1N444-B, and 1N445-B have the same characteristics but, in addition, have very low reverse (leakage) currents to insure high efficiency performance in magnetic-amplifier applications. Both groups offer types with dc forward currents up to 750 ma, peak inverse voltages up to 600 volts, and an operating ambient temperature range from -65°C to +160°C. Radio Corp of America, Semiconductor & Materials Div., Somerville, N. J. (ELECTRONIC TECHNICIAN 7-6)

New Developments

(Continued from page 37)

anode voltage promises brighter pictures.

Zenith's new chassis develops 20,000 volts of picture power.

Cabinets

The portable slim-line look is being retained by most manufacturers and the choice of wood finishes are typical of past years. However, RCA is introducing two dramatic cabinets: a hide-a-way TV console that converts into a handsome living room table when not in use, Fig. 3, and a line of built-in TV receivers called "Mural TV." Four "Mural TV" models will enable the technician to install sets into the wall of the viewing room. The four are: a 21 inch Color set, two 21 inch black and white tubes and one 17 inch black and white.

Other Developments

G.E.'s newly developed r-f tube, 6ES8, has characteristics which automatically eliminate cross modulation.

Two automatic features are introduced by RCA in their 1960 TV line. The first feature, a "Magic Memory" program selector, allows the TV set to automatically turn itself on or off or change channels at 30 minute intervals according to a pre-selected 12 hour selector. This clock-controlled selector is operated by a series of sliding buttons, one for each half hour. These buttons can be set for a desired channel, to turn the set on or off for any length of time and then back on again.

The second development is a TV model that incorporates all the convenience features of a clock radio. The unit is equipped with a clock timer and slumber switch that automatically turns off the set at a pre-determined time up to one hour and turns on the set at a specific time. •



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SHOOT TV & RADIO TROUBLE FAST

By Harry G. Cisin. The first part of this book relates to symptoms, faults and remedies for ac-dc radios. The second part covers TV, with each practical test and repair explanation related to a specific problem. Printed circuits are discussed. Soft cover, 40 large pages. Price \$1.50.

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

RADIO OPERATOR'S LICENSE Q & A MANUAL

By Milton Kaufman. This sixth edition gives you the information you need to pass FCC license examinations. In question and answer form similar to actual FCC tests, all eight elements are covered, including law, radiotelephone, radiotelegraph, aircraft and ship radar. Abbreviations, code, etc. included. Hard cover, 736 pages. Price \$6.60.

HOW TO SERVICE TAPE RECORDERS

By C. A. Tuthill. Starting with basic magnetic principles, the test goes through the recording operation, recorder mechanisms and circuitry. In addition to an explanation of the functions of the various recorder elements, the techniques for repairing various troubles and making tests are presented. Soft cover, 160 pages. Price \$2.90.

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By Alexander Schure. That most basic of electronic functions, alternating current, is fully discussed. In addition to covering RLC performance in circuits, a clear explanation is given of the "j" operator in vectorial presentation. Q & A at each chapter's end show how a-c circuit problems are solved. Soft cover, 104 pages. Price \$1.80.

GUIDE TO MOBILE RADIO

By Leo Sands. This fundamental, yet practical book on 2-way radio covers base stations, transmitters, receivers, antennas, remote controls, power supplies, portable gear, field survey, selective calling, licensing and maintenance. One section examines useful test instruments. Soft cover, 160 pages. Price \$2.85.

AUDIO MEASUREMENTS

By Norman Crowhurst. This informative book explains practical techniques for installing and repairing hi-fi equipment. Topics include test instruments, amplifiers, transformers, pickups, changers, recorders, etc. There is helpful data on using the audio generator, distortion meter and scope. Soft cover, 224 pages. Price \$2.90.

ELECTRONICS IN INDUSTRY

By George Chute. How various electronic devices operate, and how they are employed in industry is clearly explained with little use of mathematics. Subject matter includes rectifiers, time delays, gas tubes, welding controls, ignitrons, heat and light relays, thyratrons, motors, servos and others. Hard cover, 431 pages. Price \$8.00.

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Also See New Books on Page 71

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NEW BEDFORD, MASSACHUSETTS

In Swim With Sound

(Continued from page 42)

Characteristics

Sound is seemingly more true-toned from the same speaker when it is mounted underwater, than when it is conventionally mounted in air. Sound travels 5 times faster in water than in air. Also, water's acoustical coupling is better and more efficient.

The speaker niche should be no more than 18 inches below the pool's waterline. Water pressure at greater depths attenuates action of the speaker's diaphragm. And, at considerably greater depths the pressure may be enough to stop diaphragm action.

Water should be maintained at a normal PH factor of 7.2 to 7.6. Fig. 1 shows a water testing kit in use. Too much acidity or alkalinity may damage the speaker. On the other hand, algae seems to have little or no effect. Submergence speakers are nominally waterproofed, but not many manufacturers will guarantee them to stay that way for more than a few hours at a time. Actually, they will be good for years if care is taken to waterproof all connections.

How To Install

The speaker niche is cut or built into the pool wall about 6 inches below the waterline, and should be 1 inch larger than the speaker's outer dimensions both in height and depth. Thus, a typical 7¼" round x 3¾" deep speaker requires a niche about 8¼" round x 4¾" deep, as shown in Fig. 2. A ½ inch diameter bronze conduit, similar to the type used for wiring underwater lights, is installed from the rear of the niche, above the water, to a flush-mounted waterproofed deckbox as shown in Fig. 3. In this manner, the connections to the amplifier are "essentially dry." A 10" round x ⅜" thick chrome-plated brass mounting ring having an opening slightly larger than the speaker is mounted over the front of the niche with lag screws, and is used to hold the speaker in place. It is important that the metal used for this mounting ring be compatible with the metal flange of the speaker to prevent electrolysis action.



Fig. 3—Speaker leads and amplifier leads are connected to a flush-mounted deckbox.

Once the mounting ring has been secured, the speaker is slipped into place, and bolted to the ring. Neoprene gaskets may be used as a sealer between the mounting ring and speaker flange. However, the niche is not watertight. In fact, it fills with water, as does the bronze conduit tube. The water level in the tube does not go beyond the water level in the pool.

Leads from the speaker are run through the bronze tube to the deck-box above, where they are connected to leads going to the audio amplifier. The lines to the amplifier can be run through 1/2 inch electrical conduit buried just a few inches below the pool's deck. It is a good idea to waterproof, with a Glyptol type compound, all connections, even those in the deck-box.

One speaker is enough, regardless of pool size or shape. Neither depth nor distance attenuates the music to any great extent. Even at a distance of 100 feet, there is an adequate amount of sound. This may come as a bit of a surprise, but it is quite so. The Tropicana's installation uses a single speaker. In temporary installations, the speaker is allowed to dry, after being removed from the water. One speaker manufacturer recommends that the speaker be drained and flushed with fresh water, and allowed to dry completely. This procedure should be followed after each period of submergence. Drying time may be accelerated through artificial means, provided the speaker is not subjected to temperatures over 200° F, and is allowed to cool to room temperatures before again being submerged.

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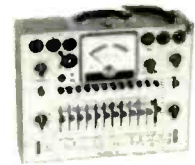
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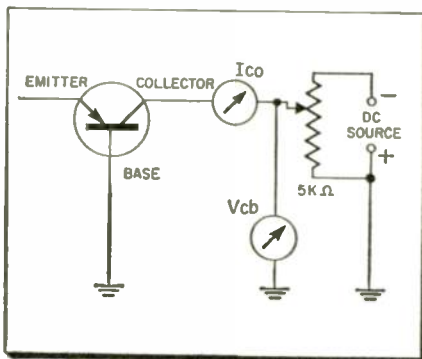
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Transistor Testing

(Continued from page 35)

rent to a change in emitter current in a grounded base circuit. Alpha is almost equal to 1 in a good junction transistor while it may approach 2 in point-contact transistors. Beta, the base-to-collector current gain in a grounded emitter circuit, usually varies from 10 to 50 for low-power transistors. The manufacturer's ratings should be checked for the individual transistor being tested. Junc-

Fig. 5—An I_{CO} test circuit, in which collector current of a PNP transistor is measured for a specified collector-base voltage.



tion (terminal-to-terminal) resistances vary with different transistor types, and also with operating voltages. The collector-to-base resistance is particularly sensitive to operating voltages.

Chief transistor ratings are: maximum collector dissipation, maximum collector voltage, maximum collector current, and maximum emitter current. The collector dissipation is the power that can be safely dissipated as heat. As a result, large power transistors have a metallic heat sink to increase the dissipation rating.

To avoid transistor damage the collector voltage must not be raised past either maximum voltage or dissipation ratings. They are far more susceptible to damage when exceeding manufacturers ratings than vacuum tubes.

Transistor Test Instruments

Many fine transistor testers are available to the service trade. Details of switching and operating procedure vary widely. However, tests are made on the basis of the principles previously stated. The medium and higher priced transistor testers commonly provide various reverse-bias tests. These are current cut-off tests, collector leakage tests, etc. Reverse bias is applied to two of the transistor terminals, and current flow is measured. These basic principles are used in typical configurations as shown in Fig. 5. The voltage is set to a specified value for the transistor and the collector current is then measured. The emitter current can be measured by interchanging the emitter and collector leads. The price range of service testers is rather wide and usually reflects the test versatility and instrument accuracy provided. The choice of a tester, of course, is normally based on the shop requirement and available budget.

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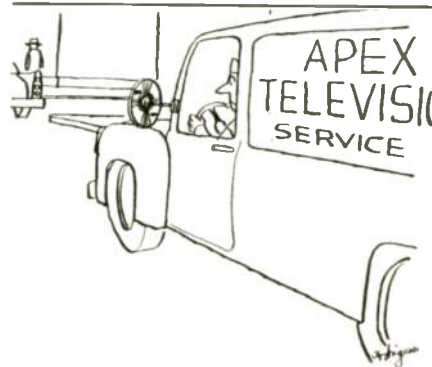
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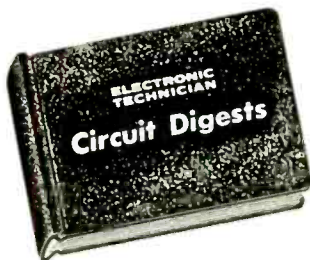
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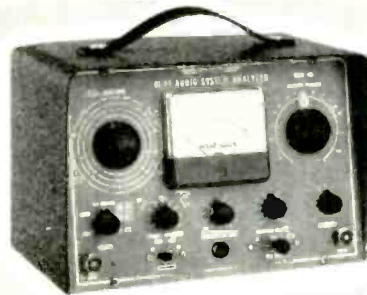
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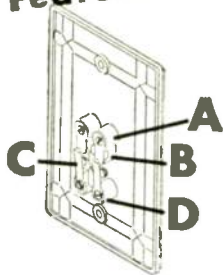


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Sweep Alignment

(Continued from page 41)

frequency, as seen in Fig. 6b. In certain cases, you'll find that the increase in height continues as the curve is moved to one side, continuing until it leaves the screen! This indicates that the transformer is being aligned at the wrong i-f frequency! For instance, a 370 kc transformer being tuned at 455 kc, or vice versa. You will also find similar responses if a 455 kc transformer is being tuned at 262 kc, or the reverse. The 262 kc transformer, for example, would be trying to respond at its 2d harmonic. A peak could be obtained, but it would be much lower in amplitude than the correct peak. (The amplitude of a 2nd harmonic would be one half that of the fundamental.)

will give you a very good idea of the vicinity of the i-f. If service information on a set is not available, look up another set of the same make and approximately the same age. It seems that designers tend to use the same i-f frequencies for several years in a row before making drastic changes.

Oscillation In I-F Stages

Oscillation or regeneration in i-f stages may be easily detected even "before it happens." Quite often small radio sets will display the characteristic once known as "railroad radio," whistles for every station! Usually this will not show up as a distinct whistle, but rather as an abnormally high hiss level, with just a hint of a "zero-beat" sound as the carrier frequency of the station is approached. This is due to incipient oscillation in the i-f and may arise from many causes. Frequently, it can

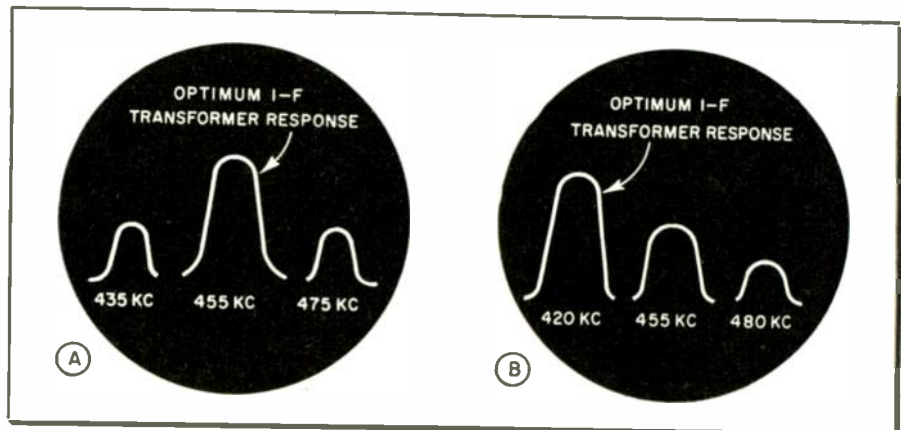
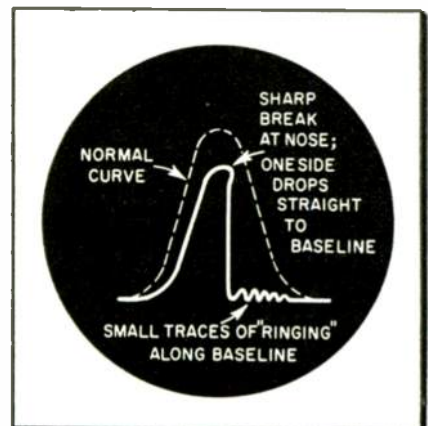


Fig. 6—When the i-f transformer is adjusted to pass its optimum frequency, response is maximum. Other settings above or below this point results in smaller indications.

Therefore, this method may be used to hunt unknown i-f frequencies. Simply make an alignment setup and run the signal generator over the band of frequencies covering the possible i-f's. (260 to 470 kc.) You will usually find several 'humps' in this band. Find the largest, and see which standard i-f is the nearest to it. For example, if the maximum amplitude shows up around 480 kc, then the transformer is in the 450 kc group: 455, 456, 460 or 470 kc. Vary the signal generator dial until the maximum amplitude is located, then align at that frequency. Align the set at the frequency which gives the maximum amplitude and the best curve shape. Checking through the service information on similar sets

Fig. 7—Curve showing signs of incipient i-f oscillation. Note characteristic shape.



be completely eliminated by a careful sweep alignment.

The characteristic pattern of this defect will always look like Fig. 7. The dotted line shows what the curve should look like. The sharp break at the nose, together with the steepness of one side (either side) and, in some cases, the small "ringing" effect along the baseline; all of these are indications of this condition. To clear it up, align the last i-f transformer alone, feeding the signal into the i-f amplifier grid. Adjust the curve of this transformer for the proper shape. Do not move the signal generator dial during this entire process. Now, transfer the signal generator to the mixer grid and align the input i-f transformer. In some cases it may be necessary to kill the set's oscillator by shorting it with a test lead, etc. Align the transformers for best curve symmetry, not maximum amplitude. Quite often, designers overdrive the i-f amplifiers in the smaller sets, to obtain more gain. This results in a highly unstable condition. Many times, quite a bit more amplitude can be attained, but the curve will show traces of incipient oscillation. Always leave it at the point of maximum symmetry; this is the point of maximum usable gain.

If alignment will not bring the curve to the proper shape, change the i-f amplifier tube. Occasionally, tubes with too much mutual conductance or a trace of gas, will cause this trouble. Also, recheck the AVC filtering and the filter capacitors in the power supply. This is quite simple: merely bridge a good capacitor across the suspected unit while watching the curve on the scope. If the traces of oscillation clear up, replace the condenser. The output filter in the power supply of an a-c/d-c radio "doubles in brass" by acting as the r-f and i-f B+ return filter, the audio filter, as well as all the screen grid bypasses. Therefore, the mixture of frequencies, voltages and phases in this capacitor would be quite impossible to predict! A slight loss in capacity, or an increase in the power factor, lowering the filtering efficiency, could cause just such difficulties. Shunting with a known good capacitor will sometimes indicate the defect. However, it may prove wiser to disconnect the old capacitor for a reliable test, since shunting with a good one will show

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very little improvement if the old component has a high power factor.

R-F Alignment

One of the most useful features of this method of alignment is the ease with which loop antennas, r-f amplifiers and other front-end circuits can be tracked. Leaving the scope connected to the volume control as before, couple the signal generator very loosely to the antenna. Connect the hot lead to a three or four turn loop of wire, or (the most common method) simply throw it on the bench, close enough to the loop to pick up sufficient signal. Increase the generator output to give the necessary curve height. Never connect the generator directly to a loop antenna; even through a blocking capacitor. The added loading will cause detuning when the connection is removed. Many technicians clip the signal generator output to the fiber backing of the loop, or to the edge of the cabinet to keep the 'spacing' constant during alignment.

Set the generator to give a signal near the high end of the band, far enough away from any strong local stations to keep them from interfering with the alignment. Set up the signal generator and adjusting its output. Now, using a long insulated tool, adjust the loop trimmer, r-f trimmer (if any) and the oscillator grid trimmer. Tune for maximum curve amplitude; the curve shape should not change during this process if the i-f has been properly aligned. If the front end is out of alignment or not tracking, the same symptoms will be noted as in i-f alignment; the height will increase as the curve is walked across the screen. Always

check high-end alignment first. Tune for maximum curve amplitude.

Retune the set and signal generator to make a curve at the low end of the band, around 600 kc. If this is a very elaborate receiver, you may find padder adjustments, though it is absent in most sets. Therefore, any adjustments made here will have to consist of bending the plates of the tuning condenser. Inductively tuned sets are easier as these can be adjusted by sliding the coils on the mounting.

Some of the smaller sets will be so badly off-track at this point that you'll be forced to readjust the oscillator trimmer, accepting the resulting loss of calibration at the high end or compensating for it by moving the dial pointer! Keep working back and forth between the two ends of the dial until the best possible compromise adjustment has been found.

This alignment method can be a very useful one if applied properly. Actually, there are only six adjustments on the average set: the four i-f trimmers, and the r-f and oscillator trimmers. With the equipment set up in a convenient way, the whole process can be completed in less than ten minutes. •



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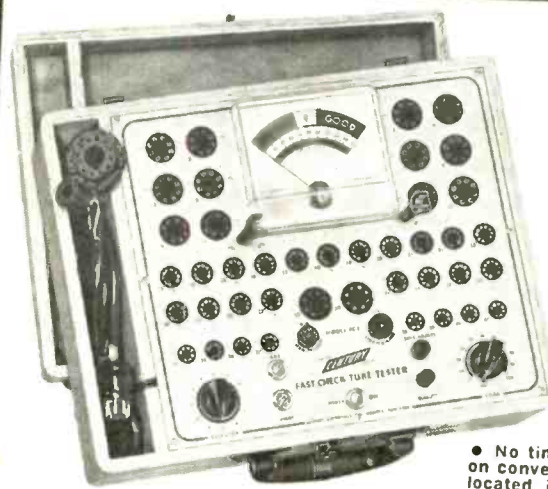
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JAMES B. LANSING SOUND introduces new line of linear efficiency infinite baffle loudspeakers, along with 3 new small enclosures designed specifically for these speakers. Named the Minigon, Metregon and Paragon, they employ the patented radiant dispersion principle.

CBS bulletin PA-218, "Tubes and Transistors in Hi-Fi" is available from CBS-Hytron Advertising Service, Parker St., Newburyport, Mass.

SHURE releases 8-page brochure "For the Critical Ear" describing cartridges. Included are specs on M-216 and M-212 integrated stereo arm and cartridge at \$89.50. Vertical and lateral compliance 9.

CONTINENTAL MFG., Omaha, releases literature on its Harmony 4-speed record changer. Unit is available as RC-6 without cartridge, as RC-8, -10, -12M with crystal cartridge, and RC-12H with stereo cartridge.

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Sonotone engineers discovered that they could correct *all three* complaints by redesigning just *one* tube.

RESULTS:

The heater element was changed to a coil heater, eliminating the hum. And rigid controls on the mount structure and processing reduced microphonics and noise. This resulted in the Sonotone reliable type 7025. It's now available for initial equipment and replacement purposes.

Let Sonotone help solve *your* tube problem, too.

Sonotone[®] PRO

Electronic Applications Division, Dept. TT-77

ELMSFORD, NEW YORK


Leading makers of fine ceramic cartridges, speakers, microphones, tape heads, electron tubes.

In Canada, contact Atlas Radio Corp., Ltd., Toronto

New!

SAVE TIME

with



Sencore Electro-Sub

Check all ELECTROLYTIC CAPACITORS in Seconds!

Model ES-102
ONLY \$15⁹⁵ DEALER NET

Less than you pay for the individual capacitors.
Carry it anywhere—measures only 4 1/4" H x 4 1/4" W x 2 1/4" D

See other SENCORE ads in this issue.

SERVICE INSTRUMENTS CORP. 121 Official Rd. • Addison, Ill.

Merely select the electrolytic and substitute it. 10 big electrolytics from 4 to 350 Mfd. to safely substitute in any circuit from 2 to 450 volts.

- ... COMPLETELY SAFE—no arc or spark when connecting or disconnecting.
- ... AUTOMATIC CAPACITOR DISCHARGE—within seconds after releasing test switch by, unique surge protector circuit.
- ... NO CAPACITOR HEALING—surge protector circuit prevents accidental heating of capacitor being "bridged" in service work.

Available at Parts Distributors.



SERVICEMEN KNOW!

Here they pay less and get the best

HUSH[®]

Chemically-Electronically, engineered for Tuners and Switching Mechanisms.

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

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

EVER-QUIET[®]

Since 1949

VOLUME CONTROL AND CONTACT RESTORER

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

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



CHEMICAL ELECTRONIC ENGINEERING, INC. Matawan, New Jersey

AUDIOTEX introduces Stere-O-Sound remote control center with 20' cable @ \$39.50. Also, new self-service hi-fi accessory display rack handles 150 item line.

WEATHERS Harmony speakers in book-type housing are \$29.75. Bass speaker is \$69.50. Stereo Trio is priced @ \$119.50.

KOSS introduces the SP-3 dynamic Stereophone @ \$24.95. These headphones are rated 30-15,000 cps. Line of transformers and control boxes are available.

BOGEN introduces 60 and 30-watt PA amplifiers: Model MX-60, at \$290.00, MX-30 at \$225.00, and M-330 at \$187.50; booster amplifiers MO-100 at \$215.75, MO-60 at \$167.50, and MO-30 at \$199.88, 100, 60 and 30 watts respectively; and a BT-25, 25-watt transistorized PA amplifier for mobile use at \$120.00.

GRAY announces the HSK-33 turntable, 33-1/3 rpm, @ \$49.50. Finished base is \$17.95, unfinished \$10.95. Also, SAK tone arm kit @ \$23.95.

SONOTONE names Texport Co., Dallas, as Southeast rep.

EMERSON has acquired control of WEBCOR through the purchase of 20% of outstanding common stock from Pres. Titus Haffa and family.

HEATH announces 2 new stereo-mono tape recorders in the TR-1A series. Half-track (TR-1AH) or quarter-track (TR-1AQ) record and play back stereo and monophonic programs. Original mono version (TR-1A) can be converted to either half-track or quarter-track by using the MK-4 or MK-5 Conversion kits. @ \$62.95. James R. Bostwick has been appointed to the newly created post of Asst. to the Vice Pres., Daniel P. Knowland, Jr.

MINNESOTA MINING's "Sound Talk" Bulletin 37 contains an interesting discussion of "Reduction of Dropout Errors in Magnetic Recording Systems."

ELECTRO-VOICE announced new products. The KD-9 Marquis folded-horn enclosure kit \$36.00; the Stereon 200 for use as a center channel speaker with two Patrician 700s as outriggers. Also line of PA speakers with 45-ohm voice coils suitable for use in intercom systems where 45-50 ohm lines are used. Models 844-45, 847-45 & 848-45 are \$34.50, \$47.83 and \$76.50. Leyton speaker system added to Wolverine line is \$78.00. Esquire 200, compact speaker 3-way system has been announced. The Model 30W, woofer used in the Patrician 700 is a 30-inch speaker with response to 18 cycles, \$139.00. Price cuts on Series 20 stereo cartridges announced. The 21-D, formerly \$32.50 is now \$15.00; the 26-DST, formerly \$37.50 is now \$16.50.

VIS-U-ALL
BUSINESS BUILDING TEST EQUIPMENT FOR SERVICE DEALERS

NOW,
THE DYNAMIC
PORTABLE TUBE
TESTER THAT DOES
EVERYTHING



New V1003 tests 99% of all radio and TV tubes plus transistors and portable radio batteries!

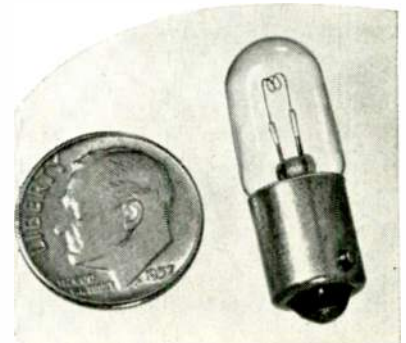
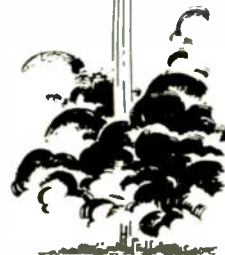
No other tester like it at any price. Not only helps you do better, faster TV-radio servicing, but sells more tubes. Also checks all transistors and portable batteries under load (a Vis-U-All exclusive). Does all this with just 6 sockets, 3 knobs . . . simplicity unequalled! New and practical features galore!

ONLY \$129.00

Write
for
Details

VIS-U-ALL
PRODUCTS CO.
640 EASTERN, S. E.
GRAND RAPIDS 6,
MICHIGAN

Designed
to Burn
for Only
15 Seconds!



This miniature lamp has a planned life of only a quarter of a minute, but its brief existence is truly spectacular! For in those few seconds it pours forth all the light normally emitted during the entire lifetime of an ordinary lamp!

Designed to provide a point of intense light for the tracking apparatus that determines the accuracy of a missile's course in the first few seconds of flight, this lamp is typical of many specially engineered lamps Chicago Miniature is called upon to produce.

Be assured that the Chicago Miniature Lamps your jobber offers will burn longer than 15 seconds! The same experienced, precision engineering that designed and produced this special lamp is producing long lasting, standard miniature lamps for your use.

Always ask for Chicago Miniature Lamps!

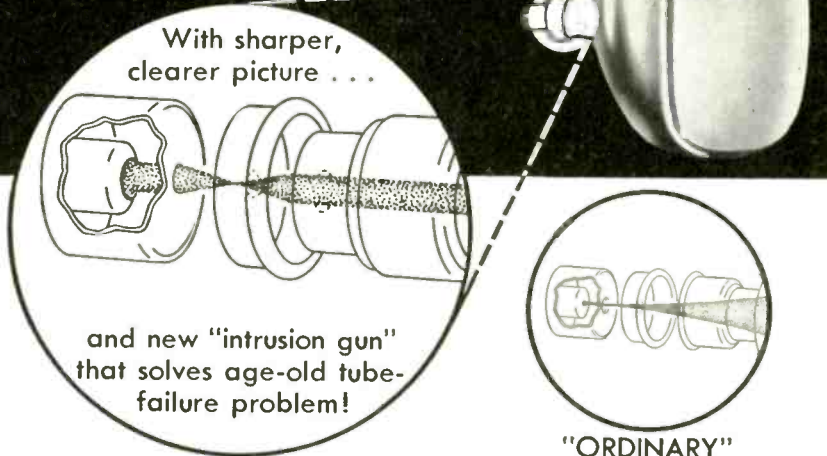
CHICAGO MINIATURE LAMP WORKS



1516 N. Ogden Ave., Chicago 10, Ill.
Miniature Lamps for every requirement

Ten times more reliable!

Motorola Golden "M" Picture Tubes



Compare the illustrations! See how Motorola's "intrusion gun" lens system draws electrons from an area on the cathode *over 10 times as large*.

Result? Cathode loading reduced to 10%... that's *10 times longer peak performance* for Motorola Golden "M" Picture Tubes!

TRADEMARK OF MOTOROLA, INC.



MOTOROLA

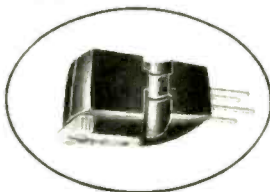
Parts and Accessories Division, Franklin Park, Illinois



Mr. SERVICEMAN

You make more profits on Stereo pickups with **PICKERING'S LWD Program!**

Think of it!... you can make 100% or more in profit on Stereo conversions and installation of Stereo pickups for replacement!



Get into the profitable stereo high fidelity business where experienced and quality conscious technicians are needed. Pickering's LWD program makes it possible for you to buy the STANTON Stereo FLUXVALVE and the STANTON Stereo KableKit from your wholesaler so you make your full markup in addition to your service charges. Call your wholesale jobber today and take full advantage of this profitable business.

EVERYTHING YOU NEED FOR STEREO CONVERSION!

STANTON STEREO KableKits

FOR CONVERTING CHANGERS



FOR CONVERTING MANUAL TONE ARMS

NEW! Low cost stereo cable assembly for converting automatic changers and manual tone arms. Prefabricated insulated and fully shielded harness assembly with all plugs and connector clips soldered... ready for instant installation! No soldering required for normal installation. Harness length 4 feet, comes complete with cable retention clips.

Model 603 Stereo KableKit for three wire systems.. \$2.98

Model 604 Stereo KableKit for four wire systems.. \$3.98

ASK FOR PICKERING AT YOUR JOBBER... EASIER TO SELL AND INSTALL.

FREE! Pickering Service-File, complete technical file on quality products by Pickering. Includes valuable bulletins on hum elimination, installation, maintenance, etc.

Address Dept. M79 for your free Service-File.



For those who can hear the difference™ THE QUALITY HIGH FIDELITY PRODUCTS BY

PICKERING & COMPANY, INC., Plainview, N. Y.

Catalogs & Bulletins

DIFFUSED SILICON REGULATORS: An 8-page booklet covering design procedure for silicon regulator diode dc voltage regulators is available from Texas Instruments, Inc., Box 312, Dallas, Texas. (ELECTRONIC TECHNICIAN B7-16)

TEST INSTRUMENTS: Illustrated 4-page folder gives features, specifications and prices for test and measuring instruments. Boonton Radio Corp., Boonton, N. J. (ELECTRONIC TECHNICIAN B7-1)

CAPACITORS: "The Ohmite News" covers the subject of "Which Tantalum Capacitor Should You Use?" Ohmite Manufacturing Co., 3603 Howard St., Skokie, Ill. (ELECTRONIC TECHNICIAN B7-19)

TRANSISTOR HOME STUDY COURSE: Up-to-date supplement available for 1957-1958 CBS course, consisting of 14 pages of additional projects and circuit descriptions for lessons 2 through 8, and 10. Price \$1.00, check or money order to CBS Electronics, Dept. TC, Danvers, Mass.

POSTER: New 17" x 21" poster, RP-21, "Call Your Nearby Independent TV Service Dealer" available as well as free mat to reprint poster in smaller 7" x 10" size for a throw-away or envelope enclosure printing. Sprague Products Co., North Adams, Mass. (ELECTRONIC TECHNICIAN B7-14)

BULLETIN: RN 459 "Rectifier News" features the silicon equivalent of the standard type 866 mercury vapor rectifier tube with an article and comparison table. Other illustrated articles include "Solid State Reference Elements" and "Temperature Control of Silicon Solar Cells in Satellite Applications." International Rectifier Corp., El Segundo, Calif. (ELECTRONIC TECHNICIAN B7-20)

SWITCHES: The following two catalogs are available which include detailed information, dimension drawings, specification tables and electrical ratings: Catalog No. 159, "Unimax Subminiature Switches" and Catalog No. 359, "Unimax Precision Snap-Acting Switches." Unimax Switch Div., The W. L. Maxson Corp., Ives Rd., Wallingford, Connecticut. (ELECTRONIC TECHNICIAN B7-18)

MOBILE COMMUNICATIONS: A 6-page brochure suitable for loose-leaf binding contains an interpretation of the FCC rules and regulations affecting mobile communications effective September 11, 1958. It also lists all frequencies available in business, manufacturer's, telephone maintenance, public safety and citizens radio. Kaar Engineering Corp., 2995 Middlefield Rd., Palo Alto, Calif. (ELECTRONIC TECHNICIAN B7-8)

(Continued on page 73)

Association News

Illinois

NATESA has rejected the membership application of TSA of Michigan. In explaining its action, NATESA stated: "Under our Constitution we can recognize only one state group and only one local affiliate in any one city. Inasmuch as TESA-Michigan (formerly AMETA) has been duly recognized, we cannot recognize TSA-Michigan. Further, since ESA of Detroit is the duly recognized local affiliate of TESA-Michigan and its predecessor group AMETA, we cannot recognize TSA as a Detroit affiliate . . . Under no condition is this action to be interpreted as an act opposed to the rank and file membership of TSA-Michigan (Detroit) . . . Membership for service business operators in all areas is invited by each of our local affiliates, regardless of what other group they may belong to at present and even simultaneously."

Indiana

ITTA, Indianapolis, appeals for advice in combatting the criminal element in the city that has burglarized member's stores. The Association reports burglaries as follows: Teskey's TV Center, burglarized for over \$1,800 worth of transistor radios, portable TV's, etc. A-B Radio reported a \$3,200 loss. Burglars entered their store April 25, and even took time to choose the correct batteries for transistor radios that they stole. Raub Radio reports eight robberies in less than a year. Police surprised burglars in Harry's Radio & TV as they were prepared to leave with their loot.

Kentucky

KTRTA of Louisville new officers are: Pres., Giles Allen; V.P., Ira Masden; Sec'y., Bud Pilkington; Treas., George Leitner.

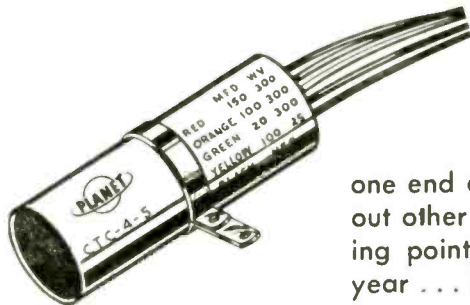
Michigan

TSA of Michigan celebrated their tenth anniversary at the Veteran's Memorial Building. The festivities drew almost 200 service dealers and distributors and the occasion also marked the annual installation of officers.

New York

RTG, Long Island, discussing tube discounting, estimates the average net cost of a tube stocked by shops is

NEW



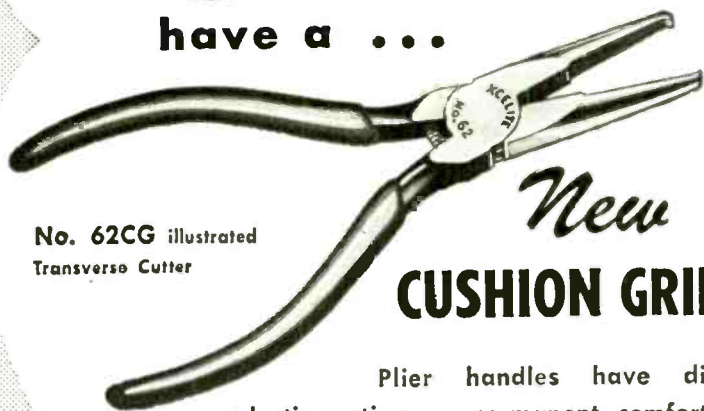
Type "CTC" . . . cardboard tube electrolytics especially designed for exact replacement in television sets . . . one end closed . . . long insulated leads out other end . . . sealed with high melting point wax . . . guaranteed for one year . . . individually packaged.

Ask for it from your parts distributor

PLANET SALES CORPORATION
225 Belleville Avenue
Bloomfield, N. J.

XCELITE PLIERS

have a . . .



No. 62CG illustrated
Transverso Cutter

New
CUSHION GRIP!

Plier handles have dipped plastic coating . . . permanent, comfortable. Heads polished and buffed to a "mirror finish". All pliers available . . . See Your Distributor!

Gives pliers a "Feel" that inspires Craftsmanship!

XCELITE, INCORPORATED
ORCHARD PARK, NEW YORK
Canada: Charles W. Pointon, Ltd., Toronto

XCELITE
Quality Hand Tools
PREFERRED BY THE EXPERTS

Here's why
you can
**MAKE MORE
MONEY**
with
ELECTRO KIT



**New multi-use
DC Power Supply
offers more power
with less ripple
to handle more servicing
jobs at less cost**

... services all these without
hum: Transistor auto and portable
radios, "hybrid" auto and marine
radios.

... and does all this, too: Oper-
ates relays, phone circuits. Battery
charging. Electroplating. Labora-
tory work. Other low voltage oper-
ations.

2 ranges: 0-20 volts for transistor
circuits; 0-16 volts for 12/6 volt
tube and "hybrid" auto radios.

.15% ripple up to 75 milliam-
peres. **0.5 ripple** up to 5 amperes.

Separate milliammeter detects
variations in transistor current.

Separate fuse in secondary cir-
cuit offers transistor protection.

Patented conduction cooling
lowers cost per ampere output.

**Compare with any other kit —
see how many more features
Electro Kit offers you.**

MODEL KPS-2 \$39⁹⁵

at your Parts Jobber

ALSO AVAILABLE — Model PS-2
factory wired and assembled... \$49.95

Send for detailed literature



**ELECTRO
PRODUCTS
LABORATORIES**

4501-T Ravenswood, Chicago 40
Canada: Atlas Radio Ltd., Toronto

9013

\$1.02. Total cost of selling each tube (based on a \$5.00 hourly rate) is said to be 49 cents. With an average list of \$2.40, this amounts to 37% off list. So, if a 40% discount, is offered, some free time is given away. These statistics do not consider obsolescence or overhead income derived from sales.

ARTSNY, New York, reports it will solicit the cooperation of all TV and Hi-Fi manufacturers to offer technical lectures and films at their meetings. V. P. Charles Edwards and Jack Wargantz of Knickerbocker Distributors were instrumental in organizing a lecture by Motorola's Ken Jones on printed circuit service techniques. Color films were used as visual aids.

Oklahoma

TESA, Oklahoma, sponsored a full-scale parts show and technical clinic in Oklahoma City, July 17 to 19. Members of the TV and Electronics Service Industry from five states were in attendance. Harold Eales, a director of TESA, Oklahoma, and a member of NATESA's board of directors, was chairman of the show.

Pennsylvania

TSA of Delaware County presented an Electronic Technician Forum June 12 to 14. The seminar covered servicing techniques for Color TV, Transistors, Record Changers, Tape Recorders, etc. In addition, the program featured new products requiring the services of skilled technicians, such as electronic washers, cooking and cooling equipment, with discussions, installation and troubleshooting methods. The official opening address was made by Pres. Sam Brenner of TSA, Delaware County. Dave Kranz was show coordinator.

Canada

RETA of British Columbia re-elected Pres., R. V. Mielen; Sec'y, S. B. Spencer. Treas. Harley Taylor was elected to succeed E. Wheeler. Sec'y, S. B. Spencer advises that the Association's Certification of Technicians Program will soon be in effect.

Usual High Voltage Arc

(Continued from page 39)

amplifier, even with the video amplifier tube pulled out. I traced the waveform to the CRT cathode. This horizontal waveform disappeared when the CRT socket was disconnected from the base. The waveform was evidently coming from the CRT! Reflecting awhile, I thought perhaps this a-c was somehow reaching the CRT second anode and reflected back through the electron gun to the cathode. I replaced the 1B3 H.V. rectifier... Presto! the raster came on with full brilliance. I surmised that a short or leakage between plate and cathode existed, but the tube tester simply showed the tube as dead.

Two facts contributed to the oversight of not replacing the tube in the home; the 1B3 was passing enough unrectified high-voltage to give a long healthy arc when the second anode lead was held to within an inch of the chassis. This type of set normally gives a fairly soft-looking d-c arc and it proved deceiving. The original CRT was then reinstalled and the set operated properly. Realigning the set, lubricating tuner and controls, the set was returned with only a minor service charge.—*Lambert C. Huneault, Windsor, Ont., Canada.*

It is inadvisable to short the 2nd anode voltage to ground. This procedure may result in H.V. rectifier damage and erroneous diagnosis. Ed.

**SAVE
TIME
with**

SENCORE

New! Improved!

**TRANSISTOR
CHECKER**

America's newest, most popular test instrument

Simple to Operate. Controls are accurately set for each transistor by referring to replaceable set-up chart on rear. Test leads or socket provides for fast hook-up.

NOW CHECKS:

- ★ Transistors for opens, shorts, leakage and current gain. Only tester that tests power transistors as used in car radio outputs.
- ★ Crystal Diodes checks forward to reverse current ratio on all diodes.
- ★ Selenium Rectifiers checks forward and reverse currents.

Service Instruments Corp. 121 Official Road, Addison, Ill.

See other SENCORE ads in this issue.

MODEL TRC4

\$17⁹⁵

DEALER NET

Cannot become obsolete. Approved by leading manufacturers.

At Leading Parts Distributors.

BUILD EXTRA SUMMER INCOME
HOME AIR CONDITIONING—Installation & Repair by J. Derman, F. Makstein, H. Scaman, #211 \$3.50

TV SERVICING

RECEIVING TUBE SUBSTITUTION GUIDEBOOK By H. A. Middleton, #135 \$3.00
 First Supplement, #139 \$.99
 Second Supplement, #139-2 \$.99
 Third Supplement, #139-3 \$ 1.35

REPAIRING TELEVISION RECEIVERS By Cyrus Glickstein, #191 \$4.40

HOW TO LOCATE AND ELIMINATE RADIO & TV INTERFERENCE by Fred D. Rowe, #158 \$1.80

PICTURE BOOK OF TV TROUBLES
 By Rider Lab Staff
Fabulous series of definitive, practical books that teach recognition of faults in TV receivers.

VOL. 1: HORIZONTAL AFC-OSCILLATOR CIRCUITS, #168, 80pp \$1.35

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VOL. 4: AUTOMATIC GAIN CONTROL CIRCUITS, #168-4, 96pp \$1.80

VOL. 5: HORIZONTAL OUTPUT & H-V CIRCUITS, #168-5, 108pp \$1.80

VOL. 6: HORIZONTAL & VERTICAL SYNC CIRCUITS, #168-6, 120pp \$1.80

VOL. 7: SOUND CIRCUITS & L-V POWER SUPPLIES, #168-7, 64pp \$1.50

TV PICTURE TUBE—CHASSIS GUIDE By Rider Lab Staff, #204 \$1.35

HOW TO INSTALL TV ANTENNAS By Samuel L. Marshall, #172 \$2.50

ADVANCED TELEVISION SERVICING TECHNIQUES By Zbar & Schildkraut

MAIN TEXT, #161 \$3.60

LABORATORY WORKBOOK, #161-2 \$.95

HOW TO TROUBLESHOOT A TV RECEIVER By J. Richard Johnson (2nd edition), #152 \$2.50

SERVICING TV VERTICAL AND HORIZONTAL OUTPUT SYSTEMS By Harry Thomas, #150 \$2.40

MORE ELECTRONIC KNOW-HOW
 quickly, easily — at low-cost
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INTRODUCTION TO COLOR TV (2nd edition) By Kaufman & Thomas, #156 \$2.70

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HOW TO INSTALL & SERVICE INTERCOMMUNICATION SYSTEMS By Jack Darr, #189 \$3.00

HOW TO SERVICE TAPE RECORDERS By C. A. Tuthill, #167 \$2.90

REPAIRING HI-FI SYSTEMS By David Fidelman, #205 \$3.90

RIDER'S SPECIALIZED TAPE RECORDER MANUAL, VOL. 1, #6001 \$4.50

TEST EQUIPMENT

HOW TO USE METERS By John F. Rider #144 \$2.40

HOW TO USE TEST PROBES By A. Ghirardi & R. Middleton, #165 \$2.90

OBTAINING INTERPRETING TEST SCOPE TRACES By John F. Rider, #146 \$2.40

HOW TO USE SIGNAL & SWEEP GENERATORS By J. Richard Johnson, #147 \$2.10

RADIO SERVICING

RADIO RECEIVER LABORATORY MANUAL By Alex W. Levey, #178 \$2.00

RADIO TROUBLESHOOTING GUIDEBOOK, VOL. 1 By Rider & Johnson, #149 \$2.40

HOW TO INSTALL AND SERVICE AUTO RADIOS By Jack Darr, #159, 2nd edition... \$3.25

REPAIRING PORTABLE & CLOCK RADIOS By Ben Crissas & David Gnessin, #224 \$2.75

Look for these books at the Rider display at your jobber, if not available order direct ET-7



JOHN F. RIDER PUBLISHER, INC.

116 West 14th Street, New York 11, N. Y.

New Books

Book marked with an asterisk (*) may be obtained prepaid from Electronic Marketers, Book Sales Division of Electronic Technician

***RIDERS COMBINATION TELEVISION, TRANSISTOR RADIO, HOME RADIO MANUAL, Volume 25.** Published by John F. Rider Publisher, Inc. 978 pages, hard cover. \$27.00.

At a cost of less than 3 cents a page, the latest manual is an excellent buy. The book has been expanded, improved and designed to be of maximum utility to the service technician. Original manufacturers' information, including schematics, parts lists, parts location, service notes, alignment data, waveforms, voltages, resistances, modifications, etc. are presented. Large easy-to-read schematics on fold-out forms where necessary are provided. An expandable and rugged binder makes it possible to insert or remove pages as desired. The home radio section also includes information and schematics on high fidelity equipment. The ability to include additional information on radio in this one manual does not reflect a compromise in material coverage, but rather the sharp reduction in the number of new set manufacturers during the last ten years. The result is a single convenient source of servicing data which is likely to encompass most if not all of radio and TV servicing activities.

THE SOUND OF HIGH FIDELITY. By Robert Oakes Jordan and James Cunningham. Published by Windsor Press, 200 E. Ontario St., Chicago 11, Ill. 208 Pages, hard cover. \$3.95.

This welcome handbook presents the layman with an interesting and comprehensive guide to High Fidelity. An historical and elementary technical survey accompanies component analysis in Hi-Fi systems. The text is written in a lucid manner, and the photos and drawings are both numerous and commendable. It's an excellent book for technicians who sell audio equipment and wish a thorough review of components and fundamental theory.

***DIGITAL COMPUTING SYSTEMS.** By Samuel B. Williams. Published by McGraw-Hill Book Company. 229 pages, hard cover. \$7.75.

Here is a basic technical introduction to digital equipment. It clearly explains how the various parts of the system operate, without going into the complex mathematics and programming techniques involved. Topics include numbers, letters, and codes, input and output devices, storage devices, circuits and components and arithmetic units. Anyone considering the computer field will find this book of general interest. (Continued on page 72)

A BIG, NEW PROFITABLE MARKET
and the perfect equipment to serve it!



G-11 GONSET Citizens' Communicator 2-WAY RADIO

Now... 22 channels within 11-meter range. For Class D use—personal or business! Easy to license... no exam, U.S. Citizens merely complete simple FCC form.

Technician/Dealers...

Gonset G-11 offers you... the perfect inexpensive equipment to serve this big, profitable market. Demonstrate... sell... install... maintain.

Multiple and repeat sales...

G-11 units can operate together as a system. Examples: industrials... buildings... yards, warehouses... aviation... branch businesses. Every industrial account you have is a hot prospect!

Dependable...

FCC type accepted. No tuning, full crystal control... RF stage... ANL... adj. squelch... panel speaker... p-p control... built-in power supply. 5 watts input (FCC max). 3 models—115 VAC, 12 VDC, and 6 VDC...

124.50 per unit

w/mike & trans, rec crystals

Send today for complete information and free booklet.

GONSET DIVISION DEPT. ET-1,
 Young Spring & Wire Corp.
 801 South Main Street, Burbank, Calif.

Gentlemen: Rush complete details on your technician dealer plan and free booklet: "11-meter Citizens' Band Radio"

NAME _____
 ADDRESS _____
 CITY _____ ZONE _____ STATE _____

GONSET

Division of Young Spring & Wire Corporation
 801 SOUTH MAIN ST., BURBANK, CALIFORNIA

MORE

OF EVERYTHING
YOU WANT IN A
**TRANSISTOR
CHECKER**



FOR ONLY
\$89.00

THE *PRECISION* MODEL 960

- Direct Icbo Readings in terms of true collector current.
- Five Icbo Ranges cover all types of transistors — low, medium and high power . . . n-p-n and p-n-p types.
- 17 D.C. Collector Voltages: .5 volts DC to 100 volts DC in 17 steps.
- Direct-Reading Gain Ranges: 5 separate injection currents.
- Leakage: Reliable check of emitter to collector leakage current provides basis for accurate gain tests.
- Crystal Diode Tests: Separate tests for both forward and reverse currents.
- Transistor Test Settings listed on high speed roller chart.
- Patchcord Selector System and universal adapter provide for future semiconductor releases.
- Wide-Angle, 5½", 100 microampere sensitivity PACE meter.
- Free Transistor Test Data Subscription Service for one full year.

MODEL 960: Complete with portable carrying case and comprehensive technical manual. . . . Net Price: 89.00

- ▶ Available and on display at leading electronic parts distributors. Write for complete *PRECISION* catalog.
- ▶ *PRECISION* Test Equipment carries a full year warranty!



(Continued from page 71)

***MARINE ELECTRONICS HANDBOOK.** By Leo G. Sands. Published by Howard W. Sams & Co., Inc. 232 pages plus pull-outs. soft cover. \$3.95.

The growth of pleasure boating and the increasing use of electronic devices aboard these craft, offer many servicing opportunities to electronic technicians. This interesting text discusses ship-to-shore radio, MF, VHF and UHF radio telephones, sound systems and radio direction finders. In addition, depth sounders, steering devices, marine radar, electronic power and boating rules are explained. The author presents a substantial number of commercial units now on the market, including both illustrations and schematic diagrams. Equipment required, how the various units operate and trouble shooting techniques are discussed. It is certainly a worthwhile book.

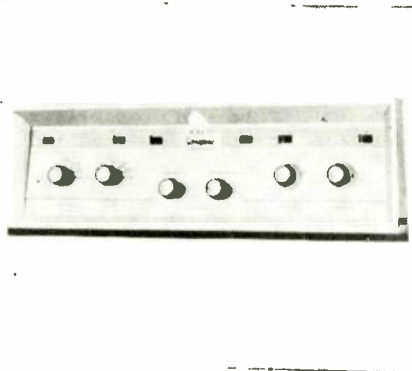
***MODEL RADIO-CONTROL.** By Edward L. Safford, Jr. Published by Gernsback Library, Inc. 192 pages, soft cover. \$2.65.

While this book is primarily intended for the hobbyist, there are a number of very interesting features which can serve as stepping stones to the more complex science of industrial radio control. Among the subjects covered are coding, transmission, receivers, decoders, power controls, servos and transistors. This volume is well illustrated with numerous mechanical drawings and circuits.

To increase your know-how, see "BUILDING A TECHNICAL LIBRARY" on Pages 56 and 57.

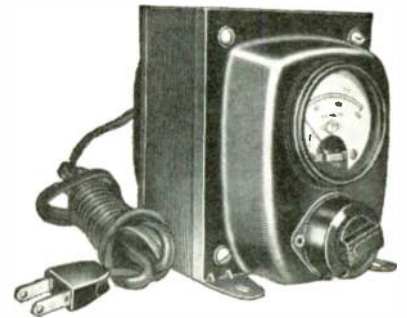
Paco STEREO AMPLIFIER

A new stereo preamp-amplifier kit, model SA-40, will deliver 40 watts continuous power, with each channel rated at a full 20 watts. Performance specifications are reported as: Frequency response 30 to 90,000 cps \pm 1 db; harmonic distortion 0.2% at rated output;



IM distortion less than 1% at rated output and a damping factor of 22. The circuit includes four 7189 output tubes and two silicon power rectifiers. Kit \$79.95. Wired \$129.95. Both are complete with case. Paco Electronics Co., 70-31 84th St., Glendale 27, L.I., N.Y. (ELECTRONIC TECHNICIAN 7-45)

**WHEN
PERFORMANCE
IS
AFFECTED BY
LOW VOLTAGE
CONDITIONS**



**SELL THIS
ACME ELECTRIC
VOLTAGE
ADJUSTOR**

TV sets are designed to operate best when voltage holds closely to 115-117 volts. Overloaded supply lines (the power industries greatest problem) may result in a voltage drop of 10 to 15% at certain times of day. Usually the TV set will function in a fashion under such low voltage conditions but with a great strain on its components. For example; narrowing of picture, output stage tube life shortened, frequent burn-out of filaments, fuzzy focus have been traced to lack of proper voltage.

These conditions can be corrected with an Acme Electric T-8394M Voltage Adjustor. Simply plug-in to convenient outlet. Plug-in television set cord into female receptacle built into adjustor. Voltmeter indicates output voltage. If voltage is incorrect turn regulating control until proper voltage is reached for best performance. Voltage range 95 to 125 volts. Tell your supply dealer you want the Acme Electric T-8394M. No other so compact, practical, inexpensive.

ACME ELECTRIC CORPORATION
887 WATER ST. CUBA, NEW YORK

SIMPLIFY TEST and TROUBLE-SHOOTING PROCEDURES

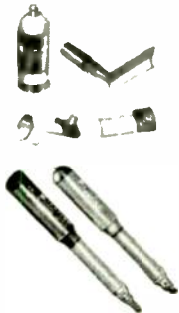
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Models EA-1 and VS-5 Kingston Absorption Analyzers provide electrostatic signal tracing and extreme sensitivity. For trouble-shooting any equipment with wave forms. CRT displays wave-form from each stage.



Model PO-1 Kingston Absorption Analyzer allows conventional oscilloscopes to be used in trouble-shooting electrostatically. Built-in speaker for use as an audio analyzer.



Accessory Probes for miniature, sub-miniature and shielded tubes. Also Direct Probe for use with VS-5 and EA-1. Transistor Radio Probe simplifies trouble-shooting of transistorized radios.



Model BB-1 Variable DC Source, battery-driven for use wherever a pure DC voltage is desired. Voltage can be varied and metered.



Probe-Master. Built-in capacitive network allows by-passing of stages, coupling of signals from one stage to another. Most versatile testing probe on the market. Complete with two clips and neon bulb.

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CATALOGS & BULLETINS

(Continued from page 68)

FILTERS: A colorful new 8-page brochure describing a line of miniature ceramic i-f bandpass filters, including applications in military and commercial equipment, is available from Clevite Corp., Electronic Components Div., 3311 Perkins Ave., Cleveland 14, O. (ELECTRONIC TECHNICIAN B7-3)

TV TEST INSTRUMENTS: "Advanced Techniques of TV Trouble-Shooting" is a new bulletin featuring illustrations, prices and descriptions of six TV test aids. Doss Electronic Research, Inc., 820 Baltimore, Kansas City 5, Mo. (ELECTRONIC TECHNICIAN B7-4)

TUBES: Eimac "Quick Reference Catalog" to be inserted at the front of the Hard-Cover Catalog, contains condensed technical information on their commercial line of over 100 tube types and accessory items, arranged in thumb-indexed form. Eitel-McCullough, Inc., San Carlos, Calif. (ELECTRONIC TECHNICIAN B7-5)

TV-TOTER TABLE: Method of assembling and the various uses of the RCA TV-Toter Table for the service shop are featured in a colorful, illustrated booklet. Radio Corp. of America, Electron Tube Div., Harrison, N.J. (ELECTRONIC TECHNICIAN B7-11)

SERVICE AIDS: "Triple Pindex Receiving-Tube and Picture-Tube Base Diagram Guide," TV-Toter Table and TV Service Auto Light are all described in a colorful wall-chart size bulletin. Radio Corp. of America, Electron Tube Div., Harrison, N.J. (ELECTRONIC TECHNICIAN B7-12)

SILICON RECTIFIERS: Design Notes No. 36 and 37 cover specifications and features of Type S-5251 silicon rectifier replacement for 5U4 tubes and Type S-5207 silicon rectifier, replacement for 6X4 tubes, respectively. Sarkes Tarzian, Inc., Rectifier Div., 415 N. College Ave., Bloomington, Ind. (ELECTRONIC TECHNICIAN B7-13)

TERMINALS: New 24-page Catalog No. 31 contains detailed dimensions and drawings of nearly 400 terminals and electronic hardware items, including newly-announced line of mil-spec instrument control knobs. Lerco Electronics, Inc., 501 S. Varney St., Burbank, Calif. (ELECTRONIC TECHNICIAN B7-9)

DIODES: Specifications of most U.S. Semiconductor diodes have been compressed to fit on one folded sheet of paper designated the "Short Form Catalog." U.S. Semiconductor Products, Inc., 3540 W. Osborn Rd., Phoenix, Ariz. (ELECTRONIC TECHNICIAN B7-17)



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**NEWEST
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ripple
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**Model 1020
POWER &
BIAS SUPPLY
FOR**

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Wired \$27.95 Kit \$19.95

- Checks All transistor radios.
- includes power transformer, full-wave silicon diode rectifier circuit, electrolytic capacitor input filter followed by a two-power transistor (2-2N256) cascaded filter circuit providing extraordinary ripple rejection.
- output voltage: 0-30 VDC continuously variable, monitored by dual-range voltmeter (0-6, 0-30 VDC).
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- 0.5A fuse protects against short circuit.
- comparable in purity of output and in voltage & current capacity to transistorized supplies selling for several hundred dollars.
- ideal for laboratory, development & service work on transistors & transistorized equipment.
- rugged grey wrinkle steel case 5" x 4" x 5 1/2".

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Wired \$19.95
Kit \$13.95**

Exclusive with
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Switching facili-
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alone, or 1350 combinations of same in series or parallel. Standard EIA resistance values (1W) from 15 ohms to 10 megs in decade multiples of 15, 22, 33, 47, 68, 100; standard EIA capacitance values (most 600V) from 0.0001 to 0.22 mfd. All 10% accuracy. Open & short circuit positions provided. Convenient jack-top binding posts. Compact: 6 1/4" h, 5 1/2" w, 2 3/8" d.



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FILAMENT**

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Wired \$5.95
Kit \$3.95**

Includes batteries



Fast filament checking of series string & all other TV & radio tubes (9-pin, octal, loctal, 7-pin); 14-pin, 12-pin, 8-pin CRTs; bayonet & screw-type pilot lamps; cartridge fuses. Just plug tube into tester socket; observe indicator lamp—no fiddling with controls or switches. Self-powered for convenience & safety. 7-pin & 9-pin miniature tube pin straighteners provided. Compact: 6 1/4" h, 3 3/4" w, 2" d.

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See EICO's other ad on page 59.

Comco BASE STATIONS

The 580/582 Fleetcom series VHF-FM uses a new concept in mobile equipment by combining its transistorized power supply with the combination/speaker control unit. The transmitter/receiver unit measures 9" x 12.25" by 5.5" in height and can be mounted in



any convenient location. It is especially designed in the 25-174 mc range for the new Business Radio Service and the Airline Company Ramp service. It provides 35-40 watts output, 25-54 mc; or 25-30 watts, 144-174 mc. Priced in the \$400 class. Communications Co., 300 Greco Ave., Coral Gables, Fla. (ELECTRONIC TECHNICIAN 7-18)

Utica 2-WAY RADIO

The new "Town and Country" 11 meter transmitter-receiver unit provides Citizen Band Communication up to 10 miles. It operates on either 110 volt ac home current or 6 or 12 volt auto or boat systems. It is portable and easily installed. Sold in matched pairs that operate on the same channel. Ac-



cessories available include: fixed location antennas, for greater coverage; car mounting brackets; telephone headset; mobile base-loaded antennas, etc. The entire unit is shock, moisture and dust proof. \$149.50 complete with antenna, cables and microphones. Utica Electronic Communications Corp., 19 S. La Salle St., Chicago 1, Ill. (ELECTRONIC TECHNICIAN 7-25)

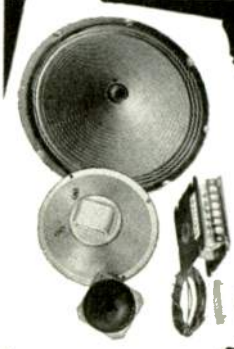
For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon, on page 48.

Heath TRANSCEIVER KIT

Model CB-1 Citizen's Band Transceiver Kit, claimed to be the first of its kind, is designed to meet all FCC requirements for 2-way radio-telephone communication for new 11-meter class D operation. It is light, compact, simple to assemble and easy to use. Distances



from 1 to 10 miles can be covered, depending on location and type of installation. The kit is complete with microphone, station identification card, all pertinent FCC regulations and FCC license registration form. Any U. S. citizen, 18 years of age or older, is eligible for license. \$42.95. Heath Co., Benton Harbor, Mich. (ELECTRONIC TECHNICIAN 7-19)



**High Fidelity
3 SPEAKER
SYSTEMS**


Here is a perfectly matched team with 3-way cross-over network. Kit includes 12" woofer; 8" midrange; 3 1/2" tweeter; hardware and network. Model 3W20... audiophile net \$39.00.

Beautiful cabinets available in variety of modern finishes and designs... write for FREE literature.

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OXFORD BRANDS: Supreme Transformers, Hudson Lamps, Tempo Hi-Fi, Oxford Speakers & Rear Deck Kits.



Vocaline 2-WAY RADIO

The "Commaire," model ED-27, Class D Citizens Band 2-Way Radio features new transistorized power supply; highly selective receiver; new sensitivity (1/10 of a microvolt); and the patented, exclusive, "Silent-Aire" squelch which



varies and controls the sensitivity to eliminate noise and unwanted signals on the same frequency. Available through leading electronic suppliers. \$179.50. Vocaline Co. of America, Old Saybrook, Conn. (ELECTRONIC TECHNICIAN 7-24)

Reeves ELECTRICAL TAPE

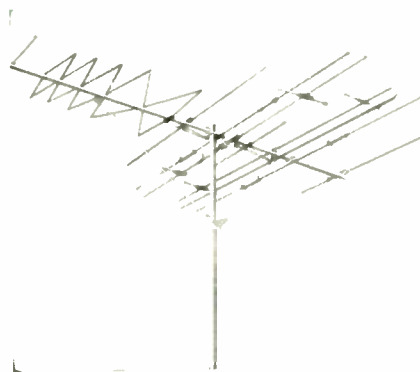
A new vinyl electrical tape, for insulation and other electrical taping jobs, protects against moisture, surface contamination, corona and excessive heat. It prevents corrosion when applied to



pipe and other metal surfaces. It may be used for harness wrapping of wire and cable groups. It gives protection on tool handles and sharp edges. The vinyl base gives the Soundcraft tape high dielectric strength (10,000 volts) and makes it flame proof. 55¢ for a 3/4" x 240" black roll. Reeves Soundcraft Corp., Great Pasture Rd., Danbury, Conn. (ELECTRONIC TECHNICIAN 7-26)

JFD ANTENNA

The new Power-Helix Model PX911 features a 24 element yagi-type design with all new spacing and phasing for increased response across the VHF band. By combining Satellite sleeve folded and straight dipoles in a twin driven collector system the capture area is enlarged, and greater average current is attained on channels 2 to 13. Improved front-to-back voltage ratios of up to 22 db on channels 2-6/and up to 28 db on channels 7-13 provide better rejection of noise and signals. Available in 4 models. \$35 to \$87.50. JFD Electronics Corp., 6106 16th Ave., Brooklyn 4, N. Y. (ELECTRONIC TECHNICIAN 7-17)



BOGEN
the sound way
to better stereo

NEW STEREO RECEIVER

NO ONE BUT BOGEN, builder of over one million high-fidelity and sound-distribution components, could have engineered the new SRB 20 stereo receiver. A superb all-in-one instrument, it's a highly sensitive FM-AM stereo tuner, a versatile audio control center, a magnificent 20 watt (10 per channel) stereo amplifier, and it's only \$199.50 - a price you'd expect to pay for a comparable tuner alone!

YEARS AHEAD. Bogen's engineering staff (largest of any sound-equipment maker) has designed the SRB 20 to be years ahead in performance as well as price. Here is all the flexibility...all the distortion-free tone quality...all the power you need for perfect stereo pleasure. Reflecting over 25 years of experience gained in building specialized sound systems for schools, theatres, industrial plants and offices, in addition to high fidelity components, the SRB 20 provides the faithful sound reproduction listeners have learned to expect from Bogen. Enjoy the beautifully styled SRB 20 yourself or install it for your customers—either way you get the best buy in hi-fi today!



BOGEN SRB 20 STEREO RECEIVER

CONTROLS: Selector. FM Tuning, AM Tuning. Separate Bass and Treble for each channel (lock for simultaneous control of both). Volume for each channel (correct imbalance, then lock for simultaneous control). On-Off Power. FM On-Off and AFC out. AM On-Off and Multiplex.

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A Division of the Siegler Corporation
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Many European radios and hi-fi components now popular in this country utilize the European-made VALVO tubes, which have thus far had no American distribution. As a special service to the trade, VALVO tubes are now being stocked by all franchised Amperex distributors. Replacement of the original tubes with completely identical types will assure optimum results in the repair and servicing of these European sets.

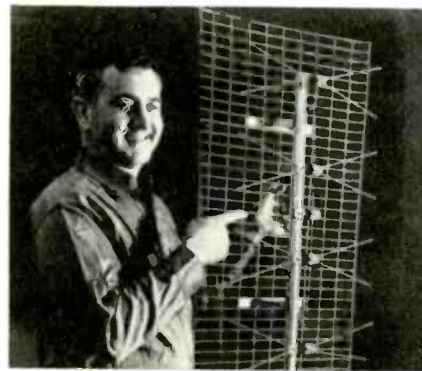


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Amperex Electronic Corp.
230 Duffy Avenue Hickville, L. I., N. Y.

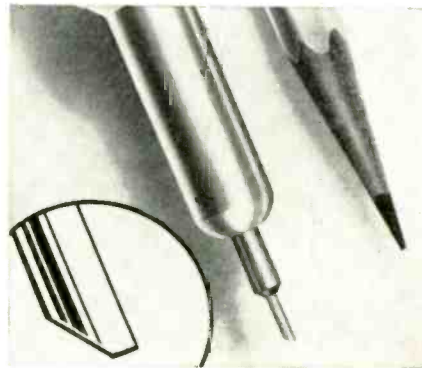
Channel Master ANTENNA →

The new Challenger Multi-Bow model #4220A is an improved version of the firm's four-bay bowtie and screen combination antenna for all-channel UHF reception. Features include: free space terminals; heavy-duty, jumbo Kralastic insulators; free space crossover of connecting rods which are made of extra heavy gauge wire; and vertical cross-arm is gripped and locked by brackets on both sides. "Supersembled." \$10.95. Channel Master Corp., Ellenville, N. Y. (ELECTRONIC TECHNICIAN 7-15)



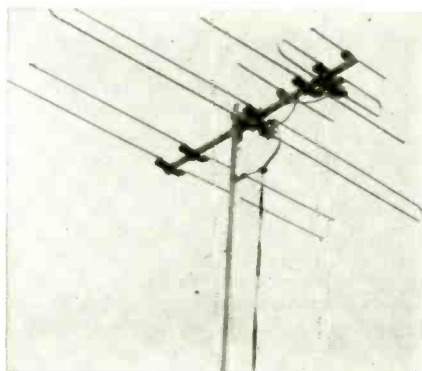
Ungar SOLDERING TIPLET →

The new Micro-Needle Soldering Tiptet, No. PL340, has been designed for use with the firm's heating units nos. 4045, 1235 and 535. This 3-way interchangeability provides a choice of tip temperatures ranging from 600 to 850 degrees. Featuring a bevelled point, the new Tiptet is perfect for soldering miniature toroids, diodes and other micro-miniature components. Its 3/4" length and 3/64" outside diameter also make it an ideal tool for soldering miniature eyelets to printed circuit boards. Ungar Electric Tools, Inc., 4101 Redwood Ave., Los Angeles 66, Calif. (ELECTRONIC TECHNICIAN 7-16)



Winegard ANTENNA →

A new addition to the "K" series is the Power Pix, a compact, all-channel VHF TV antenna designed with full wave "hairpin" driven element for full-power gain on all channels. Features include new "barrier-type" insulators which have a dual moisture barrier with a 3 1/2" leakage path; all-metal phasing lines; a one-piece wrap-around mast clamp; and the reflectors are mounted on newly designed support brackets with lock-tight hardware. Stacking 2 bays of the Power Pix increases power gain 83% over a single bay. Price, \$12.50 per bay. The Winegard Co., 3000 Scotten, Burlington, Iowa (ELECTRONIC TECHNICIAN 7-23)



SENCORE "Fuse Safe" CIRCUIT TESTER

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Save costly call backs by testing the circuit before replacing fuse, fuse resistor or circuit breaker.

Individual scale for each value fuse resistor—no interpretation, just read in red or green area.

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RME 2-WAY RADIO

A fully transistorized transmitter and receiver, for use in the 27 mc Citizens Band, utilizes the latest developments in drift transistor design. Features include: 2 x 3 x 9" dimensions; loud-speaker volume; a unique battery saver circuit; and 1 mile range. It is designed and certified in accordance with FCC regulations and requires no user's license. \$99.50, less batteries. Radio Mfg. Engineers Div., Electro-Voice, Inc., Buchanan, Mich. (ELECTRONIC TECHNICIAN 7-28)

Irish TWO-WAY PROFIT PACK

An assortment of 12 reels of Irish magnetic recording tape, a new up-to-date tape recorder service manual and a handsome banner identifying the dealer, are included in a new Two-Way Profit Pack. Four each of #'s 211, 602, and 724 tape in the 7" reel size, a 208-page recorder service manual, showing schematics, exploded views and trouble charts for most popular recorders, and the banner make up the package. \$44.40. ORRadio Industries, Inc., Opelika, Ala. (ELECTRONIC TECHNICIAN 7-27)

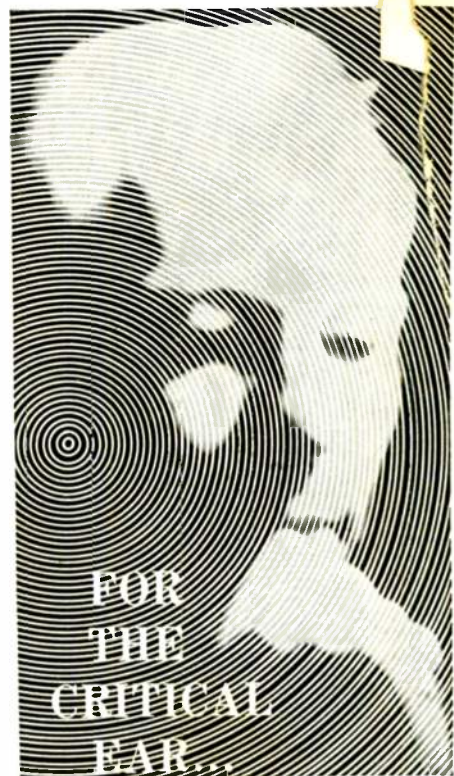
Dickinson's SOLDERING TIP CLEANER

Model 149 tins while it cleans. It doubles the life of soldering tips, tips hold shape longer; and it eliminates filing away tips. The bristles are chemically treated to stand heat; there is no fire hazard. It is easy to use and lasts for months. The tip, heated to the point where it will melt solder, is inserted at the top of the cleaner and passed through the brushes toward the bottom and out. Usually one sweep is sufficient. Available from M. N. Leventhal Co., 1806 S. Hobart Blvd., Los Angeles 6, Calif. (ELECTRONIC TECHNICIAN 7-29)

Mosley ANTENNAS

A new line of high-performance VHF antennas, Powermaster, is guaranteed against weather damage for 5 years. Element sections, measuring $\frac{5}{8}$ " and $\frac{1}{2}$ " OD, give rugged strength and a low ratio of length to diameter. Metal hardware is stainless steel or other 100% rustproof material. Element-to-boom clamping blocks are of high-impact polystyrene and are self-aligning. An exclusive matching stub permits feeding with 52 or 72 ohm coax or with 194 or 300 ohm open line or flat line. The antennas maintain low SWR over broad bandwidth. Available in 3 models: A-142, a 14 element-2-meter beam; A-56, a 5 element-6-meter beam; and the A2N6, a beam composed of a 5 element-2-meter array and a 4 element-6-meter array. Mosley Electronics, Inc., 8622 St. Charles Rock Rd., St. Louis 14, Mo. (ELECTRONIC TECHNICIAN 7-31)

For more information, write in ELECTRONIC TECHNICIAN's new product code number on coupon, on page 48.

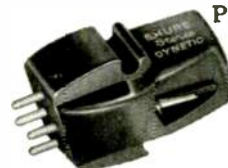


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Stereo Dynetic

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Shure High Fidelity Stereo Dynetic phono cartridges are designed to satisfy the most critical requirements. Made under custom laboratory conditions, each unit is checked electrically, mechanically and acoustically to insure trouble-free performance.



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MODEL M3D
AT \$45.00*

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Incomparable quality—the overwhelming choice of independent critics and experts. Floats at only 3 grams in transcription tone arms. Distortion-free response from 20 to 15,000 cps. Superbly designed and built to perfectionist tolerances.

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Outclasses every cartridge except the Shure M3D—by actual listening tests! Tracks perfectly at minimum pressure available in record changer arms. Smooth from 40 to 15,000 cps.

Use Only Shure Replacement Styli...
Inferior imitations can seriously degrade the performance of the cartridge.

Literature available: Department 14-G

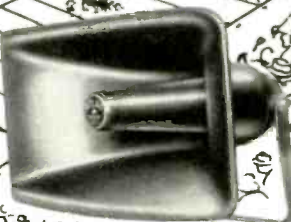
SHURE BROTHERS, INC.
222 Hartrey Avenue, Evanston, Illinois

HOW TO MAKE MONEY

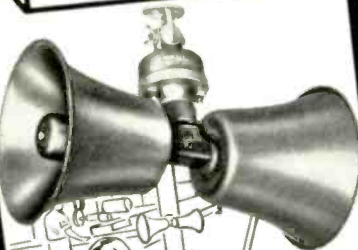
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Here today and here tomorrow — Commercial Sound is a steady-profit 12-months-a-year business of sales, installation and servicing with lots of customers right in your own neighborhood. Take advantage of the Atlas complete line of speakers — manufactured, advertised and supplied directly by Atlas. Speakers for every application, a mike support for every purpose — plus a wide variety of accessories so necessary for a complete professional installation.

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1449 — 39th St.,
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Motorola FREQUENCY METER

Model T-1020A is a new all-band frequency and deviation meter for servicing 2-way radios and other communication equipment. Features include: variable signal measurement and generation capabilities from 20 mc to 1,000 mc with calibrated plus or minus 0.0001% accuracy, and a dual range meter with 7.5 kc and 15 kc deviation scales. Power requirements: 75 watts at



115 VAC. Measurements: 15 x 12½ x 13". Weight: 40 lbs. Since the internally generated signal used to adjust or measure transmitter frequency is available at an output terminal, receivers and transmitters can be precisely "netted" without any change in dial settings. Motorola Communications & Electronics, Inc., 4501 W. Augusta Blvd., Chicago 51, Ill. (ELECTRONIC TECHNICIAN 7-20)

GE CLEANER & POLISH

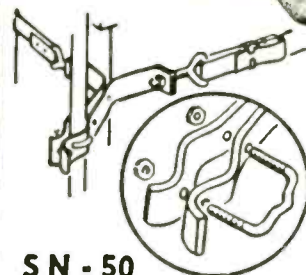
An anti-static cleaner and polish, used by GE to protect its high-impact polystyrene TV cabinets from damage during the assembly process, is now available to dealers for sale to the public. Explaining that many polishes and cleaners can cause damage to TV cabinets and windows, the firm's TV receiver department recommends the use of its anti-static cleaner-polish. General Electric Television Receiver Dept., Electronics Park, Syracuse, N.Y. (ELECTRONIC TECHNICIAN 7-30)



"The other man's tester had more knobs."

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South River



SN-50 CHIMNEY MOUNT SNAP-IN TYPE

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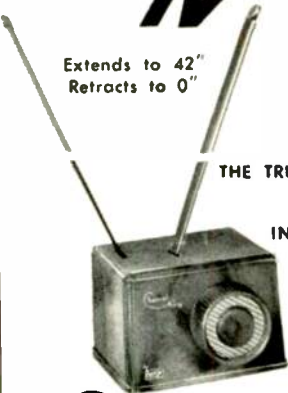
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him out, Dearie, is a Jensen
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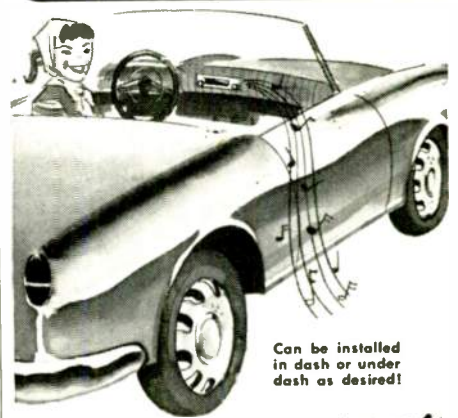
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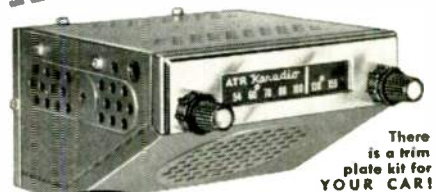
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Introducing ATR CUSTOMIZED Karadio



Can be installed
in dash or under
dash as desired!

for
small import cars
and
compact U.S. cars



There
is a trim
plate kit for
YOUR CAR!

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• VIBRATOR-OPERATED with Tone Control

The ATR Customized Karadio is a compact, new, self-contained airplane-styled radio for small import and compact American cars. This economical unit is perfect for all small cars because it can be easily and inexpensively installed in-dash or under-dash on most any make or model automobile—and its powerful 8-tube performance provides remarkable freedom from engine, static, and road noises. ATR Karadios are built to look and fit like original equipment with sleek, modern styling and solid, single-unit construction. They offer many customized features and provide highest quality fidelity—yet cost far less than comparably designed units. The ATR Customized Karadio comes complete with speaker and ready to install . . . and is the ideal way to add fun and value to your small import or American automobile!



ATR KARADIO
. . . is ideal
for small import
cars or com-
pact American
cars! Unit is

completely self-contained—extremely compact!
Can be mounted in-dash or under-dash—where-
ever space permits! For 6 volt or 12 volt!

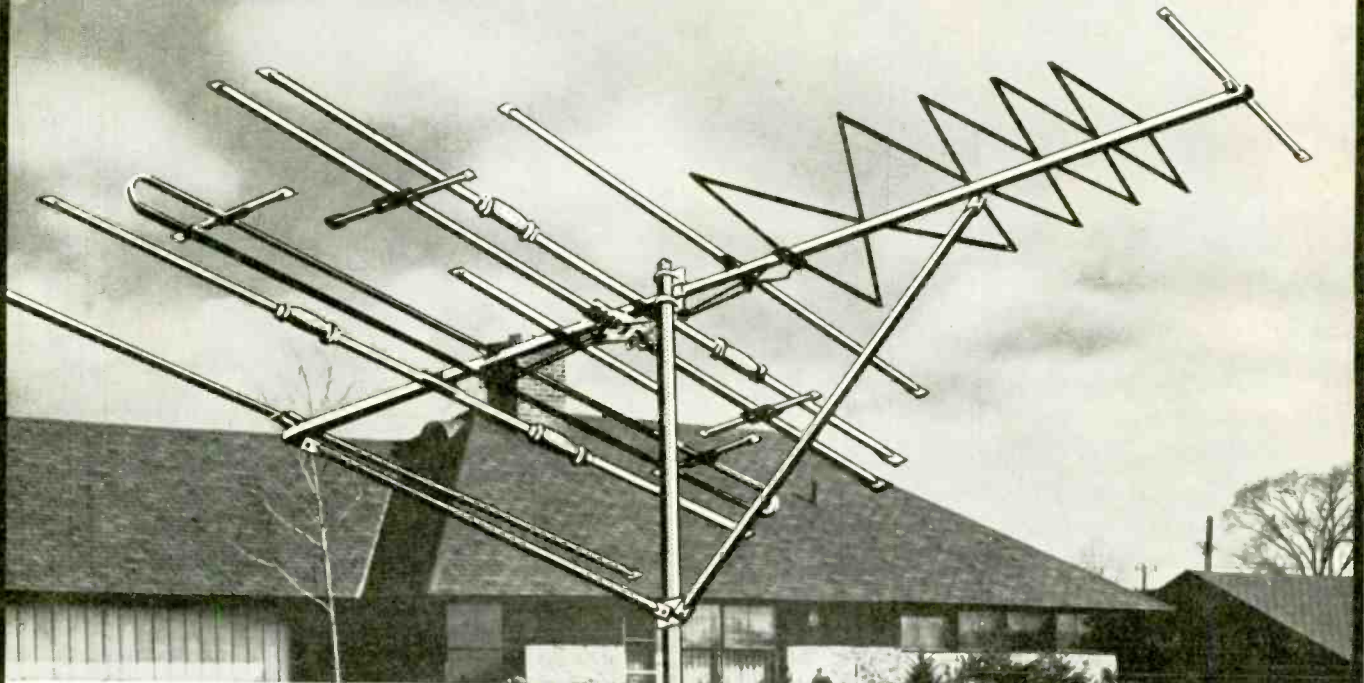
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new FROM

JFD

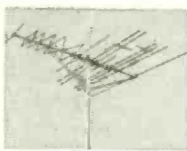


HI-FI POWER-HELIX

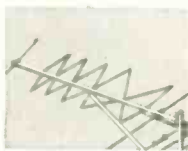
NEW 24-ELEMENT TWIN-DRIVEN SATELLITE COLLECTOR SYSTEM

LIFTS GAIN UP TO 25%*

*Over previous PX911 Design. Best reason in the world, isn't it, to buy the new Power Helix, if you haven't yet done so!



24-Elements—count them—24-Element Yagi-type design with all-new spacing and phasing develops front-to-back ratios of up to 28 db.

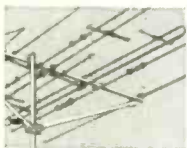


Sharply directive helical probe and director (based on space telemetering antenna principles) locks on distant stations—shuts out ghosts, increases high band gain.

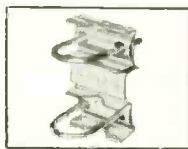


NEW

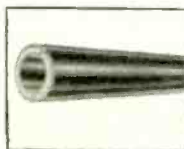
One inch tubing brace solidly supports length of crossarm without strain. Attaches instantly by means of preassembled bracket. Result: Absolute rock-steady rigidity.



New advanced Satellite Sleeve Dipole section enlarges capture area of Power Helix over previous model, develops greater average current on channels 2 to 13, maximizes ghost and interference rejection.



Ruggedly built double U-bolt assembly affixes crossarm to mast in bulldog grip. Keeps antenna on target permanently yet never damages crossarm.



1/2 inch seamless elements. All elements over 30 inches reinforced with 15 inch aluminum dowels.

The great new Power-Helix is one of 5 mighty Helix Colortennas with Satellite-Sleeve Dipole design. This versatile JFD antenna team is engineered to perfectly match the reception (and budget) requirements of any installation in any location. Make it the year for you with the new antenna line for '59—JFD Hi-Fi Helix Colortennas. Now at your JFD distributor.

JFD

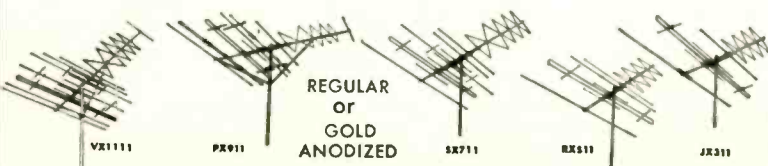
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New York, New York



ELECTRONIC TECHNICIAN 508

CIRCUIT DIGEST

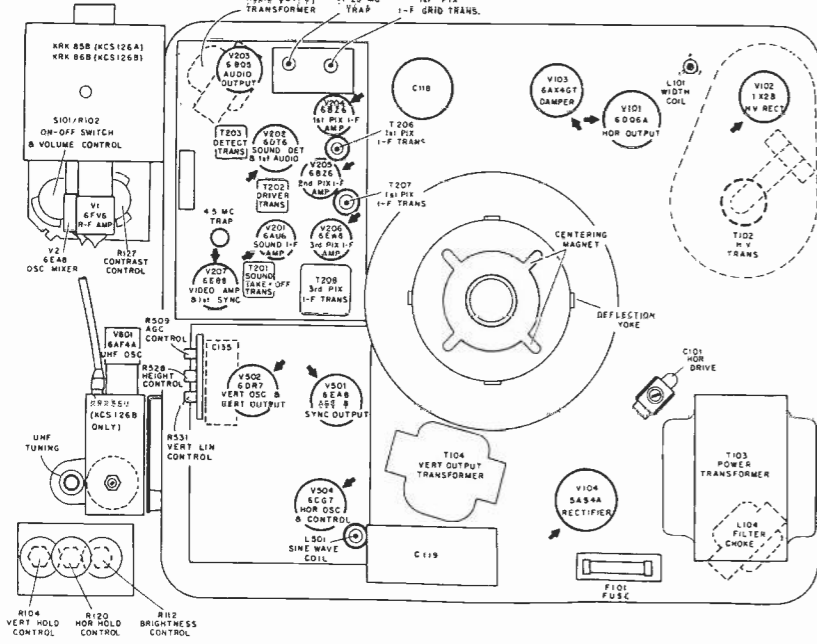
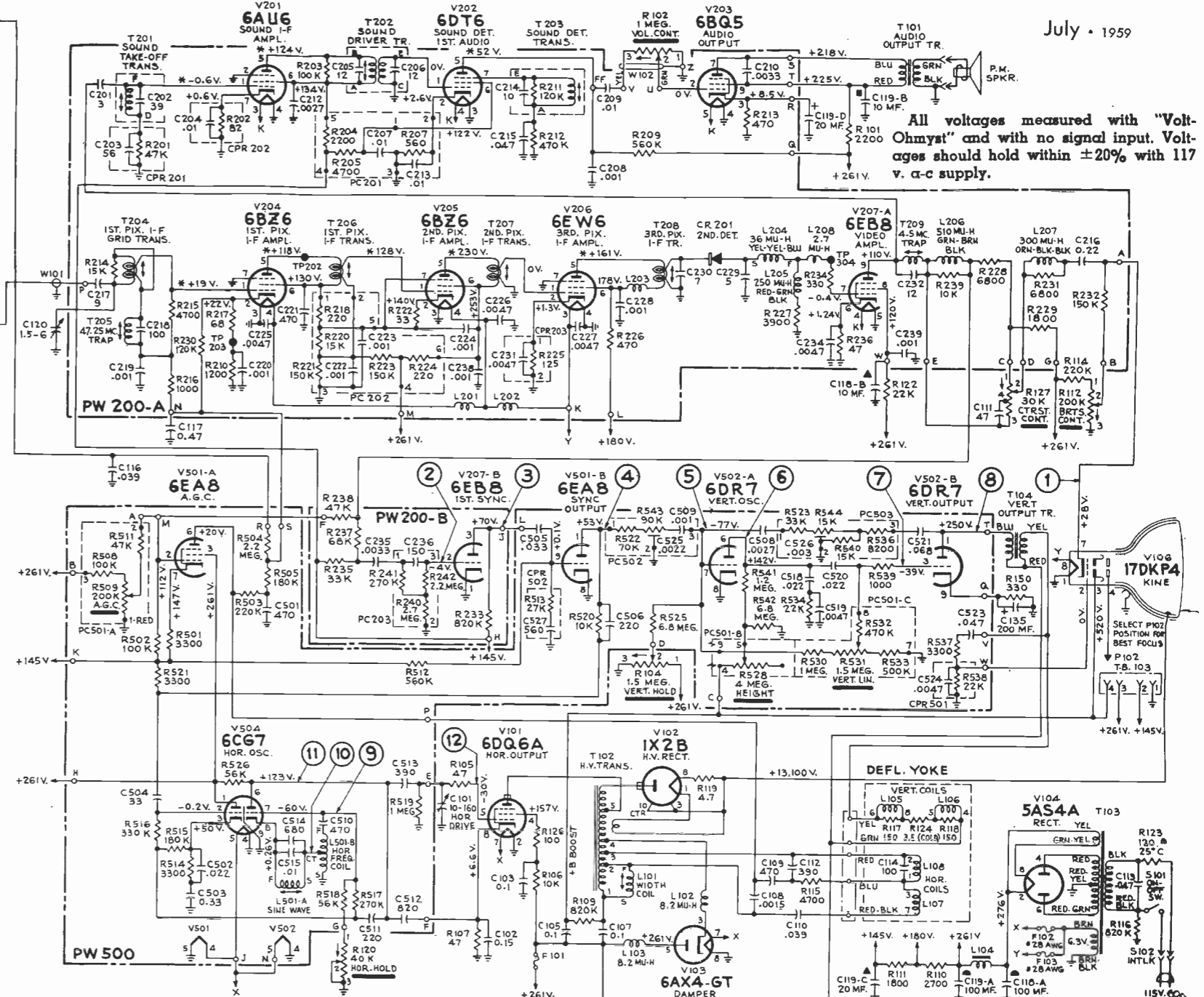
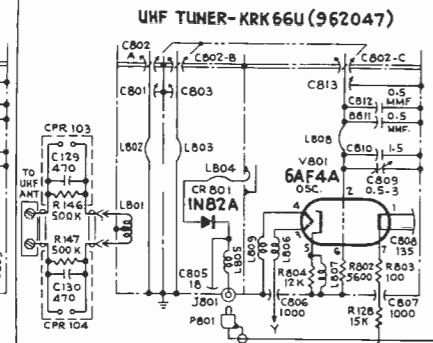
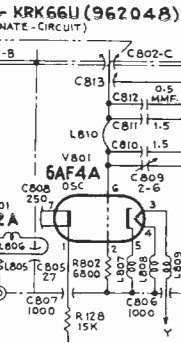
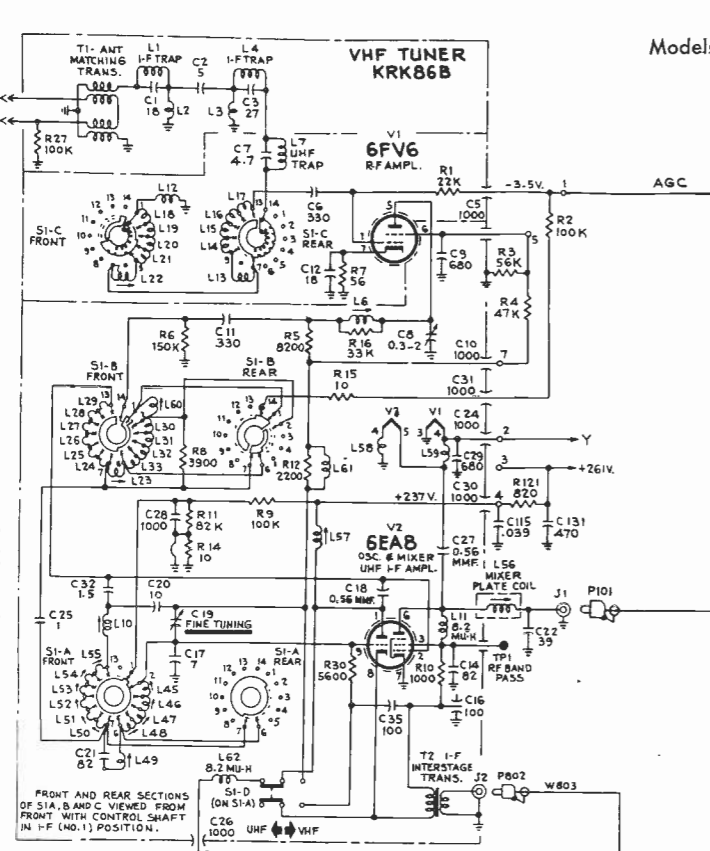
RCA
TV Chassis KCS126A & B

July • 1959

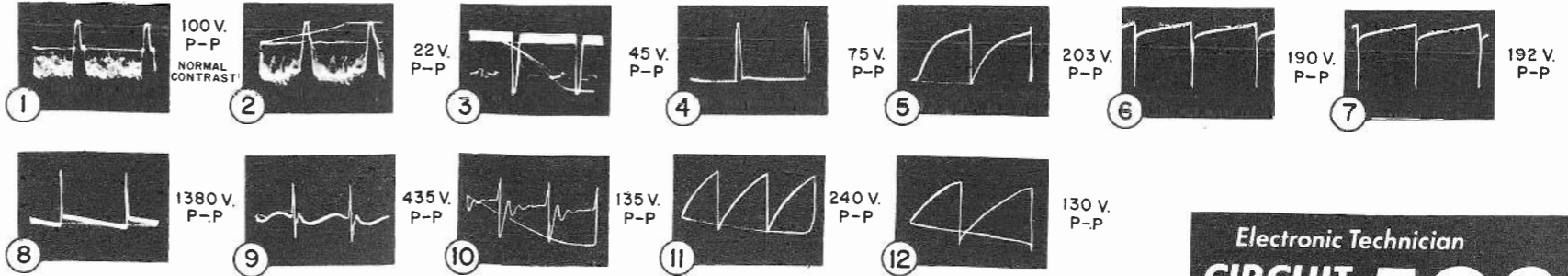
Models 170-P-048, 170-P-049, 170-P-060,
170-P-061, 170-P-063, 170-P-064;
170-P-048U, 170-P-049U,
170-P-060U, 170-P-061U,
170-P-063U, 170-P-064U

All voltages measured with "Volt-Ohmyst" and with no signal input. Voltages should hold within $\pm 20\%$ with 117 v. a-c supply.

All resistance value in ohms. K = 1000.
All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted.
Direction of arrows at controls indicates clockwise rotation.



*Measured with 1 megohm, 1/2 watt resistor in series with meter probe.



Balloons ① ② etc., indicate points of observation of waveforms

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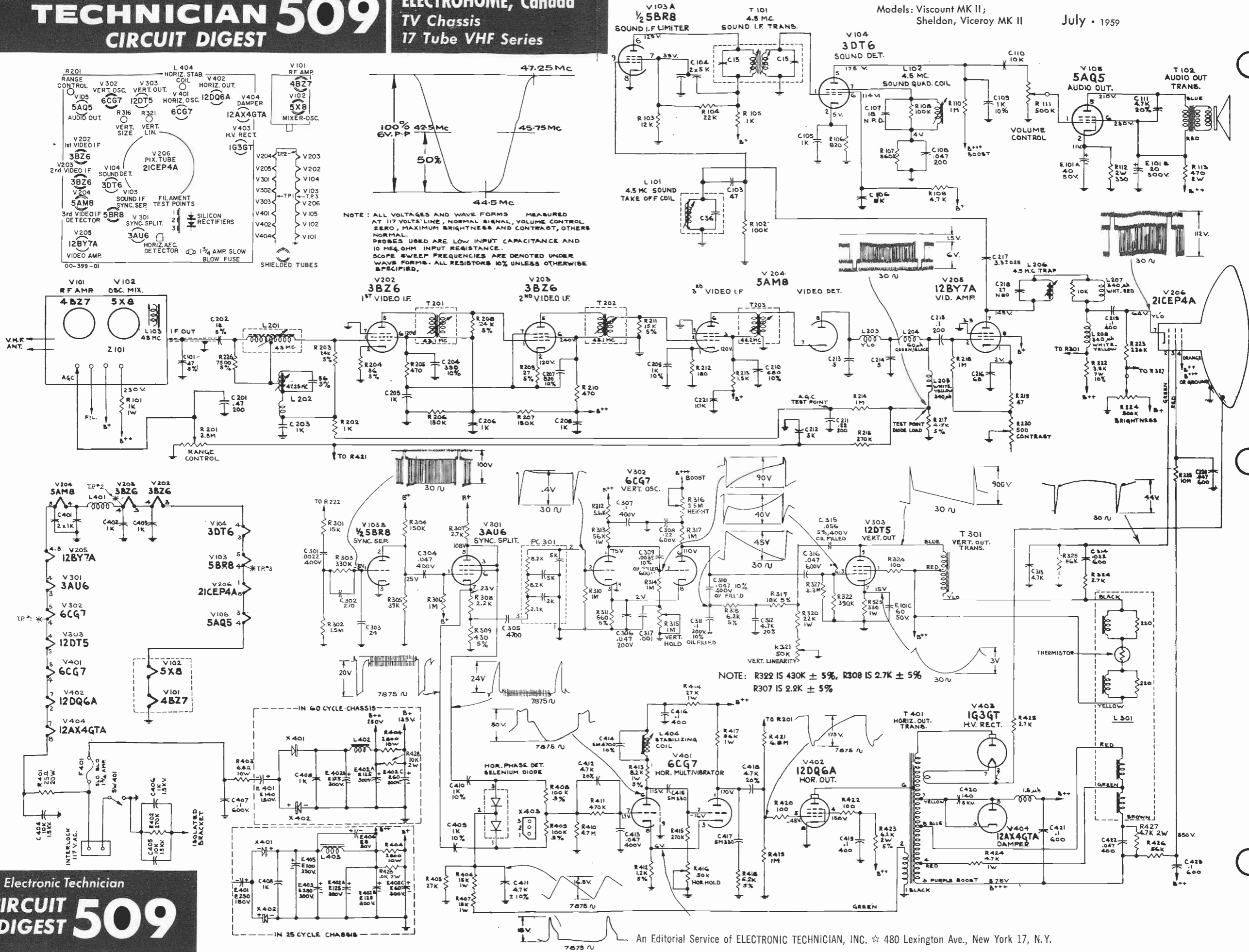
ELECTRONIC TECHNICIAN 509

CIRCUIT DIGEST

ELECTROHOME, Canada
TV Chassis
17 Tube VHF Series

Models: Viscount MK II;
Sheldon, Viceroy MK II

July • 1959

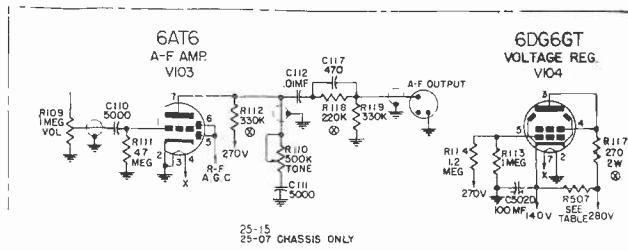
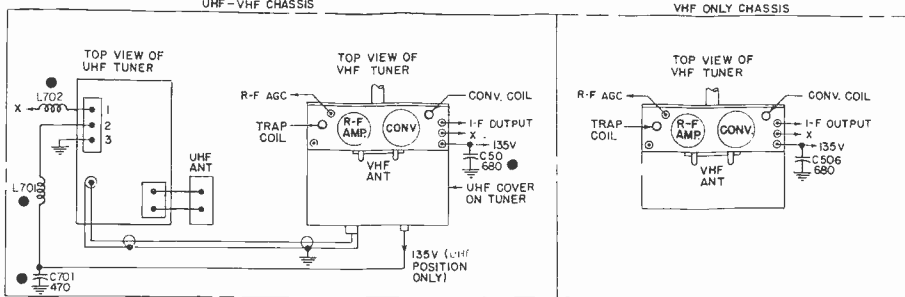


NOTE: ALL VOLTAGES AND WAVE FORMS MEASURED AT 117 VOLTS LINE, NORMAL SIGNAL, VOLUME CONTROL ZERO, MAXIMUM BRIGHTNESS AND CONTRAST, OTHERS NORMAL. PROBES USED ARE LOW INPUT CAPACITANCE AND 10 MEG OHM INPUT RESISTANCE. SCOPE SWEEP FREQUENCIES ARE DENOTED UNDER WAVE FORMS. ALL RESISTORS 10% UNLESS OTHERWISE SPECIFIED.

NOTE: R322 IS 430K ± 5%, R308 IS 2.7K ± 5%
R307 IS 2.2K ± 5%

Electronic Technician
CIRCUIT DIGEST 509

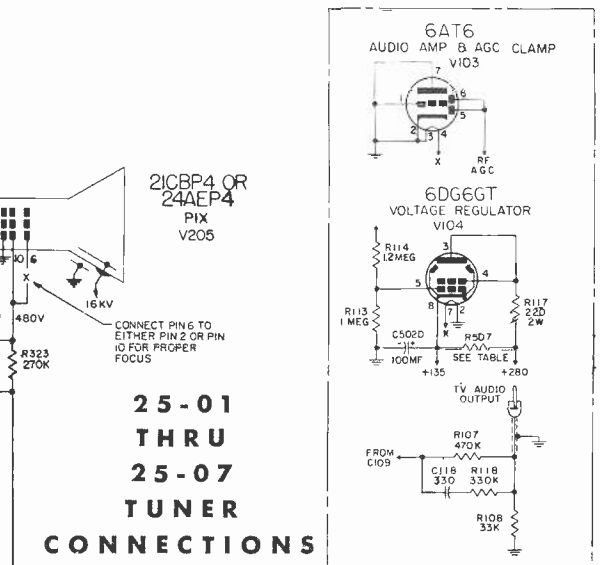
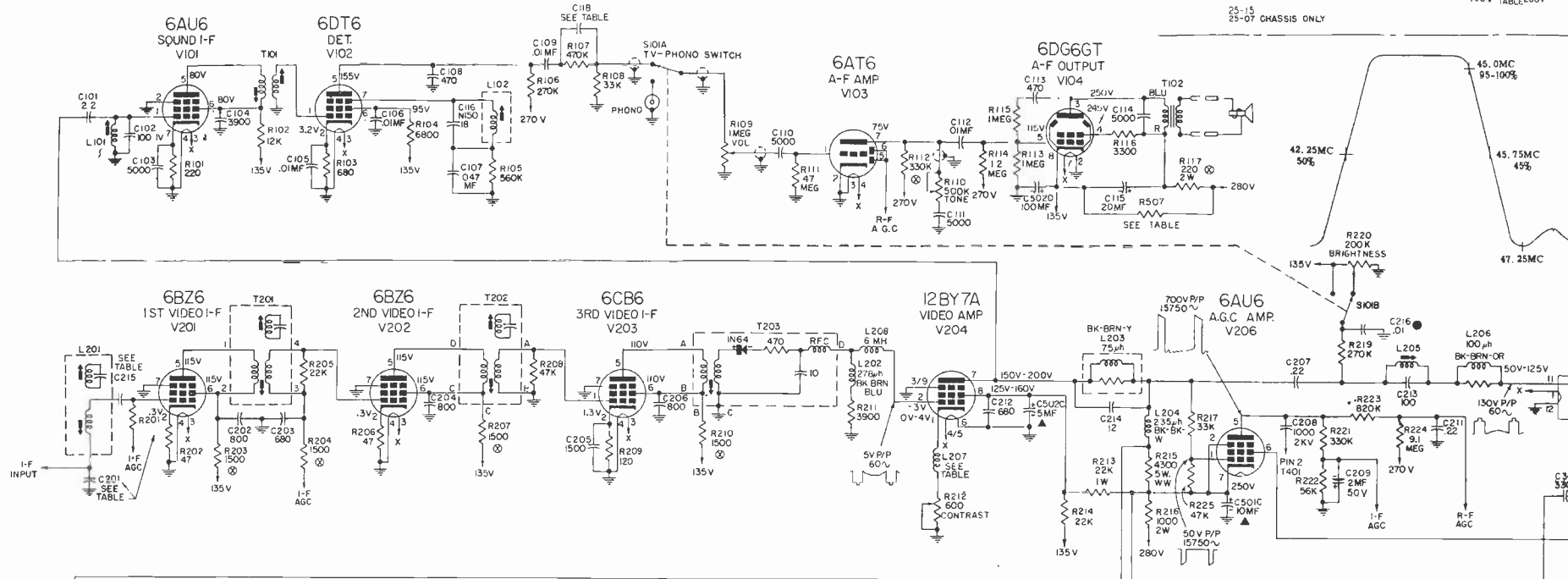
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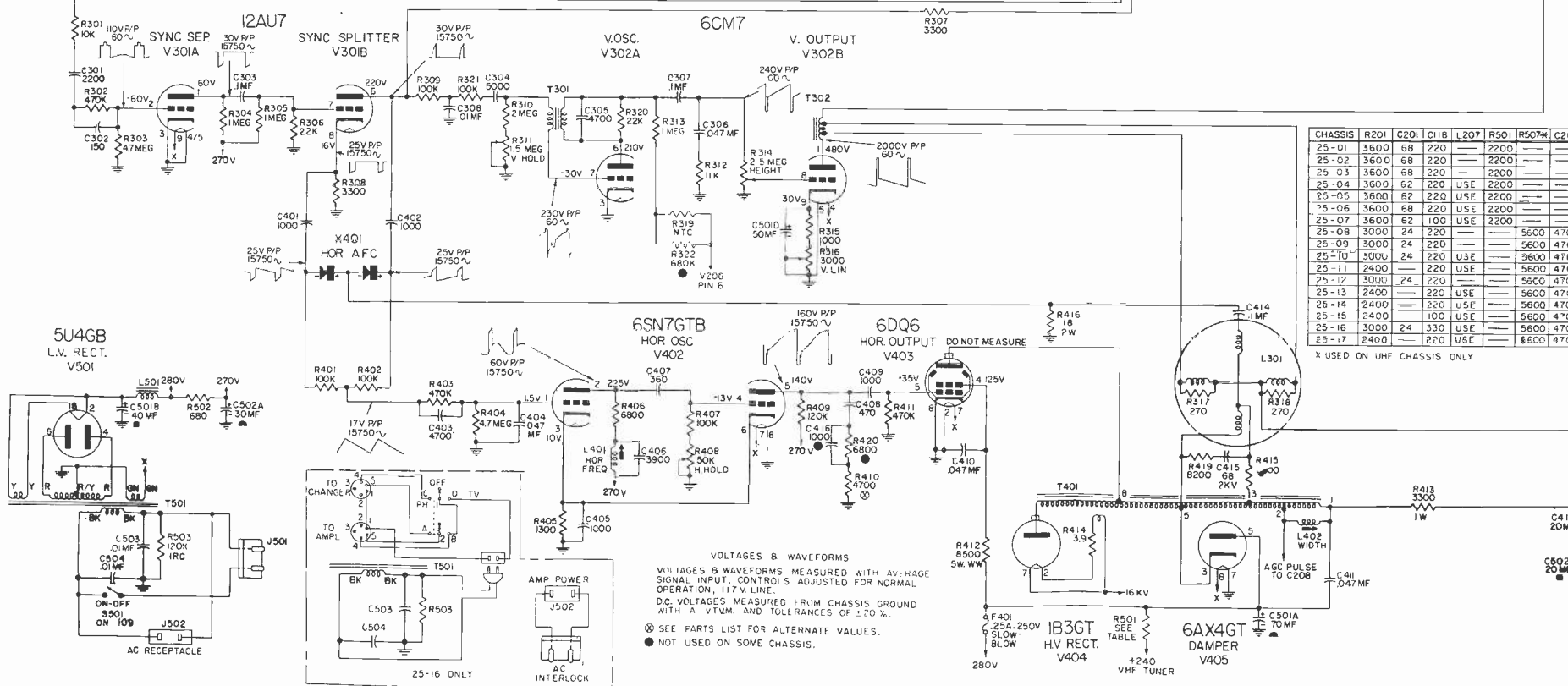
CHASSIS DIFFERENCES

CHASSIS	CRT USED	CONTROLS	VHF TUNER
25-01	21CBP4	Top Tuning	700584-6
25-02	21CBP4	Top Tuning	700584-8
25-03	21CBP4	Top Tuning	700584-6
25-04	24AEP4	Front Tuning	700584-6
25-05	21CBP4	Front Tuning	700584-6
25-06	21CBP4	Top Cluster	700584-6
25-07*	24AEP4	Front Tuning	700584-6
25-08	21CBP4	Top Tuning	700624/627
25-09	21CBP4	Top Tuning	700624/627
25-10	21CBP4	Top Cluster	700624/627
25-11	21CBP4	Top Cluster	700624/627
25-12	21CBP4	Top Tuning	700624/627
25-13	24AEP4	Front Tuning	700624/627
25-14	21CBP4	Front Tuning	700624/627
25-15*	24AEP4	Front Tuning	700624/627
25-16**	21CBP4	Top Cluster	700624/627
25-17	21CBP4	Top Tuning	700624/627

* Used with separate audio amplifier.
** Used with AMP-151 and either 700531-9 or 700770-1 Control Unit.

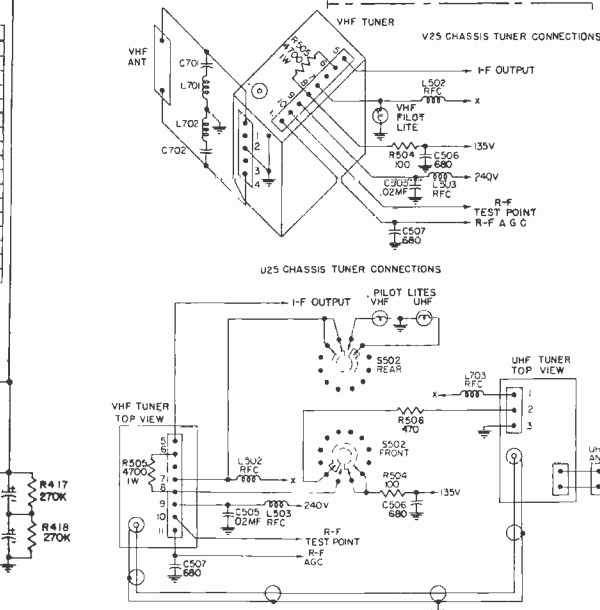


25-01 THRU 25-07 TUNER CONNECTIONS



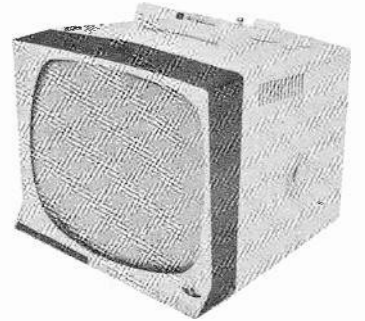
CHASSIS	R201	C201	G118	L207	R501	R507*	C215
25-01	3600	68	220	---	2200	---	---
25-02	3600	68	220	---	2200	---	---
25-03	3600	68	220	---	2200	---	---
25-04	3600	62	220	USE	2200	---	---
25-05	3600	62	220	USE	2200	---	---
25-06	3600	68	220	USE	2200	---	---
25-07	3600	62	100	USE	2200	---	---
25-08	3000	24	220	---	5600	470	---
25-09	3000	24	220	---	5600	470	---
25-10	3000	24	220	USE	3600	470	---
25-11	2400	---	220	USE	5600	470	---
25-12	3000	24	220	---	5600	470	---
25-13	2400	---	220	USE	5600	470	---
25-14	2400	---	220	USE	5600	470	---
25-15	2400	---	100	USE	5600	470	---
25-16	3000	24	330	USE	5600	470	---
25-17	2400	---	220	USE	5600	470	---

* USED ON UHF CHASSIS ONLY



VOLTAGES & WAVEFORMS
VOLTAGES & WAVEFORMS MEASURED WITH AVERAGE SIGNAL INPUT, CONTROLS ADJUSTED FOR NORMAL OPERATION, 117 V. LINE.
D.C. VOLTAGES MEASURED FROM CHASSIS GROUND WITH A V.T.M. AND TOLERANCES OF ±20%.
● SEE PARTS LIST FOR ALTERNATE VALUES.
● NOT USED ON SOME CHASSIS.

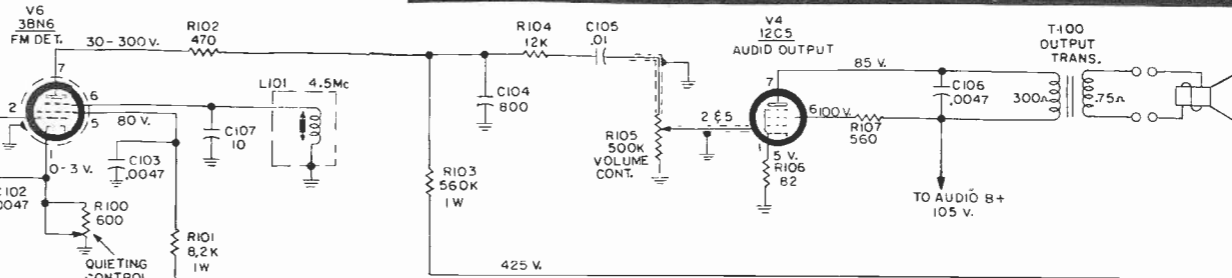
More Data on Reverse Side



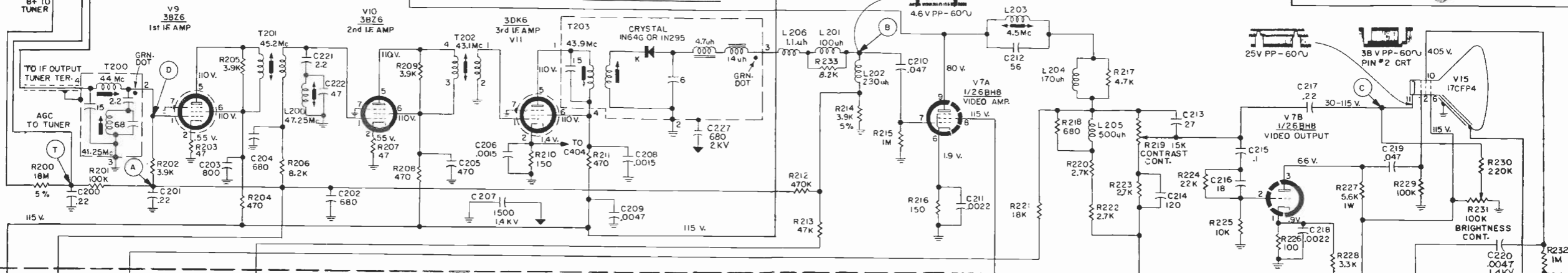
NOTES:

1. DC VOLTAGES MEASURED WITH VTVM FROM POINTS INDICATED TO B- ANT. TERMINALS SHORTED.
2. PEAK TO PEAK WAVE FORMS WERE TAKEN WITH CONTRAST CONT. SET FOR A 2.5 VOLT PEAK TO PEAK SIGNAL AT THE CRT CATHODE, ALL OTHER CONTROLS SET FOR NORMAL PICTURES.
3. ALL CAPACITANCE VALUES LESS THAN 1 ARE IN MFD AND VALUES GREATER THAN 1 ARE IN MMFD, WHILE ALL RESISTORS ARE 1/2 W UNLESS OTHERWISE INDICATED.
4. * INDICATES VOLTAGES TAKEN WITH PICTURE ADJUSTED FOR NORMAL RASTER.

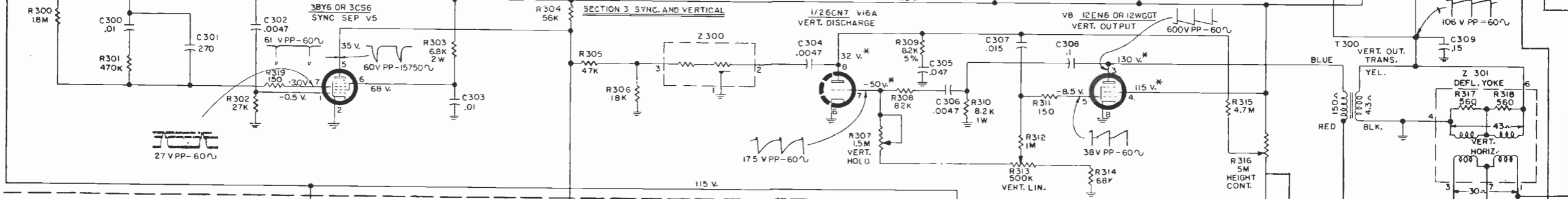
SECTION 1 SOUND IF AND AUDIO



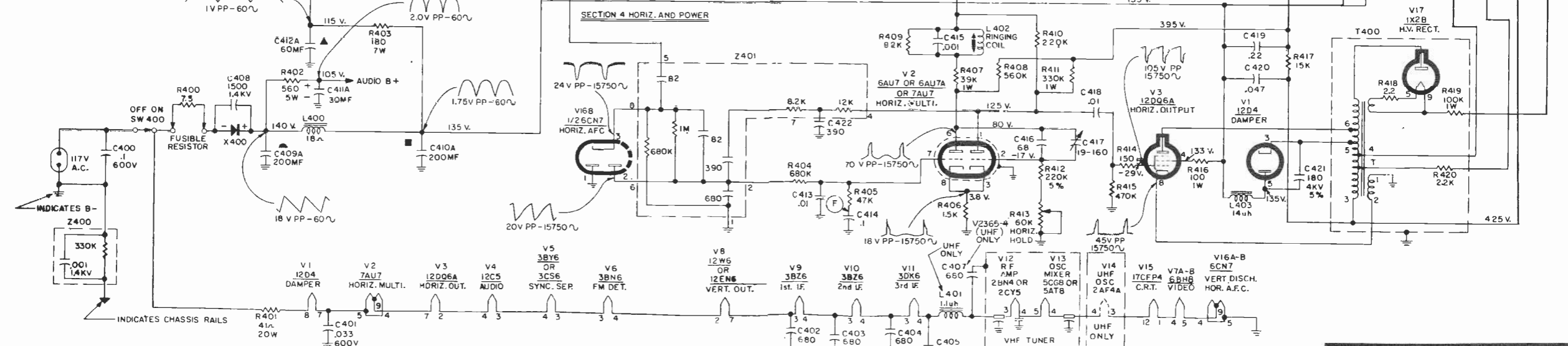
SECTION 2 VIDEO IF AND VIDEO



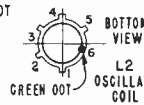
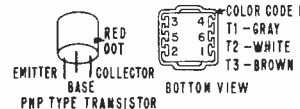
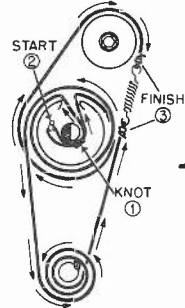
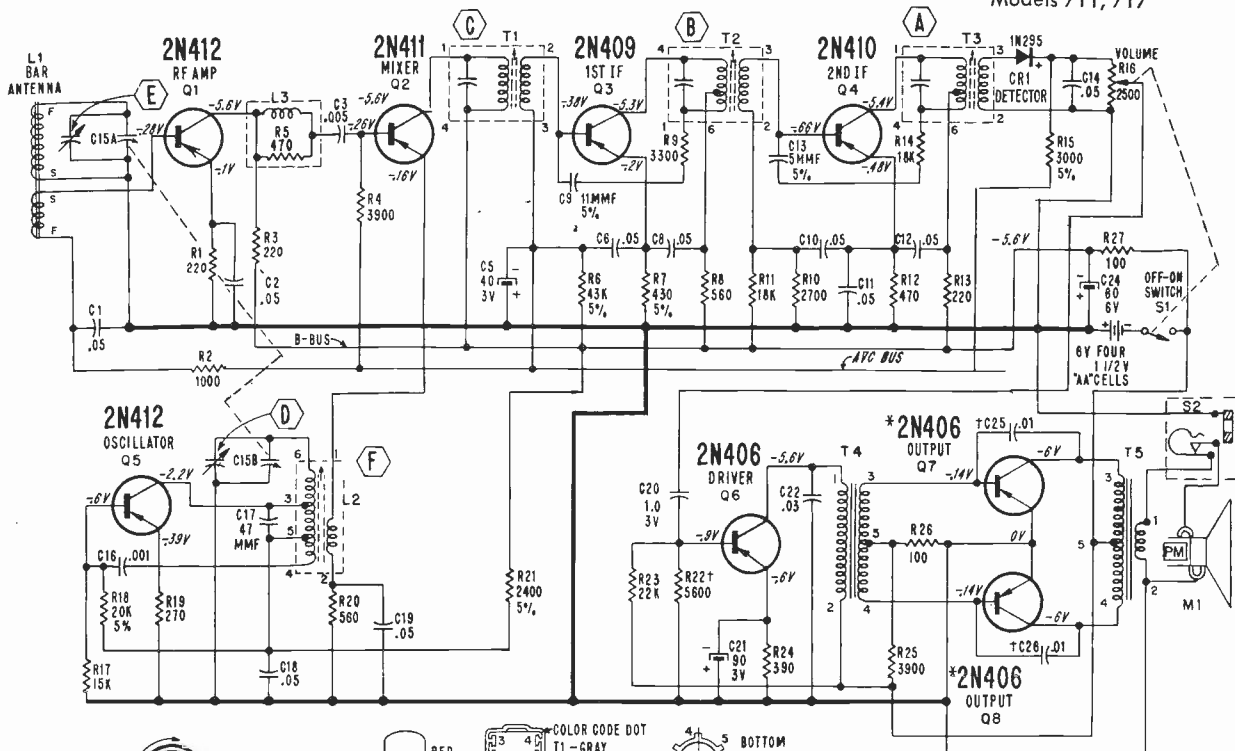
SECTION 3 SYNC AND VERTICAL



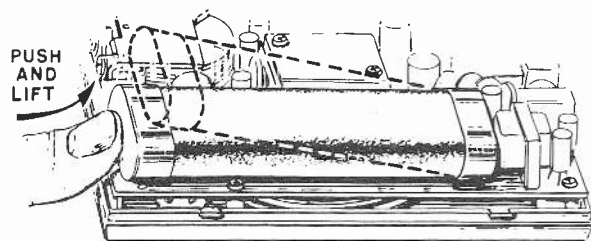
SECTION 4 HORIZ. AND POWER



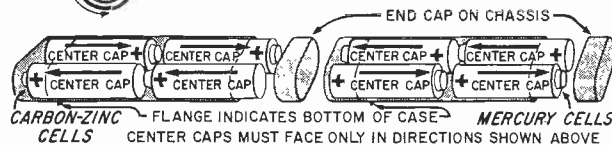
Models 711, 717



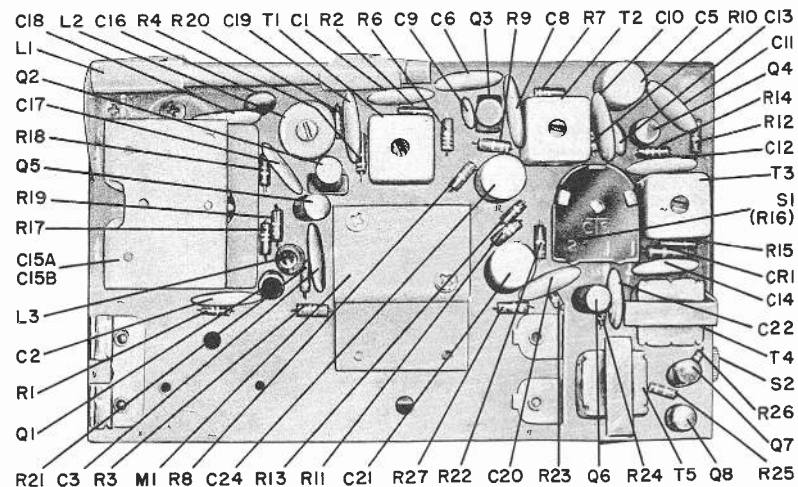
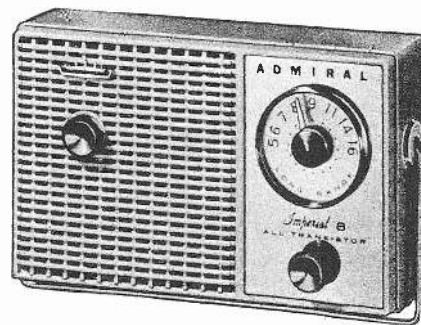
TOTAL CURRENT (NO SIGNAL) 7.8 MA
† MOUNTED ON REAR OF BOARD



PUSH AND LIFT



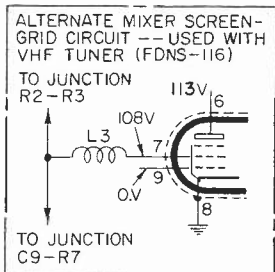
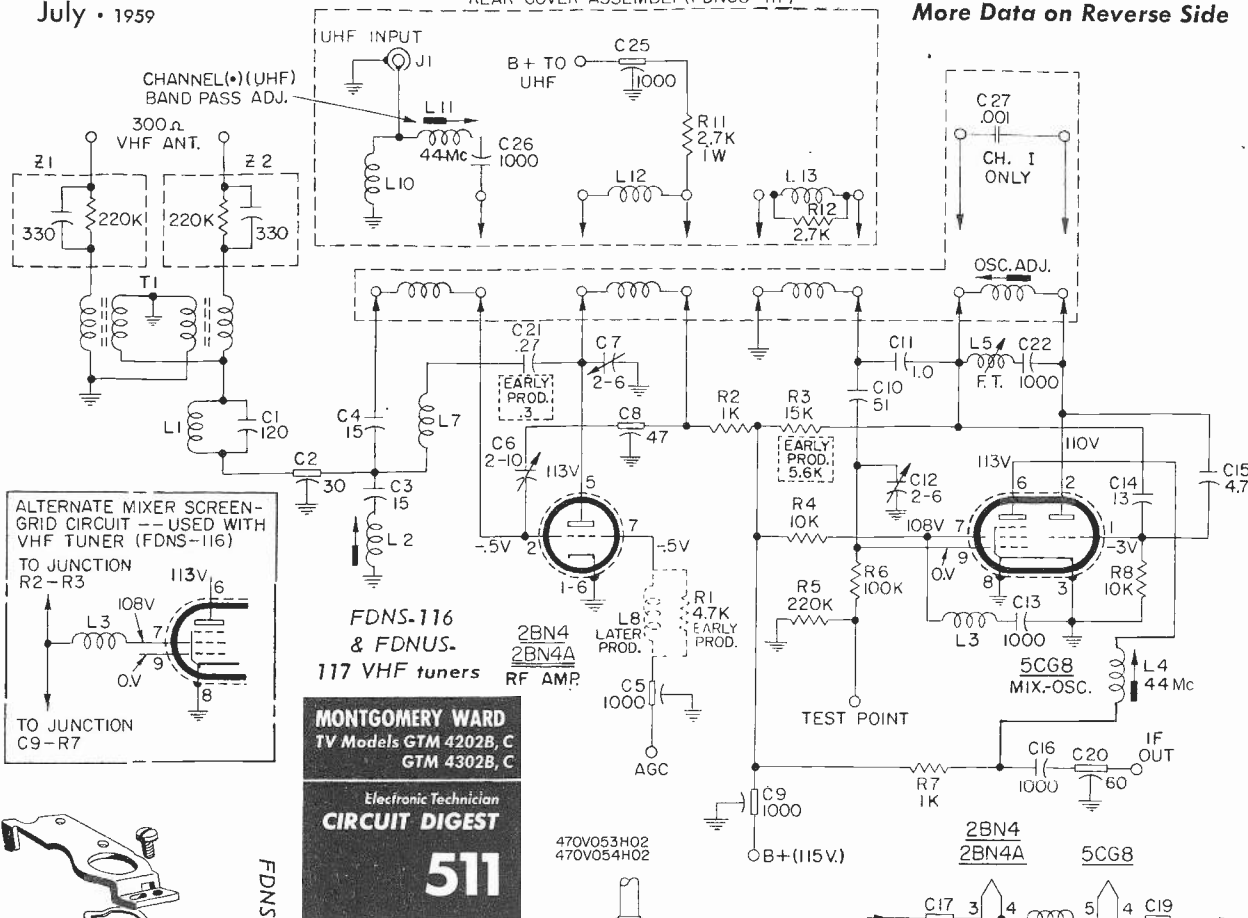
LOAD BATTERIES WITH TOP OF CASE UP



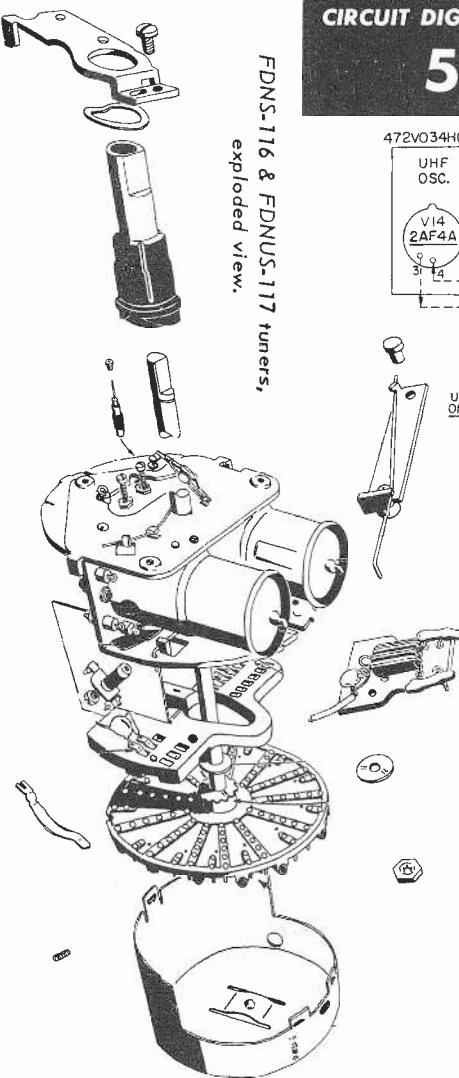
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CHANNEL (•) 13th POSITION (UHF)
REAR COVER ASSEMBLY (FDNUS-117)

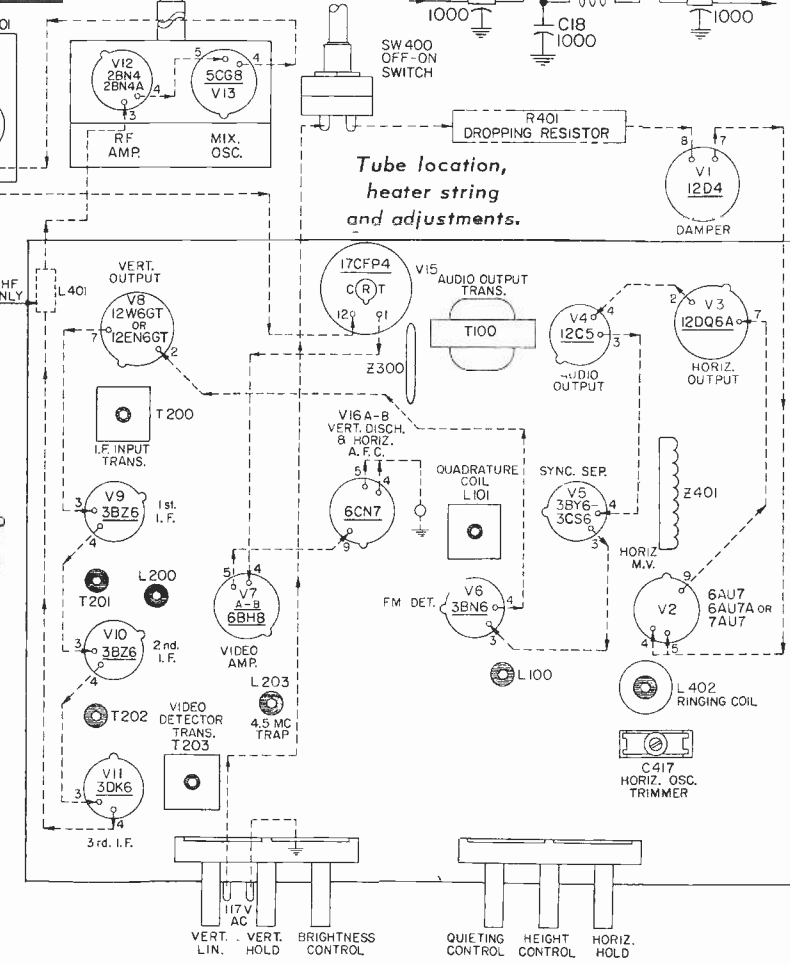
More Data on Reverse Side



FDNS-116 & FDNUS-117 VHF tuners
MONTGOMERY WARD TV Models 4202B, C, GTM 4302B, C
Electronic Technician
CIRCUIT DIGEST
511

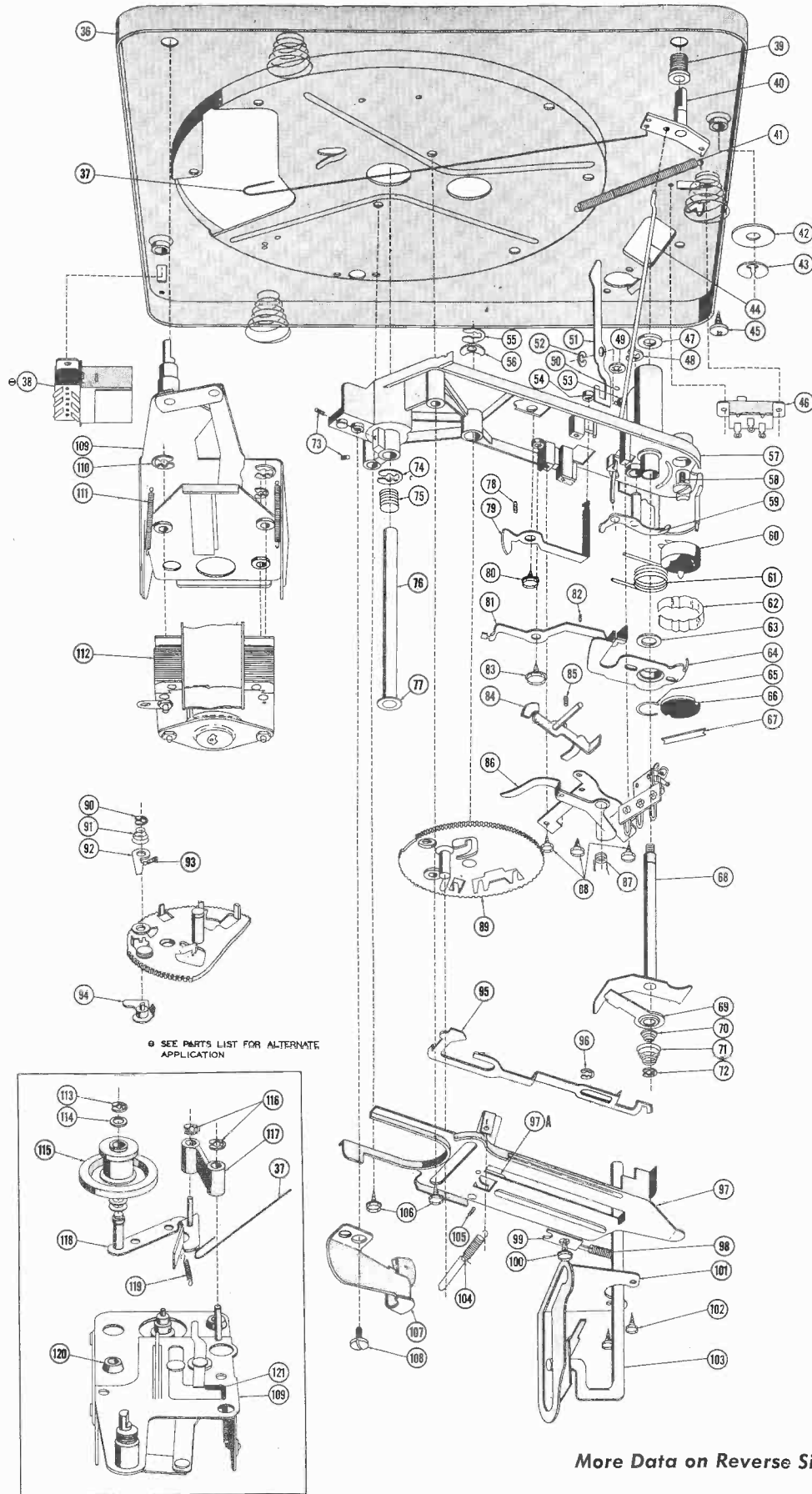


FDNS-116 & FDNUS-117 tuners, exploded view.



Tube location, heater string and adjustments.

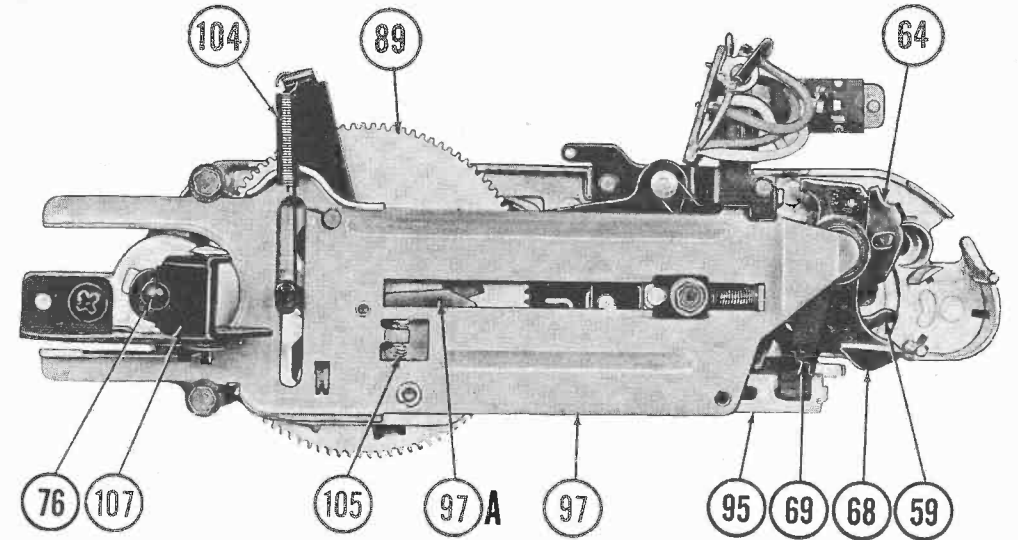
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Exploded View Of Parts Below Baseplate.

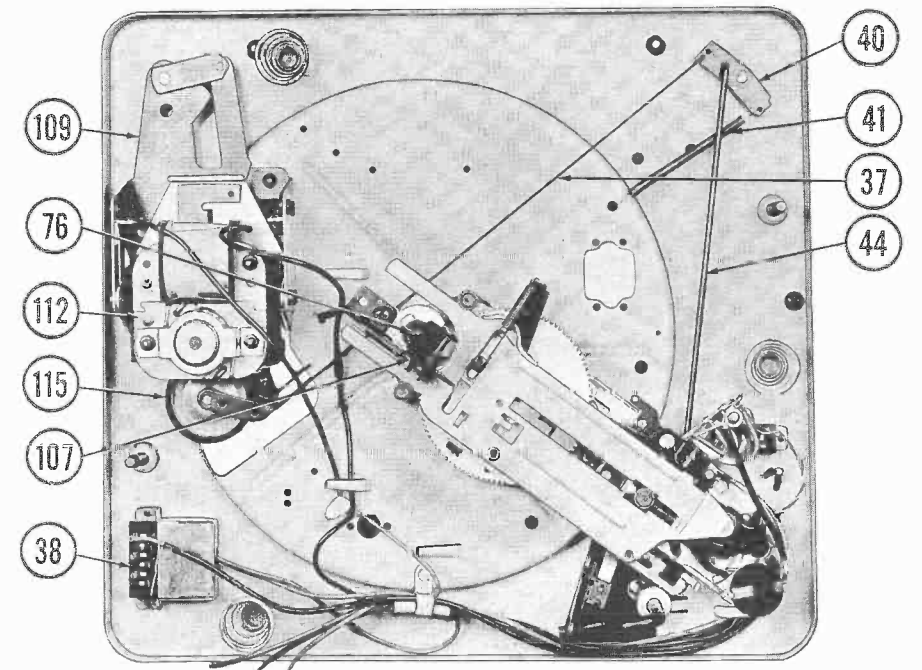
More Data on Reverse Side

Ref. No.	Description
36	Baseplate Ass'y.
37	Retraction Rod
38	Tuner-Phono Switch (Not on all units.)
39	Control Bushing
40	Control Lever Ass'y.
41	Reject Spring
42	Fibre Washer (Mtg. Bolts)
43	"C" Washer (Mtg. Bolts)
44	Reject Rod
45	Screw, Rest Post Mtg.
46	Monaural-Stereo Switch
47	Fibre Washer
48	"C" Washer
49	Speed Nut
50	Spring, 12" Record Selector
51	12" Record Selector
52	"C" Washer
53	Spring, 12" Selector
54	Rubber Bumper
55	"C" Washer, Gear Mtg.
56	Spring Washer, Gear Mtg.
57	Frame Ass'y.
58	Screw
59	Control Shaft Ass'y.
60	AC Switch
61	Return Spring
62	Fibre Insulating Strip
63	Fibre Washer (Part of Item 64)
64	Locator & Bushing Ass'y.
65	Locator Ring
66	Switch Cover
67	Retainer, Switch Cover
68	Finger & Shaft Ass'y.
69	Retard Lever
70	Anti-Skate Spring
71	Lift Pin Spring
72	"C" Washer
73	Set Screw
74	"C" Washer
75	Safety Spring
76	Push Rod
77	Thrust Washer
78	Spring, 7" Lever
79	7" Lever
80	Screw
81	Reset Lever
82	Spring, Reset Lever
83	Screw
84	Shut-Off Lever Ass'y.
85	Spring, Shut-Off Lever
86	Retard & Clip Ass'y.
87	Spring, Retard Arm
88	Screw
89	Gear Ass'y.
90	"C" Washer
91	Spring
92	Pawl Lever
93	Pawl Lever Spring
94	Trip Lever Ass'y.
95	Trip Link
96	"C" Washer
97	Slide Ass'y.
97A	Escape Lever (Part of Item 97)
98	Spring, Slide Bearing
99	Slide Bearing
100	Screw
101	Record Support Guide Ass'y.
102	Screw
103	Record Support Shaft
104	Detent Spring & Link Ass'y.
105	Spring, Escape Lever
106	Screw
107	Ejector Bracket
108	Screw
109	Motor Ass'y., Complete, 117V., 60 Cycle
110	Motor Plate Ass'y.
111	"C" Washer
112	Counter Balance Spring
113	Motor
114	"C" Washer
115	Fibre Washer
116	Idler Pulley
117	"C" Washer
118	Idler Link
119	Idler Arm Ass'y.
120	Idler Spring
121	Motor Mtg. Grommet
121	Detent Spring

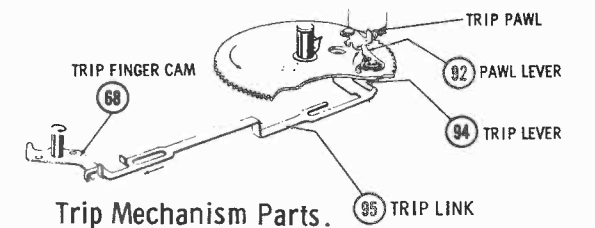


Bottom View of Cycling Mechanism.

Bottom View of Changer.



109	Motor Ass'y., Complete, 117V., 60 Cycle
110	Motor Plate Ass'y.
111	"C" Washer
112	Counter Balance Spring
113	Motor
114	"C" Washer
115	Fibre Washer
116	Idler Pulley
117	"C" Washer
118	Idler Link
119	Idler Arm Ass'y.
120	Idler Spring
121	Motor Mtg. Grommet
121	Detent Spring



Trip Mechanism Parts.

ELECTRONIC TECHNICIAN

CIRCUIT DIGESTS

In This Issue (No. 83)

Circuit Digest No.

ADMIRAL 512
Transistor Radio
Chassis 8T1
Models 711, 717

ELECTROHOME, Canada 509
TV Chassis 17 Tube VHF Series
Models: Viscount MK II;
Sheldan, Viceroy MK II

MAGNAVOX 510
TV Chassis 25 Series

MONTGOMERY WARD 511
TV Models GTM 4202B, C
GTM 4302B, C

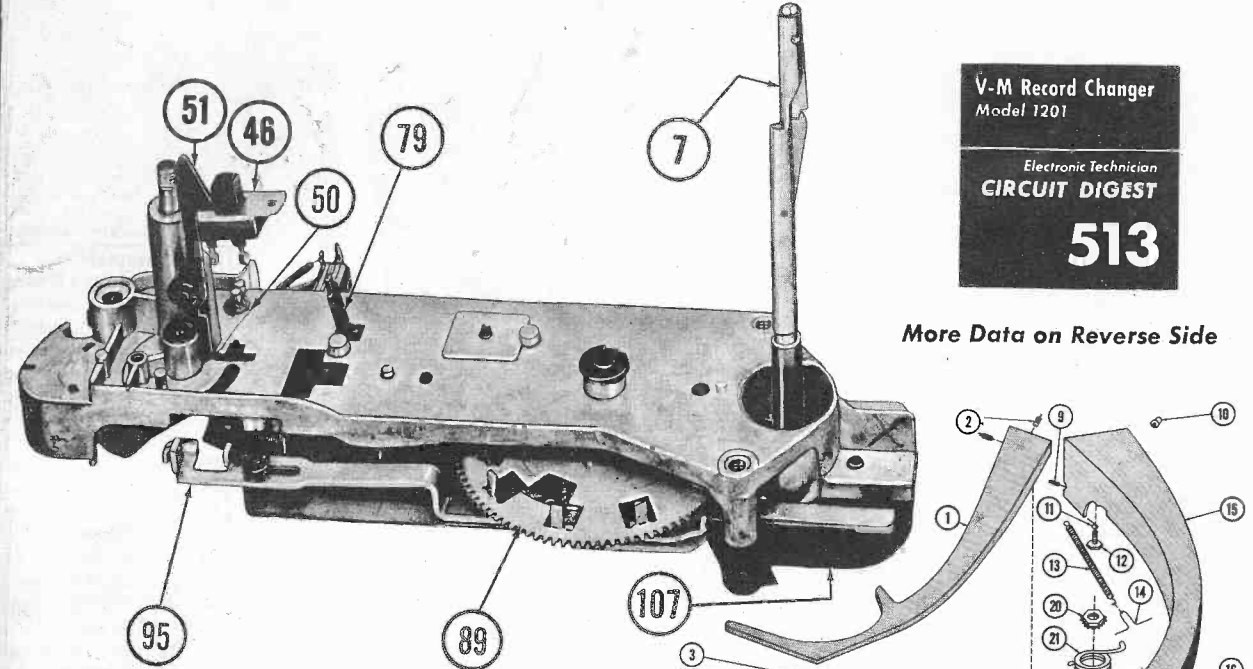
RCA 508
TV Chassis KCS126A & B
Models 170-P-048, 170-P-049, 170-P-060,
170-P-061, 170-P-063, 170-P-064,
170-P-048U, 170-P-049U,
170-P-060U, 170-P-061U,
170-P-063U, 170-P-064U

V-M Record Changer 513
Model 1201

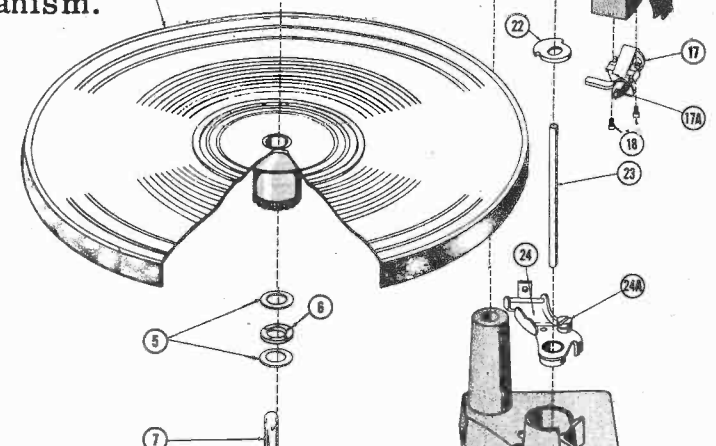
83

V-M Record Changer
Model 1201
Electronic Technician
CIRCUIT DIGEST
513

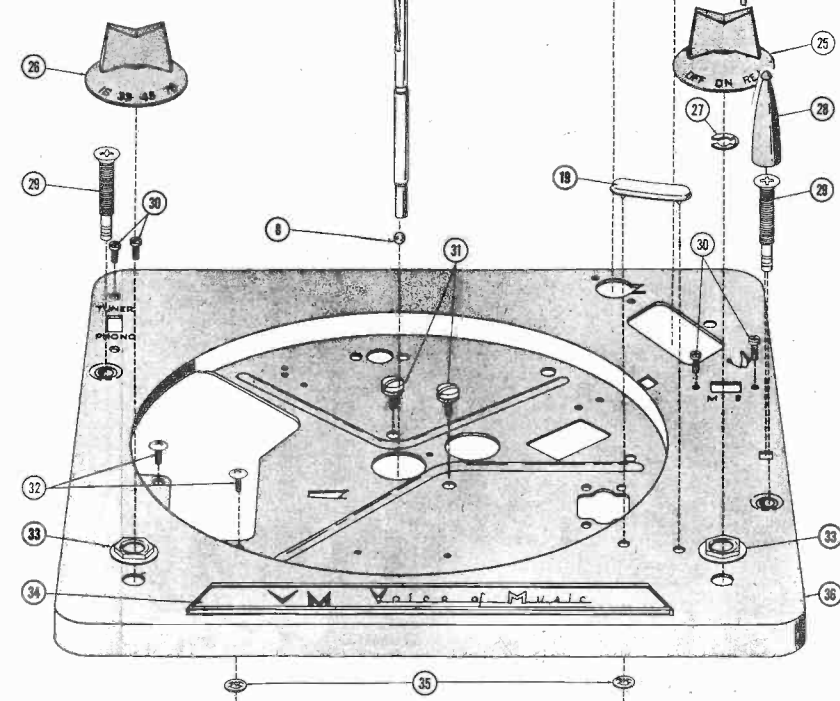
More Data on Reverse Side



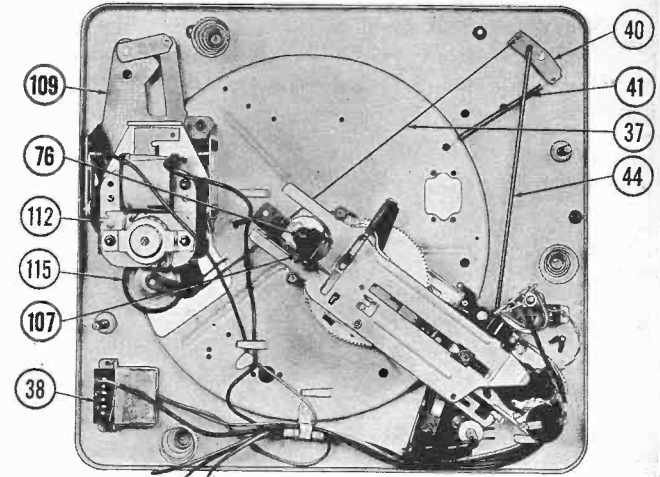
Top View of Cycling Mechanism.



Exploded View Of Parts Above Baseplate.



Bottom View of Changer

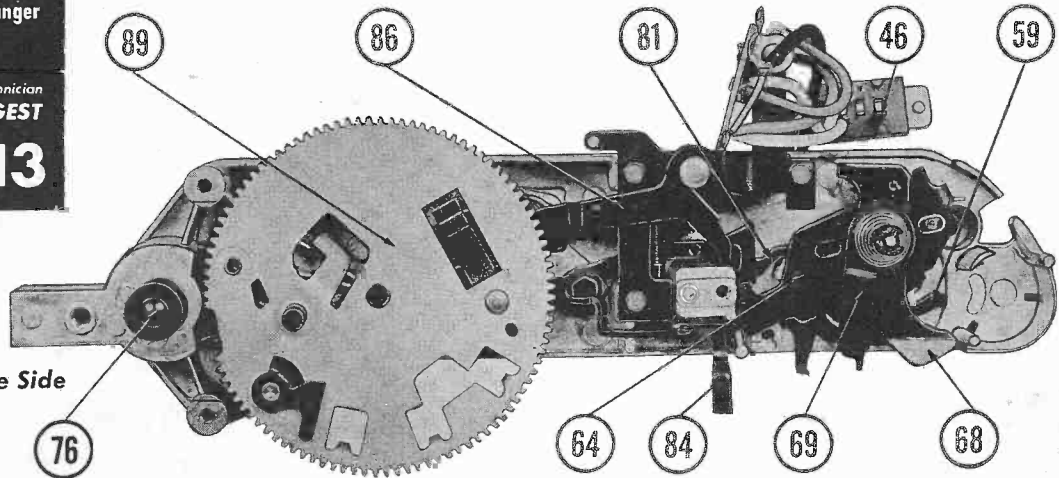


Bottom View of Cycling Mechanism with Slide Removed.



V-M Record Changer
Model 1201
Electronic Technician
CIRCUIT DIGEST
513

More Data
on Reverse Side



Ref. No.	Description
1	Record Support
2	Set Screw
3	"C" Washer
4	Turtable Assembly
5	Bearing Washer
6	Bearing Retainer
7	Spindle Assembly
8	Spindle Ball
9	Tone Arm & Hinge Ass'y.
10	Pivot Screw
11	Hinge Button
12	Lock Spring
13	Lift Screw
14	Hinge Spring
15	Weight Adjusting Spring
16	Tone Arm
17	Tone Arm Clip
17A	Cartridge
18	Needle Unit
18	Cartridge Mtg. Screw
19	Needle Protector
20	Keys Nut
21	Safety Spring
22	Safety Plate
23	Lift Pin
24	Hinge Arm Ass'y.
24A	Set Down Adj. Screw
25	Knob, On-Off-Rej.
26	Knob, Speed Control
27	"C" Washer
28	Rest Post
29	Mounting Bolt
30	Screw, Switch Mtg.
31	Screw, Works Ass'y. Mtg.
32	Screw, Motor Ass'y. Mtg.
33	Pal Nut
34	Escutcheon
35	Speed Nut

DIFILM



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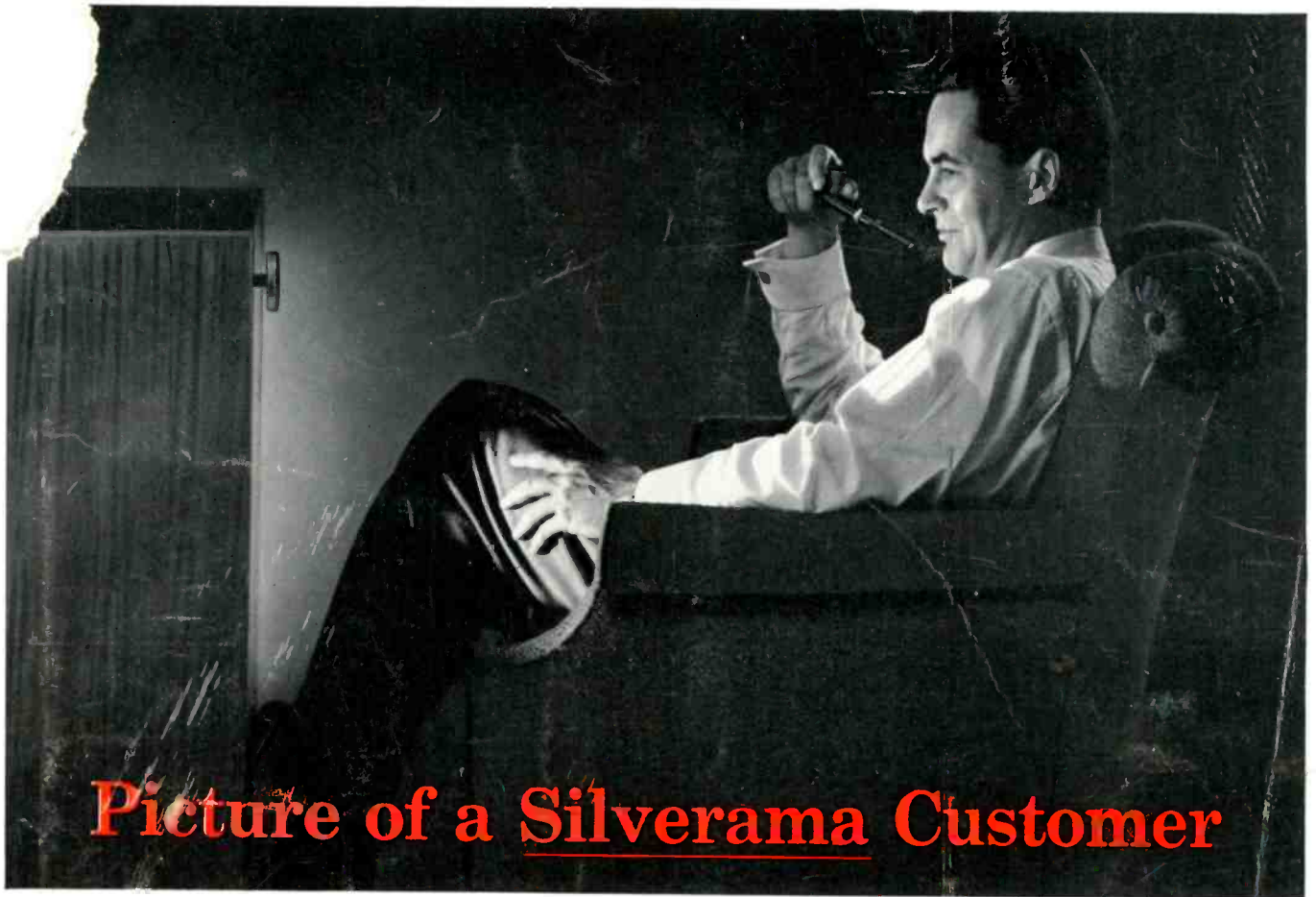
*From .001 μ F up

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Picture of a Silverama Customer

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★ ★ ★ ★ ★

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- RCA picture tubes—pre-sold by an extensive and continuing national advertising campaign.

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