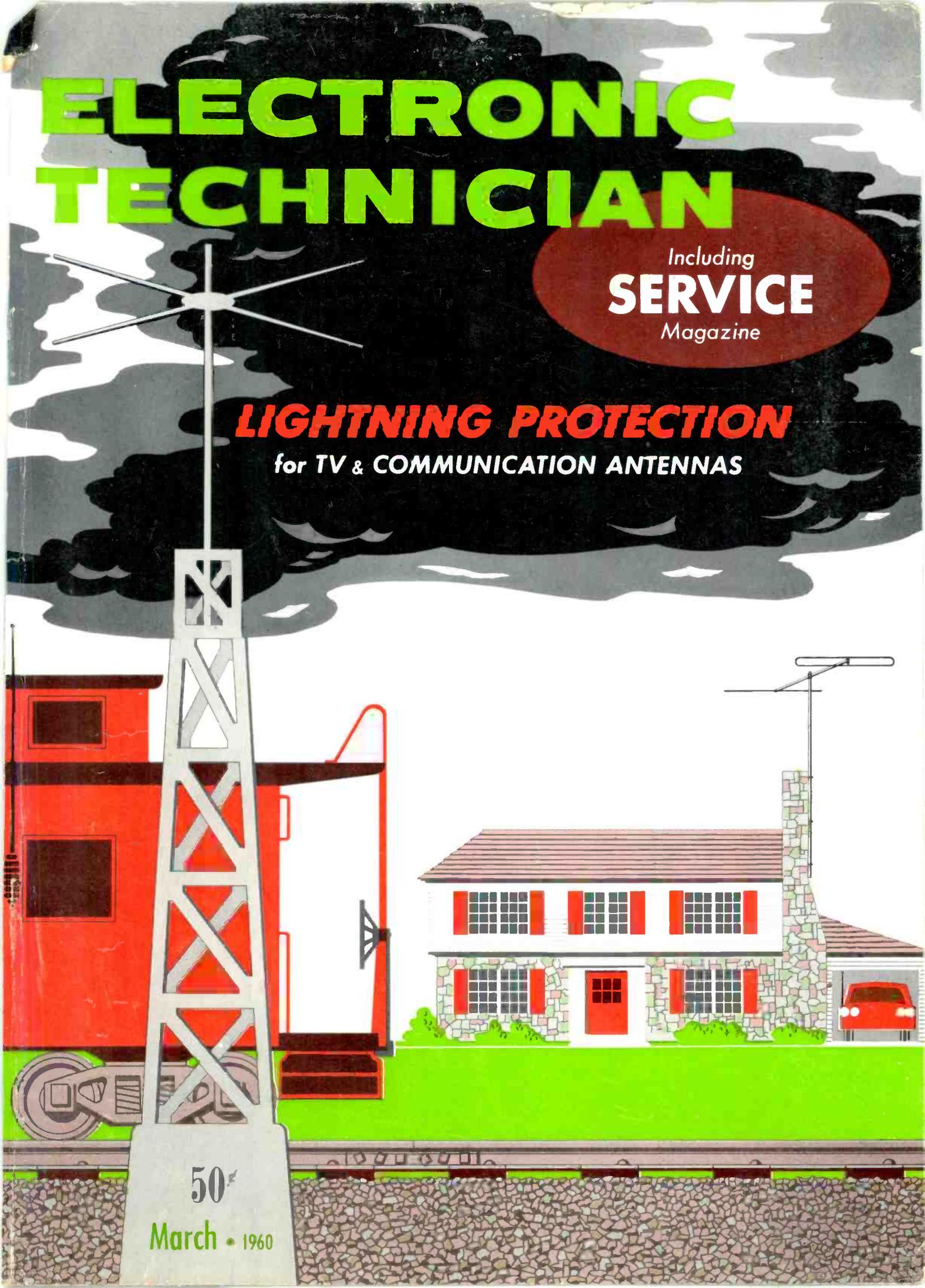


# ELECTRONIC TECHNICIAN

Including  
**SERVICE**  
Magazine

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March • 1960

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dealer-serviceman's fuse  
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# ELECTRONIC TECHNICIAN

Including  
**SERVICE**  
Magazine

World's Largest Electronic Trade Circulation

March, 1960

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**FRONT COVER** Communication and TV antennas are prime targets for lightning. Hazards may involve fires and personal injury, as well as equipment damage. For tried and tested methods for protecting against lightning, see article starting on page 34.

## FEATURES and ARTICLES

The Three Faces Of Industry (Editorial) .....	31
Tuning in the Picture .....	32
Install Antenna Lightning Protection .....	L. G. Sands 34
"Tough Dog" Corner .....	D. A. Daleske, L. C. Kisor 37
Service That Audio Amplifier .....	Mannie Horowitz 38
Uses for Closed-Circuit TV .....	40
Measure Your Service Operations, Part II .....	A. E. Kimball 41
Stop TV-Radio Interference .....	Jerry Wells 42
Shop Hints .....	C. B. Bailey, H. Leeper, G. F. Stillwell 45
Building a Technical Library .....	46
Servicing Automatic Toasters .....	Harold Katz 48
FCC Radio Statistics .....	60
Free Literature .....	61
Stop Shipping and Billing Errors .....	H. J. Ashe 64
Cases from the Files of the "Kilocycle Kops" .....	72

## DEPARTMENTS

Editor's Memo .....	6	Audio Newsletter .....	26
Letters to the Editor .....	8	Calendar of Coming Events .....	33
News of the Industry .....	14	Association News .....	58
Reps. & Distrs. ....	20	New Products .....	78
Catalogs & Bulletins .....	24	New Books .....	85

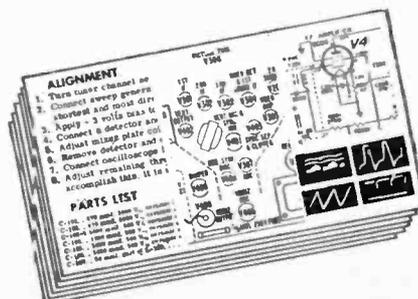
## CIRCUIT DIGESTS .....

Preceding Back Cover

## IN THIS ISSUE

(16 pp. latest schematics—see last page)

- ANDREA: TV Chassis VS-323 Series
- GENERAL ELECTRIC: TV Chassis M569
- PHILCO: TV Chassis 10L41 & U, 10L42 & U, 10L43 & U
- RCA: Transistor Radio 1-T-4 Series
- WESTINGHOUSE: FM Radio Chassis V-2400-1



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## FP ELECTROLYTICS



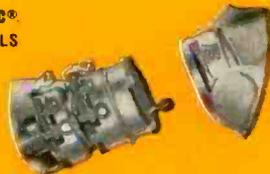
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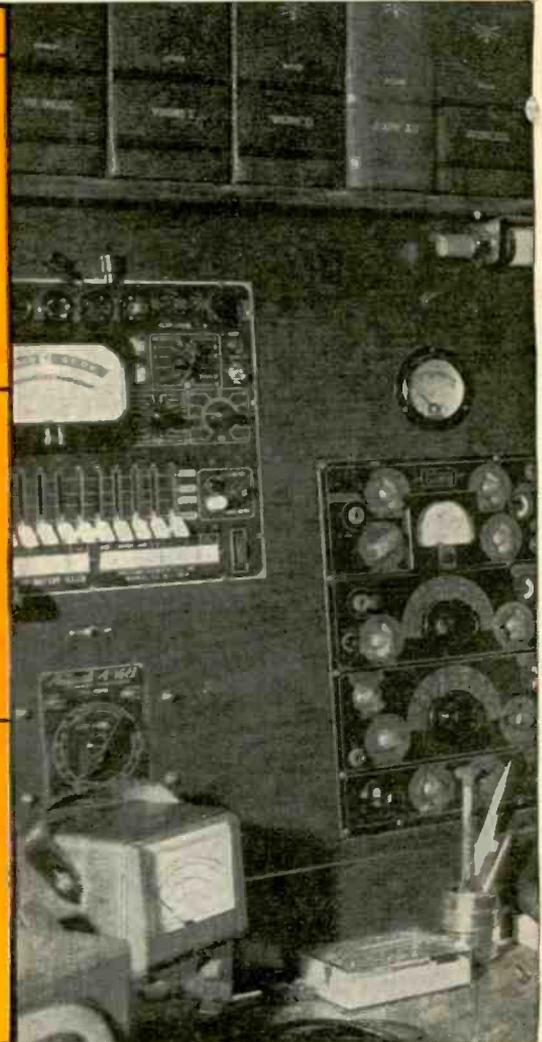


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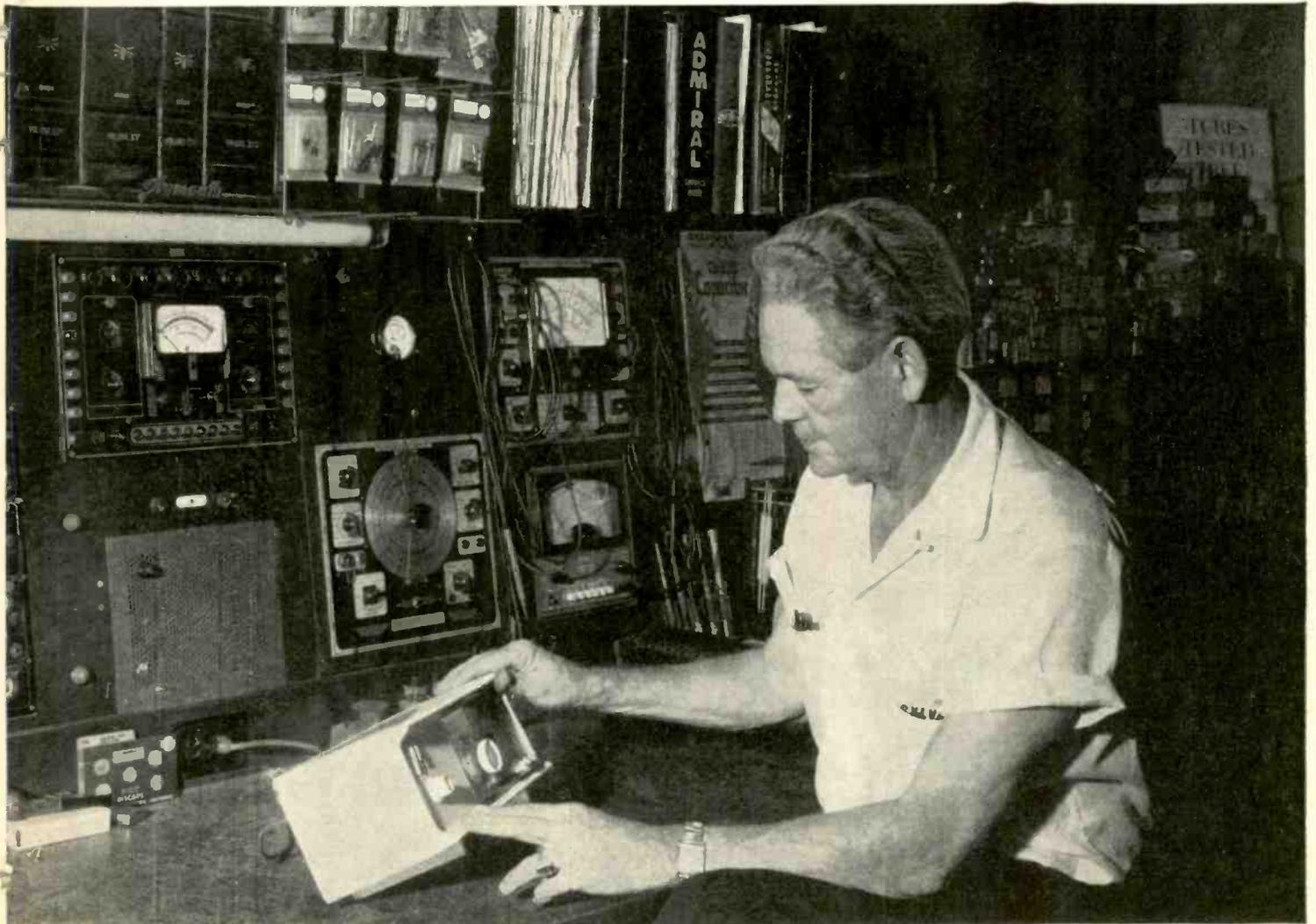
Like service technicians across the country, Jimmy Hull knows that he can depend upon quality throughout the wide line of Mallory components. For



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*Jimmy Hull owns and manages Hull's Radio & TV Service in Evansville, Indiana, serving an area within a 60-mile radius of the city. An early wireless operator, Jimmy has been in service work from the crystal set days to the present highly complicated color TV sets. Before going into business for himself he was the only radio service man for Sears, Roebuck & Company within a 100-mile radius of the city for eight years.*

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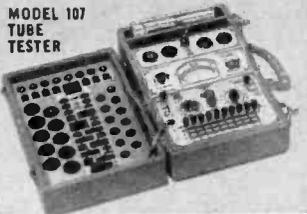


MODEL 78

### GRID CIRCUIT and TUBE MERIT TESTER

Complete test coverage of all modern TV tube types as well as all heater type radio tubes including hybrid types, using only 5 sockets. Incorporates patented Seco GRID CIRCUIT TEST plus a reliable CATHODE EMISSION test using new low impedance low test voltage circuit—also checks filament continuity and provides open element test. One easy-to-read meter indicates results for both Grid Circuit and Tube Merit Tests. Two-stage DC amplifier isolates meter from tube under test to protect meter—and makes it possible to achieve a wide range of load currents and test conditions. Complete with portable carrying case, pin straighteners, and flip-chart for quick set-up data.

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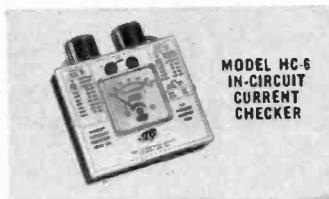


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Provides 3 important tests: amplifier types tested for gain by Dynamic Mutual Conductance method—power types tested for cathode current by Cathode Emission method—all types tested for shorts and grid error by Grid Circuit Test developed and patented by Seco. Dynamic Mutual Conductance Test pre-wired to eliminate elaborate set-up. Cathode Emission Test done by free point pin-selector method—will not be obsolete. Completely self-contained in portable carrying case.

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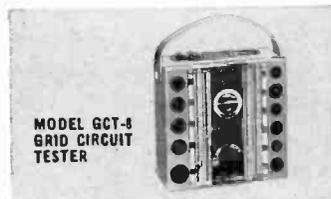


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MODEL GCT-8 Complete kit . . . \$19.95 NET

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## Editor's Memo



"The public be damned"—Commodore William Vanderbilt.

In this day of corporate enlightenment—community relations, charitable contributions, aid to education, etc.—it comes as a surprise to find a business giant that withholds product information beneficial to its customers.

I'm referring to Sears, Roebuck and Co., which is practicing a new and insidious version of Captive Service. It's done very simply. By restricting the amount of service data made available to independent service dealers, it becomes more difficult or costly for independents to compete with Sears' own service in repairing Silvertone sets.

Of course, this adversely affects the consumer since service is not made as readily available in local TV shops. Free enterprise competition is not given an opportunity to be fully exercised.

Recently we asked Sears to make service data available to us, so we could pass it on to our readers. They refused to do so unless impossible conditions were met. The devious excuse would require us to promise prompt publication of "all of the data . . . of all schematics (television, radio, stereo and tape recorders) in the Silvertone line." The italics and parentheses are Sears', not mine. It would be like printing a Sears catalog.

I know of no other significant company selling TV sets that has such a short-sighted, selfish, Captive Service policy. Every set maker is glad to disseminate service data to independents. Montgomery Ward is pleased to cooperate. For the sake of their own customers, all companies are glad to provide data to independents; that is, all except Sears.

The reason for Sears' negative attitude toward independents doubtlessly stems from solid economic motivations. Consider how Sears has been expanding its own service department. On top of repair profits, customers who charge their bills on the Sears credit plan are socked an extra 18% per year in interest.

Sears has a perfect right to operate its own service department. But holding back service data to independents—thinly veiled excuses notwithstanding—is about as arrogant a bit of corporate policy as has come down the pike in a long time.

*Al Foman*

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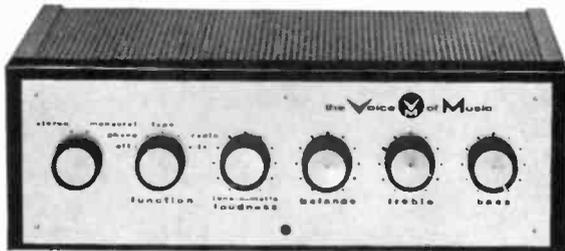
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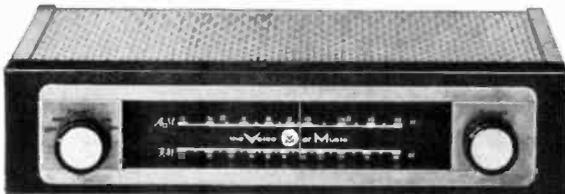
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## LETTERS

To the Editor

### Rat Race

Editor, ELECTRONIC TECHNICIAN:

Give us more articles on the business end of this rat race. All good technicians are mostly poor businessmen. We really don't know cost accounting. Keep up the good job you are doing.

C. R. COUCH, JR.

Couch's, Inc.  
Gainesville, Florida

### Address Correction

Editor, ELECTRONIC TECHNICIAN:

We wrote to Peerless Radio as listed in the Japanese radio directory on page 38 of your December 1959 issue. Our card was returned. Maybe you have the wrong address.

E. A. SMITH

Lauraville Radio  
Baltimore, Maryland

• Our apologies. The correct address is: Peerless Radio Distr., 92-32 Merrick Road, Jamaica, L.I., New York.—Ed.

### Marine Radio Precaution

Editor, ELECTRONIC TECHNICIAN:

I read the article "Precautions for Installing Marine Radios" in your January issue, and want to point up a mistake that has been made by many technicians trying, as the expression goes, to make an honest buck in someone else's field—mine. The paragraph on noise suppression states that a capacitor should be installed on the generator from armature lead to ground and/or field lead. Prior to installing the and/or part on the field lead, the customer should be asked if he has any spare generators lying around the keel of the boat, or the trunk of the car. Undoubtedly, he will be needing it within several months, if not within several hours.

We have found it best to use coaxial capacitors in the armature lead. So far as the field lead is concerned, a 3 to 6 ohm resistor in series with a 0.004 micromicrofarad capacitor connected from field to ground usually does the trick.

DAVID GOODMAN

WLAK Electronics Service  
Lakeland, Florida

• Perhaps reader Goodman meant microfarad instead of micromicrofarad, since most instructions call for a 0.002 microfarad or larger capacitor with a 4 to 6 ohm resistor in series to ground. In some cases, r-f series choke coils are recommended, as well as coaxial capacitors.—Ed.

(Continued on page 10)

# in the sets you **SELL...**

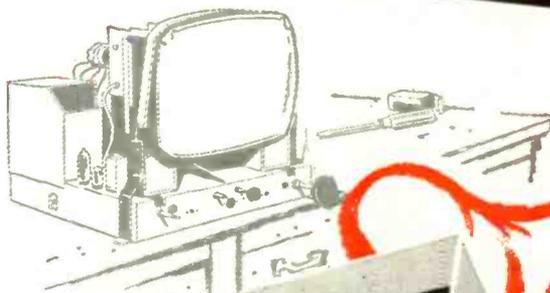


Are you satisfied with your mark-ups on transistor radios? Channel Master dealers work on large margins, even on price leaders. Are you selling the brand that does the big volume? Channel Master radio sales are in the top "Big 3". Are you building customer confidence? Channel Master's spectacular Free Replacement Warranty does just that—and it's the fastest sales-closer you've ever seen.

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**JUST SET FILAMENT AND LOAD CONTROLS...INSERT TUBE...  
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**IMPORTANT!** Mercury Tube Testers positively cannot become obsolete as they are engineered to accommodate all new tube types as introduced. New tube listings are furnished periodically to all registered owners.

## Model 101 Portable Tube Tester THE SPEED AND ACCURACY OF A MULTIPLE SOCKET TUBE TESTER AT A FABULOUSLY LOW PRICE

Checks emission of over 700 tube types... Checks inter-element shorts, leakage and gas content... Checks all sections of multi-purpose tubes... Housed in sturdy gray hammertone steel case... Handy tube chart contained in special back compartment... Size, 9 x 8½ x 2¾".

Model 101 **\$39.95**  
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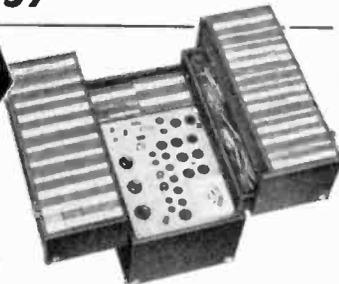
Checks emission of over 700 tube types... Checks inter-element shorts, leakage and gas content... Checks all sections of multi-purpose tubes... Checks diodes, filament and external continuity, power rectifiers, pilot lamps, auto and TV fuses... Housed in handsome oak carrying case with compartment for all test leads... Size, 11¼ x 12 x 4½".

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**Model AD-1 CRT Adapter available**... makes Mercury Tube Testers highly accurate picture tube testers of all black and white picture tubes (including the new \$39.95 short neck 110 degree RCA type) for emission, shorts and gas content. Dealer Net ...

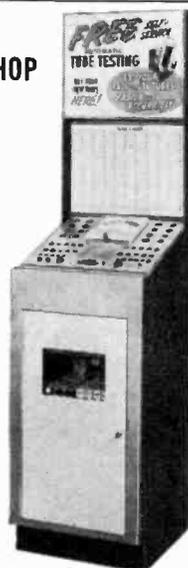
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Checks quality (emission, shorts and gas) of over 800 tube types... Checks each section of multi-purpose tubes... Tests all 6 and 12 volt standard auto radio vibrators... Handy push button fuse can be reset manually—never needs replacement... Tube compartment with own lock holds over 400 tubes... Tube storage drawers with tube carton dividers and drawer sheets provide for automatic inventory control... Etched aluminum panel always retains its handsome appearance... Takes only 19" x 19" of floor space. Stands 6' 1" high... Illuminated colorful plastic display tops the cabinet... Colorful window streamers supplied with each tester to attract customers.

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(Continued from page 8)

### Printed Circuit Problems

Editor, **ELECTRONIC TECHNICIAN**:

In your November Editor's Memo you seem to favor printed circuits, which was a surprise. I have spent hours with a jeweler's eye piece, trying to find a crack in an intermittent set until I'm half blind. Then you do find the break. By the time you get it back in the cabinet, you have the same thing happen. I'm even afraid to pull some tubes out, afraid the socket will pull out too. Some tubes that run hot look as though the printed circuit has been on fire. I just wonder what some of these printed sets will look like in 10 years time. In spite of this, I still like **ELECTRONIC TECHNICIAN**.

DUANE TOLBY

Council Bluffs, Iowa

• There certainly are servicing problems peculiar to printed circuits, and some of the early designs are dogs. Most current sets, however, are not so fragile, and have been designed with future servicing in mind.—Ed.

### Who's The Guinea Pig?

Editor, **ELECTRONIC TECHNICIAN**:

If Consumers Union thinks someone should be the recipient of the title, "Guinea Pig," it must be the service technician who not only has been plagued with harnesses threaded back and forth between two or three part chassis, but also others which must be taken in parts to the shop. Some sets require chassis removal to clean the pix tube. Most technicians are game to tackle everything that comes along, and printed circuits are not an exception. The resentment could not be attributed as much to printed boards as to the method used to introduce them. On the brighter side, many improvements have been cited and more will undoubtedly follow. Accessibility is greatly improved. Hand wiring sets have made greater strides with better parts layout and neater wiring. The manufacturers who have placed their confidence in independents can be assured that their customers will receive the courtesy and service such companies would like to extend personally.

FLOYD N. STRONG

Strong's TV & Radio  
 Chardon, Ohio

### Spare Time Learning

Editor, **ELECTRONIC TECHNICIAN**:

I just finished reading Melvin J. Miller's letter in the January issue, complaining about not being able to buy your magazine after "spending \$27.00 of his own money and most of his spare time trying to learn the business." When I get over the giggles, I've got news for him. How in the world can a man spend \$27.00 and his spare time to learn any business?

BILL HART

Hart T.V.  
 Osciola, Wisconsin

(Continued on page 14)

# How to get a Commercial FCC LICENSE!



Automation

do you know what an FCC license really can do for you in Electronics?

- ① MORE INCOME FOR YOU EVERY WEEK
- ② MORE INTERESTING JOB IN ELECTRONICS

The chances are very good that if you are reading this magazine you can qualify for the really good jobs in electronics like those shown in the pictures . . . and it won't take long to do it. Your past training and experience in basic electronics can be the foundation for a profitable career as an "across-the-board" electronics technician.

Whether you run your own shop or work for someone else, the real money, the interesting work, is available to the man who can handle the more complex electronic assignments.

The Career Information Material shown below will show you how you can qualify for a commercial FCC License . . . and acquire a really fine technical education. Find out how your success with the FCC examination is guaranteed . . . or your money back. You will also find out which jobs require the FCC license . . . where technicians are needed . . . and many other facts about opportunities for you in electronics.

It will cost you only the price of a postage stamp to get all the facts. You owe it to yourself to ask us to send you information on profitable careers in electronics.



Microwave and Mobile Radio



Guided Missiles



Radio & TV Broadcasting



Aeronautical Electronics

1. Raytheon Manufacturing Company
2. Radio Corporation of America
3. Jupiter IRBM, Army Ordnance Missile Command
4. Collins Radio Company
5. Radio Corporation of America

# Free!



Find Out How . . .

1. The new electronic devices can be handled by you
2. To solve the problems that will stump your fellow technicians
3. Training is Job Insurance when employment is tough to find . . . and more money for you when times are good

Accredited By The National Home Study Council

Cleveland Institute of Electronics

Desk T-17, 4900 Euclid Avenue • Cleveland 3, Ohio



CLEVELAND INSTITUTE OF ELECTRONICS

Desk T-17, 4900 Euclid Ave. Cleveland 3, Ohio

Please send FREE Career Information Material prepared to help me get ahead in Electronics. I have had training or experience in Electronics as indicated below:

- Military
- Radio-TV Servicing
- Manufacturing
- Amateur Radio

- Broadcasting
- Home Experimenting
- Telephone Company
- Other

In what kind of work are you now engaged? \_\_\_\_\_

In what branch of Electronics are you interested? \_\_\_\_\_

Name \_\_\_\_\_ Age \_\_\_\_\_

Address \_\_\_\_\_

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

T-17



The Businessman in the Service-Technician Suit knows that the service-dealer leaders of tomorrow install JFD Hi-Fi Helix Colortennas today. He relies on JFD for uncompromising performance...quality...durability to build confidence and insure complete customer satisfaction.

THE BRAND THAT PUTS YOU  
IN COMMAND OF THE MARKET

# JFD

JFD ELECTRONICS CORPORATION  
BROOKLYN 4, NEW YORK

# One Quality-One Line - THE BEST!

## G-C Electronic Chemicals



**G-C MAKES ALL THESE PRODUCTS FOR YOU!** Not one special purpose item—or two or three . . . but a **COMPLETE** selection of thousands of products for the service trade. That's the G-C line, first choice with radio and TV servicemen for over 30 years. Always ask for G-C . . . the line you can always trust for quality, variety, economy.

**G-C ZERO-MIST SPRA-KOAT No. 8667** Cools circuits instantly, saves hours locating intermittently defective components including capacitors, resistors and transistors. 16 oz. spray can.

Dealer Net \$2.17

**NEW G-C RED-X HIGH VOLTAGE CORONA DOPE No. 50-2** Prevent corona shorts on high voltage circuits in TV sets. Used by many of the leading TV set manufacturers. Excellent high voltage Insulating qualities. Easy to apply, air drying. 2 oz. bottle.

Dealer Net \$0.72

**NEW**



**G-C RED-X HIGH VOLTAGE CORONA DOPE**

Regular 99¢ Value  
**FREE!**



**6 oz. SPRA-KLEEN FREE!**  
When You Buy **ZERO-MIST**

Spra-Kleen . . . the finest TV Tuner Cleaner on the market made by the original manufacturers of electronic chemicals. Eliminates dust, dirt and corrosion the easy way.

**FREE...DE-OX-ID**

When You Buy  
**RED-X CORONA DOPE**

De-Ox-Id . . . the miracle cleaner that prevents contact oxidation. A dependable and superior cleaner for all electronic contacts.



Regular 66¢ Value  
**FREE!**



**G-C ELECTRONICS CO.**

Division of Textron Inc.

West Plant: Los Angeles 18, California • Main Plant: ROCKFORD, ILLINOIS, U.S.A.

**GET THE FACTS ON ALL G-C**

Chemicals and Cements, Alignment Tools, Service Aids, Hardware and all the rest. Send postcard for this free GC Catalog!



**ACT TODAY! CUT OUT AND TAKE TO YOUR JOBBER FOR FREE OFFER . . .**

**FREE G-C COUPON**

**YOU BUY** 1 G-C Zero-Mist Spra-Koat No. 8667  
Dealer Net \$2.17

**YOU GET FREE** 1 G-C Spra-Kleen Cleaner No. 8666 Worth 99¢  
Finest TV Tuner Cleaner on the Market.

Coupon void if taxed, prohibited or restricted by law.  
Cash value: 1/20th of 1¢. Offer Expires April 30, 1960.

**G-C ELECTRONICS CO.,** Division of Textron Inc.  
Los Angeles 18, California • Rockford, Illinois

**FREE G-C COUPON**

**YOU BUY** 1 G-C Red-X TV High Voltage  
Corona Dope No. 50-2—Dealer Net \$0.72

**YOU GET FREE** 1 G-C De-Ox-Id No. 19-1 Worth 66¢  
The Miracle Cleaner that prevents Contact Oxidation.

Coupon void if taxed, prohibited or restricted by law.  
Cash value: 1/20th of 1¢. Offer Expires April 30, 1960.

**G-C ELECTRONICS CO.,** Division of Textron Inc.  
Los Angeles 18, California • Rockford, Illinois

more, new, excitement from **Shell**

**CITIZEN'S BAND TRANSCEIVER**

**COMPLETE... READY TO USE**

**EQUIPPED FOR 115 VOLT AC AND 12 VOLT DC MOBILE USE**

Conforming with all FCC specifications on any of the 22 authorized channels. The transmitter is plate modulated and delivers the maximum allowable power of 5 watts input. Microphone: ceramic, Receiver: Super Regen with RF Amplifier, Sensitivity: 1 Microvolt usable signal, Tuning Range: Continuous from 26.965MC to 27.255MC, Dimensions: 4 3/4" x 11 1/2" x 6 1/4".



**\$79<sup>95</sup>**

**VOLUME TUBE SALES EXTRAORDINARY PROFITS**

WITH **Shell** TEST-O-MATIC



**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**



**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**

**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**



SHELL ELECTRONICS MFG. CORP. 112 STATE ST. WESTBURY, N.Y.

(Continued from page 10)

**Free Literature**

Editor, ELECTRONIC TECHNICIAN:

I sure do appreciate your having the electronic literature sent to me from the various manufacturers. I just can't tell you how much of a help it is in servicing and buying products. Keep up the good work.

STANLEY TUHOSKI

Turin, New York

• To receive copies of bulletins listed or more information on products described, fill in coupon on the free literature page.—Ed.

**From Canada**

Editor, ELECTRONIC TECHNICIAN:

As a full time radio-TV technician, I would like to express my appreciation of your magazine. Every page gets read and reread, and many of its ideas have been used to my advantage in servicing. I have not noticed many letters from Winnipeg in your columns. I want you to know that you have at least one ardent follower in Central Canada.

F. H. FRENCH

Winnipeg, Canada

**News of the Industry**

TUNG-SOL reports the following two promotions: RICHARD W. MOHR, Supervisor of Sales Analysis and Controls; and JOHN D. VAN DER VEER, to the newly created post of Mgr. of Govt. Relations.

GENERAL ELECTRIC reports the appointment of five men to positions in the recently established audio products section of the radio receiver dept.: MARSHALL BARTLETT, JR., Marketing Mgr.; GEORGE M. MIESENHELDER, Mgr. of Finance; WILL M. QUINN, JR., Mgr. of Engineering; WILLIAM B. SCOTT, SR., Mgr. of Manufacturing; and MARSHALL H. TERPENING, Mgr. of Employee & Community Relations.

RCA Semiconductor & Materials Div. reports three appointments to the staff of the Marketing Dept.: FRANK F. NEUNER, Mgr. Product Distribution & Control; ERWIN B. MAY, Mgr. Advertising & Sales Promotion; and IRVING H. VON ZELOWITZ, Mgr., Semiconductor Planning. The Div. has established the Southwest District Sales Office, with headquarters in Dallas. Sales and application team of the new office will be JULIUS S. LEMPNER, field engineer, and ROBERT T. MARCONI, sales rep. RCA INSTITUTES opened a new permanent school in Los Angeles March 1st to train electronic technicians. Located in the Pacific Electric Railway Bldg., the school will be headed by IRWIN A. SHANE, Dir.

(Continued on page 16)



PERMOHM\* means constant impedance . . . because its conductors are protected by encapsulation in cellular polyethylene.

for TV pictures that  
stay strong, clear . .

**NEW Belden PERMOHM\***  
lead-in wire

In spite of extremes of salt spray . . industrial contamination . . rain . . snow, PERMOHM lead-in wire delivers a stronger, clearer signal.

PERMOHM improves fringe area, UHF, and color TV reception, and eliminates the "salting out" problem in many coastal areas.

PERMOHM is easy to install . . no end sealing necessary. 300 Ohm UHF-VHF. Available in packaged lengths of 50', 75' and 100' with special merchandiser . . also 500' coils, 1000' spools.

ask your Belden Jobber

*one wire source for everything electronic and electrical*

**Belden**  
WIREMAKER FOR INDUSTRY  
SINCE 1902  
CHICAGO

- Power Supply Cords • Card Sets and Portable Cordage •
- Electrical Household Cords • Magnet Wire • Lead Wire
- Automotive Wire and Cable • Aircraft Wires •
- Welding Cable

\*Belden Trademark and Belden Patent . . U. S. Patent No. 2782251

**NEW!**

# **JERROLD ANTENNA MIXING NETWORKS**

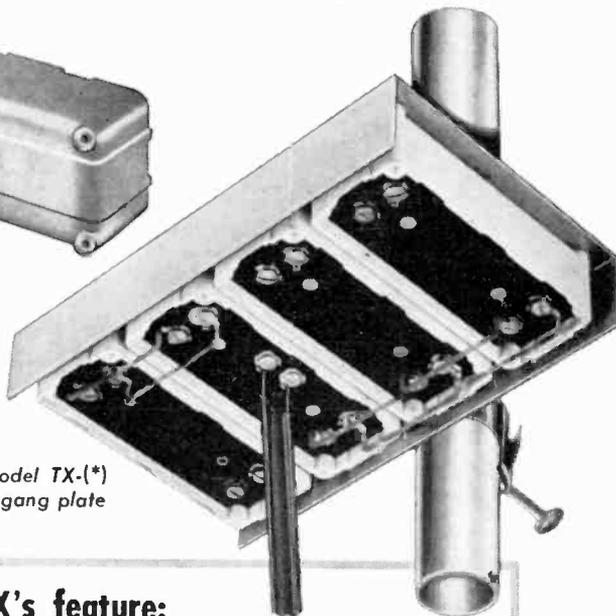
**MODEL TX-(\*)**

**Give Multi-Channel, All-Direction Reception Simultaneously...for FM, TV, UHF and Color!**

Now multi-set families can have all-direction reception at the same time on *one common line!* No more rotators or switches . . . the versatile Jerrold Model TX-(\* ) can be used individually or in any combination to reject unwanted channels and to bring in weaker stations bright and clear. They will mix cut-to-channel antennas with a single broad band antenna . . . separate individual channels . . . mix or separate VHF and UHF . . . and mix or separate VHF TV and FM . . . *all without loss of signal.*



Model TX-(\* )  
\$5.95 list



4 Model TX-(\* )  
with gang plate

## **Jerrold TX's feature:**

- up to 9 antennas on a single down lead
- high Q band-pass circuit for highest rejection
- negligible feed-thru loss . . . less than a knife switch
- matched mixing jumpers . . . for low VSWR
- unbreakable attractive housing, complete with hardware
- universal mounting . . . indoor or outdoor

\*SPECIFY UNITS DESIRED: any TV channel from 2 through 13; FM; H-L (VHF high-low) or VHF-UHF

**JERROLD** ELECTRONICS CORPORATION, Distributor Sales Division  
Dept. IDS-14, The Jerrold Building, Phila. 32, Pa.

Jerrold Electronics (Canada) Limited

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

**LOOK TO JERROLD FOR AIDS TO BETTER TELEVIEWING**

(Continued from page 14)

**JAMES ELECTRONICS INC.** is the new corporate name of **JAMES VIBRAPOWR CO.**, Chicago.

**WORKMAN TV** announces a 25% production increase in their new 20,000 sq. ft. plant in Sarasota, Fla.

**CBS ELECTRONICS** has just opened a new warehouse in Newark, N.J., providing 30,000 sq. ft. of space. **GORDON BURLINGHAM** is Div. Warehouse Mgr.

**STANDARD COIL** has elected **CHESTER J. ANTOGNOLI** as Vice Pres. in charge of sales, and **ROBERT C. A. ELAND** to the newly created position of Vice Pres. in charge of research and development.

**WELLER ELECTRIC** has appointed **LOUIS W. WHITE** as Eastern Regional Sales Mgr., with headquarters in Easton, Pa. **JOHN J. JOHNSTONE** has joined the sales force as detail man in the N.Y.C. and northern N.J. area.

**STROMBERG-CARLSON** announces the following two executive appointments: **JAMES D. MCLEAN**, Pres., and **ALLAN R. SHILTS** to the newly created position of Vice Pres. and Gen. Mgr.

**JERROLD ELECTRONICS** announced acquisition of substantial stock interests by **JOHN L. LOEB**, senior partner in Carl M. Loeb, Rhoades & Company, N.Y., and **JACK WRATHER**, head of the Jack Wrather Organization, Beverly Hills.

**UNGAR ELECTRIC TOOLS** has been merged into the **ELDON** group of companies, as the Electric Div. of Eldon. The Div. will continue to be known as Ungar Electric Tools, Inc. and its products will continue to be manufactured and merchandised under the Ungar name.

**INTERNATIONAL RESISTANCE** sales in 1959 are estimated to have increased approximately 42% over those of 1958 to more than \$19 million. The company is increasing the area of its general offices and main plant at Philadelphia by some 11% to a total of 281,000 sq. ft. **DUANE C. MANNING** has been named Mgr. of Engineering Sales in the Pacific Area.

**RAYTHEON** has announced the appointment of **DONALD B. WHITTE-MORE** to mid-Atlantic region commercial manager to coordinate sales activities of reps for the six commercial divisions in N.Y., N.J., Pa. and Conn. Three new district mgrs. have been appointed to field posts in the Distributor Products Div. as follows: **EDWARD J. KUKULA**, Detroit dist.; **EDWARD C. MEHM**, Philadelphia Distr.; and **PAUL B. CUNNINGHAM**, Md., Va., Wash., D.C. territory.

(Continued on page 20)



# ONE H- umdingers OF AN OFFER!

**Mr. Serviceman:**  
*"Do you have a pile  
of old, burned-out  
receiving tubes?"*



**WE HAVE THE DEAL FOR YOU ...  
SEE ME ... YOUR PHILCO DISTRIBUTOR**

*(turn the page for more details)*

# PHILCO OLD TUBE TRADE-IN

Here's your chance to turn old, burned out receiving tubes into cash, by trading them in on new Philco tubes you use every day. The more old tubes you have—the better! It's the most sensational tube offer ever!



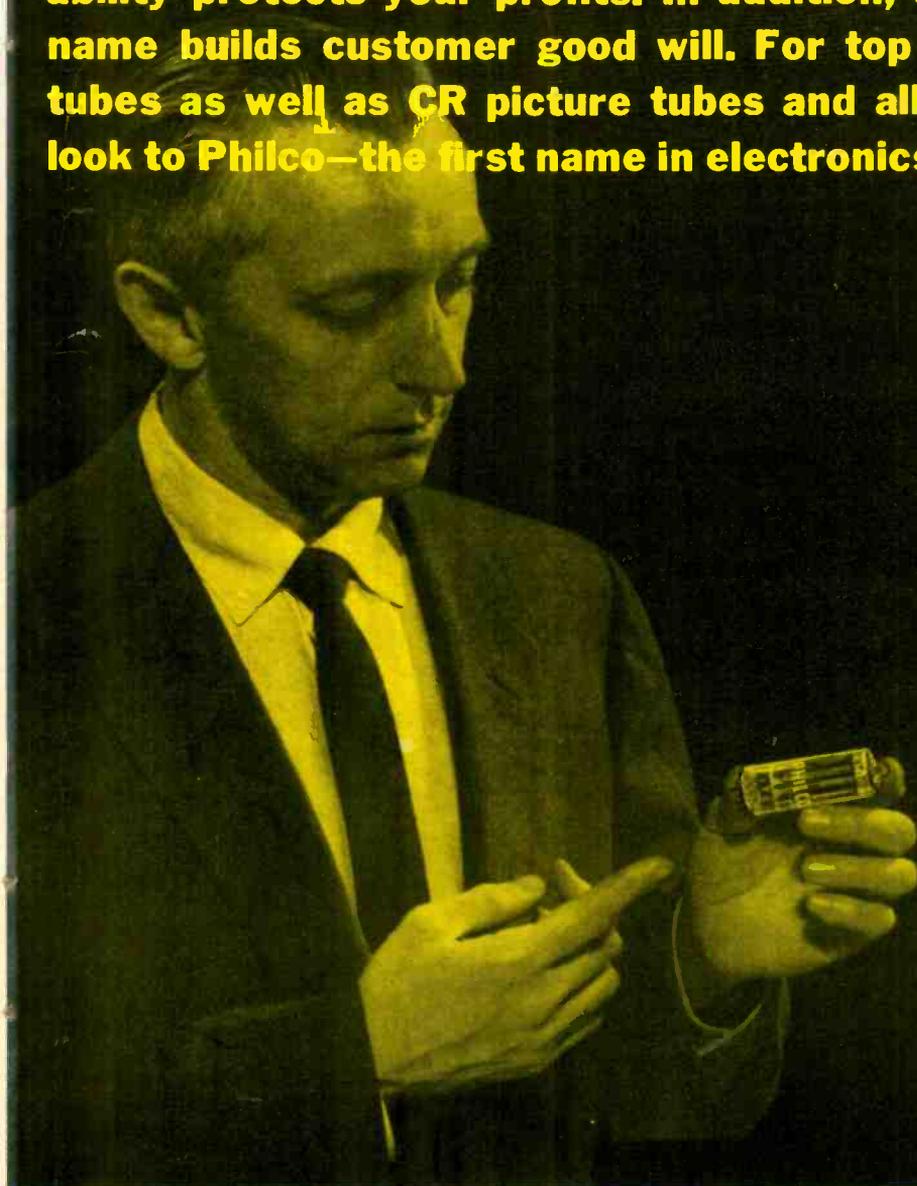
Bring In your old tubes. For years, Philco has led the industry with **TUBE RACKET-SMASHING CAMPAIGNS** to help knock out the tube racketeers. This will be the biggest of all—we'll smash all old tubes you bring in. Don't buy another tube until you see me...

## YOUR PHILCO DISTRIBUTOR

# PHILCO<sup>®</sup> THE FIRST NAME IN ELECTRONICS

# ...THE LAST WORD IN QUALITY

Because the Philco name is symbolic of quality, long-life Philco tubes are the **FIRST CHOICE** of quality-wise technicians. It will pay you to use them for all replacements—TV, radio and hi-fi. Their proven reliability protects your profits. In addition, the prestige of the Philco name builds customer good will. For top performance in receiving tubes as well as CR picture tubes and all other replacement parts, look to Philco—the first name in electronics...the last word in quality!



**SEE YOUR PHILCO DISTRIBUTOR TODAY!**

## PHILCO ACCESSORY DIVISION

*WORLD-WIDE DISTRIBUTION*

Service Parts • Power-Packed Batteries • Universal Components • Long-Life Tubes • Heavy-Duty Rotors • Star Bright 20/20 Picture Tubes • Long Distance Antennas • Appliance Parts • Laundry Parts • Universal Parts and Accessories



PHILCO CORPORATION ACCESSORY DIVISION

ATTN: Carl Areschoug

P. O. Box 3635

Philadelphia 25, Pa.

If you service television and radio receivers and would like to receive the Philco Giant Banner Sales Mailers, attach this coupon to your Company letterhead and forward to above address.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

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

(Continued from page 16)

**WEBSTER MFG.** has moved to 317 Roebing Rd., So. San Francisco, Calif., a location which provides increased space.

**AERVOX** announces the appointment of **GEORGE M. ARISMAN, JR.** to the office of Vice Pres. The New Bedford Div. has appointed **RALPH P. PARKER**, Asst. Sales Mgr.

**HAAS ELECTRONIC PUBLISHING**, under its trade name of **HEPCO**, will publish "custom" catalogs for individual electronic parts distributors, containing complete product information of only those lines handled by the distributor.

**CAPITOL RADIO ENG. INST.** has made the following two appointments: **V. T. PACKENHAM**, Advertising Mgr., and **MRS. HELEN P. ARGENTIERI**, Mgr. of Student Services, a new department.

**CORNELL-DUBILIER** has added **H. A. STEINBERG** to the sales staff. Winchester 30-30 Repeating Carabines will be awarded to distributors who do an outstanding job on the new "Electromite" miniaturized electrolytic capacitor promotion.

**MOTOROLA** Semiconductor Products Div. has named **CLIFFORD J. WOODKA** to the newly created position of Market Research Specialist.

**ERIE RESISTOR** has announced the opening of a wholly owned subsidiary, **ELECTRON RESEARCH, INC.**, 530 W. Twelfth St., Erie, Pa., for the purpose of manufacturing semiconductor components and devices. **J. W. SCHELL** has been appointed Plant Mgr. of the new subsidiary.

## Reps & Distributors

**CENTRALAB** has appointed **THE GEORGE KANGAS SALES CO.** as its rep in Kans. and Western Mo.

**VOCALINE** reports the appointment of a new sales rep, the **R. G. BOWEN CO.**, to handle their full line in Wyo., Southern Idaho, N.D., Colo., Utah, N.M., and El Paso, Tex.

**BUSSMANN MFG.** announces the appointment of **ART CERF & CO.** as its sales rep in upper N.Y. state, N.J., Eastern Pa., Md., Dist. of Columbia, and Va.

**LAND-C-AIR SALES**, rep firm, has moved their main offices to 76 Main St., Tuckahoe, N.Y., featuring a combination conference and live show room which will be used for jobber and hi fi dealer sales meetings.

**SENCORE** held a sales meeting attended by more than 30 reps from all over the nation, during which it was announced that the company would increase their publication advertising by more than 40%.

**TERMINAL ELECTRONICS** has acquired a new building at 236 W. 17th St., N.Y.C. which gives 40,000 sq. ft. of floor space for industrial sales and purchasing departments as well as warehousing. Their electronic supply house at 85 Cortland St., N.Y.C. will continue to serve for over-the-counter sales.

**DELTA SALES, INC.**, electronic sales reps in the Ind.-Ky. territories, has been formed by a merger of **THE KENNETH C. REINHARDT CO.** and the **J. C. KEITH CO.** Principals of the new corporation are **KEN G. REINHARDT**, Pres.; **G. M. WILSON**, Vice Pres.; **J. B. MOORE**, Secy.; and **JACK C. KEITH**, Treas.

**ERA** has scheduled a manufacturer-rep sales promotion session during the IRE Show for the morning of March 23rd at the Park-Sheraton Hotel, N.Y.C. The Northern Calif. Chapter has elected the following new officers: **FRANK LEBELL**, Pres.; **WILLARD M. NOTT**, Vice Pres.; **ED W. BRANDT**, Secy.; and **WILLIAM A. MELCHIOR**, Treas. Elected at the National Convention, Feb. 10-13: **WALLY SHULAN**, Pres. of ERA.

(Continued on page 24)

The exclusive Clip-on Stylus offers you another advantage of CBS-Ronette advanced engineering and precision craftsmanship. It snaps into position instantly, aligns itself automatically.

Only 27 CBS-Ronette cartridges, all with superior jeweled styli, replace over 500 different models. And they provide exact replacements for more than 6,000,000 CBS-Ronette cartridges in American phonographs alone. Ask your distributor for dependable, advance-engineered CBS-Ronette cartridges.



# Only Ronette has the Clip-on Stylus

FOR FAST REPLACEMENT ...  
FOR FOOLPROOF ALIGNMENT ...  
TO SAVE YOUR TIME



Ask for Catalog and  
Cross Reference Chart PF-285

## CBS ELECTRONICS

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

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

# NEW

# ORANGE-DROP<sup>®</sup>

## DIPPED DIFILM<sup>®</sup> CAPACITORS FOR EXACT ORIGINAL REPLACEMENT



THIS NEW . . . MINIATURE . . . DIFILM  
CAPACITOR OUTPERFORMS ALL  
OTHER DIPPED TUBULAR CAPACITORS!

SPRAGUE DIFILM *does it again!* First to give you at regular prices the finest molded tubular capacitor made—the DIFILM BLACK BEAUTY . . . and now the newest DIFILM capacitor—the ORANGE-DROP dipped capacitor.

SPRAGUE ORANGE-DROP CAPACITORS are especially made for easy installation in tight spots . . . where only an exact replacement will fit. They are the exact same dipped capacitors used by leading manufacturers in many TV sets.

### WHY ORANGE-DROPS BEAT HEAT AND HUMIDITY

Sprague Orange-Drop Mylar-Paper Dipped Capacitors combine the proven long life of paper capacitors with the effective moisture resistance of film capacitors. Their duplex dielectric of kraft paper and polyester film is impregnated with HCX<sup>®</sup>, Sprague's exclusive hydrocarbon material which saturates the paper and fills voids and pinholes in the film before the HCX polymerizes. The result is a solid, rock-hard capacitor section which is then double-dipped in bright orange epoxy resin for moisture protection. Leads are neatly crimped for easy installation on printed wiring boards.

SPRAGUE ORANGE-DROP CAPACITORS are a natural teammate for the molded DIFILM Black Beauty<sup>®</sup>. Black Beauties, born out of engineering to tough missile standards, are still far and away the best replacement capacitors—better than any other molded or dipped . . . paper, film, or film-paper combination . . . capacitor made for entertainment electronics.

Where a dipped capacitor is called for, no other dipped unit can match the ORANGE-DROP. Your distributor is stocked with all popular ratings in 200, 400, 600, and 1000 volts in handy Sprague Kleer-Paks. Order some today.

\*Du Pont Trademark

**don't be vague—insist on**

**SPRAGUE<sup>®</sup>** the mark of reliability

ANOTHER TESTED RELIABLE PRODUCT BY THE WORLD'S  
LARGEST CAPACITOR MANUFACTURER

# YOU'RE AS SUCCESSFUL GENERAL ELECTRIC'S



# AS YOU WANT TO BE WITH NEW PSM\* METHOD!

## \*PROFITABLE SERVICE MANAGEMENT

Earn the good things of life for yourself and your family by following the Profit signposts on every page of General Electric's PSM\* Method! The engraved Certificate which says you have completed this instruction program, will mean new success for you as a TV technician.

Says Dr. John K. Pfahl of Ohio State University, under whose direction the new General Electric program was prepared: "The electronic service dealer must be, at the same time, a technician, good businessman, and sales manager." You learn step-by-step how to realize these aims, by following General Electric's Profitable Service Management Method. You are shown how to assure a satisfactory profit margin, not merely

hope for it—how to increase business by methods others have found unfailingly effective.

In the LP record "Sounds of Success" you will hear from the lips of experienced TV technicians just how they have built greater incomes. After completing the two volumes of instruction that make up the study course, a questionnaire is available to check your acquired knowledge, prior to receiving your Certificate.

All come handsomely packaged for your bookshelf. Check the highlights of General Electric's PSM\* Method given below! Then see your G-E tube distributor! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.*

### HERE ARE SOME OF THE MANY SUBJECTS YOU WILL STUDY:

#### BOOK NO. 1. "SOUND BUSINESS PRACTICES"

**BUSINESS FOR PROFIT:** Your reasons for owning a business...How much money should you make?...How to make your business profitable.

**PLANNING YOUR BUSINESS:** Planning expansion...Cash planning...Shop planning.

**ORGANIZING YOUR BUSINESS:** Overhead costs...Pricing...What it costs you to make a service call...What it costs you to make a shop repair...Inventory control...Credit organization...Choosing a form of organization.

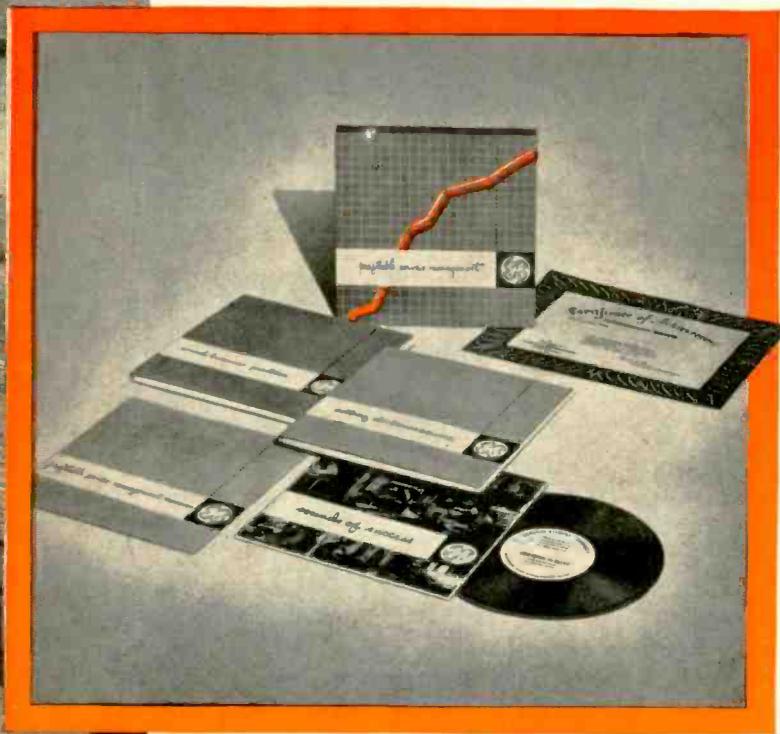
**CONTROLLING YOUR BUSINESS:** Why use records?...What records are needed...Taxation...Use an accountant.

#### BOOK NO. 2. "SELLING ELECTRONIC SERVICE"

**ARE YOU ATTRACTING NEW CUSTOMERS?:** Attracting new business...Businesslike appearance...Effective selling...Good identification...Basic market research.

**PROMOTING YOUR BUSINESS:** Advertising technique...Advertising campaign planning...Special offers...Seasonal planning...Customer contact.

**KEEPING YOUR CUSTOMERS SATISFIED:** Customer relations...Customer grievances...Guaranteeing repairs...Building new customers.



*Progress Is Our Most Important Product*

GENERAL  ELECTRIC

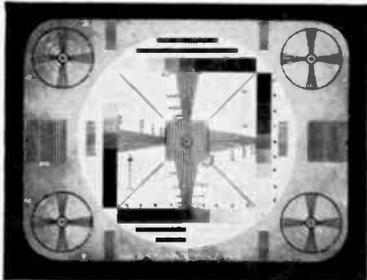
(Continued from page 20)

**SOL ALLEN** has established a new manufacturers rep organization at 1 East Main St., Bayshore, N.Y.

**PURCHASING AGENTS** of the Radio, Television & Electronics Industries elected a new slate of officers for 1960 as follows: Pres., **ARNOLD SUTTA**, Emerson Radio & Phonograph Corp.; Vice Pres., **EDWARD KOVACS**, Republic Electronic Industries Corp.; Treas., **ABE SCHNEIDERMAN**, Olympic Radio & Television Corp.; Recording Secy., **JULES LONDONER**, Emerson Radio & Phonograph Corp.; Corresponding Secy., **BIAGIO TRIMBOLI**, Telechrome Mfg. Corp.

## Catalogs & Bulletins

**CAPACITORS:** Specifications and performance characteristics of miniature and subminiature aluminum foil capacitors are covered in Bulletin 81558. Separate standard rating and selection charts for the aluminum encased and ceramic encased capacitors are listed by size and voltage rating. International Electronic Industries, Inc., Box 1368, Nashville, Tenn. (ELECTRONIC TECHNICIAN B3-3)



## TV TIPS FROM TRIAD

NO. 6 IN A SERIES

Joe, the Junior PTM, said, "How can you afford to stock TV parts, Bill?" He waved his arm around Bill's well-equipped shop.

"Some parts help me save time," replied Bill, "and I figure that time is about all I have to sell. Take this job I am working on: Sound ok, no boost or high voltage. So far I have eliminated such items as the fuse, tubes, drive, open cathode or screen circuits, and a half dozen other items without finding the cause. That leaves two possibilities: defective flyback or yoke. Since I can test both by substituting either one, I will naturally sub the easier item — which is the yoke."

"Don't you have to have thousands of yokes on hand to do that?" asked Joe.

"No, the yoke you use for substitution must be known to be good, and be within twenty percent of the inductance of the original. It doesn't have to be installed on the picture tube for the test. Less than a dozen yokes provide for nearly all tests, and in a majority of cases also serve as the replacement."

"You learn something new every day," Joe said.

\* \* \*

**MORAL:** If you would like to know more about testing flybacks by substituting yokes, ask your Triad Distributor or write the factory for PTM #3. If you are interested in which yokes make good test units ask for the YP-8 Yoke Pack information sheet. **Triad Transformer Corporation**, 4055 Redwood Avenue, Venice, California.

**POSTER:** Headlined "Everyday is Independence Day for you and your Independent TV service dealer," is a new 17" x 22" red, white and blue poster. Available free from the firm's distributors or direct from Sprague Products Co., North Adams, Mass., by requesting Poster RP-22 and enclosing 10¢ to cover the cost of handling and mailing.

**SERVICE SHOP SHORT CUTS:** The third edition of tips for the serviceman. "Stan Cor's Corner," contains 38 service shop short cuts. It offers illustrated ideas, gadgets and service hints. Chicago Standard Transformer Corp., 3501 W. Addison St., Chicago 18, Ill. (ELECTRONIC TECHNICIAN B3-2)

**TUBES:** A tube substitution guide, in the form of an 8-page, 5½" x 8½", booklet lists 416 tubes and the appropriate substitute or substitutes for each. Data for over 100 foreign tubes are included. Vis-U-All Products Co., 460 Eastern Ave. S.E., Grand Rapids 6, Mich. (ELECTRONIC TECHNICIAN B3-9)

**BANNER:** A giant size, multi-color banner carrying a TACO TV antenna sales message, measures 27" x 45". It has a supporting crossarm with braided gold hanger rope for window or wall display. Technical Appliance Corp., Sherburne, N. Y. (ELECTRONIC TECHNICIAN B3-8)

**TUBES:** Application Note AN-184 has for its subject: Recommended Handling Procedures For All-Glass Picture Tubes. Outline sketches of three sizes of TV picture tubes, showing vulnerable "hoop" area, are included. RCA Electron Tube Div., Harrison, N. J. (ELECTRONIC TECHNICIAN B3-6)

**ANTENNAS:** A new 1960 complete catalog brochure, a black, blue and gold folder, contains catalog sheets on: TV indoor, TV outdoor and auto radio antennas; portable TV and hi-fi tables; bar stools and safety ladders. Snyder Mfg. Co., 22nd & Ontario Sts., Philadelphia, Pa. (ELECTRONIC TECHNICIAN B3-7)

**SEMICONDUCTORS:** Expanded to 36 pages, the second issue of the firm's Semiconductor Directory, lists diodes, tunnel diodes, rectifiers, germanium transistors and silicon transistors. Selected schematics are included. Lafayette Radio Electronics Corp., 165-08 Liberty Ave., Jamaica 33, N. Y. (ELECTRONIC TECHNICIAN B3-4)

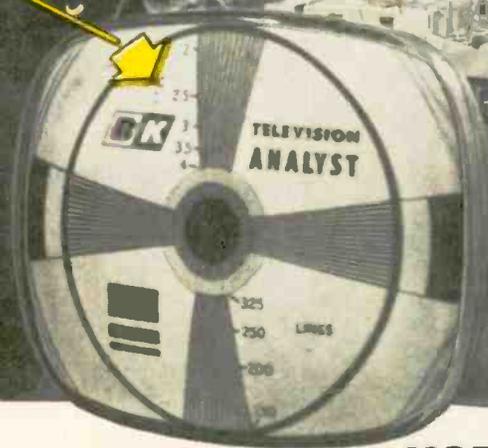
**CAPACITORS:** New catalog sheets on Mylar paper capacitors and metallized Mylar capacitors include graphs, illustrations, life data, sizes and other technical information. Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago 14, Ill. (ELECTRONIC TECHNICIAN B3-5)

# SAVE $\frac{1}{2}$ THE TIME

## Make Twice The Profit!

in TV  
Trouble-Shooting

**THIS EASY  
SIGNAL INJECTION  
POINT-TO-POINT  
DIRECT VIEWING  
WAY**



## MODEL 1075 TELEVISION ANALYST

### Solve Rough Sweep Output Problems



### NEW Model A107 DYNA-SWEEP CIRCUIT ANALYZER

Saves many hours of service work. Provides vertical and horizontal sync and driving pulses that enable you more easily and quickly to check out every stage in the sync and sweep sections of a television receiver.

Tracks down troubles in the horizontal and vertical output circuit including defective output transformer and yoke; checks for shorted turns, leakage, opens, short circuits, and continuity. Includes unique high-voltage indication. Eliminates trial and error replacements.

**Model A107 Dyna-Sweep.** Companion unit for use only with B&K Model 1075 Television Analyst for driving source.

Net, \$49.95

**Model 1070 Dyna-Sweep.** Same as Model A107 but has its own horizontal and vertical driving pulse, and is used independently of the Model 1075.

Net, \$69.95

### New Technique Makes TV Servicing Easier, Faster, More Profitable

Thousands of service technicians already save thousands of hours every day with the amazing B&K TELEVISION ANALYST. Enables you to inject your own TV signal at any point and watch the resulting test pattern on the picture tube itself. Makes it quick and easy to isolate, pin-point, and correct TV trouble in any stage throughout the video, audio, r.f., i.f., sync, and sweep sections of black & white and color television sets—including *intermittents*. Makes external scope or wave-form interpretation unnecessary. Enables any serviceman to cut servicing time in half, service more TV sets in less time, really satisfy more customers, and make more money. Color generator provides both rainbow pattern and color bars.

**MODEL 1075 TELEVISION ANALYST.** Complete with standard test pattern, white dot, white line, and color-bar slide transparencies, and one clear acetate. Net, **\$259<sup>95</sup>**

See your B&K Distributor or Write for Bulletin ST24-T

**B & K MANUFACTURING CO.**

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

Canada: Atlas Radio Corp., 50 Wingold, Toronto 10, Ont.  
Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.



## Audio NEWS LETTER

PILOT introduces the PSV-2 3-way speaker system @ \$69.50. Enclosure is 18" H x 15-3/8" W x 9-3/4" D. It includes a 12" LF driver, 6" midrange and 3" tweeter. Rating is 30 watts program power, range 50 to over 16,000 cps.

SHURE extends its deadline for stereo conversion from Dec. 31 to May 31. It's free to owners of M12 or M16 mono arms who buy an M21 stereo cartridge.

GENERAL ELECTRIC audio products section of the radio receiver dept. is being transferred to existing facilities in Decatur, Ill. Included are the home phono operation in Utica, and components in Auburn, N.Y.

ELECTRO-VOICE will package its needles in individually encased styrene plastic boxes, with needles bedded in plastic foam.

BOGEN-PRESTO names Lawrence J. Epstein, ex-United Audio, as sales and merchandising manager of hi-fi and professional products.

GELOSO releases literature on its "Slim Jim" microphone line, including the M62 @ \$48. Ratings are 60-14,000 cps, sensitivity -54 db.

FERRODYNAMICS has completed a pilot plant to produce video-instrumentation tape. Pres. Fred Kantor reports hi-fi tape sales at nearly \$1 million, annually.

FAIRCHILD & BELTONE RECORDING report a process to produce LP discs which can be played stereo on stereo phonos, mono on mono players. Records will be marketed as "Design Compatible Fidelity" under Design Records label.

WEBCOR is offering free Arthur Murray dance lessons and LP record language courses with the purchase of its recorders and phonos. It is also conducting a dealer contest, Feb. 1-April 1, with first prize of \$1000.

NEW OFFICERS have been elected by the Institute of High Fidelity Manufacturers. Herman H. Scott, pres. of H. H. Scott, was elected director and chairman of the board. Ray V. Pepe, James Lansing vp, was elected vice pres. and director, and will function as acting president until a special election is held. New directors are Saul Marantz of Marantz Co., Donald Plunkett of Fairchild, and Raymond Ward of Shure. Continuing directors are Joseph Benjamin of Bogen, Milton Thalberg of Audiogersh, William Grommes of Grommes and Walter Stanton of Pickering.

(Continued on page 29)

# AVR



## the NEW PERMA-POWER

Model D-200

# Automatic Voltage Regulator

will make you money and save you grief

**It's easy to sell.** There have been units similar to this on the market before—at prices upwards of \$75.00. The new PERMA-POWER Automatic Voltage Regulator has a list price of \$9.95—so any TV set owner can afford it . . . and any customer plagued by picture flutter, shrinking, flop-over, loss of brightness, and other similar disturbances will want it.

**It's easy to use.** This new unit insures top performance of TV sets by automatically returning full height and width to pictures when distorted by low line voltage. Whenever the line falls below 110 volts, it automatically boosts line voltage 10 volts—and it automatically feeds the line direct for normal voltages. You don't have to worry about the customer's forgetting to switch the voltage regulator when the line is normal; this new PERMA-POWER unit switches automatically!

**It's easy to install.** You plug it in, and it's ready to work; goes on and off with TV set. Compact and lightweight, it has no tubes, ballasts, relays, or other moving parts to fail; and it's fully guaranteed for one year. Can be used on any TV set or appliance rated up to 300 watts. See it at your distributor today.

**Perma-Power** COMPANY 3104 N. ELSTON AVENUE  
CHICAGO 18, ILLINOIS

Visit the Sorenson Booth at the IRE Show—March 21-24

See  
What's

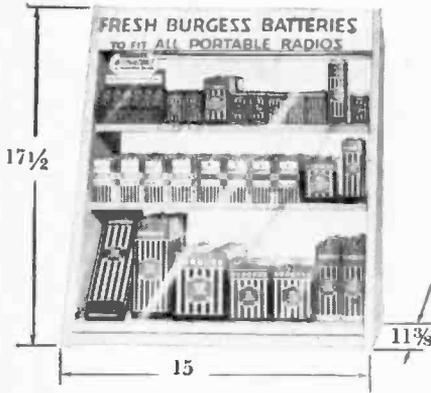
# NEW FOR YOU

## IN THE BURGESS

### 1960 PORTABLE RADIO BATTERY PROMOTION

Brand New

#### DRAMATIC MERCHANDISERS



#### No. 601 Glass Front Counter Fixture Display

Attractive display fits needs of all types of dealers. Glass front, wood sides, open in back. Three sturdy shelves display large selection of batteries. Encourages fast buying action in heavy traffic spots in your store. Height 17 1/2"; Width 15"; Depth 11 3/8". Counter fixture included with No. 601 Portable Radio Battery Assortment.

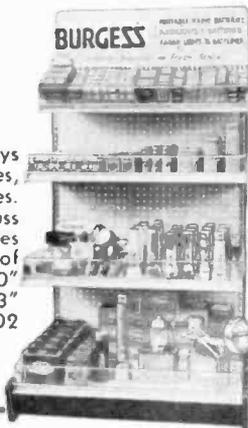
#### No. 604 Counter Merchandiser

One compact display-packaged assortment sells the most popular battery types for all makes of transistor and tube type portable radios. Compartmentalized plastic tray displays batteries most effectively and shows exactly how many of each type of battery has been sold. Makes re-ordering a "snap." Complete display assortment attracts customers, shows type of batteries required for all makes and models, lists retail prices, and makes it easy to sell batteries. Counter Display is FREE with the No. 604 Assortment.



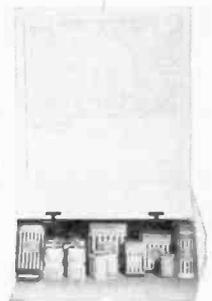
#### No. 602 Store Fixture Floor Display

Standard half-gondola store fixture displays complete line of portable radio batteries, flashlights, lanterns and their batteries. Beautiful merchandiser sets up easily; glass binned shelving is pre-assembled. Shelves are adjustable. It takes full advantage of your store traffic to build impulse sales. 30" wide; 50" high (60" with sign); and 23" deep. Floor display included with No. 602 Store Fixture Assortment.



#### Space For Back-Up Stock

Additional quantities of the most popular batteries included with No. 604 Assortment display. Compartment for this back-up stock is in rear of display.



## FREE! DYNAMIC NEW POINT-OF-PURCHASE SALES AIDS!



Customers will sell themselves with Burgess' complete and up-to-date sales aids! Ask us how you can get special point-of-purchase sales aids to build volume impulse sales during the 3 big holiday week-ends in 1960.

#### OTHER POINT-OF-PURCHASE AIDS!



No. 591  
Attention-Compelling  
Motion Display

No. 592  
Compact All-Metal  
Counter Display



No. 379  
Simpson  
Battery Tester



No. 581  
Corrugated  
Floor Stand  
Display

No. 42A  
Sterling  
Battery Tester



Contact  
Your  
**BURGESS**  
Distributor  
for full  
Information  
**Now!**

## BURGESS BATTERIES

**BURGESS BATTERY COMPANY**  
FREEPORT, ILLINOIS  
DIVISION OF SERVEL, INC.



(Continued from page 26)

REK-O-KUT announces a Feb. dealer contest offering a Tropical Holiday trip to Nassau. Photos of the best window or island display must be in by March 1.

LANGEVIN is making two of its broadcast type amplifiers available to consumers. Model HF138S 8-watter is \$192. HF128S 20-watter is \$219.

CLEVITE publishes the Walco 1960 needle catalog covering different cartridge brands, needle manufacturer cross-reference and phono models.

TELEX introduces the Dyna-Twin dynamic headset for teaching and communications. Response is 50-15,000 cps, sensitivity 80 db above .00204 dynes/sq. cm.

ALLIED RADIO announces the Knight 812A 12" 2-way speaker @ \$69.50, and 815A 15-inch 2-way @ \$89.50. 815A rating is 20-20,000 cps, 50 watts, resonance 25 cps. The company also publishes 36-page booklet, "This Is Stereo High-Fidelity," available for 25¢.

ADVANCE ACOUSTICS announces the development of the 440 Bi-Phonic Coupler, a coneless speaker system which diffuses sound front and back. According to Pres. Abraham Cohen, the unit causes a wood panel to vibrate like a violin body. Price through limited franchise dealers is under \$135.

GEOGRAPHIC DISTRIBUTION of 2362 hi-fi specialists reported by NCO revealed the following pattern: New England, 142; Mid-Atlantic, 479; South Atlantic, 255; South Central, 299; East North Central, 420; West North Central, 178; Mountain, 127; Pacific, 414; Alaska, Hawaii & Canada, 48. Total nationally is 2362. Top state by far is California, with 344 hi-fi specialists. Largest 1959 increase was in New York, up 64 to 282.

# What's the latest score on cartridges?

<input checked="" type="checkbox"/>	<b>1<sup>ST</sup></b>	ceramic cartridge was invented by Sonotone...
<input checked="" type="checkbox"/>	<b>13</b>	years ago. Today, over...
<input checked="" type="checkbox"/>	<b>65</b>	different manufacturers have specified Sonotone for...
<input checked="" type="checkbox"/>	<b>662</b>	models of high-quality phonographs. Altogether over...
<input checked="" type="checkbox"/>	<b>9,000,000</b>	Sonotone Ceramic Cartridges have been used for original and replacement purposes. ('Nuff said!)

## Sonotone PROG. P.

Electronic Applications Division, Dept. C9-30

ELMSFORD, NEW YORK

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

Leading makers of fine ceramic cartridges, speakers, microphones, electronic tubes.



## Buss and Fusetron Fuses

*... help you safeguard your reputation  
for Service and Reliability!*

Undoubtedly, you take pride in the good name your business has established for sales and service . . . and try to avoid handling any products that could result in customer dissatisfaction . . . which in turn can affect your sales curve.

That's why it doesn't pay to gamble with fuses that could be faulty and create trouble for you and your customers — either by failing to protect and causing useless damage to equipment, or by blowing needlessly and causing unnecessary shutdowns.

With BUSS and FUSETRON fuses safe, dependable electrical protection is assured. Before one of these fuses ever leaves our plant, it is electronically tested to make sure it is right in every way . . . to make sure it will protect, not blow needlessly.

When you sell or install BUSS or FUSETRON fuses, you can forget about customer complaints and costly call-backs. You are sure too, that you provide your customers with the finest electrical protection possible which, in turn, helps protect your reputation for service and reliability.

To meet all fuse requirements, there's a complete line of BUSS and FUSETRON fuses in all sizes and types . . . plus a companion line of fuse clips, blocks and holders.

For more information on BUSS and FUSETRON Small Dimension fuses and fuseholders, write for BUSS bulletin SFB.

**BUSSMANN MFG. DIVISION,**  
McGraw-Edison Co.  
University at Jefferson, St. Louis 7, Mo.

360

*BUSS fuses are made to protect - not to blow, needlessly.*

*BUSS makes a complete line of fuses for home, farm, commercial,  
electronic, electrical, automotive and industrial use.*



# ELECTRONIC TECHNICIAN

Including  
**SERVICE**  
Magazine

## *The Three Faces of Industry*

As a general rule, most industries go through three stages as they mature, each with its own attendant problems.

First, there is the development stage. This encompasses scientific discovery, experimentation and product design. Though these functions usually continue in the stages to follow, in a basic sense they occur once and are responsible for the genesis of an industry.

Second, there is the marketing stage, which concerns itself with the problems of getting products into the hands of customers. The sales pattern and merchandising techniques are of prime concern to management.

The third stage is financial, a period demanding sophisticated understanding of the most efficient means for allocating resources. Effective cost accounting, critical business analysis and solid investment management are the order of the day.

What is particularly interesting about the structure of the electronic field is that different industry segments are in different stages, almost as if they were different industries. Rapid technological changes have contributed to making this come to pass.

Consumer radio-TV designs have become well established, and the sales and service structure has firmed (first and second stages). In the present third stage, set manufacturers and service dealers alike must concentrate on evolving efficient financial methods to produce satisfactory profits, while giving the consumer the most for his money. For technicians this means effective shop management, inventory control, cost analysis and investment in up-to-date equipment.

Hi-fi components are an interesting case in point. With the development of widely available stereo units, we enter the second stage area of setting up sales channels to the mass of consumers. Currently there are only a few thousand outlets selling hi-fi components. Service dealers can open many thousands of new sales outlets to reach large population segments which have been virtually untapped. And hi-fi servicing can be quite profitable.

Industrial electronic controls is an area representing the first stage of developing devices to help industry meet its production needs. Both independent and factory-employed technical specialists are learning how to keep industry's electronic equipment in good working order. The means for marketing the potential of electronics to industry at large is in its earliest stages. The growth opportunities for industrial electronic technicians are impressive indeed.

These then are the three faces of industry—development, marketing and financing. Their impact on every business, whether one-man shop or giant manufacturer, demands that every business manager indulge in some critical self-appraisal to see where he is going.

# Tuning In the

**PUBLIC AFFAIRS** should be of prime interest to every citizen. One service dealer, Antonio Catavolo, proprietor of Elm Radio and Vice Pres. of ETG of Massachusetts, takes full page advertisements in the newspaper to encourage improved education. Here is a small sample: "Johnny has become a pig in a beautiful pig-pen—stuffed with garbage, soon to be set adrift, unprepared. The teachers are glorified baby sitters because they cannot overcome tradition, custom, fear of progress. They are not properly equipped and cannot produce desired results . . . parents should insist on the use of modern, up-to-date improvements in audio-visual aids . . . to encourage, to educate every student."

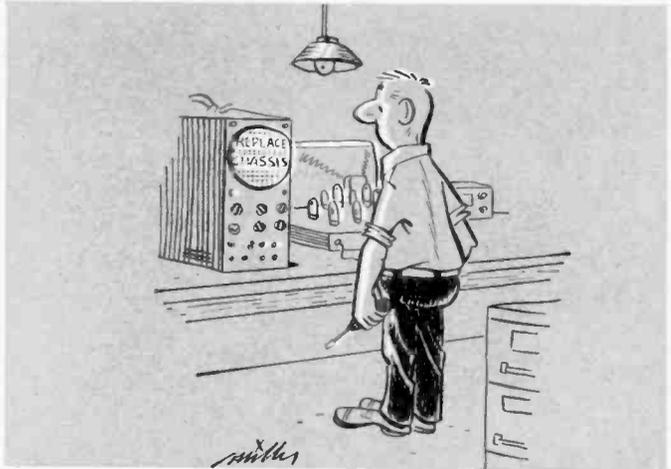
**AUTO ELECTRICAL INTERFERENCE** protection for radio and TV reception is the result of a new cooperative action by motor vehicle producers, the Automobile Manufacturers Association. The TMA Board of Directors has recommended to U. S. car, truck and bus makers that a concerted effort be made to suppress interference-producing electrical radiation in all motor vehicles, based on new standards established by the Society of Automotive Engineers.

**UHF TV** production has been requested by the FCC. The commission wants Congressional permission to require manufacturers to make TV sets capable of ultra-high frequency, as well as the normal very high frequency reception. A Senate Commerce subcommittee was also asked to approve appropriation of \$2,500,000 for a study, largely in New York City, into means of increasing the quality and range of UHF broadcast.

## TV THROUGH A PIPE



TV pictures are being transmitted more than half a mile (3,600 ft.) through a hollow metal pipe (arrow) 3 inches in diameter. Developed by ITT to provide simultaneous transmission of 400 TV channels or several hundred thousand telephone conversations, the "pipe" system is expected to ease burden of existing communication facilities.



**CAPEHART** is reportedly planning to introduce a line of TV and stereo consoles before midyear. This line was discontinued sometime ago. The company is said to be planning to market its products through a maximum of 500 dealers, and is setting up franchised service agencies to install and maintain the equipment. The units will carry a 90 day in-home service warranty in addition to the one year parts warranty.

**ELECTRONIC AIR CONDITIONERS** and refrigerators may be produced by at least nine electronic manufacturers in Japan by next summer. Applying a theory that some semi-conductor elements alter air temperatures when placed in contact with other semi-conductors, engineers of these firms believe they will be able to turn out elements which can be used efficiently for home air conditioners and refrigerators.

**STATE PRISON** officials, following a riot at Wethersfield, Conn., uncovered a secret radio network, run by and for prisoners and used to keep check on guards' movements. The network's tiny transmitters sent voice signals to other inmates' radios, but the weak transmissions did not penetrate the prison walls.

**FOREIGN ORIGIN LABELING** is urged by the Import Study group of the Association of Electronic Parts and Equipment Manufacturers, Inc. Companies handling foreign-made electronic components should make certain that the country of origin is clearly marked on products, packing, advertising, and literature, in compliance with Federal Trade Regulations outlawing deceptive trade practices. These requirements apply to all levels of supply, from the manufacturer to the ultimate user.

# Picture .....



**INTERCONTINENTAL TELEVISION** may soon be possible, according to the Air Force Cambridge Research Center. An experimental program by the Navy and Air Force showed that there was a radio pipeline about 5,000 feet above the South Atlantic Ocean, which can carry radio voice and TV-type signals with very little loss between South America and Africa. Until now, dependable year-round undistorted transmission of signals in TV frequencies for long distances over oceans has not been possible. A world atmospheric data study pointed to other such radio ducts—between California and Hawaii; Cape Verde in Africa and Puerto Rico; in the Indian Ocean; and from the Philippines to Australia. Such ducts provide a broad transmission band, capable of accommodating voice and visual signals with little distortion.

**DEALER** in New Orleans is reported to include a hidden charge of \$3.00 on portable stereo units to take care of servicing, for 90 days. The hidden charge for consoles is \$15.00. The owner states that while he may lose an occasional sale because the hidden charge increases the price beyond competition, he finds that the relations with customers are improved.

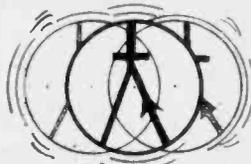
**SUPERSENSITIVE TV CAMERA TUBE**, the new image orthicon GL-7629, is interchangeable with standard tubes, but requires only 1/10 to 1/20 the light, announces GE. Usable for black-and-white, it promises to extend the application of color TV.

## CALENDAR OF COMING EVENTS

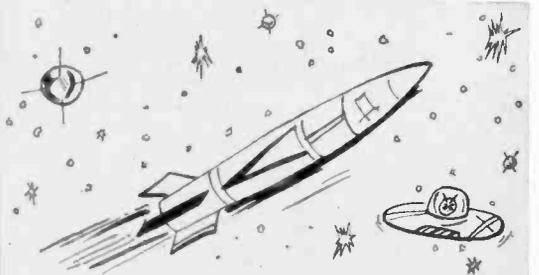
- Mar. 16-18: Electronic Industries Assoc., Spring Conference, Statler-Hilton Hotel, Washington, D.C.
- Mar. 21-24: IRE National Convention, Coliseum and Waldorf Astoria Hotel, New York, N.Y.
- Mar. 24-25: IRE Professional Group on Human Factors in Electronics, 1st Annual Symposium, Bell Telephone Laboratories Auditorium, 463 West St., New York, N.Y.
- Mar. 27-31: Scientific Apparatus Makers Assoc., Annual Meeting, Boca Raton Hotel, Boca Raton, Fla.
- Apr. 4-7: 1960 Nuclear Congress & Atomic Exposition, New York Coliseum, New York, N.Y.
- Apr. 7: Instrument Society of America, Digital Computers Clinic, Philco Corp., Willow Grove Plant, Willow Grove, Pa.
- Apr. 18-19: Conference on Automatic Techniques, Sheraton Cleveland Hotel, Cleveland, Ohio.
- Apr. 20-22: S.W. IRE Regional Conference & Electronics Show, Shamrock-Hilton Hotel, Houston, Tex.
- Apr. 29- May 1: Producers of Associated Components For Electronics, Annual Meeting, Nevele Hotel & Country Club, Ellenville, N.Y.
- May 2-4: National Aeronautical Electronics Conference, Baltimore and Miami Hotels, Dayton, Ohio.
- May 3-5: Institute of Radio Engineers, American Institute of Electrical Engineers and Association for Computing Machinery; Western Joint Computer Conference, Jack Tar Hotel, San Francisco, Calif.
- May 9-12: Instrument Society of America, Instrument-Automation Conference and Exhibit, Brooks Hall, San Francisco, Calif.
- May 10-12: Electronic Components Symposium, Hotel Washington, Washington, D.C.
- May 16-18: Electronic Parts Distributors Show, Conrad Hilton Hotel, Chicago, Ill.

## RANDOM NOISE

CLAIMING THE WORLD'S FASTEST SWITCHING TRANSISTOR, RAYTHEON'S NEW 2N1468 SILICON UNIT SWITCHES 200 MILLION TIMES FASTER THAN AN EYE'S BLINK.



Len ROTTER



RCA V-P SAYS, JUST ONE MISSILE LAUNCHING MAY REQUIRE 100,000 ELECTRON TUBES FOR ROCKET AND CONTROL STATIONS.

DID YOU KNOW? A CRT'S ION TRAP SHOULD BE ADJUSTED WHEN HIGH VOLTAGE CIRCUITS ARE REPAIRED?



# Install Antenna Lightning Protection

## Protect Property With Correct Antenna Placement, Wire Routing, Grounds And Lightning Rods

LEO G. SANDS

• Although antennas can invite lightning to strike, they shouldn't create a lightning hazard. Damage to nearby property—and even lives—can be minimized or avoided by properly grounding the antenna. Each year, lightning in the United States alone causes damage amounting to more than \$120,000,000, kills around 600 people and injures up to 1,500 others. It is the cause of more than 1,500 reported fires annually.

Much is still unknown about

lightning. However, it is believed that lightning is caused by the earth and the lower surface of a cloud assuming opposing electrical charges. The earth is usually (not always) positive, the cloud negative. A huge condenser is formed, with the atmosphere serving as the dielectric. The two points of each, closest to one another, provide a spark gap. When the charge across the spark gap gets high enough (100 million to one billion volts), flashover may occur. Present theories indicate that a small discharge takes place from the cloud to an object on the earth,

ionizing the air around it and reducing its electrical resistance. This is followed by a big flash in the other direction, from the earth to the cloud, which is comparable to a d-c arc. Experts point out that lightning strokes from the Empire State Building shoot upward to a cloud. But, first there is a *leader* flash from the cloud to the building, which creates the path for the big, upward flash. The current may run anywhere from 250 to 500,000 amperes.

Lightning is most apt to strike a lone object such as a tree, antenna or building which is isolated from

Fig. 1—A metal mast or pole higher than other objects in the area will provide a protective cone against lightning discharges when its base is properly grounded.

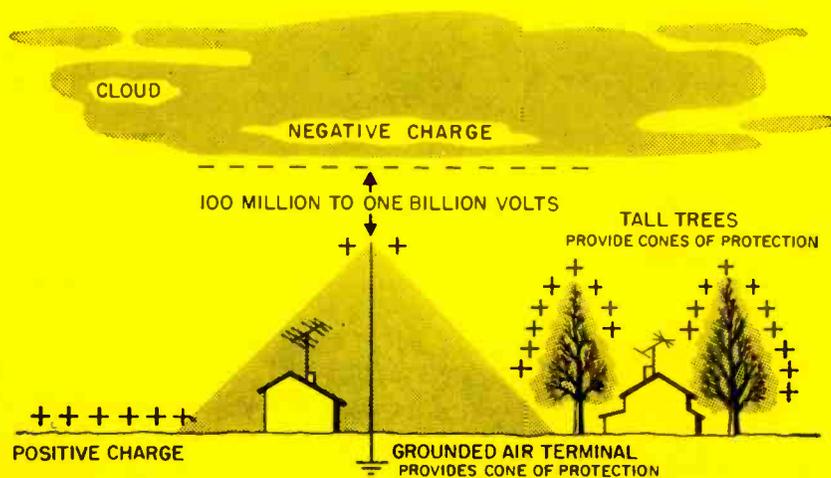
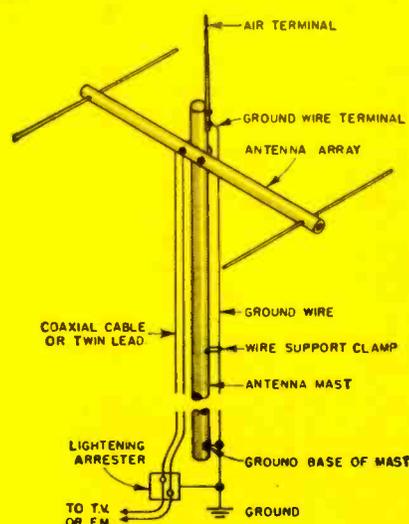


Fig. 2—A mast-mounted ground rod above the antenna can provide lightning protection.



other tall objects, and particularly, if it is on top of a hill. The object which is closest to a charged cloud is most likely to get hit. An antenna on the roof of a building, above other nearby objects, may become one of the electrodes of a spark gap when it is the object nearest to a charged cloud.

At a railroad station in New Jersey, a mobile system base station antenna perched high upon the steeple of the depot was struck so often that the railroad abandoned this otherwise ideal antenna site for one that would place the antenna within the cone of protection of the steeple itself. An antenna was destroyed each time it was struck and the cost of replacement became excessive. The radio equipment, however, was not damaged, since it was effectively grounded.

Treating an antenna for lightning protection does not guarantee immunity from lightning strokes or lightning damage. However, it might prevent a disastrous fire and may reduce damage if lightning does strike the antenna. Aside from lightning, static is drained off. Sometimes these static charges get enormous. A few years ago when the writer was testing a railroad radio base sta-

tion in Atlanta, Georgia, he noted that a spark jumped from the coaxial connector at the end of the antenna transmission line to the radio equipment—when the two were disconnected and separated by about six inches. It takes a dangerously high voltage to jump across such a gap. Had the antenna been grounded, it would have been at ground potential and the static accumulation would not have occurred.

Without touching the antenna system, it can be protected from lightning by installing a grounded air terminal (lightning rod) above it. An air terminal, in this case, could simply be a metal pole or other vertical support which extends above the antenna. When the air terminal is properly grounded, it provides a cone of protection to the objects below it within the cone as shown in fig. 1. Another way to do this is to install a tall vertical pipe or metal mast, near but independent from the antenna, so that its top protrudes above the antenna. However, it must be borne in mind that either might cause some distortion of the antenna's directive pattern, if the antenna is vertically polarized.

### TV Antennas

TV antennas, which are horizontally polarized, as well as horizontally polarized HF, VHF and UHF communications antennas, can be readily protected by installation of an air terminal above the antenna as shown in fig. 2. Or, when a metal pipe is used for supporting the antenna, the pipe itself can be made to act as an air terminal simply by positioning the antenna about two feet below the top of the mast. It is believed that capping the open top end of the pipe with a metal ball or a sharp spike will make it more effective as an air terminal.

The air terminal as well as the top and base of the mast (particularly when the mast consists of two or more sections) should be grounded to a common ground bus. Details on the ground system will be given later.

When twin-lead is used, a lightning arrester should be installed on the outside of the building, but near the point where the lead-in enters the building. The lightning arrester ground terminal should also be grounded to the air terminal ground.

Fig. 3—A typical vertically polarized coaxial antenna affords little equipment protection from heavy lightning discharges.

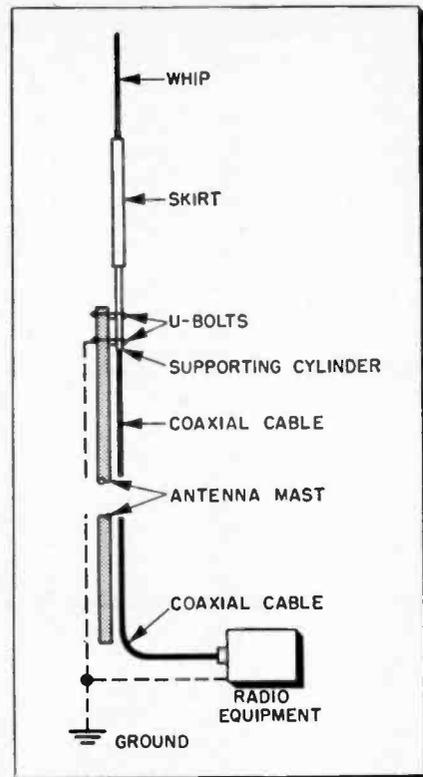
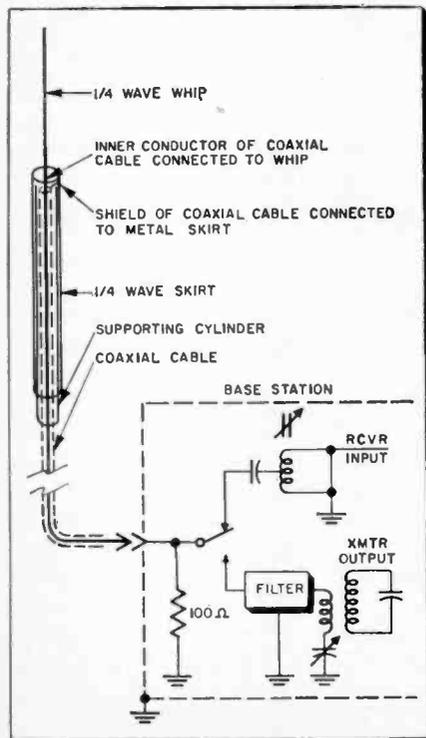


Fig. 4—Lightning protection is provided by joining the metal cylinder and mast and grounding through heavy gauge copper or aluminum wire. Equipment chassis should be connected to the same ground.

### Vertically Polarized Antennas

A communications antenna is grounded, partly at least, via the shield of the coaxial cable or hollow transmission line—if the radio equipment chassis is grounded. As shown in fig. 3, the radiating element of a typical vertically-polarized base station antenna is not grounded adequately to afford any appreciable lightning protection. It can be seen that when the antenna plug is disconnected from the radio equipment, the whip and skirt of the coaxial antenna are insulated from each other as far as d-c is concerned. When the plug is connected, the antenna whip is grounded to the equipment chassis via either the transmitter or receiver input circuit or a resistor as shown in fig. 3. The antenna skirt is grounded to the equipment chassis via the shield of the coaxial cable.

In the event lightning strikes the antenna, it will probably seek out the whip. Very high current will then flow through the center conductor of the coaxial cable, the coaxial connectors, the shunt resistor (if there is one), the antenna relay contacts and through the receiver or transmitter antenna coil, depending upon the setting of the relay. This current will undoubtedly be so high

that the cable's inner conductor will burn out. There have been cases reported in which the conductor of a rubber covered wire had completely disappeared without apparent damage to the insulation. It is quite likely that the stroke would destroy the

supporting hardware meet, may be grounded in the same manner as above. See Fig. 5.

Some mobile system base station antennas have a certain amount of lightning protection built in. The Unipole, for example, employs a trombone-type U-shaped vertical radiating element. One end of the U is connected to the center conductor of the coaxial cable leading to the radio equipment. The other end is connected to the ground plane of the antenna. For d-c, the radiating element is grounded, but not for r-f at the operating frequency. By grounding the antenna base, the entire structure is at d-c ground potential.

The Bendix lance antenna contains an internal matching stub which applies a d-c short circuit across the two halves of the antenna. Grounding the supporting hardware grounds the entire antenna. Some antennas are provided with a built-in lightning arrester in the form of a toothed lock washer whose points come close, but do not touch the inner conductor of the antenna cable.

In some special antenna designs, a top cap is provided which is above the vertical radiating element and can be grounded. Maximum protection is afforded by extending a grounded element above the antenna radiating sections. With conventional vertically-polarized antennas, this is difficult to do without causing distortion of the antenna's radiation pattern.

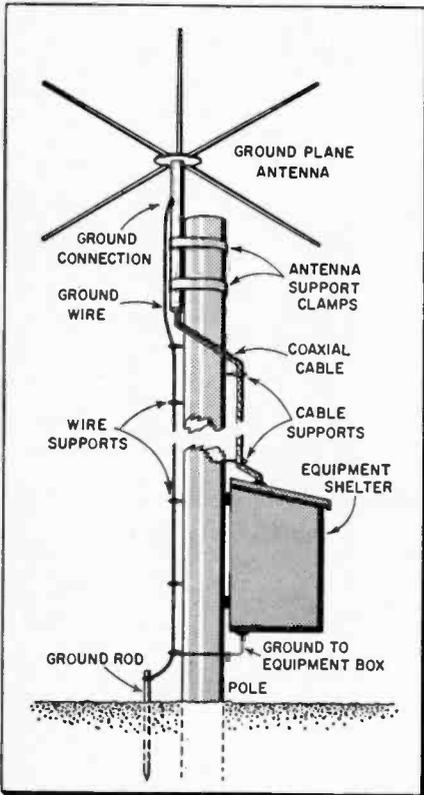


Fig. 5—Heavy gauge copper or aluminum wire from a ground-plane antenna base to a heavy rod driven deep into the earth will give optimum protection from lightning.

antenna and transmission line and cause extensive damage to the radio equipment.

Fig. 4 shows how such an antenna can be treated to provide better lightning protection. The metal cylinder which protrudes downward from the antenna skirt, and which is attached to the antenna mast to support the antenna, should be grounded through a solid copper or aluminum wire. This grounds the lower half of the antenna. Static charges are dissipated to ground via the radio equipment's antenna circuits, if the equipment is grounded. Preferably, the equipment chassis should be connected to the same ground as the antenna protection ground.

The same kind of treatment may be applied to a ground plane antenna. The base of the antenna, where the ground plane radials and

When feasible, only one ground should be used; the radio equipment, lightning arrester, air terminal, antenna mast (if metal) and antenna supporting hardware being connected to the same ground. The best ground connection is usually a cold water pipe with connection made near to the point where it enters the ground. Obviously, a sturdy ground clamp should be used. When a cold water pipe is not available, a 6-foot ground rod may suffice if the ground is moist. When the ground is dry, several ground rods should be installed radially and connected as shown in fig. 7. Sometimes this is impractical and improvisations may be necessary.

In areas where the land is dry, it may be difficult to obtain a low resistance ground. In such cases, adequate grounding, as far as lightning

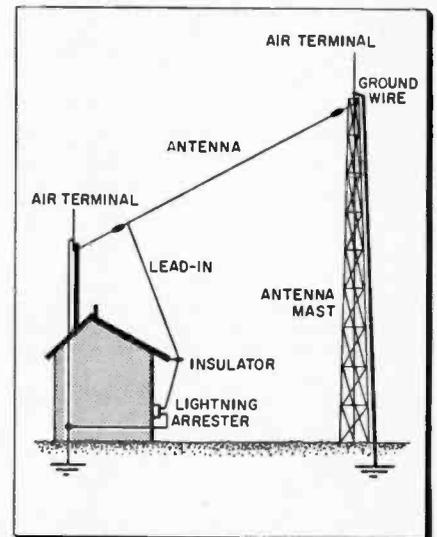


Fig. 6—A greater degree of protection can be made available for base station equipment by erecting air terminals on all masts.

### Wire Antennas

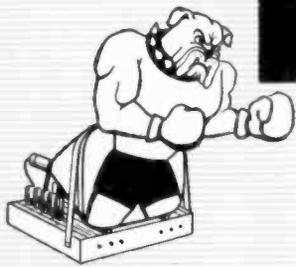
It has been common practice for almost half a century to use lightning arresters in connection with outdoor antennas made of wire. When properly installed, some protection is afforded. If the antenna wire protrudes above surrounding objects, it may be struck. The arrester may prevent damage to the radio equipment, and then again it may not. It will, however, aid in bleeding off static accumulation on the antenna.

Greater protection can be obtained by installing one or more air terminals as shown in fig. 6. An air terminal is installed on the top of each antenna mast. Each may be grounded independently. However, if the distance between the two masts is small, they should be connected to the same ground.

protection is concerned, may be obtained by installing several ground rods or burying wires which extend radially from a common point. In some instances, a counterpoise is used. A counterpoise, as old timers in radio will recall, is used in lieu of a ground and consists of an array of wires resembling an antenna, placed near, but above the earth's surface.

The ground wire, ideally, should run straight down from the antenna to ground. Kinks and bends offer high impedance to the sharp leading

(Continued on page 57)



# "Tough Dog"

# Corner



## Difficult Service Jobs Described by Readers

### Heaters Too Cool

When called to service a Motorola TS-410A chassis, the complaint was a dim raster, small picture and a vertical fold-over at the bottom—plus weak sound. Since a B+ fault was suspected and the set had soldered-in selenium rectifiers, it was brought to the shop. Our experience has indicated that merely changing seleniums in the home without a thorough check of electrolytic filters, circuit load, etc., plus a regular heat-run, results in a high call-back rate.

I checked the B+ with a VOM and it was right on the nose—250

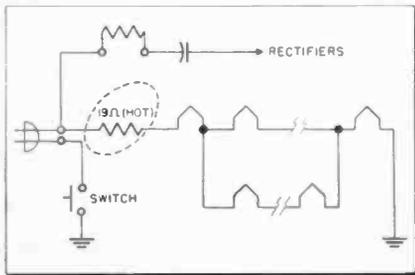


Fig. 1—The temperature coefficient changed on this "globar," resulting in lower-than-normal voltage on tube heaters.

volts! B+ boost was low, however. Our shop routine specifies checking all tubes at this point and after replacing a few that checked faulty, including a 12BH7 vertical tube and one sound tube, the set's sound returned to normal. But now there was a bright horizontal line across the screen.

Subsequent vertical circuit checks revealed that the new 12BH7 had just gone out. After replacing this tube again the set now worked exactly as it did when first brought in—including weak sound!

I again checked B+ boost and

found it low. Inspecting the horizontal oscillator and amplifier section revealed that their 150 volt B+ line was below normal, with low drive at the horizontal output tube's grid. A re-check of the higher B+ again confirmed it to be 250 volts!

Attacking the sound section, I next changed the 25L6 audio output tube, though it tested "good" on the tube checker. The 150 volt B+ rose to normal.

Again using a VOM, I began checking along the boost line, eventually arriving at the 12BH7 vertical tube. The drive on pin 7 was near normal.

While sizing up the situation and lighting what I considered to be a well-deserved cigarette, I observed that most of the tube heaters appeared to be throwing off a little less than the normal amount of light. This is crazy, I thought to myself, as I reached for my VOM probes.

A check of the tube heaters, according to specifications, indeed indicated lower than normal heater voltages throughout the string. Since all tubes showing any faults had previously been replaced, I next checked the globar resistor, shown in Fig. 1. It was obvious the globar's resistance was too high when hot.

After replacing the globar, both the set and I resumed normal operation in every respect.—L. C. Kisor, Beaverton, Oregon.

### TV Antenna Completes Circuit

I answered a service call on a Crosley TV model 10-421MU, with the complaint, "poor vertical hold and horizontal slipping." Replacing the sync amplifier and horizontal afc tubes I adjusted the horizontal phasing. (In order to perform the latter

it was necessary to remove the chassis from the cabinet.) After making this adjustment the set appeared to work fine.

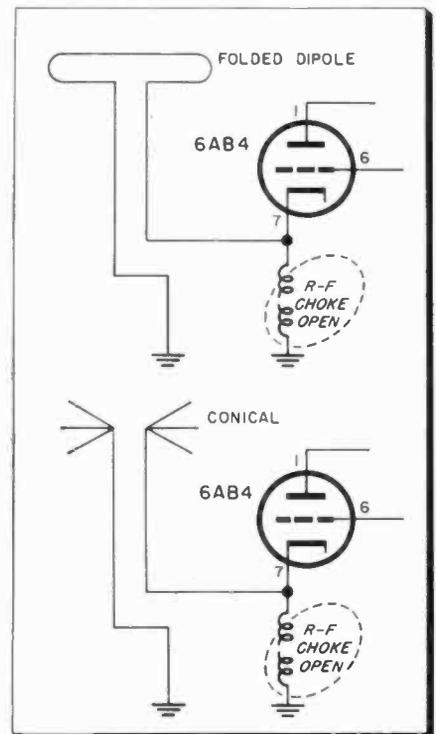


Fig. 2—With the cathode r-f choke open, TV set worked on a folded dipole antenna—but didn't operate on the customer's conical.

Replacing the chassis in the cabinet I turned the set on and the picture was snowy. I then substituted the tuner tubes—with no improvement. After checking the lead-in and antenna, I removed the set to the shop.

Connecting the set to the antenna and turning it on, the picture came in clear and sharp—with plenty of  
(Continued on page 88)

# Service That Audio Amplifier

## Additional Test Equipment

## & Different Service Approach

## Needed For Hi-Fi Repairs

MANNIE HOROWITZ  
ELECTRONIC INSTRUMENT CO. INC.

• Audio amplifiers are frequently dismissed by TV service technicians as one of the simplest circuits to repair. In view of the relative complexity of television circuitry, this attitude may be warranted. Accordingly, better-quality audio amplifiers should be a snap to service, yet TV specialists shy away from this work.

How can this contrary condition exist? Simply because hi-fi work is perfectionist service, while TV work is not. Where radio-TV owners have a reasonable degree of tolerance concerning the operating condition of their sets, hi-fi owners are abominable perfectionists. It isn't unusual to find possessors of hi-fi equipment listening for defects, rather than music.

Consequently, the TV service approach to hi-fi does not suffice. Getting the sound back to the intelligible point is not enough. Proper equipment (which most shops already have) and an intelligent, patient service technique are fundamental *musts* when applying audio amplifier repair knowledge to quality sets. In addition, the labor charges must, of necessity, be higher.

### Test Instruments

Where qualitative analysis is needed, accurate test equipment must be used. Basic audio test equipment consists of: oscilloscope, sine-square wave generator, a-c voltmeter, and the normal complement of other equipment, such as capacitor-resistor decade boxes, VOM, dynamic tube tester, etc.

There isn't any limit to "accuracy"

in instruments. Invariably, you get what you pay for, give or take some individualized features. The more accurate the instrument—the less interpretation of readings will be necessary. Even a grossly inaccurate piece of equipment can give fairly correct results—if you have the time and patience to learn the instrument's direction of error and compensate for it. This, of course, is not desirable.

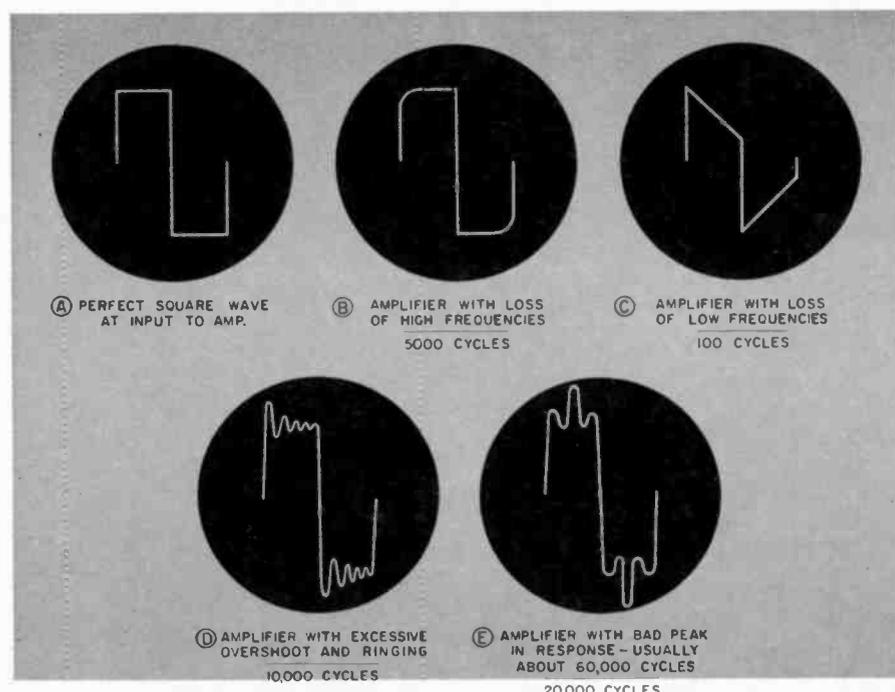
Audio work requires a scope exhibiting a bandwidth of 20 to 50,000 cycles in the vertical section, although it is more desirable to have a scope with a response from d-c to

about 200,000 cycles or more. In the latter instance, the scope can serve the dual purpose of checking for proper square wave response of an amplifier as well as for TV alignment applications.

Other characteristics of the scope are as follows: the trace should be thin and bright. A sine wave applied to the vertical amplifiers should not appear distorted on the screen. The sweep oscillator in the scope should synchronize easily with the applied signal.

A second vital piece of equipment is the sine wave signal generator. The distortion must be negligible.

Fig. 1—A illustrates a perfect square wave fed to the input of an audio amplifier. B through E are waveshapes that can appear at the output of the amplifier, indicating various degrees of deficiencies. D and E may indicate instability.



Observe the waveshape on an oscilloscope to check that no trace of distortion is apparent. If there is any intention of doing careful work with distortion analyzers, the measured harmonic distortion of the oscillator between 20 and 20,000 cycles should be in the vicinity of 0.1%.

20 to 20,000 cycles is the minimum acceptable frequency range of any audio oscillator. A more desirable range is from below 10 to more than 100,000 cycles. The output should be flat within 1 or 2 db over the complete range.

A square wave generator is useful for checking bandwidth, power peaks or excessive ringing. Fig. 1 shows an idealized square wave as well as the waveshapes resulting from the aforementioned conditions. Approximate frequency response checks can be made rapidly with a square wave generator. Sine square-wave generators in one unit are commercially available which can serve well in ordinary troubleshooting functions.

It is advisable to have an a-c voltmeter with a frequency response wide enough to monitor the input and the output, as well as measure the power delivered by an amplifier to the load (speaker or resistor). It is further convenient to have two such meters—one at the input and one at the output. If one meter is used, an arrangement can easily be devised to enable the switching of the single meter from input to output, as shown in Fig. 2. The economy in using one meter is logical since this instrument must be accurate, stable, and therefore, fairly expensive. Voltage regulation should be an integral part in the circuitry of the meter. Depressed zero type movements are advantageous, although not absolutely required. The most sensitive range should be at least 0.01 volt full scale deflection. A db scale, as well as a voltage scale, should be printed on the face of the meter.

### Other Equipment

General servicing instruments are naturally needed. A good multimeter (minimum 20,000 ohms per volt) or VTVM is indispensable. If you obtain a VTVM, be certain that the a-c section measures peak-to-peak voltages. This will add flexibility as well as supplement the RMS reading a-c monitor meter previously mentioned.

A tube tester measuring dynamic

conductance is a convenient piece of equipment. A unit with a micromho scale will be helpful for matching output tubes. Avoid emission type testers for quality audio work since they will not give as conclusive information concerning the condition of a tube.

A capacitance and resistance decade box is a real time-saver. This investment will repay itself many times.

An additional equipment aid peculiar to audio service work is a quality hi-fi set-up. Unlike TV or radio, which are complete within themselves, hi-fi equipment is frequently in component form. This being the case, it is imperative that the audio technician have the means for testing the various supplemental units used with the "heart" of a hi-fi system, such as tuners, record changers, etc. Sometimes the difficulty is *not* in the audio amplifier, although symptoms may indicate that it is; and vice versa.

Therefore, it is most helpful to have a quality audio amplifier, with separate preamplifier for added versatility, a properly enclosed hi-fi speaker (or quality head phones) and a sound source, such as tuner or record player. This equipment, like all test equipment, should be maintained in excellent operating condition.

Fig. 2—A DPDT switch conveniently switches the VTVM input to output. Input and output circuitry grounds are independent to avoid interaction. Low capacity shielded wire should be used for connections.

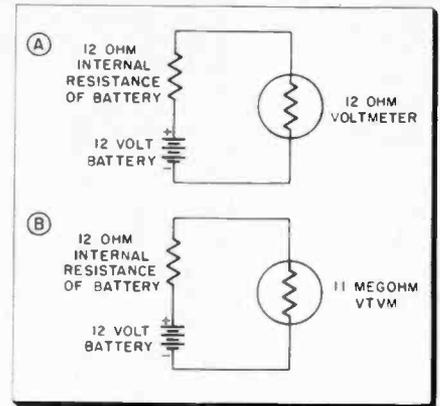
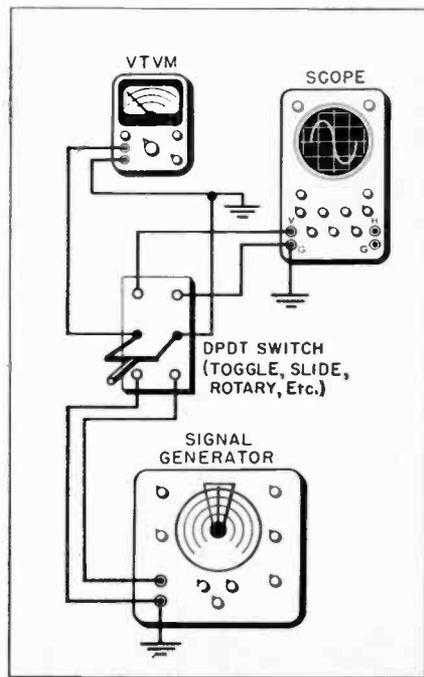


Fig. 3—Erroneous readings can result due to the effect of different meter resistance loads. In A, a 12 ohm voltmeter measures six volts. The 11 megohm VTVM in B measures 12 volts across the battery.

### Troubleshooting

The most economical audio amplifier troubleshooting procedures come with ease after many years of experience. The procedure outlined may seem needlessly long at first glance. However, experience will prove that following the step-by-step procedure and applying logic in each case will eliminate wasteful effort.

The vacuum tube is the component most likely to go bad. Before proceeding with any circuitry tests, check all the tubes. This can best be accomplished by substitution of known good tubes in the amplifier.

After being convinced that all tubes in the amplifier are good, the next logical step would appear to be signal tracing. By chance, this may point out the defective stages. Signal tracing can be very misleading unless the operation is performed with a thorough knowledge of the audio circuit under test. Complications due to feedback loops dictate that signal tracing should be postponed as a means of troubleshooting and used only when other methods fail. [Technicians are divided on this point. Many do prefer the signal tracing method.—Ed.]

The logical step is to check all the voltages in the amplifier with respect to B—ground. An effective procedure is to start at the power supply and work back from the output to the input stages. The cathode voltage is an indication of whether or not a particular tube circuit in question is operating. A second indication is the presence of a voltage drop across the plate load resistor.

(Continued on page 70)



# Uses For Closed-Circuit TV

It's well known that closed-circuit TV has many applications, both present and potential. Such systems can be used in education and homes, industry and commerce, sports and transportation, and on and on.

Presented below is a list of applications prepared by Sylvania's Argus Cameras division. Well over 100 uses are presented . . . and the surface has just been scratched.

## Education

Teach multiple classrooms—1 teacher  
Project complicated experiments  
Church overflow  
Language teaching  
Observation of children in school for blind  
Microscopic & telescopic work

## Industrial

Plant security  
Supervisory aid  
Time Study  
Inspection work  
Observation of furnaces  
Use on large boom cranes  
Power plant night watchman  
Expedite inspection & change notices  
Watch nuclear reaction  
Watch drop testing  
Observe all dangerous tasks  
Use in mines  
Inventory control  
Observe blasting conditions  
Observe ground structure in drilling wells  
Monitoring coffee hour & tardiness  
Icy conditions on power lines  
Observe movement & erection of beams on construction jobs  
Sidewalk superintendents

## Home

Supervise children in pools, sleeping, etc.  
Observe ill people  
Home amusement  
Check on baby sitter  
Home shopping  
Door monitor

## Department Stores

Sales Training  
Stop pilferage, pick pockets

Observe stock depletion  
Displaying of wares  
Store monitor  
Monitor cashier & registers  
Observe customer reaction  
Observe for burglars

## Marine Work

Underwater observation—marine life  
Construction & inspection of bridges, dams, flood control areas, etc.  
Submarine accessory to avoid mines  
Shipboard operation—loading—unloading  
Check docks, visible clearance on locks, floating logs, etc.

## Farms, Kennels, Stables, Zoos

Wild life studies  
Observe cattle in barn  
Close observance of small chicks  
Observe animals in zoo, check on animals in dens, reduce watchmen  
Veterinarians to observe sick animals  
Observe horses in stable

## Sports

Golf—observe swing  
Bowling—watch ball break on alley  
Life Guard on beaches  
Rifle & archery ranges—check hits  
Horse racing, boat racing, track, baseball, football, swimming meets, etc. to observe close-up action and finish

## Medicine

Clinic work—to observe groups  
Observation of operations for teaching  
Observe patients in hospital  
Microscopic displays  
X-ray work—transmit plates  
Silent page for calling doctors  
Dental work  
Extend view of patients in iron lungs, etc.

## Police Work

Police and fire training  
Observe inmates in jails and penitentiaries  
Use in banks—have police control  
Game wardens—to check legal catch  
Allow guards to monitor larger areas  
Check vaults—for burglary and locked-in persons  
Extra line-up for police work. No bright lights and easy transmittal to other areas  
TV camera & infra red for night work  
Observe men in solitary  
Monitor own radar station  
Museums for guarding art

## Advertising

Advertising medium for sale of TV  
Barber shops to show waiting time  
Display restaurant menu  
Monitor kitchen to patrons  
Put screen on outside to show what's going on inside  
Monitor in large restaurants to locate empty tables  
Use as artificial windows

## Trains

Car control at yards  
Check hot boxes on moving trains  
Locate trains in storms  
Check bad weather in snow and in mountains  
Control switching  
Periscope for rear view on trains  
Scenic display to passengers

## Traffic Control

Subway & train control  
Freight traffic—trucks, airlines, buses  
Bus companies to check time & number of buses past stops  
Parking ramp to locate spaces  
Elevators & escalators—have camera on each floor  
Taxi dispatching—install at hotels, airports, etc.  
Customs people to inspect under cars  
Check weather & road conditions ahead  
Point out dangerous areas & blind spots  
Reservation desk & schedule observation  
Automatic intersection—control traffic TV on trucks or docks for backing up  
Rear view mirror on automobiles

## Military

Install on planes for elimination of blind spots  
Miniaturize and use in spy work  
Ground observation  
Observe gun crews—check efficiency  
Observe front lines

## Miscellaneous

Fire fighting equipment  
Observation of forest fires  
Information transmittal from record rooms  
Kinescope & recording  
Rescue squads to locate explosives, gases  
Stock market ticker tape observation  
On amusement rides for ground observation

# Measure Your Service Operations

Survey Gives TV Service Dealer Business Comparison Tool

For Advertising, Tube Sales, Hours Worked, Annual \$ Volume

ANDREW E. KIMBALL  
MANAGER, MARKETING RESEARCH  
REC. TUBE DEPT., GENERAL ELECTRIC CO.

• Last month, G.E.'s extensive survey of business practices among radio-TV service dealers covered characteristics and pricing of TV service work. Another phase of this study, and equally important, is the operating details of the service business. This includes: advertising media, hours worked, dollar investment for equipment, gross receipts, etc. How you compare with others in your profession can help you analyze future business directions.

1. Types of advertising done regularly.

Yellow pages ads and newspaper ads are the most popular types of advertising in all city and dealer size groups, as indicated in Table I, with direct mail also very important in large cities. Dealers in small cities tend to be greater users of newspaper and radio advertising and

lesser users of direct mail than dealers in large cities.

It is interesting to note the large numbers of dealers who do no advertising. As might be expected, most of these are small dealers. These dealers may have sufficient work available without advertising, may have insufficient means to pay for ads, or may feel that reputation and word-of-mouth communication is sufficient.

Large dealers tend to do more of all types of advertising than do small dealers. Speculating on the cause and effect relationship here, it is possible that large dealers are larger because they advertise more than smaller dealers.

2. Percent of receiving tubes sold over-the-counter.

There has been a slight downward trend in over-the-counter sales over the past four years. Over half of service dealers surveyed sell less than 10% of their receiving tube volume over-the-counter. On the other

(Continued on page 54)

TABLE I

Percent of Service Dealers Using							
By City & Dealer	Yellow Pages	Newspaper Ads	Direct Mail or Handbills	Radio Spots	Billboards	TV Spots	None
<b>Over 100,000 population</b>							
Under 1 Technician	53%	22%	33%	3%	—	—	25%
1-3 Technicians	60	37	44	5	7	—	9
Over 3 Technicians	88	68	60	20	—	4%	12
<b>10,000-100,000 population</b>							
Under 1 Technician	65%	27%	30%	11%	3%	—	22%
1-3 Technicians	80	62	32	19	16	—	6
Over 3 Technicians	85	79	37	26	5	5%	5
<b>Under 10,000 population</b>							
Under 1 Technician	50%	39%	24%	13%	4%	—	33%
1-3 Technicians	75	71	29	20	14	—	16
Over 3 Technicians	na	na	na	na	na	—	na

TABLE II

By City Size	Average Hours per Week	
	1955	1959
Over 100,000 population	59	54
10,000-100,000	56	53
Under 10,000	53	52

TABLE III

By City Size	Volume Added by Each Employed Technician	
	Gross Annual Volume*	Net Annual Volume*
Over 100,000 population	\$11,000	\$1,050
10,000-100,000	12,000	1,500
Under 10,000	6,500	850
<b>By Dealer Size</b>		
1-3 Technicians	\$ 9,500	\$1,100
Over 3 Technicians	11,500	1,400

\* Figures above should be recognized as rough indicators only. Volumes shown are median values.

TABLE IV

DEALER SIZE BY NUMBER OF TECHNICIANS	AVERAGE EQUIPMENT DOLLAR INVESTMENT	
	1955	1959
ONE	\$1,000	\$1,500
1-3	\$1,500	\$2,300
OVER 3	\$2,300	\$3,400

TABLE V

By Dealer Size	Percent of Dealers		
	Store Front	Home Shop	Other
Under 1 Technician	60%	37%	3%
1-3 Technicians	88	11	1
Over 3 Technicians	92	4	4

# Stop TV-Radio Interference



Fig. 2—A professional type noise locator permits rapid location of interference sources.

## Identify, Locate & Correct TVI and Radio Disturbances

JERRY WELLS

• Interference complaints received by the Federal Communications Commission last year totaled more than 18,000. This figure, no doubt, represents only a small fraction of interference difficulties, since most persons do not bother to contact the FCC.

Visual and aural irritants caused by external interference have reached immense proportions. This can be more fully appreciated by knowing that the FCC, even with its comprehensive facilities, sponsors

more than 500 cooperative self-help interference committees composed of engineers, TV technicians, amateur radio operators, and others. In addition, a number of technical societies are engaged in practical interference research.

Using proper techniques, much of this interference can be eliminated or greatly reduced.

### Interference Sources

Disregarding interference originating in receiver components, poor antenna connections, and that caused

by multi-path reflections, interference is caused by electromagnetic radiations. Sources can be broadly classified as follows:

1. Appliances and other electrical devices.
2. Electronic equipment.
3. Atmospherics.

### Types of Interference

Electro-magnetic waves radiated by these devices are diverse in character. The electrical group is composed of more than a hundred different offenders, including fluorescent lights, truck and auto ignition systems, dental drills, shoe repair machinery, etc.

Electrical interference comes primarily from sparking motor brushes and make-and-break circuits, flashing light devices, relays, thermostats, etc.

The electronic group includes AM and FM transmitters of all types, oscillators in FM and TV receivers, TV horizontal output circuits, TV relay "boosters," medical equipment, industrial electronic heaters, etc.

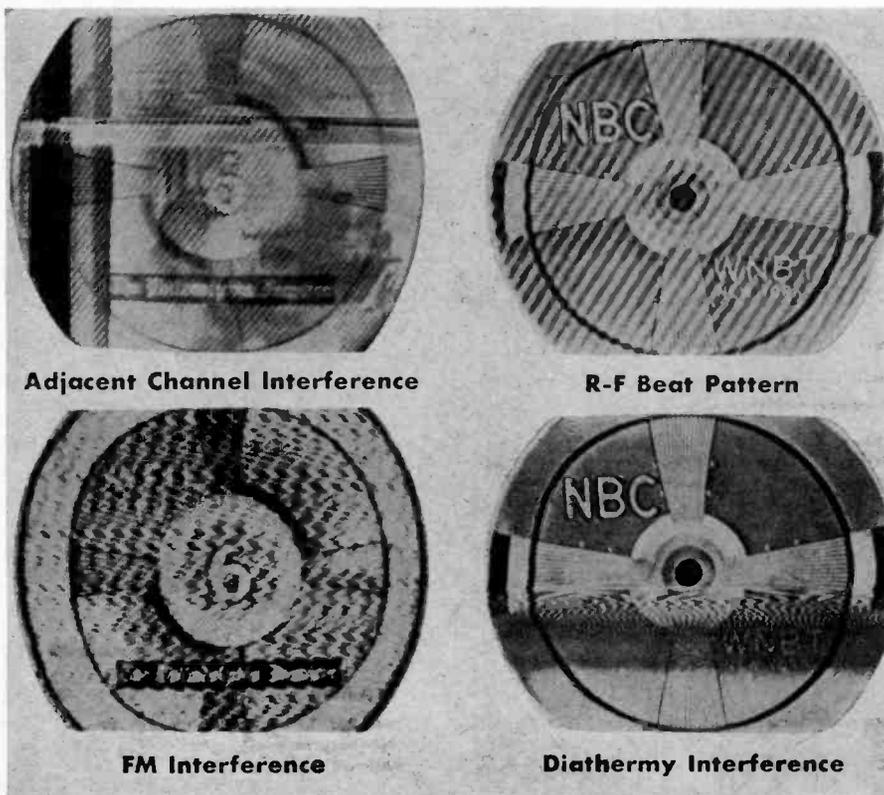
External interference is injected into radio or TV receivers in the following ways:

1. Directly through the a-c or d-c supply line, or by radiation from power lines.
2. Through the antenna and/or feed-line.
3. Direct pick-up by i-f stages.

### Identifying Interference

Before interference can be reduced or eliminated, it is helpful to know how to identify electrical and electronic types.

Fig. 1—Some typical interference patterns as they appear on a TV screen. Each of the forms identified can vary widely, but primary interference characteristics remain the same.



The sound of *electrical* interference from the speaker of a radio or TV approximates the normal background noise. The fact that it generally covers the entire tuning dial or appears on a number of TV channels is the most revealing clue.

Electrical interference on the TV screen may appear as black horizontal streaks, or as black and white dots and dashes, depending upon radiation intensity. It may cover the entire screen or be arranged in one or more horizontal bands. For example, an ordinary light bulb, when oscillating, is somewhat similar to twin Barkhausen oscillations, but appears horizontally across the screen instead of vertically—indicating it's low frequency emission.

The sound of *electronic* interference usually stands out prominently from the receiver's normal background. It can be identified by its audible "whistles," with varying degrees of pitch, and its highly selective tuning characteristic. On frequency modulation, audible whistle may have a bubbling or distorted quality. As previously mentioned, reference is being made only to *external* interference—not to internal receiver faults that frequently create similar sounds.

On the TV screen, electronic interference may appear as a black

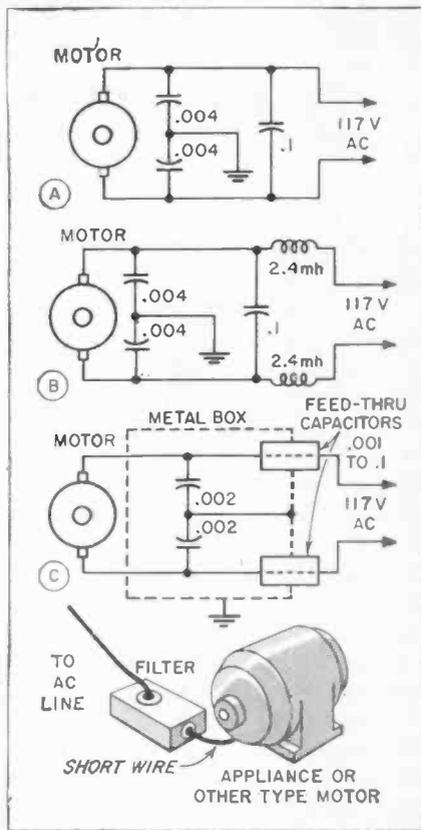


Fig 4 (A)—Delta type filter suppresses interference caused by sparking motor brushes. (B)—Similar filter with h-f chokes. (C)—Using feedthru capacitors enclosed in a metal box gives maximum suppression.

horizontal bar, covering approximately one quarter of the screen; (as strong diathermy) or as a herring-bone, zig-zag pattern, (weaker diathermy).

Other types of horizontal bars may be caused by AM interference. Alternate white and dark vertical or diagonal lines, frequently called "cross-hatching," is caused by some types of c-w interference, including harmonics beating with the i-f, image or picture frequency. Additional types are indicated by "S" curve patterns across the screen. These lines will vary in width, position and number, depending upon the frequency and frequency variations of the interfering signal. See Fig. 1.

If the interference is on or near an r-f band and is beating with the TV picture or sound carrier, little or no change will take place in the sound or in the interference pattern on the TV screen when the fine tuning control is adjusted.

If the interference is at or near the i-f or image frequency, a slight variation in the fine tuning control will change the tone of the signal

and the number of lines in the beat pattern on the screen will increase or decrease.

### Locating Interference Sources

Some professionals use elaborate commercial noise locating instruments, as illustrated in Fig. 2. However, many experienced technicians utilize all-wave type portable receivers with non-directional vertical antennas. By attaching an output meter, the direction of an offending source is easier determined by observing signal level variations as the distance from the source varies. Other technicians have provided VHF and UHF coverage to some all-band receivers by using converters.

Many electrical sources of interference have been successfully located with nothing more than an ordinary battery portable broadcast receiver, having a closed circuit jack wired in for rapid shifting from speaker to meter.

When faced with an interference problem the technician should first make certain the interference is external from the receiver. Take nothing for granted, otherwise considerable embarrassment may arise.

The next step is to eliminate the possibility of interference originating in the customer's home.

If a battery operated radio is avail-

Fig. 3—A pi-type filter between the wall outlet and a TV or radio, suppresses h-f interference received through the a-c line.

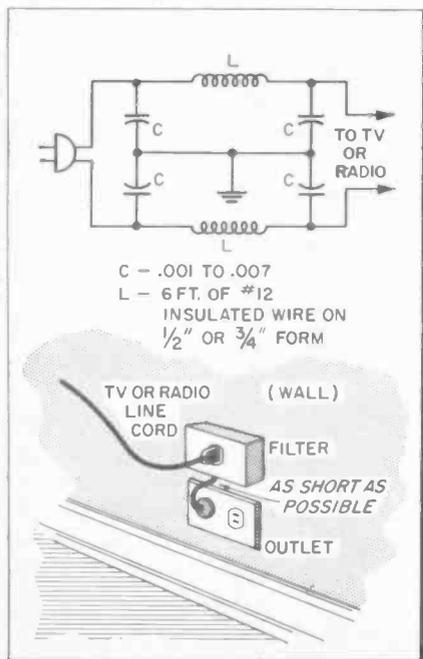
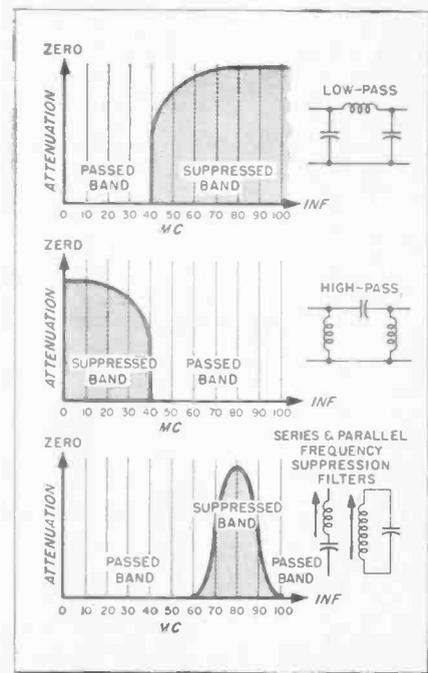


Fig. 5—Band filters can suppress specific frequency interference radiations at transmitters and TV receivers.



able on which interference can be heard, the disturbance can be isolated in or out of the house by pulling the main power switch. If this type of receiver is not available, the a-c line from each electrical or electronic device in the home can be removed from the outlets, one at a time, while observing the interference on the customer's radio or television.

If the interference is found to be outside the customer's home, then it must be located with hand-carried portable equipment on foot, or with equipment mounted in an auto.

To obtain an approximate "line" on the interference, move away from the customer's home over a circular area, observing if the interference becomes weaker or stronger on the speaker or output meter. The direction indicating an increase in interference strength will generally indicate the direction of the source. It is followed in this manner until located.

Certain types of interference are difficult to locate. For example,

radiations from plastic heaters. Their emission intensity and frequency constantly vary, and a "fix" even with a direction finder, is almost impossible. Interference of this character should be reported to the local Cooperative Interference Committee (CIC), Television Interference Committee (TVIC), or to the nearest FCC office.

Once an offending device is located, the technician is obliged to reduce or eliminate the interference.

Although best results can generally be obtained by installing proper filter networks at the interference source, a filter at the a-c outlet may prove helpful. Fig. 3 illustrates a pi type filter for eliminating interference being fed to the set through the a-c line. Of course, if the receiver is picking up the interference by radiation from the a-c line this may not prove effective. All components in a-c line filters must be capable of withstanding power drawn by the equipment. The pi type filter is also effective in preventing high frequency harmonics feeding back into the power line from any electronic device.

Two variations of the delta type filter are shown in Fig. 4. This filter can be effective in reducing or eliminating medium and high-frequency components caused by spark discharges at motor brushes. The capacitors are generally not too critical, although for suppressing very high frequency radiations, feed-through type capacitors are used and all components should be mounted in a metal box, as illustrated in Fig. 4C. The feed-through capacitors are also known as coaxial, thru-pass, bushing, etc., types. Whenever possible, all filter networks should be attached as closely as possible to the device. Capacitor values should be as small as possible, consistent with optimum results.

In addition to normal motor filtering, thermostats, foot-pedal switches, circuit breakers and relays often require their own filters.

Fluorescent lamps can also cause strong interference. Commercial 3-in-1 delta type filter units are available. Capacitors should be enclosed in a metal box and grounded. In severe cases the pi type filter, shown in Fig. 3, may prove superior.

In eliminating interference caused by electronic equipment, three basic

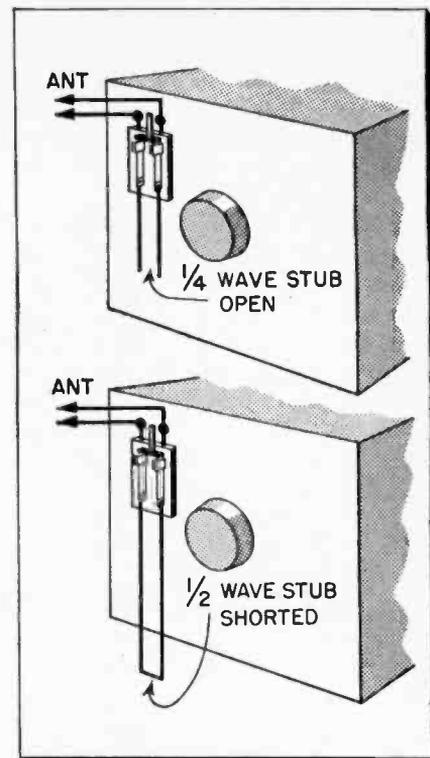


Fig. 7—A  $\frac{1}{4}$  wave open stub or  $\frac{1}{2}$  wave shorted stub, cut to the exact frequency of the interference, is an effective band suppression trap. If the stub reduces gain when viewing another channel this can be corrected by opening the switch.

filters are available: low-pass, high-pass and band suppression types. Filters previously described are essentially low-pass. Basic configurations and graphic illustrations of their individual uses are shown in Fig. 5. These filters can be relatively simple or elaborate in design, depending upon requirements. A number of constant K and M derived sections can be placed together for maximum suppression over specific and wide bandwidths.

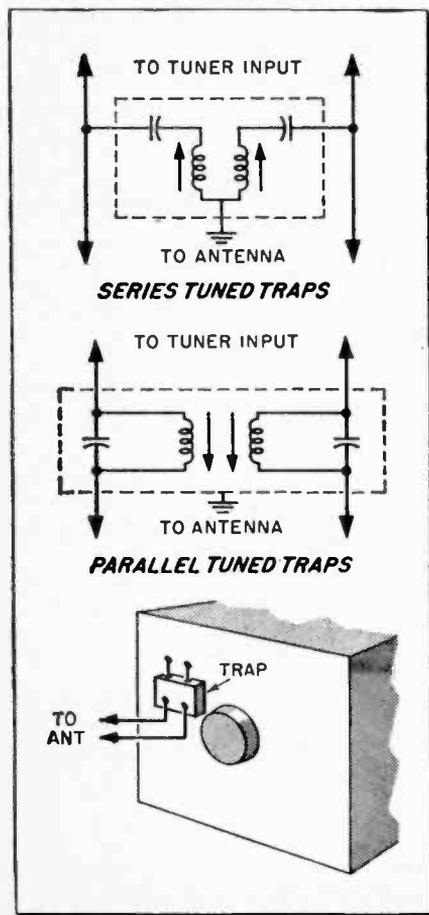
To eliminate electronic radiation in an efficient manner, the frequency of the interfering signal should be known. To know the fundamental frequency of the transmitter or other equipment may help in some cases, but interference is not always caused by the fundamental frequency.

### TV Problems

All transmitters causing interference must be completely shielded, have a low-pass filter in the a-c supply line, and a properly terminated low-pass filter inserted in the antenna feed-line directly at the transmitter.

If a near-by transmitter is over-  
(Continued on page 53)

Fig. 6—Series and parallel tuned traps inserted in the feed-line, tuned to the interfering frequency, can eliminate many types of interference in a TV receiver.



# SHOP HINTS



## Tips for Home and Bench Service

### Long Handle Tweezers

Tool users occasionally need tweezers with a greater reach, more stable holding action, or stronger gripping power. When needed, it is a simple matter to meet these requirements in the following manner:

Tape a tweezer to one jaw of a needle nose pliers or spring type clothespin, as illustrated in Fig. 1. The tweezer should be positioned between the jaws of a plier or

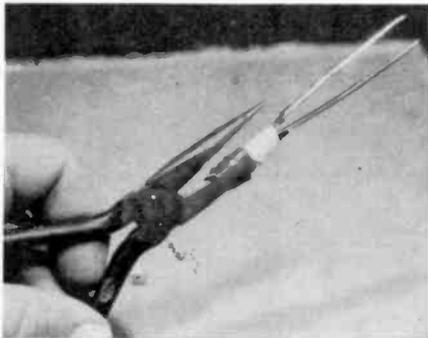


Fig. 1—A simple extension tool can be devised to get those inaccessible screws, nuts, etc., by taping tweezers to long-nosed pliers or a spring-type clothespin.

clothespin so their jaws are closed when the tweezer jaws are closed, and vice versa.

When using the clothespin arrangement, no pressure is required from the hand or fingers to maintain the tweezer's grip.

This arrangement provides a handy tool—quickly improvised—for picking up small objects from inaccessible places.—*Glen F. Stillwell, Manhattan Beach, Calif.*

### CRT Heater Repair

A high resistance solder joint frequently occurs on CRT pins 1 or 12, causing the heater to open. In some cases we have found new CRT's with insufficient solder or cold joints in the pins—rendering the tubes inoperative. The tube, regardless of age,

may be perfect in every respect but lack of heater voltage has made it a useless dud.

After trying many soldering methods we found the following procedure to be the most effective:

Using a small fine-cutting rat-tail file and holding the heater pins firmly with long nose pliers, carefully file into the heater pins to a point where the wire protruding from the glass bulb are exposed. See Fig. 2. File the wire itself slightly—just enough to produce a clean raw surface. Apply a small amount of rosin core solder to the exposed area with a soldering iron, allowing solder to flow into the opening until the area is just filled.

When the job is done in this man-

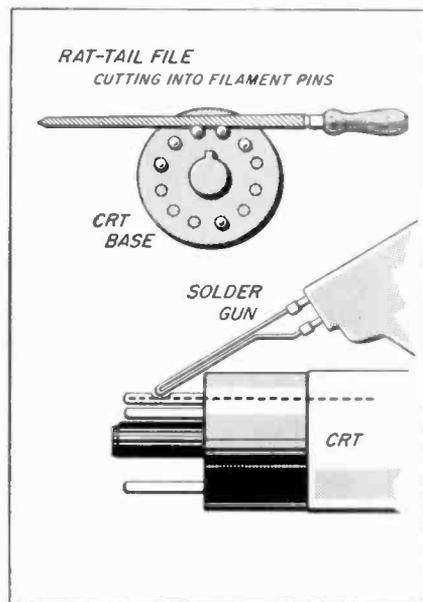


Fig. 2—CRT's with cold-solder filament connections can be permanently saved by baring the pin's heater wires before soldering.

ner there is little chance of a second failure because of a poor joint.—*Calvin B. Bailey, Erwin, Tennessee.*

### Versatile Jig

A commercially available jig for cutting control shafts can be adapted to many other uses by the technician. Fig. 3, for example, illustrates two practical shop applications.

By mounting a control in the jig, it is easy to remove excess solder or straighten lugs.

When not being used for its original purpose, the jig can also serve as

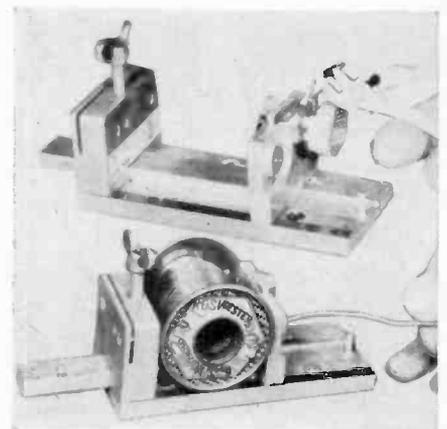


Fig. 3—Ordinarily used for cutting control shafts, this popular jig can double as a "third hand" when lying idle.

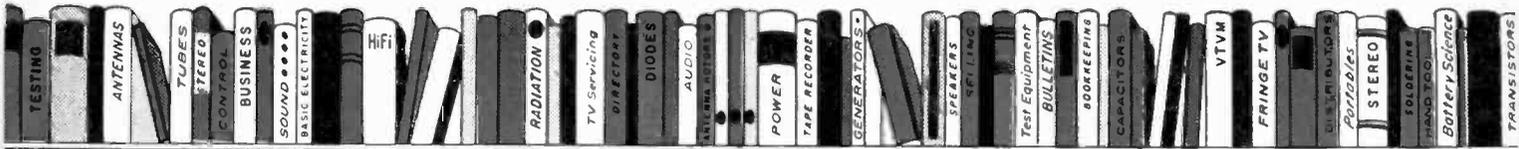
a solder dispenser. A large spool of rosin-core solder handles well when placed between the two upright sections shown in Fig. 3. The solder can be pulled through one control opening, as needed.—*H. Leeper, Canton, Ohio.*

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\$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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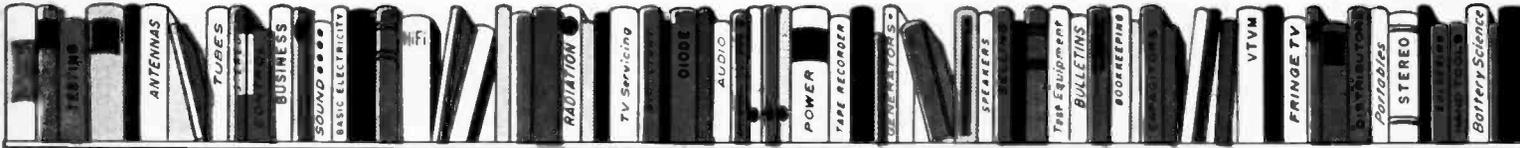
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# Servicing Automatic Toasters

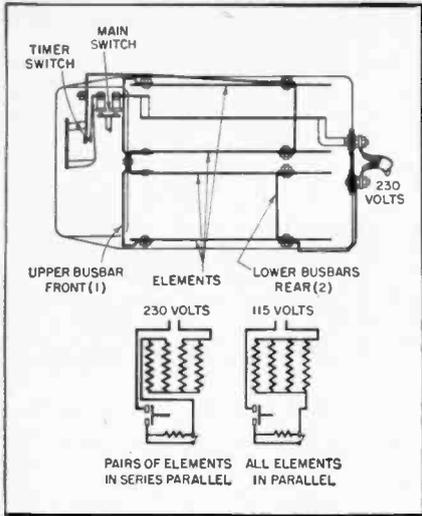


Fig. 1—Toaster elements are usually connected in parallel for 115 volt home use. 220 volt lines are usual for luncheonettes, etc.

## Toaster Repairs Require Electro-Mechanical Know-How

HAROLD KATZ

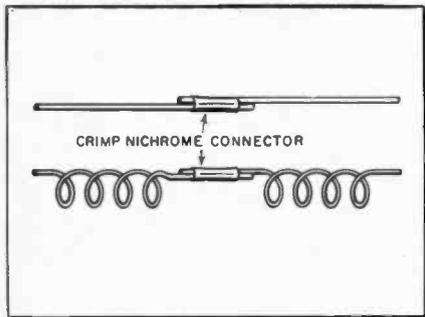
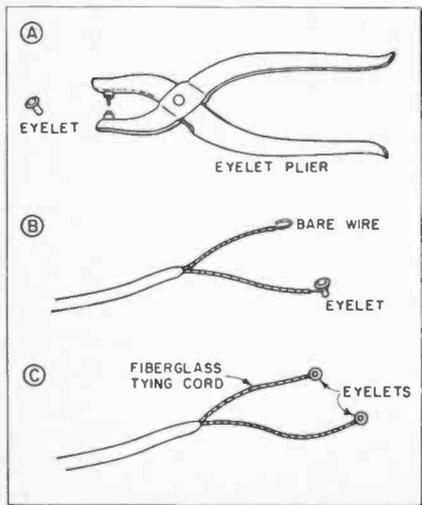


Fig. 2—Broken toaster element leads, or any nichrome heating element, can be repaired by cleaning both ends of the broken lead—inserting into a nichrome connector—and crimping the connector for a firm, non-sparking connection.

Fig. 3—Eyelets, used in conjunction with eyelet pliers, make neat, safe lead terminations on asbestos line cords. When the eyelet leads are secured to a terminal board with screws, the possibility of stray strands causing a short-circuit is minimized.



● *Who owns toasters?* Practically every home includes an automatic toaster. *Who repairs toasters?* A few appliance service organizations, some hardware stores and not nearly enough independent radio-TV companies.

For some obscure reason, the automatic facility of toasters appears forebodingly difficult to the TV technician. He doesn't question his ability to cope with TV antenna installation, installing a new power transformer, troubleshooting complex electronic circuitry, etc., but a piddling toaster repair seemingly destroys his ego. It shouldn't.

Besides having the obvious technical ability to easily service toasters, their mass use presents the technician with a large and profitable potential. In addition, this added service will acquaint people with other services offered by him.

Toasters have few major parts that need repair or replacement. These include a group of heating elements, line cord and timing mechanism. In addition, bakelite frame and handle parts occasionally chip or break, therefore needing replacement.

### Heating Elements

Heating elements usually consist of nichrome wire wound on a rec-

tangular pressed mica board. They are usually connected in parallel for 110 volt use, although series-parallel connections are used for 220 volt lines. See Fig. 1. They can become defective through normal use, resulting in a break in the wire, or because of the housefrau's enthusiasm when attempting to dislodge a piece of oversized bread, accidentally ripping some of the element wires. In either case, the particular element that is broken ceases to light and consequently doesn't toast the bread on one side.

Testing for the defective element is simple. Just plug in the toaster, start the operation and observe the location of the unlit element. If the light of the element is not readily perceptible, the technician can place bread in the toaster and notice which side is not toasted.

### Disassembly

Once identifying the element, it is now necessary to disassemble the toaster in order to repair or replace it. Depending on the brand of toaster and the technician's familiarity with it, the entire repair should not consume much more than 20 minutes.

Before disassembling the toaster to expose the heating elements (or any other internal parts), the technician should carefully study the toaster's assembly, rather than haphazardly

*Unlike radio-TV sets, household toasters have few components and, therefore, locating a defective part is comparatively simple. Most frequent failures are exhibited by line cords, nichrome elements, timing devices and switches. The technician planning to enter the appliance service field will find a talent for the "mechanical side" of servicing a definite asset.*

removing screws. If possible, the manufacturer's service notes should be referred to until experience with the specific toaster is acquired.

The toaster should be placed on a padded surface when disassembling it to avoid scratching the polished finish of the case. Also, in view of the number of screws and nuts to be removed, some containers should be used to prevent losing them and ease the reverse order of assembly.

Disassembly, although differing from brand to brand, is basically similar for most toasters. The metal case assembly must be removed to expose the elements. In order to do this, a few parts must first be removed. Usually, they comprise the timing button, lifting handle, base and possibly the crumb tray. Once this is done, the case assembly can be lifted away from the basic toaster assembly. Sometimes a little maneuvering is necessary to accomplish this. One word of caution, though, some units include removable bread guards. These bread guide rods may fall out and damage the heating elements if care is not exercised.

As previously stated, disassembly variations exist; however, some forethought should enable the technician to tackle it without much difficulty. Sometimes, the removal solution seems impossible. For example, removing the base screws of some Toastmaster toasters will not necessarily result in easy removal of the base. (Front and back handles are extended to form the base in a particular model.) However, it is really a simple matter to effect removal if one knows how. The bakelite handle-base is provided with a flat bayonet head. To remove, after taking out pertinent screws, it is only necessary to press downward and then out to remove the part. Simple, but de-

ceiving to the uninitiated. And incidentally, a wonderful solution to the "do-it-yourselfers" who invariably break the bakelite part before giving up on it.

#### Element Removal

Once the shell is removed, the technician has the choice of replacing or repairing an element. If the defective element is from a fairly new toaster and only a single break is located, a repair may be effected, rather than replacing the part. The final choice, however, should rest with the customer. If it is repaired, the service charge is naturally lower, since the customer doesn't have to pay for a brand new element; however, only the specific break repair can be guaranteed, whereas a new element is normally completely guaranteed. In some instances, the customer will wish to have the element repaired in order to either save money or prevent waiting for the part if the technician doesn't stock it.

The elements may be attached to bus bars through asbestos leads attached to it or by metal eyelets which have nichrome wire affixed to it. Whichever the case, remove the screw and nut attached to the terminal post or a bus bar. Then, remove parts, if any, obstructing removal of the defective element. These parts may be bread guards,

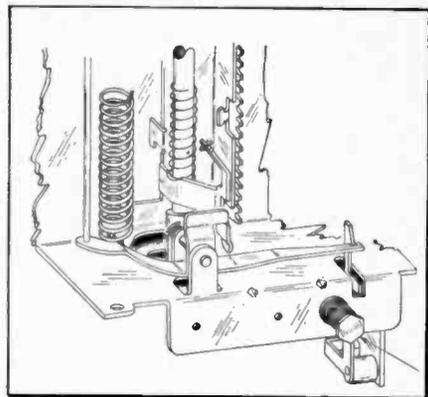


Fig. 4—A popular toaster uses a latch that catches the release lever, preventing pop-up. As the thermostat heats, the latch slowly moves, eventually releasing the lever.

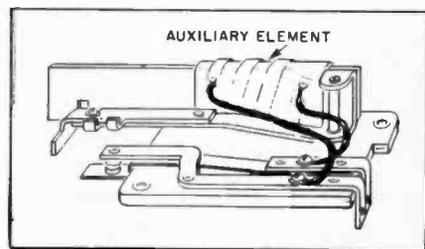


Fig. 5—Timing mechanism of a popular toaster is shown, together with its auxiliary heater.

### CHART I

#### Manufacturers of Automatic Electric Toasters

Arvin Industries  
Columbus, Ind.

Camfield Mfg. Co.  
700 N. Kingsbury  
Chicago 10, Ill.

Dominion Electric Corp.  
Mansfield, Ohio

Dormeyer Corp.  
Chicago 10, Ill.

General Electric Co.  
Portable Appliance Div.  
Bridgeport, Conn.

Hamilton Beach Div.  
Scoville Mfg. Co.  
Racine, Wis.

Knapp-Monarch  
3501 Bent Ave.  
St. Louis, Mo.

Landers, Frary & Clark (Universal)  
New Britain, Conn.

Proctor Electric Co.  
700 W. Tabor Rd.  
Philadelphia 20, Pa.

Sunbeam Corp.  
5600 Roosevelt Rd.  
Chicago 50, Ill.

Toastmaster Products Div.  
McGraw-Edison Co.  
1200 Charles Rd.  
Elgin, Ill.

Westinghouse Electric Co.  
Mansfield, Ohio

porcelain insulators atop element "ears" or any other device used to retain the element within the toaster or to protect it.

On occasion, the screw fastening the element to the bus bar or terminal may be frozen due to the generated heat of the unit. If this happens, a few drops of penetrating oil should unlock it.

Replacing the element requires the reverse procedure accorded removal. If ordering a new element, particular care should be taken to list the name, model, serial number and element, whether left-center, right-side, etc.

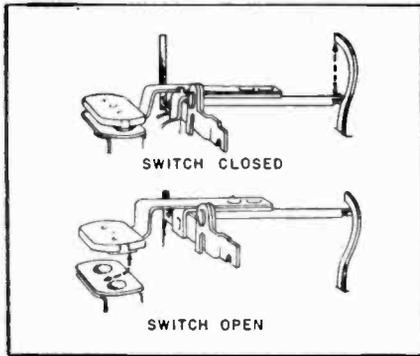


Fig. 6—Typical toaster switch contacts are illustrated. This part is often a cause of toaster operating failure. The part could be bent, contact points themselves can be burnt, preventing completion of the circuit.

(The position is determined by facing the toaster's bread release handle.)

Elements often vary from year to year, within the same brand. For example, connection holes may be aligned differently. Also, outside elements frequently have different amperage ratings than the center ones since they should emit more heat. If the incorrect amperage element is obtained, it may fit physically, but cause uneven toasting of bread. The need for a serial number is mentioned because different runs of the same model may have a number of modifications made.

### Element Repair

An element may be repaired by locating the break in the nichrome wire and bridging it with a nichrome connector. Heating element connectors, shown in Fig. 2, are available from most appliance parts suppliers. A crimping tool is sometimes used in conjunction with the connector. Cutting pliers, though, are also successful in crimping the connectors

and is the most likely tool for this job.

Be sure that the crimp is tight, thereby avoiding any spark gaps. It is sometimes desirable to repair an element with an exceptionally long break, making it impossible to bridge the open circuit with a single connector. In this case, an extra piece of nichrome wire is needed, using two connectors to break the gap. Be certain that the added piece of wire is flush against the mica board to prevent it from shorting against the crumb guards.

### Line Cords

The most frequent defect encountered with toasters is line cord breaks or shorts. After examining the plug end of the cord, it may be necessary to partially disassemble the toaster in order to check the terminal end for continuity or short.

Use the same type and length line cord, usually 16 or 18 gauge asbestos covered wire, to replace the defective cord. If the cord is bulk-purchased or if a repair of the defective cord is being made, it is advisable to wind the asbestos covering of the individual leads with fibreglass thread, otherwise the asbestos frays and relinquishes its purpose.

## CHART II

### TOASTER REPAIR CHECK LIST

#### If Toaster Fails to Heat

1. Fuse blown out; 2. Faulty outlet;
3. Break in cord; 4. Broken lead;
5. Main switch does not make contact; 6. Heating elements defective.

#### If Toaster Heats, But Toast Fails to "Pop Up"

1. Auxiliary switch does not make contact; 2. Timer release lever binds; 3. Broken operating lever spring

#### If Operating Lever Will Not Stay Down

1. Timer release lever binds; 2. Broken timer release lever spring; 3. Main trip lever not properly adjusted to timer release lever.

#### If Toast Is Too Light Or Too Dark Timer mechanism is not properly adjusted.

#### If Successive Slices of Toast Are Not Uniform

1. Timer mechanism not properly adjusted; 2. Texture and type of bread.

In addition, eyelets should be used for the wire ends that attach to the terminals, as illustrated in Fig. 3. Eyelet tools are inexpensive and are available for different sizes. They form neat, non-loosening connections. Further, a line cord strain relief should be replaced to prevent the user from pulling the connections out.

### Timing Devices

Timers may be in the form of clocks or thermostat devices. They determine the length of time that the bread will remain within the confines of the heating elements. The speed is controlled by a knob available to the users, permitting varying degrees of heat before automatically lifting the toasted bread upward, disconnecting the current at the same time.

If a clock is used as a timing device, actuating the lever by pressing down the operating handle will determine whether it is working or not. If it is not operating, check for obstructions, such as accumulated bread crumbs. Usually, however, it is more expedient to replace the entire clock unit.

A common form of timing device is the bi-metal thermostat. This operates on the principle of two dissimilar metals fused together which expand differently when heat is applied, causing the strip to flex in one direction.

When the bread carriage is lowered, a popular toaster incorporates a lever that hooks on to the carriage, maintaining it and the bread inside the toaster. See Fig. 4. A switch contact assembly is depressed, completing the electrical circuit at the same time.

A bimetal strip can then move in a certain direction, actuating a trip lever that releases the carriage, automatically lifting out the toast and disconnecting the current. Some toasters use two-stage thermostat timing with an auxiliary heater.

A timing mechanism using an auxiliary element is shown in Fig. 5. The auxiliary element is in series with the main toaster heating elements. Depressing an operating lever, closes the electrical circuit through a switch. A switch contact assembly is shown in Fig. 6.

When the circuit is closed, the

(Continued on page 66)

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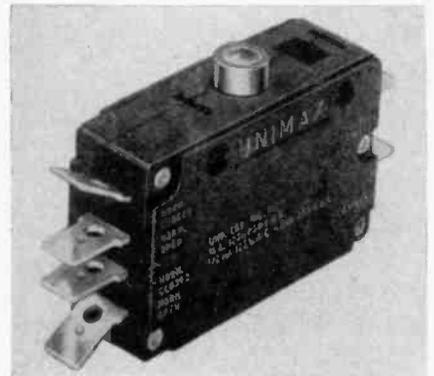
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### Unimax SWITCH

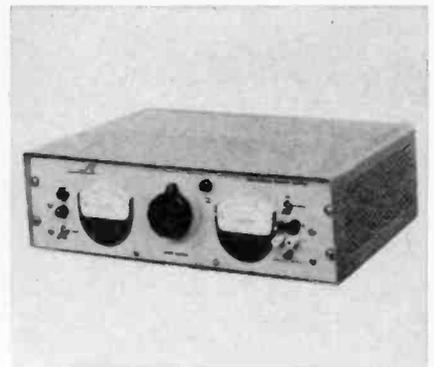
Type DA, a new low-cost snap-acting precision switch, provides double-pole double-throw control in a single unit. It embodies all the features of the single-pole type A—quick-connect terminals for snap-on wiring and ex-



cellent resistance to dirt, dust and moisture, in addition to low cost. UL listing is 15 amperes 125/250v a-c and a-c horsepower ratings are: ½ hp 125v; 1 hp, 250v or ¾ hp, 125v and 1½ hp, 250v. The molded phenolic body is 1⅛" high, 1¾" long and ¼" thick. Unimax Switch Div., W. L. Maxson Corp., Ives Rd., Wallingford, Conn. (ELECTRONIC TECHNICIAN 3-42)

### Armour POWER SUPPLIES

T-200 B Series transistorized d-c power supplies, available in 8 models, features the ability to respond in less than 10 μsec. Output voltages with a total envelope of uncertainty of ±0.08% is provided by the circuit design which includes the Armour "ultra-



differential" amplifier plus the application of high speed transistors as series regulators. Output voltage ratings: from 0 — 10 volts to 0 — 150 volts. Current ratings: from 0 — .75 amperes to 0 — 30 amperes. Armour Electronics, 4201 Redwood Ave., Los Angeles 66, Calif. (ELECTRONIC TECHNICIAN 3-40)

For More Information On  
NEW PRODUCTS  
Circle Code Numbers, p. 61

## STOP TV-RADIO Interference

(Continued from page 44)

loading a TV receiver, a high-pass filter should be installed in the TV antenna directly at the receiver antenna terminals. In most cases a high-pass filter having a cut-off frequency at 50 mc will prove highly effective. These filters are available commercially in small, compact, shielded units ready to mount on the TV set.

In cases where a fundamental frequency causes severe overloading, resulting in harmonics falling in one or more channels, additional band suppression filters inserted in the TV antenna, and adjusted to the interference frequency will often prove effective. See Fig. 6.

A  $\frac{1}{4}$  wave open and a  $\frac{1}{2}$  wave shorted stub made from 300 ohm twin-lead, connected across the feed-line at the set's antenna terminals, will prove effective in many cases. See Fig. 7.

If a stub reduces or eliminates the interference on one channel and suppresses reception on another channel, attach a double pole single-throw switch to open the stub when the other channel is desired.

Under certain circumstances both filter and stub must be attached directly to the tuner antenna input, by-passing the short piece of twin lead extending from the back of the set to the tuner since this length of wire can pick up considerable interference.

Co-channel and adjacent channel interference from other TV stations is a problem in certain areas, especially when ionospheric conditions are favorable.

Some signals "bounce" for long distances, causing this interference. It can generally be identified by a vertical bar moving back and forth across the screen, called "windshield" wiper effect. This is the horizontal blanking bar of the interfering signal. When this interference is strong, moving or stationary horizontal lines or bars (venetian blind effect), together with crosshatching and herringbone lines may also appear.

This interference can frequently be reduced or eliminated, but all factors involved in the individual

case must be carefully analyzed before practical remedies can be formulated and applied. The stub arrangement, with switch, is sometimes effective. The stub should be tried at the frequency of the interfering channel. Other remedies include: a high front-to-back ratio antenna (if the interference is not in the same direction as the received channel), antenna orientation, reversible beam signal antenna or out-of-phase antennas, careful r-f, i-f and trap alignment.

In crowded areas considerable interference is caused by local oscillators in TV, FM and short-wave receivers. Since a TV set can operate perfectly with only 100 mv of signal at its antenna terminals, it is apparent that only 4 or 5 mv of signal, beating with the picture frequency, can cause visible cross-hatching across the screen.

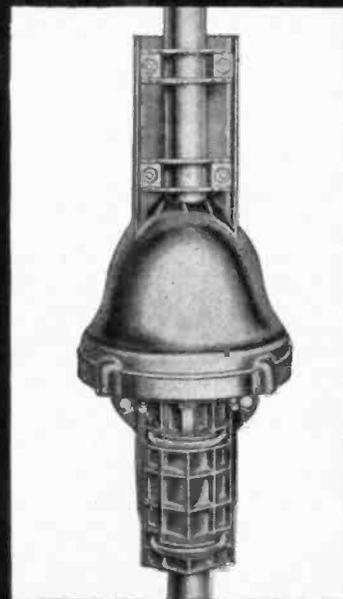
This interference, while difficult, can be eliminated in most cases if the interference frequency can be determined. It is frequently "here-one-minute-gone the next," depending upon what channel or frequency the offending oscillator and receiver is tuned. If the receiver is in a strong signal area, with microvolts to spare, and the offending signal is being received through the antenna, an attenuator pad placed in the antenna feed-line at the set may help. If the interference is being fed to the receiver via the power line, a low-pass filter at the a-c outlet may eliminate it. Here again, each problem must be thoroughly analyzed, applying the required remedy to the individual case.

It has become obvious that the number of interference problems have maintained pace with the expanding use of electronic and electrical equipment. The subject problem cannot be ignored, and with promise of increased disturbances all technicians should try to become expert in handling this broad field.

Many different type packaged filters are available from your local distributor. However, *one* simple filter will not correct all types of disturbances. Commercial interference substitution equipment is also available that enables the technician to ascertain, through experience, the type filter needed to eliminate the trouble. •

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## Measure Service

(Continued from page 41)

hand, a small proportion of dealers sell over half their tube volume in that way. Drugstore-supermarket tube checkers have siphoned off an increasing amount of the "do-it-yourself" business, resulting in declining over-the-counter sales.

### 3. "Free" checking of receiving tubes.

About 90% of service dealers will check tubes "free" for customers. This percentage has increased from 85% in 1955. More service dealers now recognize the need to meet the increasing competition from self-service tube checkers. Some dealers have found that active promotion of free tube checking in the shop has

TABLE VI

DEALER SIZE BY NUMBER OF TECHNICIANS	PERCENT OF DEALERS WITH WIFE ASSISTING IN BUSINESS
ONE	62%
1-3	48%
OVER 3	35%

helped them retain the business of "do-it-yourself" customers.

### 4. Average number of hours worked per week by service dealer owner.

As shown in Table II, dealers tend to work slightly longer hours in large cities than in smaller places. Average hours worked per week has declined since 1955 in all city size categories, with the greatest decline in the larger cities.

### 5. Source of replacement technicians for service dealers.

A major problem in operating a service business is that of hiring service technicians, either for replacement or expansion.

The most important source of technicians for dealers in large cities is "other dealers." This form of "piracy" is much less important in medium or small size cities. In these smaller places, the most common practice is to hire untrained men and train them on-the-job as service technicians.

Hiring of part-time technicians is

a fairly common practice in all sizes of city.

Technical schools are relatively unimportant as a source for service men, except in very large cities.

### 6. Average annual volume each employed technician adds to dealer's business.

The service dealer considering business expansion through the adding of more technicians should find the averages shown in Table III interesting as rough indicators of expected added volume. The average experience of dealers responding to the survey indicates surprisingly small \$ increases from personnel expansion, especially in small cities.

### 7. Dollar investment in test and repair equipment (excluding vehicles).

Investment in equipment, shown in Table IV, has increased sharply over the past four years in all dealer size categories. This undoubtedly reflects the increasing complexity of the service job as well as a growing sophistication in use of new test and repair equipment. Service dealers apparently recognize the need for increasing productivity on their jobs—using their time more effectively, with the aid of better equipment.

### 8. Return on investment.

The service dealer risking his money in his own business should calculate his return on investment. While a dealer may expect to obtain an adequate profit if he prices properly, controls expenses carefully, and runs a "tight" shop, such a result is not automatic. It is very important to periodically measure profit results against investment to be sure that the return on investment is worth the risk involved.

The survey results show that an

TABLE VII

By City Size	Average Number of Technicians			
	1955	1959		
Over 100,000 pop.	2.8	2.3		
10,000-100,000	2.3	2.3		
Under 10,000	1.4	1.6		
	Percent of Dealers with—			
	Less	2-3	4-5	6 and Over
By City Size	than 2 Tech.	Tech.	Tech.	Tech.
Over 100,000 pop.	43%	30%	12%	15%
10,000-100,000	41	40	15	4
Under 10,000	60	32	4	3

alarming number of dealers do not have adequate profit measurements. About one-fourth of service dealers do not calculate return on investment. Many others do not know if they calculate this figure, which is equal to saying they do not.

More large dealers and dealers in large cities calculate return on investment than do small dealers and dealers in small towns.

**9. Types of shop facilities.**

The home shop is quite widespread among small dealers, but is infrequent among dealers with several employees. See Table V.

**10. Percentage of Dealers utilizing wife's services in the business.**

A surprisingly large percentage of service dealers utilize a wife's services in operating the business. As might be expected, this proportion is greater for small businesses. See Table VI.

**11. Number of technicians employed (in addition to owner).**

The average number of technicians per dealer has declined somewhat since 1955 in large cities, but has increased in small cities. Small cities, however, tend to have smaller dealers with fewer technicians than do large cities, as evidenced by Table VII.

**12. Percent of receipts from TV-radio service vs. set sales or other.**

Dealers in smaller cities obtain a smaller percentage of their receipts from servicing than do dealers in large cities. It is undoubtedly more

difficult to achieve adequate volume as a repair specialist in these smaller places. The average percent of receipts from service is 89% in cities over 100,000 population; 86% in cities of 10,000-100,000; and 67% in cities under 10,000.

Small dealers (less than one full-time employed technician) obtain an average of 93% of receipts from service, compared with 85% for firms with 1-3 technicians and 88% for dealers with more than three technicians.

**13. Approximate annual gross re-**

*ceipts from servicing and parts sales.*

Substantial increases in gross receipts have occurred since 1955 for the average dealer in all dealer size and city size categories. Overall, 67% of respondents indicated volume increases over the past four years, 23% indicated decreases, and 10% reported no change. It can be assumed that many of those reporting volume decreases have had such results because of a decline in the number of technicians employed. See Table VIII.

**TABLE VIII**

Average Dollar Gross Receipts of Service Dealers		
By Dealer & City Size	1955	1959
Under 1 Technician		
Over 100,000 population	\$12,500	\$17,500
10,000-100,000 population	11,000	14,000
Under 10,000 population	10,000	12,500
1-3 Technicians		
Over 100,000 population	\$26,000	\$30,000
10,000-100,000 population	23,000	28,000
Under 10,000 population	19,000	24,500
Over 3 Technicians (All Categories)	\$52,000	\$60,000

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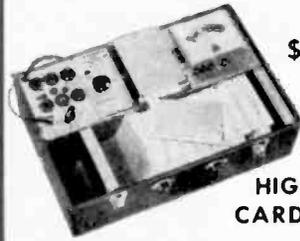
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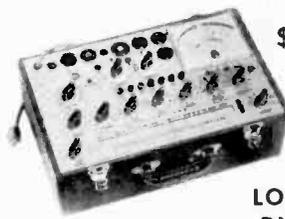
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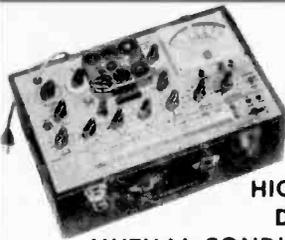
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In conclusion, it seems wise to repeat that the best dealers are not necessarily those who parallel the averages shown in the preceding tables. These figures serve only as a benchmark in measuring and comparing your own operations with those of "typical" dealers in your city size and dealer size category. Your own intelligent business decisions, implemented aggressively, can take you far ahead of the "average" dealer and place you in a position of leadership in your industry. •

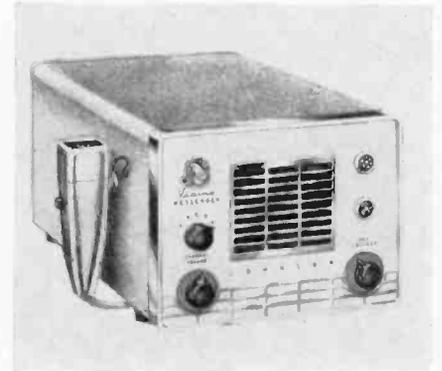
### Philco TRANSISTOR RADIOS

The "All American" is a new line of transistor radios featuring the "Power-Boost" circuit for extended battery life and greater power output. Some of the models are: T-51, 5 transistors, palm size, has "Magnecor" antenna, 2¼" speaker, weight, 10 oz. \$24.95. T-52, horizontal styled, 5 transistors, \$29.95. T-62, 6 transistors, operates on two "AA" penlight or mercury batteries, 14 oz. \$29.95. T-70, 7 transistors, 14 oz. \$34.95. T-74, 7 transistors, contains a 3½" speaker, private listening jack, operates on four "C" flashlight batteries. \$39.95. T-802, 8 transistors, specially designed for out-of-door use, operates on four regular flashlight bat-

teries, private listening jack, \$49.95. Special showcase, for use as counter, window or floor display available. Has full vision glass face and locking back panel. Philco Corp., Tioga & C Sts., Philadelphia 34, Pa. (ELECTRONIC TECHNICIAN 3-12)

### G-E/Johnson 2-WAY RADIO

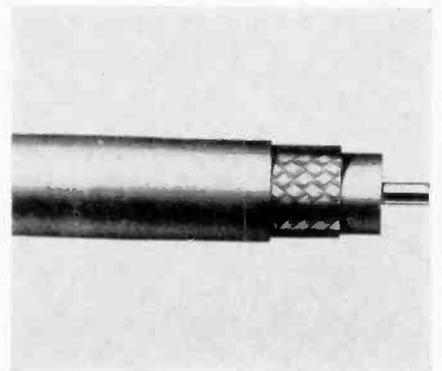
"Viking Messenger" Class D Citizens Radio, manufactured by E. F. Johnson Co., Waseca, Minn. is sold by the General Electric two-way radio sales offices and, also, by existing Johnson



distributors. Units are installed and serviced by G-E's extensive network of several hundred authorized independent service stations. General Electric Communication Products Dept., Lynchburg, Va. (ELECTRONIC TECHNICIAN 3-5)

### Times CABLE

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## Install Antenna Lightning Protection

(Continued from page 36)

edge of lightning current and should be avoided. When they can't be avoided, only rounded bends rather than square turns should be permitted. The ground wire should be as short as possible and of heavy gage. While #12 solid copper or aluminum wire is often used, much heavier wire is better. A #12 wire might easily carry a 250-ampere stroke for a fraction of a second, it would evaporate if the stroke current was in the 100,000 ampere or

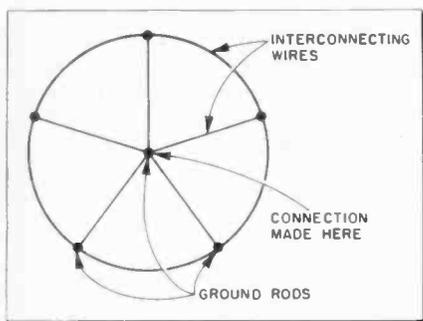


Fig. 7—Proper grounding can be effected in dry ground by using radial ground rods.

higher range.

When a metal antenna mast is used, which is set into the ground, the mast itself might be used as a ground lead. However, if the antenna mast is not set deeply in the ground, it is better to run a ground wire to the antenna base (and air terminal, if used). The mast should also be grounded.

When the ground wire comes near or parallels other metallic objects, it may be desirable to connect these objects to the ground conductor. If not grounded, there may be a side flash from the ground wire to such an object as a metal gutter downspout. When heavy current flows through the ground wire, current may be caused to flow through other nearby metallic objects due to induction.

In Coeur d'Alene, Idaho, the nails in the vicinity of the electrical wiring of a house struck by lightning were partially pulled out of the wood by the strong magnetic field around the wiring. Obviously, lightning is pretty powerful stuff.

No part of the United States is completely devoid of thunder storms. They are most frequent in Florida and almost unknown in California, west of the Sierras. Because of the unlikelihood of lightning troubles, very few, if any, antenna installers in California install lightning arresters or even think of any form of lightning protection. However, lightning has been known to strike buildings and cause damage, even in

coastal California.

Regardless of the locality, it makes sense to consider lightning protection when installing antennas. Lightning arresters cost very little. The grounding of the antenna structure requires time and some expense, but the protection it provides is well worth it. In addition, fire insurance rates may be considerably lower if positive lightning protection is provided. •

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**Model C40 Adapter.** For use only with all previous B&K Model 400 and 350 CRT's. Tests and rejuvenates TV color picture tubes and 6.3 volt 110° picture tubes. Net, \$9.95

**Model CR48 Adapter.** For use only with all previous B&K Model 400 and 350 CRT's. Tests and rejuvenates 110° picture tubes with 2.34, 2.68, and 8.4 volt filaments. Net, \$4.95

See your B&K Distributor or Send now for Bulletin ST24-T

**B & K MANUFACTURING CO.**  
 1801 W BELLE PLAINE AVE • CHICAGO 13, ILL.  
 Canada: Atlas Radio Corp., 50 Wingold, Toronto 10, Ont.  
 Export: Empire Exporters, 277 Broadway, New York 7, U.S.A.

## Association News

### California

CSEA, Fresno, and affiliates, make public two interesting concepts in their Code of Standards:

1. To maintain a properly licensed business in an area zoned for business and to be open during generally accepted business hours.
- 12 (B). Advertisers claiming "Day and Night" service or "24 Hour Service," must operate their place of business on that basis.

RTASCV, San Jose, reports a joint appeal has been made by Russell Hamm, president, and H. F. "Bud" Ash, chairman of the Apprenticeship Committee, for every Valley firm to participate in the apprentice program. Ash said: "The program has produced good results for service technicians who signed up at its inception." The first students to receive journeyman certificates from the State of California are expected to graduate this year.

### Service Personnel Shortage

APA, Los Angeles, advises its Per-

sonnel Exchange gets about two hundred requests every month for qualified trained service men, while filling at most, twenty of these requests.

### Florida

TESA, Miami, elected the following officers at its last annual election: Pres., A. Edward Stevens; 1st V.P., Roger J. Misleh; 2nd V.P., Charles D. Pierce; Sec'y, Samuel Kessler; Corres.-Sec'y, James J. Ross; Treas., Charles W. Minter.

### ANNUAL ASSOCIATION ROSTER

ELECTRONIC TECHNICIAN's annual Service Association Roster, published every May, is being prepared.

A questionnaire has been sent to every association on last year's list. To be included in the 1960 Roster, be sure to complete the form and return it promptly.

Association officials not receiving the questionnaire are urged to write on association letterhead to the Association Editor, ELECTRONIC TECHNICIAN, 480 Lexington Ave., New York 17, N.Y. Please give address and names of president and secretary.

### Indiana

#### Request TV License Tithe

IESA, Indianapolis, appeals to every shop in the State for a pledge of one service call per annual quarter, for the next 5 quarters, to finance the preparation of a TV license law proposal.

### Michigan

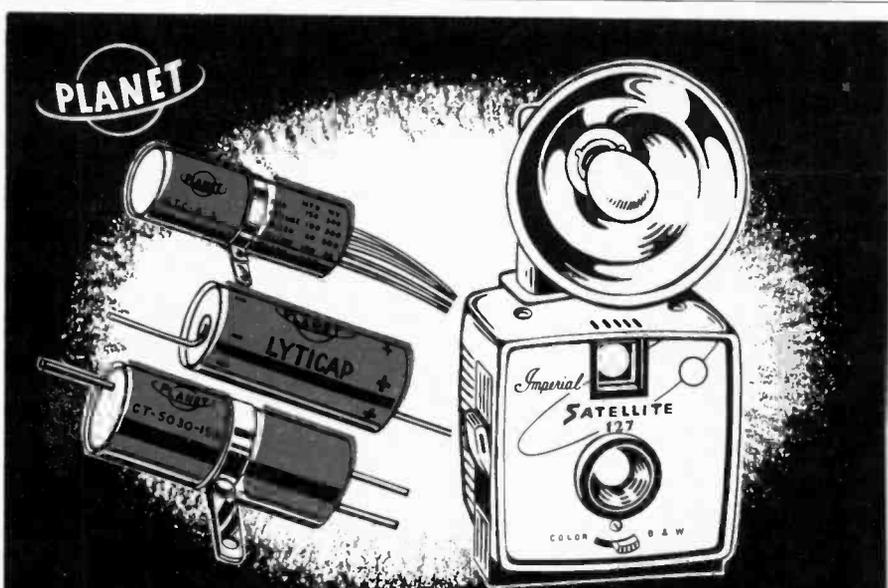
#### Court Declares Licensing Constitutional

TSA, Detroit, informs that the Detroit ordinance requiring licensing of TV dealers and technicians has been declared constitutional by Circuit Judge Ferguson. Two TV service technicians, after being convicted for non-licensing, had appealed their convictions by charging the law gave unrestricted and arbitrary power to an administrative board.

### Missouri

#### War Chest For KC Bill

TSE, Kansas City reports a cam-  
(Continued on page 77)



## BUY 35 CONDENSERS and GET CAMERA FREE

IMPERIAL SATELLITE 3-WAY FLASH CAMERA FREE with the purchase of 35 PLANET capacitors . . . takes color snaps, color slides or black and white . . . easy to operate . . . even a child can take excellent pictures . . . attractively packaged with free film offer enabling user to have film developed and processed and receive a new roll of film for \$1.00 . . . MAKES A WONDERFUL GIFT.

Limited time offer . . . call your PLANET Distributor now . . . ask for Assortment CA-35.

**PLANET SALES CORPORATION**  
225 Belleville Avenue Bloomfield, New Jersey

Superior's New Model TV-12

# TRANS-CONDUCTANCE TUBE TESTER



## SPECIFICATIONS

### TESTING TUBES

- TESTS ALL TUBES including 4, 5, 6, 7, Octal, Lock-in, Hearing-Aid, Thyratrons, Miniatures, Sub-Miniatures, Noval, Sub-Minar and Proximity Fuse types.

- Employs improved TRANS-CONDUCTANCE circuit. An in-phase signal is impressed on the input section of a tube and the resultant plate current change is measured. This provides the most suitable method of simulating the manner in which tubes actually operate in Radio & TV receivers, amplifiers and other circuits. Amplification factor, plate resistance and cathode emission are all correlated in one meter reading. Although the Model TV-12 is not calibrated to provide mutual-conductance reading (MHO'S), the Engineer or Technician who needs that information may easily compute it with calibrations we supply.

- NEW IMPROVED ROLL CHART MECHANISM uses a combination of fibre and brass gears to eliminate back-lash and slippage.

- NEW LINE VOLTAGE ADJUSTING SYSTEM. A tapped transformer makes it possible to compensate for line voltage variations to a tolerance of better than 2%.

- SAFETY BUTTON — protects both the tube under test and the instrument meter against damage due to overload or other form of improper switching.

- This model retains the INDIVIDUAL ELEMENT IDENTIFYING SYSTEM developed by Superior in 1945. All elemental switches are numbered according to RMA pin number designations. This procedure enables the operator to instantly identify the particular element being tested.

- NEWLY DESIGNED FIVE POSITION LEVER SWITCH ASSEMBLY. Previously because of switch limitations, the same voltage was applied to the plate and grid. Extra position and unique design of new switch permits application of separate voltages as required for both plate and grid of tube under test, resulting in improved Trans-Conductance circuit.

### TESTING TRANSISTORS

Although Transistors may be tested for forward and inverse action with an Ohmmeter, such procedure will not identify an inefficient transistor. Also, if the ohmmeter uses a high-internal battery voltage, the transistor will likely be damaged. A transistor can be safely and adequately tested only under dynamic conditions. The Model TV-12 will test all transistors in that approved manner, and quality is read directly on a special "transistor only" meter scale.

The Model TV-12 will accommodate all transistors including NPN's, PNP's, Photo and Tetrodes, whether made of Germanium or Silicon, either point contact or junction contact types.

## ALSO TESTS TRANSISTORS!

A RADICAL CHANGE IN DESIGN PROCEDURE. Customarily, a new model Tube Tester means a revised model. For usually when a manufacturer designs a "new" model, he actually re-designs the last model made, including new improvements to meet changing requirements, and circuit improvements resulting from experience in producing the last model made. That is the usual practice, but doesn't apply to the new Model TV-12.

We at Superior have been designing and producing Tube Testers since 1935. About two years ago, we asked our engineers to select a circuit which would meet the requirements of those technicians who want a top quality Tube Tester. Our engineers selected the basic TRANS-CONDUCTANCE circuit employed in our Model TV-12. And then, thanks to the cooperation of a leading switch manufacturer, who designed a special five position lever switch for us, we were able to improve that basic circuit.

The Model TV-12, therefore, is not a "rehashed" model—it is not a tester which simply tests good tubes "good" and bad tubes "bad." This radically new tester will check tubes under dynamic conditions very closely simulating the manner in which they would function in a receiver or amplifier. It is a tube tester we are proud of. It is a tube tester which we claim will compare favorably with laboratory instruments selling for double the price.

And about Transistors. We doubt that the Transistor will ever wholly replace the Vacuum tube. Unquestionably, however, the present already substantial rate of production and use of Transistors will be very greatly increased in the near future.

The Model TV-12 will test all Transistors produced to date and provision has been made for testing the new Transistor types known to be designed but not yet in production.

Model TV-12 housed in handsome rugged portable cabinet sells for only

**\$72<sup>50</sup>**  
NET

# SHIPPED ON APPROVAL NO MONEY WITH ORDER — NO C. O. D.

Try it for 10 days before you buy. If completely satisfied then send \$22.50 and pay balance at rate of \$10.00 per month for 5 months—No Interest or Finance Charges Added. If not completely satisfied, return to us, no explanation necessary.

MOSS ELECTRONIC, INC.

Dept. D-732

3489 Tenth Ave., New York 34, N. Y.

Please rush one Model TV-12. If satisfactory I agree to pay \$22.50 within 10 days and balance at rate of \$10.00 per month. If not satisfactory, I may return for cancellation of account.

Name .....

Address .....

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

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

# FCC Radio Statistics

The following statistics, released by the Federal Communications Commission, show the growing use of special radio services, and the status of microwave and broadcast stations.

The 1959 fiscal year closed with 507,171 stations authorized in the Safety and Special Radio Services, or 69,320 more than the 437,851 in

1958. For these purposes, separate license, construction permit, or combination construction permit and license have been counted as one station. Therefore, in many cases, a station includes a base transmitter and various mobile units. The following table compares station authorizations at the close of fiscal years 1958 and 1959: →

Private microwave systems in the safety and special services have been of notable interest. The following table shows the number of stations authorized as of Feb. 12, 1959. In cases where two frequency bands are used at a particular station, that station has been counted twice. These stations are included in the station count listed earlier in this article. The services are abbreviated as follows: Industrial (Ind.); Public Safety (Pub.); Land Transportation

(Trans.); Marine (Mar.); Aeronautical (Aer.)

## Microwave Stations

Freq. mc	Ind.	Pub.	Tr.	Mar.	Aer.	Tot.
952-960	179	241	19	9	6	454
1850-1990	780	130	4	0	5	919
2110-2200	3	0	0	0	0	3
2500-2700	38	39	0	0	0	77
6575-6875	788	144	29	0	14	975
Above 10K	0	0	0	0	0	0
<b>Total</b>	<b>1788</b>	<b>554</b>	<b>52</b>	<b>9</b>	<b>25</b>	<b>2428</b>

The 1959 fiscal year closed with 5,405 AM, TV, and FM broadcast station authorizations outstanding. Of these, 4,920 had authority to go on the air, and the remaining 485 held construction permits. A breakdown follows:

Class	Operating authorizations	Construction permits
Commercial AM	3,377	123
Commercial TV	566	101
TV translator	158	187
Educational TV	43	46
Commercial FM	622	11
Educational FM	154	71
<b>Total</b>	<b>4,920</b>	<b>485</b>

Further breakdown and readjustment of the TV figures give these results:

## Broadcast Authorization

	On air	Not on air	Total
Commercial VHF	436	135	471
Commercial UHF	74	217	191
<b>Total comm.</b>	<b>510</b>	<b>152</b>	<b>662</b>
Educational VHF	33	5	38
Educational UHF	9	16	25
<b>Total educa.</b>	<b>42</b>	<b>21</b>	<b>63</b>
<b>Grand totals</b>	<b>552</b>	<b>173</b>	<b>725</b>

<sup>1</sup> Includes 2 stations which went on the air and subsequently went off the air.  
<sup>2</sup> Includes 45 stations which went on the air and subsequently went off the air.

The TV translator stations are all UHF. Also, 127 FM stations held subsidiary communications authorizations to engage in functional (background) music operations.

## Stations in Safety and Special Radio Services

Class of station	June 30, 1958	June 30, 1959
<b>Amateur and disaster services:</b>		
Amateur	179,314	195,776
Disaster	380	390
RACES	7,668	9,422
<b>Total</b>	<b>187,362</b>	<b>205,588</b>
<b>Aviation services:</b>		
Aeronautical and fixed	3,122	3,554
Aircraft group	48,037	61,441
Aviation auxiliary	254	318
Aviation radionav.	327	363
Civil Air Patrol	10,944	12,006
<b>Total</b>	<b>62,684</b>	<b>77,682</b>
<b>Industrial services:</b>		
Business		8,861
Forest products	1,648	1,792
Industrial radiolocation	218	255
Low power	2,333	
Manufacturer		90
Motion picture	71	67
Petroleum	7,151	7,341
Power	11,320	11,878
Relay press	130	142
Special industrial	17,107	19,246
Telephone maint.		25
<b>Total</b>	<b>39,978</b>	<b>49,697</b>
<b>Land transportation services:</b>		
Auto emergency	962	1,052
Citizens	38,611	49,269
Highway truck	503	349
Interurban pass.	59	46
Interurban Prop.	1,386	1,606
Railroad	2,265	2,449
Taxicab	4,733	4,827
Urban passenger	110	116
Urban property	172	180
<b>Total</b>	<b>48,801</b>	<b>59,894</b>
<b>Marine services:</b>		
Alaskan group	1,054	1,132
Coastal group	434	393
Marine aux. group	92	95
Marine radio-location land	23	31
Ship group	70,911	83,296
<b>Total</b>	<b>72,514</b>	<b>84,947</b>
<b>Public safety serv:</b>		
Fire	4,725	5,283
Forestry cons.	3,264	3,618
Highway maint.	2,580	3,068
Police	12,450	13,103
Public safety (combined)	158	148
Spec. emergency	3,325	3,631
State Guard	10	10
Local government		502
<b>Total</b>	<b>26,512</b>	<b>29,363</b>
<b>Grand total</b>	<b>437,851</b>	<b>507,171</b>

# FREE LITERATURE

To receive the literature without charge, simply circle the numbers on the coupon corresponding to the items of interest. Cut out and mail to **ELECTRONIC TECHNICIAN**, 480 Lexington Avenue, New York 17, N. Y.

**1 Capacitors:** A complete replacement catalog of Red Seal capacitor listings is available, to implement the current six-month promotional appeal of guarantee, packaging and display cabinet. (1B3: Astron Corp.)

**2 Sound Equipment:** Described in a new catalog is an assortment of speakers and sound equipment for regular and special applications. Included is the new DU-12 paging speaker for modern decor. (2B3: Atlas Sound.)

**3 TV Tuner Service:** A leaflet describing the repair service covering ALL makes and models of UHF and VHF tuners, is available to service dealers and technicians. (3B3: Castle TV Tuner Service.)

**4 Chemicals:** A complete line of electronic chemicals and cements, tools, service aids and hardware is covered in a new catalog. (4B3: G-C Electronics.)

**5 Tube Testers:** Literature is available covering tube testers: Model 820 Tube Caddy-Pal; Model

121 High-speed Cardmatic; Model 800 low cost dynamic Mutual Conductance; and Model 6000 high speed Mutual Conductance. 5B3: Hickok Electrical Instrument.)

**6 Tube Testers:** Three models for which literature is available are: Model 658, checks receiving tubes, voltage regulators, eye tubes; Model 598, provides lever switching and incorporates the firm's test principle, and Model 648R, featuring super-rapid sequence switching. Also, power roll chart. (6B3: Jackson Electrical Instrument.)

**7 Protective Coatings:** Crystal Clear and "Push-Button" Acrylic Spray coatings for radio, TV and hi-fi equipment are described in new literature. Choice of 24 colors. (7B3: Krylon, Inc.)

**8 Citizens Radio, also Tube Testers:** Covered in current printed matter are: a citizens band transceiver for 115v a-c and 12v d-c mobile use; also tube testers: S-18

"Test-O-Matic," Deluxe 102 and TM-18. (8B3: Shell Electronics.)

**9 Microphones:** The following models, comprising the versatile line of Commando controlled magnetic microphones, are described in new literature: DeLuxe 430, Lavalier 420 and Standard 415. (9B3: Shure Brothers.)

**10 Self-Service Tube Testers:** Two models, a caddy and a console are covered in a brochure. Tests more than 800 tube types; tests each side of multi-purpose tubes. (10B3: Universal Teletronics.)

**11 Tools:** A colorful spring promotion brochure gives details of tool advertising campaign and information on a soldering gun, sander and sabre saw. (11B3: Weller Electric Co.)

**12 Signal Tracer:** The new Buzit transistorized signal tracer is described in a catalog sheet. The tracer fits the pocket like a pen, and operates on two pen light batteries. (12B3: Workman TV Products.)

CUT HERE

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

For more information on:

	1	2	3	4	5	6	7	8	9	10	11	12
1—Free Literature, circle numbers												
2—New Products, circle numbers	3-1	3-2	3-3	3-4	3-5	3-6	3-7	3-8	3-9	3-10	3-11	3-12
	3-11	3-12	3-13	3-14	3-15	3-16	3-17	3-18	3-19	3-20	3-21	3-22
	3-25	3-26	3-27	3-28	3-29	3-30	3-31	3-32	3-33	3-34	3-35	3-36
	3-39	3-40	3-41	3-42	3-43	3-44	3-45	3-46	3-47	3-48	3-49	3-50
	3-51	3-52										
3—Bulletins, circle numbers	B3-1	B3-2	B3-3	B3-4	B3-5	B3-6	B3-7	B3-8				
	B3-9	B3-10	B3-11	B3-12	B3-13	B3-14	B3-15					

Name .....

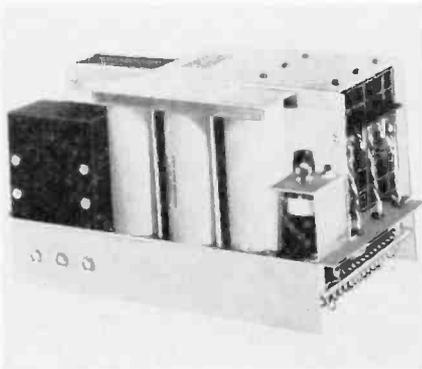
Position ..... Firm .....

Address .....

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

### Dressen-Barnes POWER SUPPLIES

Four new fully transistorized d-c power supply modules provide power over ranges including 5 to 32 volts and up to 6 amperes. By combining the modules in series, the upper voltage range is increased to 64 volts. These



modules are designed for optional mounting in the firm's model 70-101 rack mounting kits. Input: 105-125 vac, 60 cps. Ripple: less than 2 mv rms; regulation for line, 105-125 v, 25 mv; and load, NL to FL, 15 mv. Dressen-Barnes Corp., 250 N. Video Ave., Pasadena, Calif. (ELECTRONIC TECHNICIAN 3-43)

### Trad SIGNAL GENERATOR

Some of the features of the TD-1101 are: frequency drift after warm-up, less than 0.001% over a 10-minute period; incidental FM, less than 300 cycles at any r-f and modulation frequency; output measurements, as low as 0.1 $\mu$ v;



FM on CW less than 100 cycles deviation; frequency calibration of six bands, within 0.5%; resettability, under 0.05%; r-f output, continuously variable and variable in discrete steps; calibration, directly on  $\mu$ v and 12-position resistive attenuator. Trad Electronics Corp., Asbury Park, N.J. (ELECTRONIC TECHNICIAN 3-44)

### Newman SOLDERING IRON

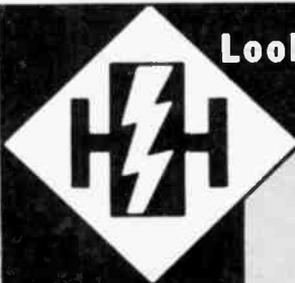
A pen-shaped precision, miniature, soldering iron weighs 1 oz., is 6 $\frac{1}{2}$ " long and operates on 110-115 volts without a transformer. Complete with safety handle that stays cool and withstands contact with other hot soldering



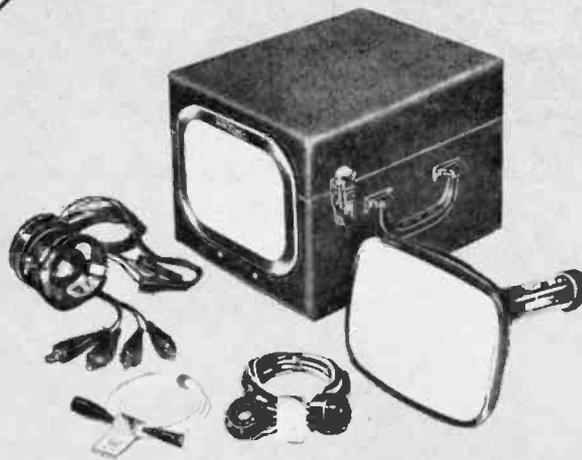
irons, it has a 50 megohm insulation between element and tip... ideal for use around semiconductors. Heat-up time, about 45 seconds. A sealed element maintains constant temperature at approximately 625°F. Tip stays hot under production speeds. Ultra-flexible, three-wire cord allows grounding. M. M. Newman Corp., 79 Clifton Ave., Marblehead, Mass. (ELECTRONIC TECHNICIAN 3-45)

## Look for the I. H. Mark of Quality

IT MEANS "DOUBLE ASSURANCE" FOR YOU!



I. H. Mfg., with its resources as the subsidiary of one of the leading manufacturers of OEM hardware — now makes a natural progression into the electronics distribution industry, with the assets and know-how of the former TELEMATIC line. It's your double assurance of superb product precision, tested performance, and "long" profits — down the line.



Brochure on request

## 8" TELE-CHECK

Now available for Both 90° and 110°

CRT Test Tubes

**I. H. MFG. CO.** — "the mark of quality"

Subsidiary of Industrial Electronic Hardware Corp.  
121 Greene Street — New York 12, N. Y. • ORegon 7-1881

Export: Roburn Agencies, 431 Greenwich St., N.Y. 13 • Canada: Active Radio & TV, 58 Spadina Ave., Toronto

### Technibilt SCOPE CARRIER

Oscilloscope carrier, model OC-5, with plug-in amplifier cabinet, writing desk, and tool drawer has the following specifications: frame, 7/8" steel tubing, chrome plated; cabinet, 16 gauge sheet



metal; angle of top, 15 degrees; scope carrying surface, 22 $\frac{1}{4}$ "; and 5x1.5" donut wheels. 110 V. inlet and 3 outlets on rear of the carrier. \$105.00. Technibilt Corp., 905 Air Way, Glendale 1, Calif. (ELECTRONIC TECHNICIAN 3-46)

For More Information On  
NEW PRODUCTS

Circle Code Numbers, p. 61



## **DESTROYED—NOT FIRST QUALITY!**

**...why General Electric cannot ship recovered  
or rebranded receiving tubes!**

One area in every General Electric tube plant is given over to destruction. Here steel jaws chew to fragments all tubes that aren't (1) brand-new production, (2) proved first-quality by extensive tests.

No recovered receiving tubes, no "seconds" can leave a G-E factory. Be quality-safe! Buy only from your G-E tube distributor! *Distributor Sales, Electronic Components Div., General Electric Co., Owensboro, Ky.*

*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**

311-002

# Stop Shipping And Billing Errors

## Cut Costs By Efficient Checking Methods

HAROLD J. ASHE

• Do you accept incoming shipments from suppliers without careful checking? Do you accept invoices and monthly statements without question? If you indulge in these practices you may be sustaining

losses. These losses decrease your net earnings.

This does not mean your suppliers deliberately make mistakes in their favor. Quite the contrary. They are as concerned as you should be regarding errors. But, many human

factors are involved in filling orders and preparing invoices. Bookkeeping errors can and do creep into monthly statements. A shop owner may be innocently overcharged in several ways, including over-pricing, short-count and failure to receive proper discount credit. He may fail to receive credits for defective items returned, such as tubes and parts in warranty, and picture tube duds.

Suppliers, just as unhappy about these mistakes as their customers, welcome a chance to make corrections. However, they cannot do so if errors are not brought to their attention. They know these mistakes damage the good will they have built over a period of years. Sometimes, repeated errors point to a certain employee, prone to making errors. This is a problem of the supplier.

It is a good idea for the shop owner to find time to carefully check all incoming goods and parts, and examine invoices and monthly statements for errors. In a larger shop, this task may be delegated to



***NOW take another look at***

**NEW  MODEL 644**

**SOUND SPOT MICROPHONE • LIST \$110.00**

If you are in the commercial sound business, you have had your share of . . . "they couldn't be done" . . . jobs at one time or another in your business life. These jobs could not be solved because general purpose microphones just couldn't do the job. That, fortunately, is past history. E-V's new Model 644 ushers in a new era in the concept of microphone pick-up. So *take another look* and see how many of those "tough" jobs the 644 reclassifies to "simple and easy". Your local E-V distributor has all the details on the Model 644. Why not call him today or write Dept. 30T for our new Commercial Sound Catalog No. 132.

***Electro-Voice***<sup>®</sup>

one or more employees; perhaps an office girl or bookkeeper skilled in such matters. If it is not practical to have one person do this work, and two are available, one may handle incoming goods, while the other does the paper work.

Costly errors creep into goods received and bills presented in numerous manners. (This is equally true for shop owners on a C.O.D. basis.)

Here are some common errors to watch for:

- (1) Short count on goods shipped.
- (2) Billing for certain goods not shipped and not back-ordered.
- (3) Substitution of lower for higher priced goods, but with billing not corrected to reflect this fact.
- (4) Shipment of damaged, defective or imperfect goods, or damage in transit.
- (5) Incorrect pricing of one or more items on invoice.
- (6) Incorrect total on invoice.
- (7) Monthly statement not coinciding with the month's invoices.
- (8) Absence of credits for goods returned or for amounts paid on account.

(9) Discount is lower than agreed on when the order was placed, or the altering of other terms, such as quantity discounts.

Only one designated person should receive incoming shipments. Except in his absence, other employees should not be permitted to open shipments and draw on the parts until they are checked and added to inventory. Of course, emergencies do arise. When a part or other item is needed in a hurry, the person next in responsibility should withdraw the part, attaching a voucher or memo noting the withdrawal to the invoice or shipping list.

A numerical count, particularly in broke-case goods, should be made. Attention should be given to possible substitutions, defective or sub-standard material or goods damaged in transit. In the latter event, goods should be set aside in original shipping container to await filing of claim and adjustment. All invoices should be totaled for accuracy.

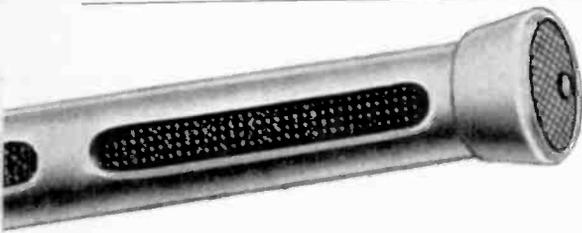
Invoices should be filed according to date and supplier for future refer-

ence against monthly statements. When goods have been returned for credit, a receipt or memo should be attached and filed with invoices.

If any payment has been made during the month, a memo to this effect should be attached to and filed with the invoices. In this way, it is possible to rapidly check an itemized monthly statement against goods bought as well as credits received. Even if the monthly statements appear correct, they should be totaled.

An elaborate system is not necessary, particularly for owners of smaller shops. A series of spindles may be used, one to a supplier. The main thing is to retain all records, keep them orderly and carefully check for any errors.

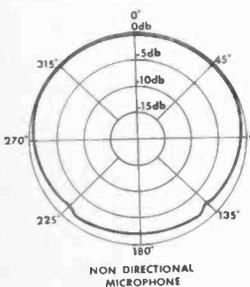
Time-consuming? No. Orderliness in record-keeping is never really time-consuming. It actually saves time. Records are quickly available for any need, including sales, income tax, budgets, etc. It may also uncover errors which, otherwise, would go undetected. •



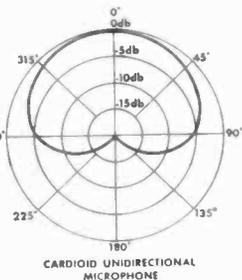
# those "impossible" sound jobs!

compare polar patterns yourself

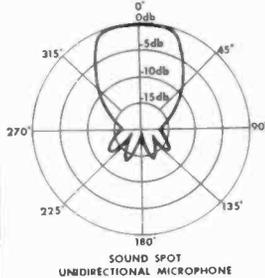
NON-DIRECTIONAL



CARDIOID



SOUND SPOT



- Four times greater working distance than the best cardioids, depending on acoustics
- Greatly reduces feedback
- Retains "on-mike" presence despite extended working distance
- Excellent outdoors . . . less wind noise
- Priced low to fit most budgets
- Lasts a lifetime

Another better product for better sound from . . .

**ELECTRO-VOICE, INC.**

Commercial Products Division • Loudspeakers-Microphones

BUCHANAN, MICHIGAN



## Servicing Toasters

(Continued from page 50)

auxiliary element heats the bimetal strip causing it to flex. This flexing results in the operating arm closing the auxiliary heater switch contacts thereby shunting the auxiliary element. The bimetal strip then cools

and moves back to its original position, striking a release link in its path. This trips the operating lever, resulting in the toast popping-up and disconnection of the electrical circuit.

The aforementioned surface description of a timing mechanism does not pretend to cover complete operations, rather, it is used as an example. Different toasters use different means to obtain the same end result; that is, toast the bread to a

predetermined point, then disconnecting the current and allowing the carriage to rise, lifting the bread.

Mechanical and electrical means are operating together and the best way to learn this phase of the service business is through consultation of manufacturers' service manuals and experience. A list of some popular toaster manufacturers is offered in Chart I. Requesting service information from these companies will no doubt advance the technician's knowledge of automatic toasters. Some of the companies offer free manuals, while others charge a nominal sum.

### Other Defects

Adjustments of timing mechanisms differ with the brand and model. Some infrequent defects, such as a broken operating spring, resulting in everything heating without the toaster popping up, can also occur. This may mislead the tech into thinking it must be due to the timing mechanism.

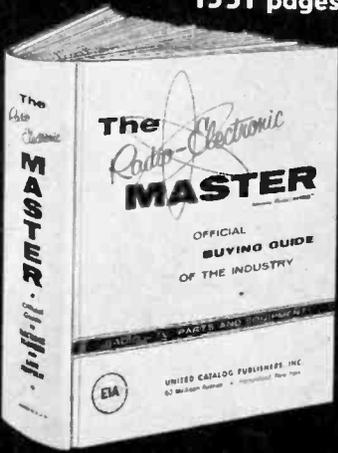
Binding of the release or difficulty depressing the bread carriage may be due to bent parts or the need for cleaning. A simple check list provided by one manufacturer, and shown in Chart II, is often helpful as a general guide to toaster repairs. When the repair is complete—a final check *with bread* should always be made.

A point of interest to technicians entering the appliance repair field . . . parts discounts to the trade are ridiculously low. They're usually around 25%. Couple this low discount with postage or transportation, bookkeeping and storage costs and the tech comes up with a fat zero. Therefore, the profit lies in sensible labor charges that will enable the service technician to earn the fair profit he is entitled to make.

Rather than jump into the toaster business with a "We Repair All Toasters" sign, it is advisable to concentrate on one or two popular toasters. This will allow the service technician to acquire the know-how of repairs for individual toasters and enable him to slowly build a parts stock, a good reputation and extra earnings when those "slow TV days" occur. ●

Information and illustration credit: Toastmaster Div., McGraw-Edison Co., Elgin, Illinois.

1551 pages



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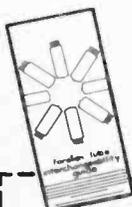
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October 27, 1959

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For complete specifications write Dept. ET-3



FAIRCHILD appoints Stan Cluphf as Rocky Mountain rep.

TELECTRO introduces 5 tape decks, \$89.95 and up, and 6 preamps from \$29.

WEBCOR develops magazine loading tape recorder for government aircraft.

REEVES SOUNDCRAFT publishes new wholesale and dealer product and price lists.

SCHOBER ORGAN offers electronic organ kits, said to save 50% over factory-builts.

GURIAN, Chicago, is producing the Stereo-Sonic dual hi-fi speaker kit for auto installation. Prices are \$18.95 & \$19.95.

FERRODYNAMICS names reps: Robert Smith Co., Brookline, Mass; Winfield Electronic Sales, N. Miami, Fla.; Hal F. Corry Co., Dallas, Texas.

RADIO FREQUENCY LABS. will introduce its Spacial Stereo line of hi-fi systems ranging from \$1000 up. Included are all-transistor components.

PORTER & DIETSCH, St. Paul, introduces Flexicone, a chemical which, when applied to a speaker cone's edge, is said to make it pliable, improve performance.

NORELCO introduces the AG-3400 moving magnet stereo cartridge @ \$29.95 with 0.7 mil diamond. Specs are vertical compliance 3.5, horizontal 4.5; output over 30 mv/channel; separation more than 22 db @ 1 kc. Unit employs new platinum-cobalt alloy rods magnetized along their lengths.

ALLIED introduces the Knight 740 stereo amplifier @ \$99.50. Ratings are 20 watts/channel, response 30-20,000 cps  $\pm 1$  db, harmonics 0.9% and IM under 3% at full rated output.

SWITCHCRAFT adds two models to its line of Mini-Mix audio mixers. The units fit late models of Revere and Wollensak recorders, permitting mixing of two sound sources. List price is \$8.95.

ERIC ENGINEERING introduces the FM 100 auto FM tuner for any car @ \$79.95, and the Dual Twenty Model 2160 amplifier/preamp @ \$103.75. Also available is the Dual Ten listing for \$79.95.

TAPE RECORDER PREDICTIONS, courtesy MRIA Pres. Herbert Brown: 750,000 machines valued at \$170 million will be made in 1960. This compares to 650,000 machines valued at \$140 million made in 1959.

AMERICAN CONCERTONE introduces a 4-lb. portable tape recorder using 6 transistors and 2 diodes. It uses 6 penlight cells for the drive motor, a 9 v battery for amplifier, or 110 vac. 3" reel, 3-3/4 & 1-7/8 ips. \$199.95.

SARGENT-RAYMENT introduces two stereo AM-FM tuners with preamps, Models SR-7000 and SR-8000. Prices are \$199.40 and \$249.40 respectively. A blending control varying channel separation is featured in both units.

AMPEX is scheduling stereo FM/AM radio programs in 10 top markets, with a reported potential stereo audience of 44 million persons; AM potential is 90 million. The company also introduces the 303 amplifier-speaker system @ \$285.50 less enclosure, and 302 @ \$174.50. Includes amplifier, speakers and crossover.

CROWN announces the 714C Stereo-X tape recorder, featuring 3 speeds, 3 motors, and automatic stop. It accepts 10" reels. Performance specs at 7-1/2 ips are 40-17,000 cps  $\pm$  2 db, noise 54 db, flutter & wow 0.09%.

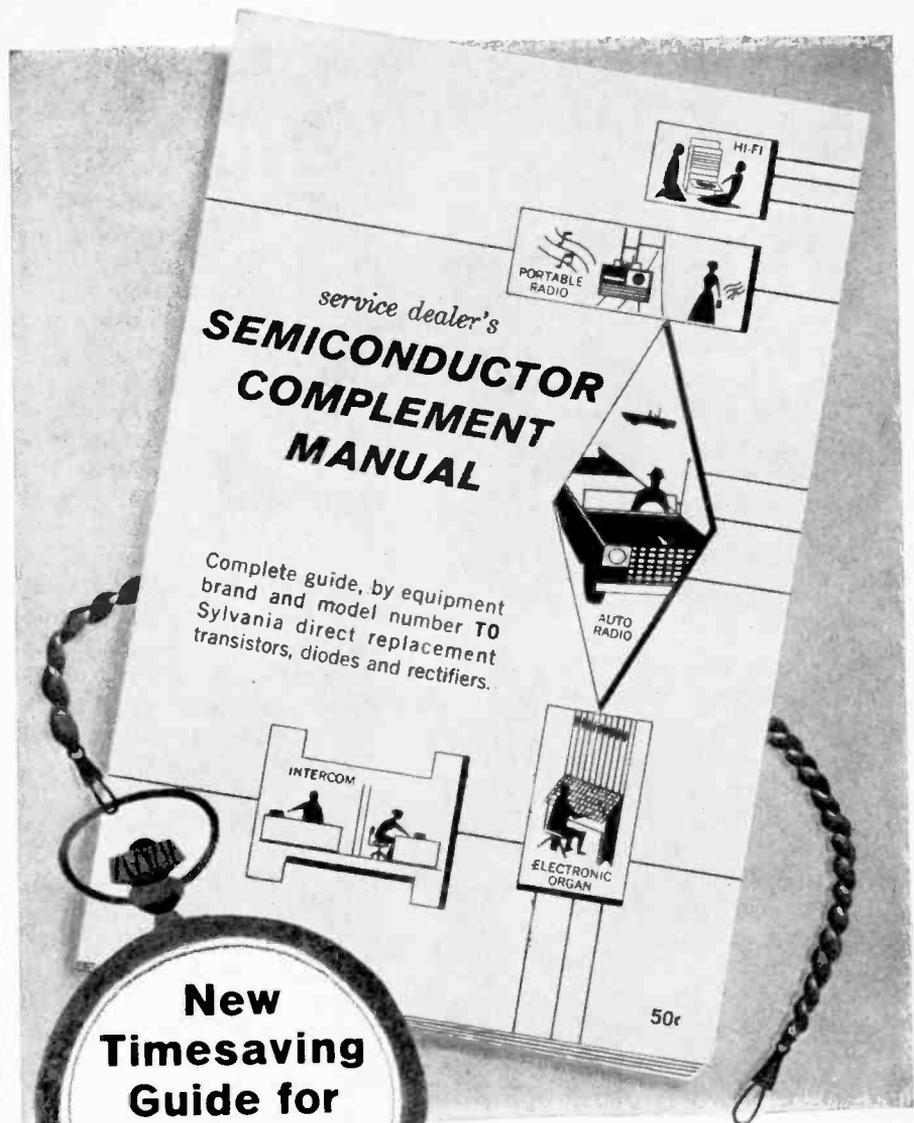
DYNAKIT announces the PAS-2 stereo preamp @ \$59.95 kit, \$99.95 wired. It includes 7 stereo inputs and blend control. Ratings are 0.05% IM, noise 74 db below 10 mv cartridge, and 10-40,-000 cps  $\pm$  0.5 db.

NORELCO announces the EL-3752/01 stereo microphone for home recording @ \$39.50. It consists of two mike elements set at right angles in a single housing. They are the moving coil type with a cardioid pattern. Output is -50 db.

ISOPHON SPEAKER, said to be Europe's largest speaker manufacturer, announces availability of a complete line of speaker systems, individual speakers and multipurpose speakers through Isophon Speaker Div. of Arnhold Ceramics, N.Y.C.

RCA has developed a new automatic record player to provide motorists two hours of 45 rpm play. Plymouth and De Soto will offer it in 1960 models. The company has also asked FCC to adopt its stereo AM broadcast system. RCA is not a member of the National Stereophonic Radio Committee.

MAGNETIC RECORDING INDUSTRY ASSOCIATION appoints International Business Relations as public relations counsel. New MRIA officers are: Pres., Herbert L. Brown (Ampex); Vice-Pres., Ken Bishop (Bell); Treas., Charles Murphy (Michigan Magnetics); Sec., Herman Kornbrodt (Audio Devices); Directors, Hugh Daly (Magnetic), Victor Miller (V-M), Ross Molloy (Bel Canto), J. Herbert Orr (ORRadio), Irving Rossman (Pentron), and Harry Sussman (Telectro).



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RESISTANCE  
UNITS

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## SERVICE THAT AUDIO AMPLIFIER

(Continued from page 39)

When a voltage chart for the unit is available, use it to ascertain the accuracy of the d-c operating characteristics of the various amplifier stages. If a voltage chart is not available, you can only rely on past experience and the conduction or lack of conduction of a tube in any particular stage. As indicated, this is determined by the presence or absence of a voltage at the cathode or across the plate load resistor.

The readings tabulated on the voltage chart supplied with most amplifiers can rarely be exactly duplicated in the service shop. The measurements at the manufacturer's laboratories are frequently made using "bogey" tubes under ideal conditions. Exceptionally accurate professional meters are used. The line is adjusted and maintained to the 117 volt standard.

Readings may vary by as much as 20% to 25% from the listed value. This may be due to various factors. The line voltage in the service shop may differ from that under which measurements were originally made. Components vary by as much as 20%. The voltmeter used may load the circuit improperly.

Fig. 3 illustrates how improper loading can result in false voltage readings.

All active circuits found in an audio amplifier can be broken down to a voltage in series with a resistance. A battery is this type of circuit. Fig. 3 shows the case of a 12 volt battery with an internal resistance of 12 ohms. If a 12 ohm voltmeter were connected across this battery, the meter would indicate 6 volts, since half the voltage drop appears across the internal resistance of the battery. Now, if an 11 megohm VTVM were across the battery, there would be a negligible voltage drop across the 12 ohm internal battery resistance. The full 12 volts would appear across the VTVM. Meters with internal resistances of between 12 ohms and 11 megohms will indicate anywhere from 6 to 12 volts, depending upon the resistance of the particular meter.

In an amplifier, a circuit loaded by a 1,000 ohms per volt meter may give entirely different readings than

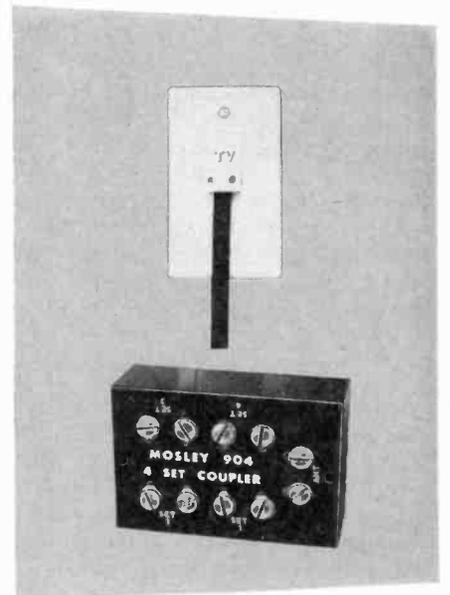


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when loaded by a 20,000 ohms per volt meter, which in turn may give different readings than when loaded by a VTVM. Measurements made with a high impedance meter will best correlate with the voltage charts supplied by most amplifier manufacturers.

The tests just described were to determine whether or not the d-c conditions within the amplifier are proper. Most faults with the unit will become apparent from these measurements.

Once it has been determined that the d-c conditions are correct, it is logical to check the signal path. The initial check should be made with an ohmmeter. Shorts or opens show up instantly and can frequently be corrected in seconds.

If this fails, you must then necessarily resort to signal tracing. Feed a 1,000 cycle sinusoidal signal to the amplifier input. Using a high impedance signal tracer—preferably an oscilloscope—trace the path of the signal from the input to the output. (Be certain that a speaker or resistor load is connected to the output.) If the trouble appears within a circuit that is enclosed in a negative feedback loop, open this loop, (decrease the strength of the signal fed to the amplifier to compensate for the increased gain), and trace within this suspected loop. Signal tracing with an oscilloscope is particularly useful when checking for distortion.

The above signal tracing procedure can locate many of the faults not easily found when employing other methods. It is frequently more convenient to check for distortion by reversing the tracing procedure. Connect the oscilloscope across the output terminals of the amplifier. Insert the 1,000 cycle sinusoidal signal into the various sections of the amplifier. Start at the output tube grids and work your way back to the input. This is especially useful when more than one circuit is defective in the amplifier at any one time.

When the amplifier has been repaired, additional careful tests can be made with harmonic and intermodulation meters. This follow-up test technique is invariably limited to service shop personnel deriving a substantial portion of their income from audio work. An alternative final check, even if these instruments are used, is to have the customer listen

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All-new "Transi-Pak," twin to TRC4 Checker above. Provides variable DC voltage to 24 volts; 1.5-volt biasing tap (a "must" for servicing Philco and Sylvania radios). Metered current output, to 100 ma. Handles 200-ma peaks. Two 200-mfd electrolytics provide proper filtering and low output impedance. No hum or feedback problems. Ideal for alignment using station signal; adjust IF slugs for max. current, also ideal for charging nickel-cadmium batteries. Size, 5x4½x2½". DEALER NET..... 17<sup>95</sup>



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### SENCORE HG104 HARMONIC GENERATOR

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to his repaired unit before it leaves the shop. This isn't always practical, but it often prevents any differences of opinion regarding the fidelity of the repaired unit.

An important consideration in audio amplifier work is: know your amplifier. Hum, distortion and output specifications differ with the type amplifier. Some alleged hi-fi amplifiers are marginally designed and specifications are not attainable in production units. Always consider the limitations of the unit you are troubleshooting. •



"Each unit represents 1,000 sets I've serviced."

# Cases From The Files Of The "Kilocycle Kops"

From uncovering a hidden radio transmitter communicating with a foreign country to being nearly drowned in an encounter with a small boat owner—it's all part of the day's work of FCC field engineers who monitor and police the technicalities of traffic on the nation's radio highways.

The varied nature of their tasks and experiences is indicated in the following cases gleaned from recent monthly reports of the Commission's Field Engineering and Monitoring Bureau.

With mobile equipment, FCC field engineers traced on the Florida Keys an illicit transmitter which was sending messages to Cuba that were antagonistic to the Castro government.

As a result, other Federal officials were enabled to arrest two refugees from that country who were operating the clandestine station.

In a Chicago suburb four youths, using a makeshift "station" composed of parts of a cast-off theater sound system and the power supply of an old TV receiver, not only broadcast recorded music and commercials (free) but were conducting "man-on-the-street" interviews. However, one of the persons interviewed on the sidewalk was an FCC field engineer who, in response to the opening questions, announced that he was there to close down the station. There was a sudden sign-off announcement by the "ex-manager." A visit

to the "studio" revealed a posted schedule of staff penalties for violating the station's rules. They ranged from "Goofing names on the news —3¢" to "Messing up commercials —5¢."

In Detroit a one-man, 100-watt unlicensed station was found broadcasting over a 15-mile radius. The 18-year-old operator, owner, manager and disk jockey was warned of the law violation and, with the help of his father, dismantled the equipment.

Interference to TV reception in a Philadelphia neighborhood was caused by a 14-year-old boy. He had built his own transmitter but failed to pass the amateur examination. So he was "just testing" under the impression that the equipment would deteriorate if not used. He dismantled it—temporarily, he hoped—pending further attempt to qualify for a "ham" license.

In another case, TV viewers in Bloomington, Ind., complained that an amateur was ruining their reception on Channel 6. FCC inquiry revealed that the "ham" was being blamed for interference during periods when his set was not operating. However, the amateur's fraternal interest was aroused. He enlisted the aid of neighboring "hams" and they were able to trace the offending signal to the vicinity of a university where a conference of TV engineers was being held. The engineers joined in the search and found the culprit to be an experimental oscillator used for the ionization of helium gas in the university's chemical laboratory. Whereupon the university took remedial action.

Good neighbor policy was also evinced in a Baltimore TV interference case. An FCC engineer installed a portable TV receiver in an in-

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COLLECTORS' SERIES 380.

OUTPUT: 15 mv per channel. CHANNEL SEPARATION: 30-35 db. FREQUENCY RESPONSE: + 2 db 20-20,000 cycles. SIGNAL TO NOISE RATIO: —65 db below reference. TRACKING FORCE: "A" type stylus—2.5 grams; "C" type stylus—3.7 grams.

Model 380E Collectors' Ensemble includes the Stanton Stereo FLUXVALVE with 3 "V-GUARD" stylus for stereo, microgroove and 78 rpm records. \$60.00

Model 380A includes Stanton Stereo FLUXVALVE with D3807A "V-GUARD" stylus for transcription arms. \$34.50

Model 380C includes Stanton Stereo FLUXVALVE with D3807C "V-GUARD" stylus for auto-changer arms. \$29.85

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Only the Stanton Stereo FLUXVALVE features the safe, comfortable, easily replaceable stylus assembly.

FOR THOSE WHO CAN HEAR THE DIFFERENCE

 **Pickering**

PICKERING & CO., INC., PLAINVIEW, NEW YORK

vestigative car and cruised about the complaining area. He traced the obnoxious signal to an antiquated TV set in a private home. The owner was requested to stop using his set until its excessive radiation could be corrected. He balked, insisting that he should be given a new TV receiver to replace his old, defective set. He became cooperative, however, when warned of possible consequences from operating a device causing radio or TV interference. The case was closed on a happy note when the TV station, whose reception had been affected, replaced the man's obsolete set with a used but more modern receiver—without charge.

Severe ghost-type interference to TV reception at Ventura, Calif., was traced to a huge sheet metal reflector on a mountain top which was used for directing microwave transmission of a communications company. The latter's engineers solved the difficulty by installing a screen of hog-fence wire in front of the reflector so as to deflect the microwave beam from the direct waves of the TV stations.

Cross modulation between AM broadcast stations often intrudes on transmissions of other radio services. In the area of Jacksonville, Fla., engineers discovered that the antenna of one broadcast station was picking up energy from another broadcast station and then radiating a combination of both over the aircraft marker frequency. This was cured by the installation of tuned filters in the antenna circuits of both stations.

"Rock-and-roll" music invaded a marine rescue frequency to give operators an additional headache. The Millis, Mass., monitoring station found it was caused by an overmodulated emission of a broadcast station. When notified, the broadcast station promptly suppressed it—the overmodulation not the "jive."

Many complaints of interference to various kinds of radio stations are found to be unwittingly caused by the stations themselves. Typical is the case of an Air Force station in North Dakota which thought that an amateur station was responsible. By

# Servicemen! SAVE TIME...SUBSTITUTE THE SENCORE WAY

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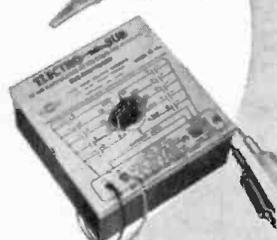
**Substitute for Capacitors, Resistors**  
**SENCORE H-36—THE "HANDY 36"**  
 36 most-often-needed resistors and capacitors, for fast, easy, direct substitution in all circuits. • Eliminates searching for replacement components for test purposes. • Avoids unnecessary unsoldering and soldering—no more solder mess. • Pays for itself the first month in time saved. • Flick of a switch instantly selects any one of . . .  
 24 RESISTORS from 10 ohms to 5.6 megohms  
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**Substitute for Electrolytic Capacitors**  
**SENCORE ES102 ELECTRO-SUB**  
*Usable from 2 to 450 volts, D.C.*  
 Contains 10 electrolytics from 4 to 350 mfd. Select the correct value with the flick of a switch. Features automatic discharge, surge protector circuit. Prevents accidental "healing" of capacitor being bridged. Completely safe—no arc or spark when connecting or disconnecting. **DEALER NET..... 1595**

**Substitute for Fuse Resistors During Repair**  
**SENCORE FS3 "FUSE-SAFE" CIRCUIT TESTER**  
 Instantly tells you whether or not it is safe to replace fuse resistors, fuses, or circuit breakers. Separate red and green scale for each commercially available fuse resistor used in radio and TV. Eliminates guesswork and wasted time. Also handy for wattage checks up to 1100 watts. **DEALER NET..... 895**

**Substitute for Bias Batteries During Repair**  
**SENCORE BE3 "ALIGN-O-PAK"**  
 Completely isolated DC supply, with less than 0.1% ripple. Eliminates messy batteries in TV service work. Handy for alignment, AGC trouble-shooting, or checking gated sync circuits. Just dial the voltage you need, 0-18 volts, positive or negative. Covers all voltages recommended by TV set manufacturers. Size, 3½x4½x1¾". For 110-120 volts, 60 cycle AC. **DEALER NET..... 785**

**UNIVERSAL TV JUMPER CORD.**  
 Fits any set from back to chassis. Box has male and female plugs for additional power source, soldering, etc. **DEALER NET 195**



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means of direction finding equipment, FCC engineers quickly determined that the cause was a defective Government transmitter.

Radar used for air traffic control at Oakland, Calif., experienced interference of long duration before FCC assistance was asked. An FCC engineer with a mobile unit speedily determined that the disrupting signal was coming from a radar installation on Mount Tamalpais. The bearings were accurate enough to show which of

the three radar units there was responsible. The Air Force took immediate steps to eliminate its trouble.

The Chillicothe, Ohio, monitoring station received complaints by an electronics firm about interruptions of its communication in the citizens band. The wayward transmissions were deciphered to be taxicab dispatching messages. However, they were accompanied by no call signals or other identification. Direction finders fixed their origin in Bermuda.

Inasmuch as citizen frequencies are used on a shared basis without interference protection, there was no justification for complaining to the British authorities.

The Seattle engineering office received complaint from a scientist that his satellite-tracking receiver was beset by severe interference. It appeared only when two local TV stations were operating. However, the equipment for receiving signals from space objects was found to have insufficient selectivity. At the suggestion of an FCC engineer, the scientist installed input filters and his gremlin disappeared.

A Western state's forestry service relayed to the Portland monitoring station an interference complaint from another state's forestry department. The annoying signal had been on the air continuously for several days. Direction finder fixes showed that it came from an unattended repeater station operated by the com-

plainant. The repeater had inadvertently been left "on."

Interference from moving objects is harder to trace. However, an interruption to air-ground communication of an airline at Chicago was quickly pinpointed on a plane in flight over Utah. The aircraft was surprised to find that it had a "stuck" transmitter.

Countless electronic gadgets, if not adequately shielded, can emit energy disturbing to radio communication. For example, one "wireless baby sitter" in New Orleans probably minded the baby all right but played havoc with broadcast reception up to a distance of four miles from the home in which it was used. Upon being notified of the neighborhood's displeasures, the owner discontinued use of the apparatus in favor of live talent.

Brute force diagnosis was resorted to in a Spokane interference case.

The Federal Aviation Agency reported reception of severe noise on one of its frequencies. It suspected a nearby power line, but the power company failed to find any defects. An FCC engineer located the particular power line pole responsible. A few lusty whacks on the pole convinced the power company that it was time to repair some faulty insulated and grounded hardware thereon.

That interference can span great distances is illustrated by the following instances:

The Coast Guard requested FCC assistance in locating signals blotting out ship communication. Bearings showed that they came from far-Pacific waters. When the Coast Guard contacted Japan it was learned that they were from a vessel in distress in the Philippine Sea.

Interference to Internal Revenue Service domestic communication was identified by FCC monitors as originating from a station in Rio de Janeiro, over 4,000 miles away.

When an international telegraph carrier complained of multiple interference on its circuit to Saudi Arabia, the FCC net found that it was caused by 10 different radio stations scattered throughout the world.

Monitoring continues to be an invaluable aid in air and sea search-and-rescue operations:

At the request of the Coast Guard, the Fort Lauderdale, Fla., monitoring station obtained three bearings which enabled a Navy plane to make visual contact with a ship lost off the coast and direct it to port.

"This is no drill; I'm really lost" radioed an Army plane en route from the Azores after an alert had been cancelled on word that the aircraft was not in difficulty. FCC direction finders established the plane's position so that it could correct its course.

The licensee of a citizens radio station who had been cited for violating Commission rules by trying to get distance on his equipment returned his license with the explanation that "the temptation of having it around is just too great and I have decided to remove the temptation."



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... the Leader

**WALTZ ME AROUND AGAIN, WILLIE!**

A phrase aimed for increasing your profits. Since the original equipment manufacturer demands speakers to the most exacting electrical characteristics . . . and demands OXFORD . . . WHY DON'T YOU? Oxford, major suppliers for original equipment provides the finest replacement speakers for any and every application. A complete line for your every need.

**OXFORD SPEAKERS**  
... Preferred for original equipment,  
Proven for replacement.  
Our catalog is available upon request.

**OXFORD Components,**  
A Division of Oxford Electric Corp.  
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Oxford Speakers are available from  
recognized electronic parts distributors.



A field engineering office was unable to comply with a youngster's request to "take a 50 kilowatt examination" but was sympathetic to his desire for more practical information, especially since the lad added: "I've got eight years to memorize everything I'll have to know, so why not memorize the FCC regulations?"

The San Diego police asked FCC field engineers to examine some radio equipment found in the possession of a man the police had arrested on a narcotics charge. It proved to be a sub-miniature battery-operated transmitter and a separate receiver with a specially constructed antenna for signaling between two confederates in a card game. The concealed transmitter on one player was capable of inducing a slight electric shock or pulse in the leg-receiver hidden on his pal.

The fact that some transmitters are on mountain tops, reached only by poor roads or footpaths, makes access for inspection difficult during bad weather. Sometimes an FCC instrument-laden truck is bogged down, or ditched, and the rest of the way made on foot. Even the Grand Island, Nebr., monitoring station was recently snowbound for several days.

Sport fishing and other small boats carrying more than six passengers for hire must maintain a safety watch on the distress frequency. It is difficult to inspect so many vessels individually. So FCC inspectors often accompany Coast Guard ship or helicopter patrols. Whenever small boats are sighted they are called on the distress frequency. If there is no answer it is evident that the prescribed watch is not being kept. In such cases a follow-up inspection is made when the vessel returns to dock and a formal notice of violation is issued.

Not long ago an FCC inspector boarded a motor vessel at a California marina. The uncooperative owner ordered the inspector off the boat. When the latter stopped on the float to write his official report he was followed by the boat owner and, in a resulting altercation, somehow

# Check TUBES, VIBRATORS THE SENCORE WAY



**America's Most Popular Tube Tester**  
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Whips those "tough dog" tube troubles . . .



Ask any serviceman who owns one . . . or try one for just one day of servicing in your shop. You'll see for yourself how much time the LC3 can save you. Checks for leakage between all elements, whether caused by gas, grid emission or foreign particles. Also checks leakage on all capacitors with voltage applied—including electrolytics. Provides instant filament checks in "Fil-Check" position—no need for a second filament checker. One spare pre-heating socket and new roll chart prevent obsolescence. New charts provided—no charge. Leakage sensitivity; 100 megohms, control grid to all other elements; 50,000 ohms, heater to cathode. Size, 7x6x3½". Wt., 3 lbs. For 110-120 volts, 60 cycle AC. DEALER NET **28<sup>95</sup>**

**NOW . . . checks 172 tube types—more than any other checker of this type.**

**NEW . . . replaceable Roll Chart prevents obsolescence.**

---

**Check Filaments of All Receiving Tubes and Picture Tubes**



**FC4 FILAMENT CHECKER**

For fast, easy checking of all tube filaments, without pulling chassis. Neon light goes out if tube filament is good. Also acts as continuity and voltage tester. Neon lamp glows when 115 v. AC is applied by cheater cord, providing a check on power to TV set. Size, 3½x4x1". **2<sup>95</sup>** With leads. DEALER NET.....

**Check 3- and 4-Prong Vibrators . . . Faster, Easier**



**VB2 "VIBRA-DAPTOR"**

Plugs into any tube checker; ideal for use with LC3 above. To check 6-v. vibrators, set for 6AX4 or 6SN7; for 12-v. vibrators, set for 12AX4 or 12SN7. Two No. 51 lamps indicate whether vibrator needs replacing. Instructions on front panel. Steel case. Size, 1½x1½x3". **2<sup>75</sup>** DEALER NET.....

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Time Savers

# SENCORE

ADDISON 2, ILLINOIS

found himself—literally—in deep water. Not having a pen that would write under water, he had to swim for shore to complete his report. As a result, the FCC is taking administrative action against the boat owner—this time through the mails.

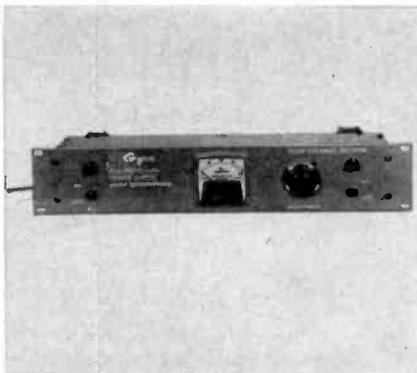
This case typifies one reason the FCC wants its field inspectors brought under a Federal law which makes it a criminal offense to assault certain Government inspectors. FCC field men have no such protection at present so the Commission has proposed covering legislation.



"We just put the set through here and one of our electronic brains takes over."

### Gyra POWER SUPPLY

Model 2000VPS-100 features double and triple filament regulation to provide long term stability of 0.0004 per day. In addition to its primary application to nuclear reactor instrumentation and scintillation counter spectrometry, it will provide ultra precise regulation of line voltages ranging from 105-125 volts, 60 cycles for the working with all types of electronic circuits requiring negative polarity in the 0-2000 volt range. Ripple is less than 5 mv. \$325.00. Gyra Electronics Corp., P. O. Box 184, La Grange, Ill. (ELECTRONIC TECHNICIAN 3-48)



### TI TRANSISTORS

Two VHF silicon mesa transistors, 2N715 and 2N716, feature high power combined with high frequency. They are capable of a guaranteed minimum power output of 500 milliwatts at 70 mc, and will deliver approximately 50 milliwatts at 200 mc. Both have a guaranteed beta spread of 10 to 50 and a collector reverse voltage of 50 and 70v (for the 2N715 and 2N716 respectively). Collector reverse current at 25°C is 0.5 microamps maximum and 50 microamps maximum at 150°C. Temperature limits are -65°C and 175° C. Texas Instruments, Inc., Semiconductor-Components Div., P. O. Box 312, Dallas, Texas. (ELECTRONIC TECHNICIAN 3-49)



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ELECTRONIC EQUIPMENT

MODEL PS-2  
2 OUTPUT RANGES  
\$49<sup>95</sup> net

## 2-IN-1 DC POWER SUPPLY

1... use it for operating ALL TYPES of auto radios  
(transistor, hybrid and tube)

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(transistor)

...also operates experimental transistor circuits, relays; use it for electroplating, laboratory work.

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- Longer life with EPL patented conduction cooling.

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VOLTS	CURRENT	RIPPLE
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CHEMICAL ELECTRONIC ENGINEERING, INC. Matawan, New Jersey



### Kilovolt POWER SUPPLIES

Models KV30-5 and KV30-2.5, employing selenium rectifiers, are instrumented with dual range voltage and current meters. Outputs are continuously variable by an auto-transformer from 0 to 30 kv in 0.5% increments.

Current ratings: model KV30-5, 5 ma; model KV30-2.5, 2.5 ma. The supplies may be operated with either negative or positive polarity. A relay removes input power when load exceeds 110% of rated current. Applications include electrostatic precipitators, CRT's, sprayers, insulation testers and corona printers. Model KV30-5, \$525.00. Model KV30-2.5, \$425.00. Kilovolt Corp., 2 Manor House Square, Yonkers, N. Y. (ELECTRONIC TECHNICIAN 3-47)



"Say, Fred, I've got a little problem—mind coming out of retirement for a few hours?"

(Continued from page 58)

paign is under way to collect a war chest of \$5,000 to assist in defending the Kansas City license bill, now under attack by opposition forces. New officers elected were: Pres., John Alex Earp; Sec'y, Jim White; Treas., William Puitt.

**New Jersey**

TSDA, Pennsauken, announces the election of the following new officers: Pres. Pete Rapagnanni; V.P., William Boyd; Sec'y., Leon Skalish; and Treas., Harry Goodchild.

**New York**

**BBB To Aid L. I. Techs**

RTG, L.I., N.Y., reports the Better Business Bureau is making efforts to improve advertising and selling practices among TV sales and service firms in Nassau and Suffolk counties. The Long Island BBB plans to make available a number of pamphlets designed to educate the public about industry practices.

**Ohio**

TESA, Springfield, elected: Pres., Marvin Miller; V.P., Robert Allan, Sec'y, Wade Campbell and Adolf Stanguts was returned to the office of Treas.

TESA, Columbus, announces its Spring convention will take place Sunday, April 3rd at the Zane Hotel, Zanesville, Ohio.

**Pennsylvania**

TSADV, Philadelphia, elected the following officers: Pres., Wayne Prather; V.P., Charles Ross; Corr.-Sec'y, Leon Helk; Rec.-Sec'y, John Rook; Treas., L. B. Smith.



"What ails your set is called non-conjunctivitis—meaning not plugged in."



NEW  
**SENCORE**  
Time Saver

The missing link in TV service . . .

**SENCORE SS105 SWEEP CIRCUIT TROUBLE SHOOTER**



HORIZ. OSC.	VERT. OSC.
HORIZ. O.P. STAGE	VERT. O.P. STAGE
HORIZ. FLYBACK XFORMER	VERT. O.P. XFORMER
HORIZ. DEFLEC. YOKE	VERT. DEFLEC. YOKE

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**UNIVERSAL HORIZONTAL OSCILLATOR.** For direct substitution. No wires to disconnect in most cases. Traces trouble right down to the defective component. Variable output from 0-200 volts, peak-to-peak.  
**HORIZONTAL OUTPUT CATHODE CURRENT CHECKER.** A proven method that quickly checks the condition of the horizontal output tube and associated components. Adaptor socket prevents breaking wires. Easily replaceable Roll Chart gives all necessary pin, current and voltage data.  
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**DYNAMIC FLYBACK TRANSFORMER CHECKER.** Merely flip switch to "Flyback Check" and meter will indicate condition of flyback transformer, in degrees of horizontal deflection. Extremely sensitive and accurate; even shows up one shorted turn on flyback.  
**VOLTMETER.** For testing bootstrap, screen and other voltages. Direct-reading voltmeter, 0-1000 volts.  
**UNIVERSAL VERTICAL OSCILLATOR.** Checks oscillator, output transformer and yoke. Merely touch lead to component and check picture on screen.  
 Size, 7x6x3½". Wt. 4 lbs.  
 For 110-120 volts, 60 cycle AC.

DEALER NET 42.95

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\$7.50 plus parts, C.O.D. and postage charges

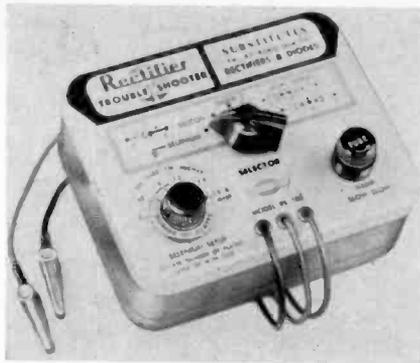
**Precision Tuner Service**

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 UHF - VHF COMBINATIONS — \$13.50

See your local distributor or send to:  
 P.O. Box 272, 601 N. College State make and model. Send BLOOMINGTON, INDIANA all parts, tubes and shields

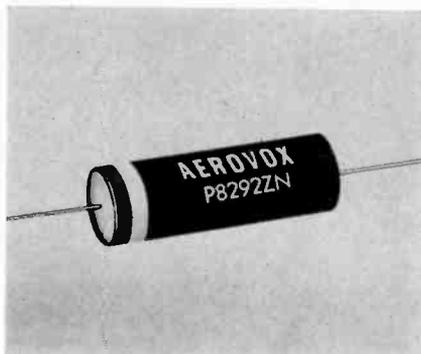
### Sencore TROUBLE SHOOTER

RS106 rectifier trouble shooter provides instant direct substitution for: selenium rectifier types used in radio, TV and electronic circuits up to 500 ma; silicon rectifiers; single diodes with the exception of some used in high frequency circuits and dual diodes types used in sync discriminator circuits. It has full controls for selection of proper values in testing and is protected by a 1/2 amp. slow-blow fuse. \$12.75. Sencore, Addison, Ill (ELECTRONIC TECHNICIAN 3-16)



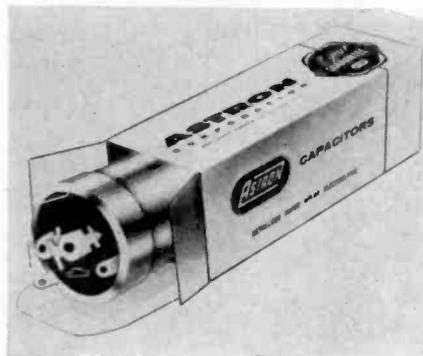
### Aerovox CAPACITORS

Type P8292ZN, a new line of miniature, economically priced, metallized-paper capacitors, offers outstanding electrical characteristics. Features include: the exclusive "Polycap" plastic case construction and a high temperature solid impregnant; excellent humidity resistance and improved insulation resistance characteristics. Units are free of any wax coating. Available in a complete range of sizes, voltages and capacitances. Aerovox Corp., New Bedford, Mass. (ELECTRONIC TECHNICIAN 3-1)



### Astron CAPACITORS

A new container, for "Red Seal" Twist Prong and Minimate electrolytic capacitors, combines point-of-sale advertising and an aid to systematic inventory. The long sides display the "Red Seal" and signed guaranty, while one of the die-cut opening ends shows



name and item stock number. The tab, bearing this information, is extra long so that the jobber who tears it off when making a sale can "keep tab" for re-orders. A compact metal wall cabinet displays over 500 popular Twist Prong ratings. Astron Corp., 255 Grant Ave., East Newark, N. J. (ELECTRONIC TECHNICIAN 3-19)

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## For Master Antenna Systems

### ANTENNA FILTER AND FILTER BASE

- Sharp Selectivity for Antenna Multiplexing
- Single Channel Preadjustment Eliminates Field Adjustments
- TUG-PLUG\* Quick-Disconnect Fittings and Built-In Connecting Cable Simplify Installation



Years of EXPERIENCE in the television transmission field, plus the MOST ADVANCED RESEARCH AND DEVELOPMENT FACILITIES have made ENTRON the watchword in quality, precision-built master television antenna equipment.

Modular design of the entire Entron system assures ease and rapidity of installation, inspection, and maintenance. Each component also features the Entron TUG-PLUG\*, a revolutionary, time-saving, quick-disconnect fitting.

### COMPLETE LINE OF OUTLETS IN ALL ATTENUATIONS FROM 10 TO 30 DB.

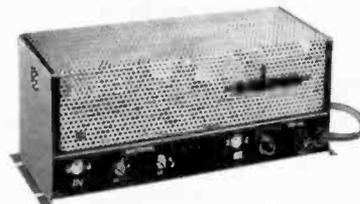


- Easily Installed—No Special Tools Required
- OP Series (Flush Mounting)—OB Series (Surface Mounting)
- DK Series with Two Outlets (Both Flush and Surface Mounting)
- New TUG-PLUG\* Quick-Disconnect Fittings
- Response Flat from AM thru VHF TV Band

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- High Power Output—High Gain
- 10,000 Hour, Type 6922 Tubes
- Long Life Silicon Rectifiers
- Separate Tilt and Gain Controls for Each Band
- New TUG-PLUG\* Quick-Disconnect Fittings

Plug-in power splitters available to split signal 2 or 4 ways. Ask for ES-2 or ES-4.

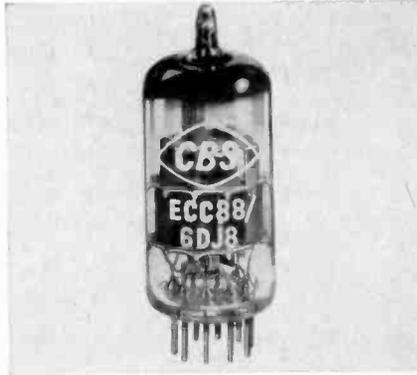


\*Trade Mark

For further information, write or phone: **entron** INCORPORATED P. O. Box 287 Dept. A Bladensburg, Md. Phone: APpleton 7-9585

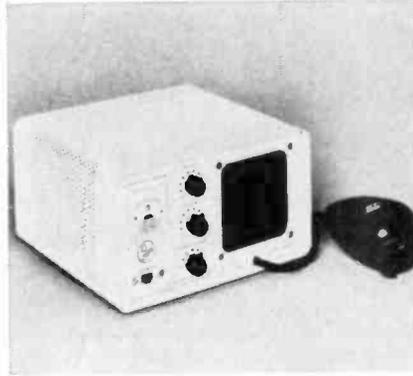
**CBS TWIN TRIODE**

The ECC88/6DJ8 high-gain twin triode with true frame-grid construction offers high reliability for instrumentation, industrial controls, nuclear electronics, communications and broadcast equipment and TV tuners. This new tube provides high transconductance, high input impedance, low noise figure, and uniform characteristics. Its grid operates cooler, and it features a trouble-free coil heater. CBS Electronics, Danvers, Mass. (ELECTRONIC TECHNICIAN 3-2)



**Kaar 2-WAY RADIO**

TR326 "D" Phone conforms to the Limited Radiation Regulation, Part 15 of the FCC Rules and may be put on the air immediately. Power generated by the transmitter, 100 milliwatts. Antenna height, 5'. Range, 1/2 mile in urban areas to approximately 4 or 5 miles over water. Can be used while waiting for return of Citizens Band License; and then restored to its full Class D power and range. Kaar Engineering Corp. 2995 Middlefield Rd., Palo Alto, Calif. (ELECTRONIC TECHNICIAN 3-7)



**U.S.L. "RADIO-PHONE"**

The new U.S.L. TR-800 "Radio-Phone" is a low cost superhet citizens band transceiver featuring: 5-channel transmitting; 22-channel vernier tuned receiving; 3-watt audio output; input power to transmitter, 5 watts fully plate modulated and power pack for



6 to 12v mobile use. Transmitting crystals are changed through a removable panel located in the front of the transceiver. Universal type mobile mounts will be furnished with each unit. \$99.95 including one crystal and microphone. United Scientific Labs., 35-15 37th Ave., Long Island City 1, N. Y. (ELECTRONIC TECHNICIAN 3-3)

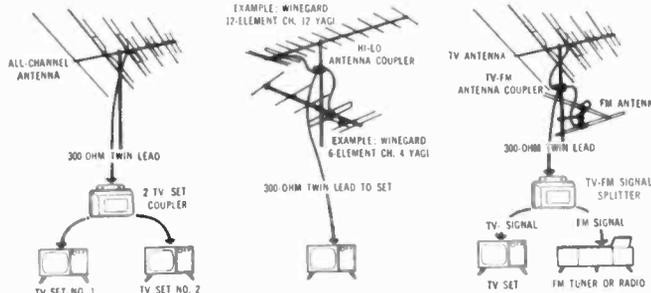
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Reflecting the Quality of Winegard TV Antennas  
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Here is a new low in insertion loss . . . here's complete isolation of signals and impedance match . . . and perfectly flat response all in one quality-built coupler from Winegard. Right-priced, superbly built, electronically superior, handsomely packaged, and easily

installed. These mast and flat mount coupler systems will earn you bigger, quicker profits on any installation of two or more TV sets, color or black and white, and FM.

Tell your Winegard Distributor you want to test the new Winegard Precise-Match Couplers.

Available Now in These Mast or Flat Mount Models



**2 TV Set Coupler**, to give two TV sets the same fine reception off one UHF-VHF antenna. Precise 300 ohm impedance match at antenna and receiver terminals.

**Hi Lo Antenna Coupler**, to combine a high band and a low band TV antenna. Highest isolation factor of any coupler on market.

**World's only true TV-FM Coupler System.** All others divide signal, with 3 DB loss. Winegard separates signal, but sends total signal to TV or FM set—no loss.



Underside of mast mount coupler showing super quality construction. No hex nuts. Heavy-duty wing nuts tighten easily. All metal parts dichromate triple plated for rust and corrosion protection.

**Winegard ANTENNA SYSTEMS**



WINEGARD CO., 3019-3 SCOTTEN, BURLINGTON, IOWA

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Name \_\_\_\_\_

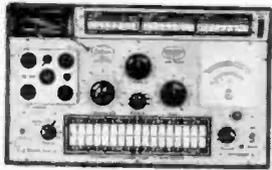
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Checks receiving tubes, voltage regulators, eye tubes. Shows heater continuity without warm-up. Reads heater current. Provides both shorts test and grid leakage test. Has 231 heater voltage combinations. An outstanding professional tube tester. **\$189.95**



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Provides convenient lever switching and time-proved Jackson Dynamic test principle. Has variable plate voltage and load controls. Shorts test has variable sensitivity to 2 megohms. Convenient roll chart and grouped tube socket sub-assembly. **\$89.95**



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Features super-rapid sequence switching. The set-up time is less than the warm-up time of the tube. Twenty-three separate heater voltages. Line voltage control indicates actual line voltage. Famous for dependability the world over. **\$129.95**



## POWER CHART ACCESSORY

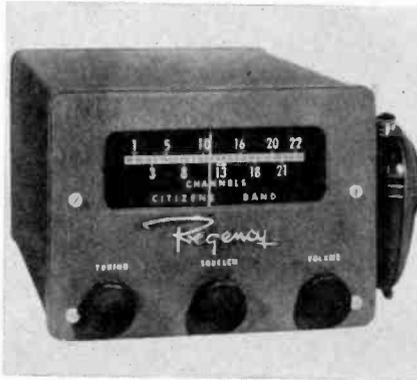
Here's a new addition! The Jackson Power Roll Chart—available in all three tube testers for those who require the extra. Roll the chart from one end to the other in less than 25 seconds with the touch of a finger. **\$20.00 net**

SEE YOUR DISTRIBUTOR OR WRITE FOR LITERATURE.

**Jackson**  
**THE JACKSON  
ELECTRICAL  
INSTRUMENT  
COMPANY**  
16-18 SOUTH PATTERSON BLVD.  
DAYTON 2, OHIO  
In Canada: The Canadian Marconi Company

## Regency 2-WAY RADIO

Model CB-27 citizens band transmitter features a crystal controlled first oscillator for receiver performance that approaches the stability and resetability of a crystal controlled unit, yet retains the flexibility of a tuneable receiver. Supply power, 115v a-c (model CB-27) or 12v d-c (model CBM-27).



Power consumption, 30 watts (standby) 50 watts (transmit). Dimensions, 4½" x 6½" x 8¾". Weight, approx. 9 lbs. Receiver sensitivity, 2µv or better; selectivity 6 kc @ 6 db down and 14 kc @ 60 db down. Regency Div. I.D.E.A. Inc., 7900 Pendleton Pike, Indianapolis 26, Ind. (ELECTRONIC TECHNICIAN 3-15)

## Sonotone MICROPHONES

"Matched Twin" microphones for stereo taping are: CM-T10 paired "Ceramics," acoustically matched to a tolerance of 2 db. Jacked into any quality stereo recorder, it feeds the tape a substantially flat 50-to-13,000 cycle signal at an output level of -62



db. Where greater sensitivity is desired, the CM-T11, also in matched twins, has frequency response of 50 to 8,000 cycles within 2 db of each other and the sensitivity is 55 db below 1.0v per microwatt. \$36.75 per pair for either CM-T10 or CM-T11. Sonotone Corp., Elmsford, N. Y. (ELECTRONIC TECHNICIAN 3-24)

# ATLAS PAGING SPEAKER STYLED FOR MODERN DÉCORS

The New Atlas DU-12 Perfect for the Most Discriminating Applications. For the first time here's a loudspeaker that doesn't look like one. Modeled along the sleek, straight lines of a modern lighting fixture, and finished in brushed satin aluminum, the Atlas DU-12 is styled to harmonize and enhance the most ultra of modern decors.

Acoustically, the Atlas DU-12 offers high intelligibility, efficiency and directivity — features that mark it as a fine quality loudspeaker. The frequency response of the DU-12 is "tailored" to reproduce speech with clean, crisp articulation. Its horn type construction and universal mounting bracket provide complete directional control, confining the sound coverage to the required service areas. And, there's no wiring exposed to mar its appearance because all connections and line matching transformer are completely hidden behind the mounting canopy. Canopy is equipped with adapter strap for mounting on any flat surface or for use on standard electrical outlet box. In commercial installations where both décor and true acoustical quality are important, the Atlas DU-12 is the only answer. Investigate the profit opportunities for yourself. Write for information on the complete line of Atlas P.A. speakers, mike stands and accessories.



**Décor-Projector DU-12**

List \$35.00  
Net \$21.00

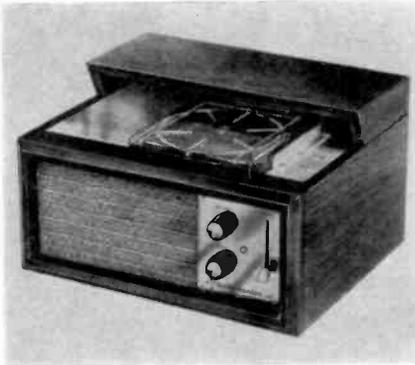
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Write for complete Catalog

**ATLAS Sound Corp.** Dept. ET-3, 1449 39th Street, Brooklyn 18, N. Y.  
In Canada: Atlas Radio Corp., Ltd., Toronto, Ont.

## Melo-Sonics MUSIC SYSTEM

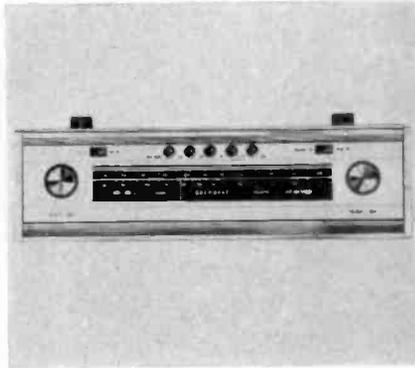
A new continuous-play tape repeater console is compact, fully self-contained, has transistorized pre-amp, dynamically balanced capstan flywheels, heavy-duty precision motors and transformers, spring-action positive-lock clutch and the Melo-sonics "Pow-R-Pack" satellite



amplifier construction. Tape speed, 3.75 ips. Frequency response @ 3 3/4 ips, 40-12,000 cps  $\pm 3$  db. Output power, basic 10/w, 18/w peak. Power source, 110v-60 cycle. Impedance, 8 ohm. 14" wide, 11 1/2" deep, 8" high. Melo-sonics Corp., 249 E. 49 St., New York 17, N. Y. (ELECTRONIC TECHNICIAN 3-22)

## Sherwood STEREO TUNER

Model S-2200 FM-AM-Multiplex high fidelity stereo tuner provides separate reception of FM-AM simulcast broadcast and internal plug-in adaptor for stereo FM multiplex. It gives push-button monaural or stereo FM/AM/Multiplex. FM section has .95  $\mu$ v for 20



db quieting sensitivity and interchannel hush. AFC gives 20 db correction. AM section permits selection of either a 15 kc-wide bandpass or sharply selective 5 kc bandwidth. \$179.50 Model AMX FM Adaptor, \$49.50. Sherwood Electronic Labs., 4300 N. California Ave., Chicago 18, Ill. (ELECTRONIC TECHNICIAN 3-23)

ONE OF A SERIES

## THE PRACTICAL APPROACH



Robert Cornell\*

## Antenna Antics

Ever run into a customer who tells you reception on a rainy day becomes greatly improved on one or more channels, or conversely, one or more channels seem to fade out when it rains?

Ever try to convince a customer that the old antenna is not functioning, simply by cutting the lead-in wire near the antenna and observing absolutely no difference in reception?

Ever replace an old beat-up antenna and lead-in with a super-duper installation and wind up with new and additional ghosts, or with snow that didn't exist before?

I'm sure most of us have, as these are common happenings.

Each element and component contribute to the characteristics of the whole system. Defective antenna systems are responsible for "suck-out" of all or part of the desired signal spectrum. They cause standing waves and ghosts to be created and can radiate like mad. Not all ghosts are due to reflected signals from buildings and obstructions.

Unfortunately, a defective antenna system can do exactly the opposite. It can cause a signal or part of a signal to be unduly amplified, sometime to the point of overloading a receiver. It is usually pretty difficult to convince a customer that he needs a new system, even if only one channel is coming in strong.

A practical suggestion is to survey the antenna installation from the outside of the house before ringing the doorbell. An embarrassing incident in my life may serve as an object lesson.

It was an ordinary service call in a two-story private home. A heavy snowfall caused me to dash from the truck to the house without once looking up. Two tubes restored the set to normal operation and the set worked fine on all channels. The customer looked curiously at me and asked if her antenna is defective. I reassured her all was well . . . she could not get such fine reception otherwise. Not until I was back in the truck, ready to drive away, did I look up.

You guessed it . . . the antenna was lying face down with a broken mount, bent mast and bent elements. Time and the elements have made me a wiser man.

Instead of using an ordinary coupler in a 2 or 4-set installation, consider the new Blonder-Tongue B-24 Pow-R Booster. For 1 set it can be used as a "straight-thru" booster with as much as 10 db gain. As a two-set amplified coupler, a gain of 3 to 5 db per set can be had. Compare this with the 3 to 12 db loss resulting from the use of passive couplers. It is possible to hook up the B-24 in a 4-set "No-Loss" installation. The B-24 lists for only \$24.95.

Do write me and let me know of your unusual experiences. If you have a problem, I'll try to get you some expert advice. Contact me at Blonder-Tongue, Laboratories, 9 Alling Street, Newark 2, New Jersey.

\*Member: IRE, AES, & N. Y. State Attorney General's Committee on Fair Practices in the Radio and TV Supply Industry. President of Certified Electronic Technicians Association. Former Technical Editor. Electronic Technician Magazine.

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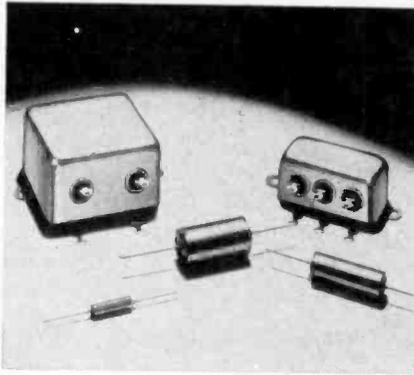
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**Plastic CAPACITORS**

New metallized Mylar capacitors, available in bathtub type AB and metal tubular type AM, have temperature range for operating and storage of -90° C to 125° C, and capacitance tolerances are 1%, 2%, 5%, 10%, and 20%. Mil requirements are met and exceeded and the capacitors have many applications. Advantages include extremely small size, dependability, low dielectric absorption, high resistance and longer life. Also self-healing characteristics. Plastic Capacitors, Inc., 2620 N. Clybourn Ave., Chicago 14, Ill. (ELECTRONIC TECHNICIAN 3-13)



**Lafayette 2-WAY RADIO**

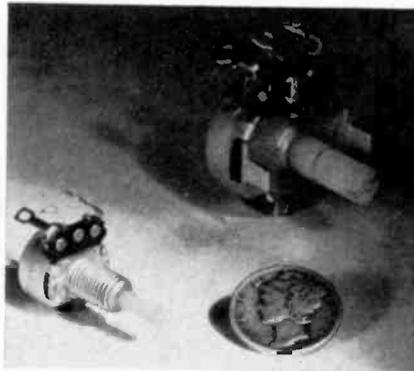
Model HE-15 superhet 2-way Citizens Band Radio features 5 crystal controlled transmitting channels operating at a maximum legal power input of 5 watts, 22 channel band; 3-watt audio output and 20-mile coverage. Controls include 3-position function switch, planetary vernier tuning and squelch noise lim-



iter. Output impedance matches 52 and 72 ohm antenna and has Amphenol type coaxial connector for operating into dipole, ground plane or rod antenna. \$59.95 including one crystal and microphone. Lafayette Radio Electronics Corp. 165-08 Liberty Ave., Jamaica 33, N. Y. (ELECTRONIC TECHNICIAN 3-8)

**Mallory CONTROL**

Type MLC, a new conventional-type miniature carbon control, 1/2" in diameter, offers performance characteristics and features of larger controls. It can be supplied with a full-rated switch for 2 ampere, 125 volt a-c service, using a floating contact ring of the same size and design employed in larger Mallory switches for minimum contact resistance. Either nylon or steel shaft can be supplied with the control. P. R. Mallory & Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind. (ELECTRONIC TECHNICIAN 3-10)



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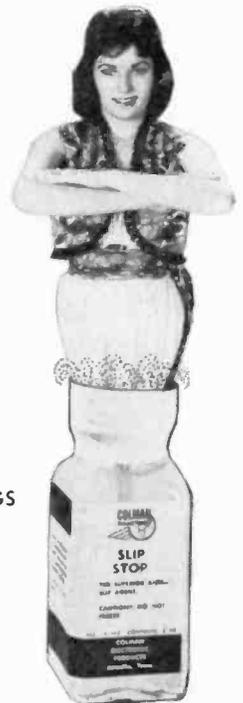
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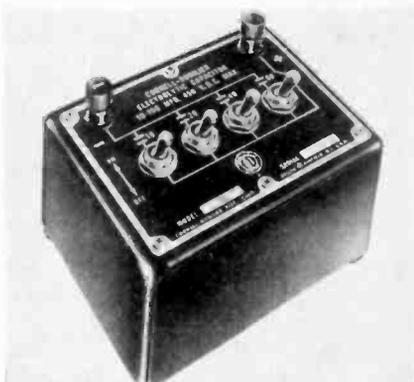
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### Perma-Power TV TUBE BRIGHTENERS

A new 12-pack dispenser carton is now standard packaging for both series and parallel Vu-Brites, models C401 and C402. Also for the Golden C-Brite model C201. The new package tucks readily to any wall and permits quick removal of individual brighteners. It is not only a handy dispensing unit but also a handy purchasing unit. However, the units are still individually packaged and can be purchased in quantities smaller than a dozen. Perma-Power Co., 3100 N. Elston Ave., Chicago 18, Ill. (ELECTRONIC TECHNICIAN 3-14)



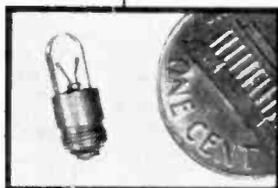
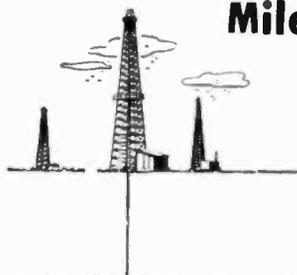
### Lawrence AMPLIFIER SYSTEM

"Road Commander" model No. RC-1225 transistorized mobile public address and radio amplifier measures 6 $\frac{5}{8}$ " x 5 $\frac{1}{4}$ " x 3 $\frac{3}{4}$ " and weighs only 3 lbs. Output power, 25/w on 12.6v; response, 400 to 6,000 cps; gain, 103 db; distortion, less than 10% at full-rated



output; controls, microphone gain, radio gain, on-off, radio, p.a. selector; current drain, 180 ma no signal-radio monitor position, 3 ampere full power; output impedance, 16 ohms; input impedance. 150-200 ohms. Lawrence, Inc., P.O. Box 5106, Seven Oaks Station, Detroit 35, Mich. (ELECTRONIC TECHNICIAN 3-9)

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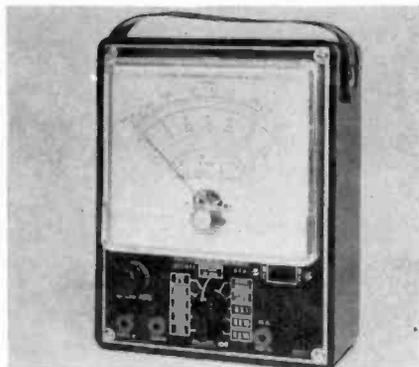
## NEW PRODUCTS

For More Information On  
NEW PRODUCTS

Circle Code Numbers, p. 61

### EMC VOM

Model 109 features the use of a 40 microampere 4½" meter and a-c voltage sensitivity of 10,000 ohms per volt. It has five d-c voltage ranges to 3,000 volts at a sensitivity of 20,000 ohms per volt; five a-c voltage ranges to 3,000 volts at a sensitivity of 10,000 ohms per



volt; three a-c and d-c current ranges and three resistance ranges to 20 megohms. Housed in a high impact molded bakelite case. Wired, \$26.95. Kit, \$19.25. Electronic Measurements Corp., 625 Broadway, New York 12, N. Y. (ELECTRONIC TECHNICIAN 3-31)

### G-C CHEMICALS

Free offer good during the month of March: Free: one 6-oz can of G-C Spra-Kleen (No. 8666)—claimed to be among the finest and most popular TV tuner cleaners—with the purchase of a 16-oz. can of G-C Zero-Mist Spra-Koat (No. 8667)—used to cool circuits having intermittent trouble. Also, Free:



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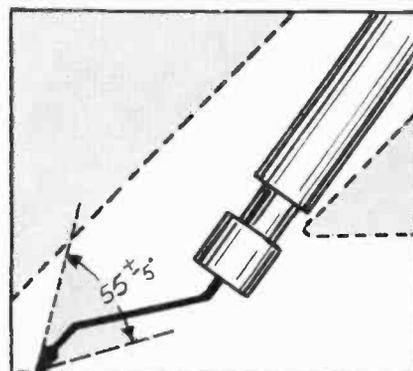
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## New Books

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

**SOUND BUSINESS PRACTICES & SELLING ELECTRONIC SERVICE.** Prepared under the direction of John K. Pfahl by the General Electric Co. Two hardcover volumes and 10" record disc. 85 & 57 pages respectively. Price \$22.50 (may be obtained at little or no cost based on tube purchases from GE distributors).

This attractive package contains two excellent manuals. *Sound Business Practices* covers business for profit, planning your business, organizing your business, and controlling your business. Subjects such as overhead, pricing, inventory control, credit and records are clearly discussed. *Selling Electronic Service* examines attracting new customers, business promotion and customer satisfaction.

The disc, "Sounds of Success," features actual interviews with 30 of the most successful service technicians in the country. In their own words, these men reveal the selling secrets used in their operations. In addition, a 4-page Profitable Service Management Workshop is included, with test questions. Filling in the correct answers, based on the texts, qualifies the technician for a management award certificate. This book-record package is a most worthwhile aid to sound independent business operation.

**RADIO TELEPHONE LICENSE MANUAL.** By Woodrow Smith. Published by Editors and Engineers, Ltd., Summerland, Calif. 184 pages, hard cover. \$5.00.

Covering Elements 1 through 4, from FCC "Study Guide and Reference Material for Commercial Radio Operator Examinations," each page of this book is arranged in an easy-to-read, two column format. Questions appear in bold type, followed by answers. A modest appendix illustrates typical and most-used electronic formulae, and explains in a clear manner many typical mathematical problems from simple arithmetic notation through quadratic equations. A complete explanation on the use of logarithms is likewise included. Although essentially a book for the person preparing for a First or Second-Class Telephone License examination, it should be useful to anyone concerned with this aspect of radio communication.

**\*AUTO RADIO MANUAL, Vol. 9.** Published by Howard W. Sams & Co., Inc. 160 pages, soft cover. \$2.95.

Continuing a series of manuals covering auto radio service data, this latest addition, Vol. 9, includes 35 models produced in 1958-1959. Information is presented on schematics, parts lists and alignment instructions for the individual models.

**\*COMPUTERS AND PEOPLE.** By John A. Postley. Published by McGraw-Hill Book Co. 246 pages, hard cover. \$6.00.

Written by the director of the Rand Corp. Data Processing Group, this book delves into the environmental aspects of computers. Adroitly bypassing its technical side, the author deftly analyzes the effect of computers on business activities, together with its functions, applications, inadequacies and future development prospects. Although a non-technical book, it should be of interest to technicians desiring information concerning the computers' impact on our social and economic lives.

**\*HOW TO GET THE MOST OUT OF YOUR VOM.** By Tom Jaski. Published by Gernsback Library, Inc. 224 pages, soft cover. \$2.90.

This book is devoted to the remarkable, versatile multimeter. The author covers the service tech's workhorse in a deservedly thorough manner. Commencing with the basic principles of VOM's, the text progresses to analyzing kit-type and commercial units. The remaining five chapters cover: practical measurements, using the VOM for servicing, and miscellaneous applications, such as checking auto distributor timing. The clearly written text is augmented by numerous photos, drawings and schematics. If you own a VOM—and who doesn't—this practical book is certainly recommended.

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## NEW RIDER BOOKS

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**HOW TO USE METERS (2nd edition)** by John F. Rider & Sol D. Prenskey. Engineers, laboratory and service-technicians—everyone who uses meters in their daily work—will find this revised, expanded and modernized version of the fabulously popular original text absolutely indispensable.

Everything that is new in meter instrumentation will be found in this book. For example, in addition to full coverage of the many types of conventional d-c, high frequency a-c and modulated type VTVM, the digital voltmeter is also discussed in full detail. Also covered are the ultra-high impedance electrometer vacuum tube voltmeter; transistor voltmeter and industrial transducers for voltmeters.

Explains in detail the construction and operation of all types of electrical meters to use for making different kinds of measurements in electronic and electrical equipment and industrial applications. Also explains how to make measurements... namely, where to connect the meters. A section is devoted to multi-phase circuit measurements. #144, \$3.50.

**HOW TO TROUBLESHOOT TV SYNC CIRCUITS** by Ira Kemmer. The sync system of TV receivers provides the triggering for the horizontal and vertical stages. This text covers the many variations in monochrome and color TV sync circuits and the possible troubles that might occur in them. It covers such areas as: sync takeoff, sync clipping and limiting, noise cancellation and time constants. The discussion of the output circuits of the sync section includes the integration and differentiation of the vertical and horizontal circuit signals. Possible sync failures with relationship to the components that might cause them are explained. Sync circuits found in modern TV receivers are covered in great detail. Special circuitry is analyzed. Synchronization in color TV receivers is covered. #249, \$2.90.

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**LABORATORY WORKBOOK,** 32 pp. #161-2, \$9.50. **TV PICTURE TUBE-CHASSIS GUIDE,** by Rider Lab Staff. This easy-to-use TV tube type chassis guide covers all picture tube types used in TV receiver production from 1946 to February 1957—over 7,000 listings. Organized by chassis number, and in some cases, by models so that the technician can immediately locate the correct picture tube type simply by knowing the chassis number. #204, Only \$1.35.

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ET-3

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## NEW PRODUCTS

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NEW PRODUCTS

Circle Code Numbers, p. 61

### Vaco SOFT FACE HAMMER

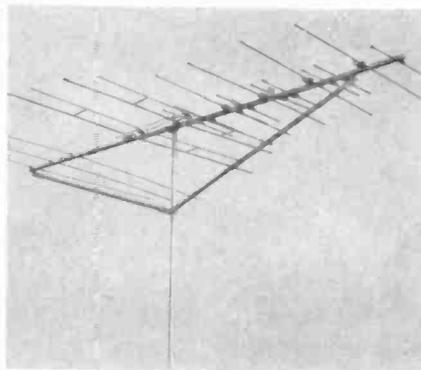
Features include: Three interchangeable screw-in replaceable tips, including nylon, that are shock-absorbing, non-slip and will not mar delicate surfaces. They are chip-proof, flake-proof, mushroom-proof and will not change shape and are 1 $\frac{3}{8}$ " in diameter,  $\frac{5}{8}$ " thick and equipped with a plated



stud that extends outward  $\frac{1}{4}$ ". The hammer has a shot-loaded head which prevents rebound and adds 30% more power to the drive. Overall length is 12 $\frac{3}{4}$ " with a 4 $\frac{5}{8}$ " head including tips. \$4.75. Vaco Products Co., 317 E. Ontario St., Chicago 11, Ill. (ELECTRONIC TECHNICIAN 3-18)

### JFD ANTENNAS

A newly designed series of eight Banshee broad band TV antennas feature completely preassembled "Quik-Rig" construction. Other advances include 1" square heavy-wall crossarms with capped ends for better rigidity,  $\frac{1}{2}$ " and  $\frac{3}{8}$ " od preassembled dipoles



reinforced with heavy duty inserts at ends for added strength and permanence, new improved element brackets, and wide-angle boom bracing for the larger Banshee antennas. JFD Electronics Corp., 6101 16th Ave., Brooklyn 4, N. Y. (ELECTRONIC TECHNICIAN 3-6)

### Kormat SOLDER DISPENSER

A new wire soldering dispenser has a push button feeder to supply the correct amount of solder for each application. It provides for a selection of attachments including straight or curved probes in several lengths for hard-to-reach areas; and is equipped with a 20' roll of 60/40 rosin core solder of .050" diameter wire. Flip action re-loads wire solder in seconds. The dispenser will feed solder wire from .028" to .074" in diameter. Products For Industry, 220 S. Rose St., Los Angeles, Calif. (ELECTRONIC TECHNICIAN 3-11)

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- Goes on in seconds—DRIES IN MINUTES

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ELECTRONIC TECHNICIAN • March, 1960

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Tests all receiving tubes (picture tubes with adapter), n-p-n and p-n-p transistors.



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Peak-to-Peak VTVM #232 & Uni-Probe (pat. pend.)  
Wired \$49.95  
Kit \$29.95

Uni-Probe — exclusive with EICO — only 1 probe performs all functions: half-turn of probe tip selects DC or AC-Ohms.

In stock at over 1500 distributors in the U. S. and Canada

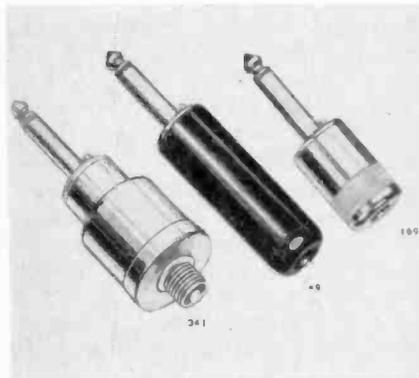
**IMPORTANT NOTE:** All EICO kits built according to our Instructions, and all EICO factory-assembled equipment, conform to the high standards and specifications published in EICO literature and advertisements. All EICO factory-assembled equipment is completely and meticulously hand-wired throughout — no printed circuitry; each factory-assembled unit is 100% final-tested throughout for each feature and function — no "spot" or "partial" checking. In EICO's final-test techniques, nothing is left to chance.

EICO, 33-00 Northern Blvd., L.I.C. 1, N. Y.

See you at IRE Booth 3505

## Switchcraft "SILENT PLUGS"

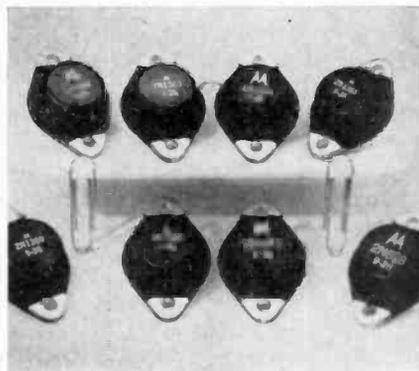
Amplifier open circuit noises are eliminated when plugs or connectors are replaced with one of the new "Silent Plugs." A circuit closing device, built into the plug, closes the circuit automatically and eliminates squeaks, hum and distorted noises which occur when the "hot" plug is touched,



bumped or dropped on the floor. Plug No. 49 is a 2-conductor plug with 2" long Bakelite handle, \$1.50. No. 169 has 1" long shielded handle. \$1.75. Plug Adapter No. 341 has 2-conductor jack input to 2-conductor plug output. \$2.95. Switchcraft, Inc., 5555 N. Elston Ave., Chicago 39, Ill. (ELECTRONIC TECHNICIAN 3-17)

## Motorola POWER TRANSISTORS

New low and high voltage military type industrial power transistors, in 3-ampere ratings, are types 2N1359-60 and 2N1362-65. These germanium, PNP, alloy junction devices, expand the firm's present 2N375 and 2N618 3-ampere line. The high voltage types, with collector-base voltage ratings of 120 volts, and collector-emitter ratings of 100 volts,



permit higher output voltages in transistor regulated DC power supplies. The low voltage types, with breakdown voltages as low as 50 volts, were introduced to permit power supply manufacturers to economize by purchasing devices without unneeded capabilities. Motorola, Inc., Semiconductor Products Div., 5005 E. McDowell Rd., Phoenix, Arizona. (ELECTRONIC TECHNICIAN 3-30)

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FM Tuner HFT90 Wired \$65.95\* Kit \$39.95\*  
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Stereo Dual Power Amps  
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Wired \$74.95 Kit \$43.95 Wired \$114.95 Kit \$74.95



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Semi-Kits HFS-3 & HFS-5

- Complete with factory-constructed enclosure
- Easy to assemble — no gluing or woodworking
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EICO, 33-00 Northern Blvd., L.I.C. 1, N. Y. ET-3

Show me how to save 50% on top quality:  Hi-Fi  Test Instruments  Ham Gear. Send free catalog and name of neighborhood EICO supplier.  Send free STEREO Hi-Fi Guide.

Name .....

Address .....

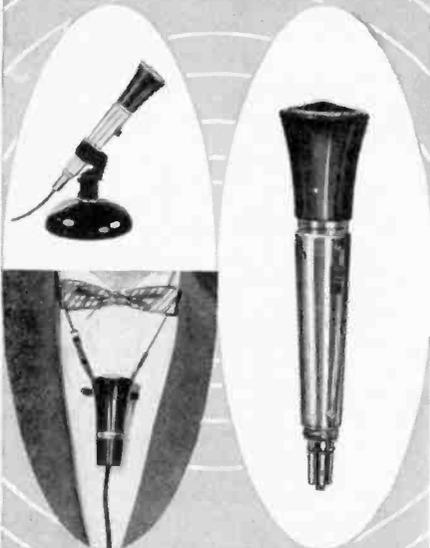
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unlimited versatility . . .  
exceptional performance . . .  
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nominal cost . . .



*Commando*  
controlled magnetic microphone by

## SHURE

Striking, streamlined unit delivers fine voice and music reproduction in dozens of public address and home recording applications. Whether used indoors or out, in-the-hand, or on a desk or floor stand, you'll be impressed by its fine response, high output, ruggedness and beauty of design. The Commando offers you such important features as dual impedance, on-off switch, and cable connector. Patented controlled magnetic construction is unaffected by extremes of temperature and humidity, can be depended on to maintain high level of quality through tough, sustained usage, year after year.

*the Commando is available in three models:*

### DELUXE Model "430"

A dual-impedance unit with A25 swivel adapter, on-off switch, cable connector  
list price \$3850

### LAVALIER Model "420"

A dual-impedance unit with lavalier cord and clip assembly  
list price \$3000

### STANDARD Model "415"

A high impedance unit with A25 swivel adapter  
list price \$2750

## SHURE

write for free literature:

**SHURE BROTHERS INC.**

222 Hartrey Ave.

Evanston, Ill., Dept. 14-C

Manufacturers of world-famous Shure High-Fidelity Stereo Dynamic Phono Cartridges.

## TV Antenna

(Continued from page 37)

gain. Suspecting something intermittent, I checked the set over thoroughly, lightly tapping r-f and i-f tubes, but no difficulties appeared. After allowing it to "cook" for some time, I delivered the set to the customer. Again the screen was covered with snow! I tried to explain to the customer that the set worked perfectly in my shop, but the customer was, at best, a tolerant listener. I began to wonder about it myself, as the set went back to the shop.

On the bench I was again confronted with a perfect picture! Wild ideas began circulating through my head. Could the customer's feed-line be off at the antenna terminals? Was the coax feed-line filled with water? Nonsense! The set was operating normally in the customer's home only a few hours before. I decided that the difficulty was external to the set and installed a completely new feed-line from antenna terminals to the set.

With the new line connected the "snow" still appeared. That did it! It must be an intermittent in the set, I thought again.

True to form, after the set was back on the bench and connected to the antenna, it operated perfectly.

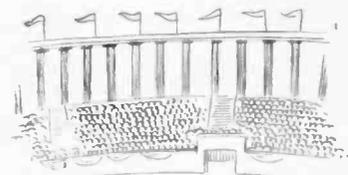
Probing into the tuner with a VOM revealed an open r-f choke coil in the cathode of the 6AB4 r-f amplifier, illustrated in Fig. 2. You are probably beginning to see the end of this ghastly story, as I did shortly thereafter.

You see, the customer used a conical antenna. My antenna had a folded dipole driven element, allowing a closed loop for the 6AB4 cathode through the antenna and feed-line to chassis ground—even with the r-f choke open. Under the same condition, however, the conical did not allow such a return and for all practical purposes the r-f tube was dead, having no cathode return.

The r-f choke was either intermittent prior to the service call or opened permanently when the chassis was first returned to the cabinet and the set switched on.—Dean A. Daleske, Eldora, Iowa.

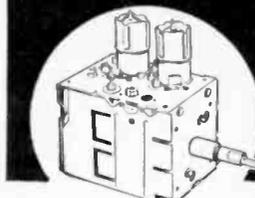
### TOUGH DOGS WANTED!

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



"I once took a JENSEN NEEDLE out of his paw."

## TARZIAN Offers 48-Hour, Direct Factory Service on Tuner Repairs



only  
**\$8.50**

Price Effective Jan. 1, 1960

That's right. Net, \$8.50 per unit and \$15 for UV combinations, including ALL replacement parts. 90-day warranty against defective workmanship and parts failure. Tuners repaired on approved, open accounts. Replacements offered at these prices\* on tuners not repairable:

VHF 12 position tuner . . . . .	\$22.00
VHF 13 or 16 position . . . . .	23.00
VHF/UHF combination . . . . .	25.00
UHF only . . . . .	15.50

\*Subject to change



Tarzian-made tuners are easily identified by this stamping on the unit.

When inquiring about service or replacements for other than Tarzian-made tuners, always give tube complement . . . shaft length . . . filament voltage . . . series or shunt heater . . . IF frequency, chassis identification and allow a little more time for service. Use this address for fast, 48-hour service:

## SARKES TARZIAN, Inc.

Att.: Service Mgr., Tuner Division

East Hillside Drive

Bloomington, Indiana

INDEX TO ADVERTISERS

March, 1960

**Aerovox Corp.** ..... 86  
Agency: Lescarboursa Advertising, Inc.

**American Television & Radio Co.** ... 89  
Agency: Firestone-Goodman Adv Agency

**Atlas Sound Corp.** ..... 80  
Agency: Zam & Kirshner, Inc.

**B & K Manufacturing Co.** ... 25, 56, 57  
Agency: Henry H. Teplitz Adv Agency

**Belden Manufacturing Co.** ..... 15  
Agency: The Fensholt Co.

**Blonder-Tongue Laboratories, Inc.** ... 81  
Agency: Jack Gilbert Associates

**Burgess Battery Company** ..... 27  
Agency: Kane Advertising

**Bussmann Manufacturing Co.** ..... 30  
Agency: Henderson Advertising Co.

**Castle TV Tuner Service** ..... 84

**CBS Electronics** ..... 20, Cover III  
Agency: Bennett & Northrop, Inc.

**Centralab Div., Globe-Union, Inc.** ... 8  
Agency: Stral Advertising Co.

**Channel Master Corp.** ..... 9  
Agency: Duso Advertising, Inc.

**Chemical Electronic Engineering, Inc.** 76  
Agency: Madison Advertising Agency

**Chicago Miniature Lamp Works** ..... 83  
Agency: Merchandising Advertisers, Inc.

**Cleveland Institute of Electronics** ... 11  
Agency: The Bruthers Co.

**Colman Tool & Machine Co.** ..... 82  
Agency: Bob Bayle Advertising

**Cornell-Dubilier Electric Corp.** 51, 52, 53  
Agency: Friend-Reiss Advertising Inc.

**Duotone Co.** ..... 84  
Agency: Halsted & Van Vechten, Inc.

**EICO** ..... 87  
Agency: Zam & Kirshner, Inc.

**Electro Products Laboratories** ..... 76  
Agency: Robertson, Buckley & Gotsch, Inc.

**Electro-Voice, Inc.** ..... 64, 65  
Agency: The Jaqua Company

**Entron, Inc.** ..... 78  
Agency: S. Gunnar Myrbeck & Co., Inc.

**G-C Electronics Co.** ..... 13  
Agency: Paul J. Steffen Co.

**General Electric Co.** ... 4, 5, 22, 23, 63  
Agency: Maxon, Inc.

**General Electric Co., TV Receivers** ... 90  
Agency: Young & Rubicam, Inc.

**Hickok Electrical Instrument Co.** ..... 55  
Agency: Ritchie & Sattler, Inc.

**I-H Manufacturing Co.** ..... 62  
Agency: Zam & Kirshner, Inc.

**Institute of Radio Engineers** ..... 81  
Agency: Raymond Schoonover Advertising

**International Resistance Co.** ..... 84  
Agency: Arndt, Preston, Chapin, Lamb & Keen, Inc.

**Jackson Electrical Instrument Co.** ..... 80  
Agency: R. L. Conhaim Advertising

**Jensen Industries, Inc.** ..... 88  
Agency: Wright, Campbell & Suitt, Inc.

**Jerrold Electronics Corp.** ..... 16  
Agency: Irving Gould Advertising

**JFD Electronics Corp.** ..... 12  
Agency: Delphi Advertising Inc.

**Krylon, Inc.** ..... 86  
Agency: Gray & Rogers

**Littelfuse, Inc.** ..... Cover II  
Agency: Burton Browne Advertising

**Mallory & Co., Inc., P. R.** ..... 2, 3  
Agency: The Aitkin-Kynett Co., Inc.

**Mercury Electronics Corp.** ..... 10  
Agency: Nat Kermin Advertising

**Mosley Electronics, Inc.** ..... 70  
Agency: H. George Bloch, Inc.

**Moss Electronic, Inc.** ..... 59  
Agency: Bass and Co., Inc.

**Motorola Inc., Parts & Accessories** ... 28  
Agency: Leo Burnett Co., Inc.

**Ohmite Manufacturing Co.** ..... 70  
Agency: The Fensholt Adv. Agency

**Olson Radio Corp.** ..... 84  
Agency: Wilson & Wagoner Advertising

**Oxford Components, Inc.** ..... 74  
Agency: Sander Rodkin Adv Agency

**Perma-Power Co.** ..... 26  
Agency: Stral Advertising Co.

**Philco Corp.** ..... 17, 18, 19  
Agency: Maxwell Associates, Inc.

**Pickering & Co.** ..... 72  
Agency: Greene-Posner, Inc.

**Planet Sales Corp.** ..... 58  
Agency: Gordon A. Pihl & Assoc.

**Precision Tuner Service** ..... 77

**Radio Corporation of America** ... Cover IV  
Agency: Al Paul Lefton Co.

**Rider Publisher, Inc., John F.** ..... 85  
Agency: Jack Gilbert Associates

**Seco Manufacturing Co.** ..... 6  
Agency: Firestone-Goodman Adv Agency, Inc.

**Sencore** ..... 71, 73, 75, 77  
Agency: R. N. Johnson Advertising

**Shell Electronic Mfg. Corp.** ..... 14  
Agency: Robert Orchant

**Sherwood Electronic Laboratories, Inc.** 68  
Agency: Burton Browne Advertising

**Shure Brothers, Inc.** ..... 88  
Agency: William Hart Adler, Inc.

**Sonotone Corp.** ..... 29  
Agency: Doherty, Clifford, Steers & Shenfield, Inc.

**Sprague Products Co.** ..... 21  
Agency: The Harry P. Bridge Co.

**Sylvania Div., General Telephone & Electronics** ..... 69  
Agency: Kudner Agency, Inc.

**Tarzian, Inc., Sarkes** ..... 88  
Agency: H. L. Ross Advertising

**Triad Transformer Corp.** ..... 24  
Agency: Fletcher Richards, Calkins & Holden, Inc.

**Jung-Sol Electric Inc.** ..... 67  
Agency: E. M. Freystadt Assoc., Inc.

**United Catalog Publishers** ..... 66  
Agency: Jack Gilbert Associates

**Vaco Products Co.** ..... 83  
Agency: O'Grady-Andersen-Gray, Inc.

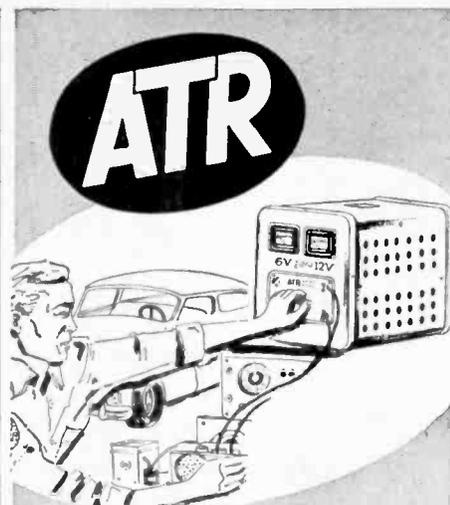
**V-M Corporation** ..... 7  
Agency: Mayer-Klann-Linabury Advertising, Inc.

**Winegard Co.** ..... 79  
Agency: Gourfain-Loeff, Inc.

**Xcelite, Inc.** ..... 54  
Agency: Harold Warner Co.

**Zalytron Tube Corp.** ..... 82  
Agency: Bergman Advertising Agency

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**"A" BATTERY ELIMINATORS**



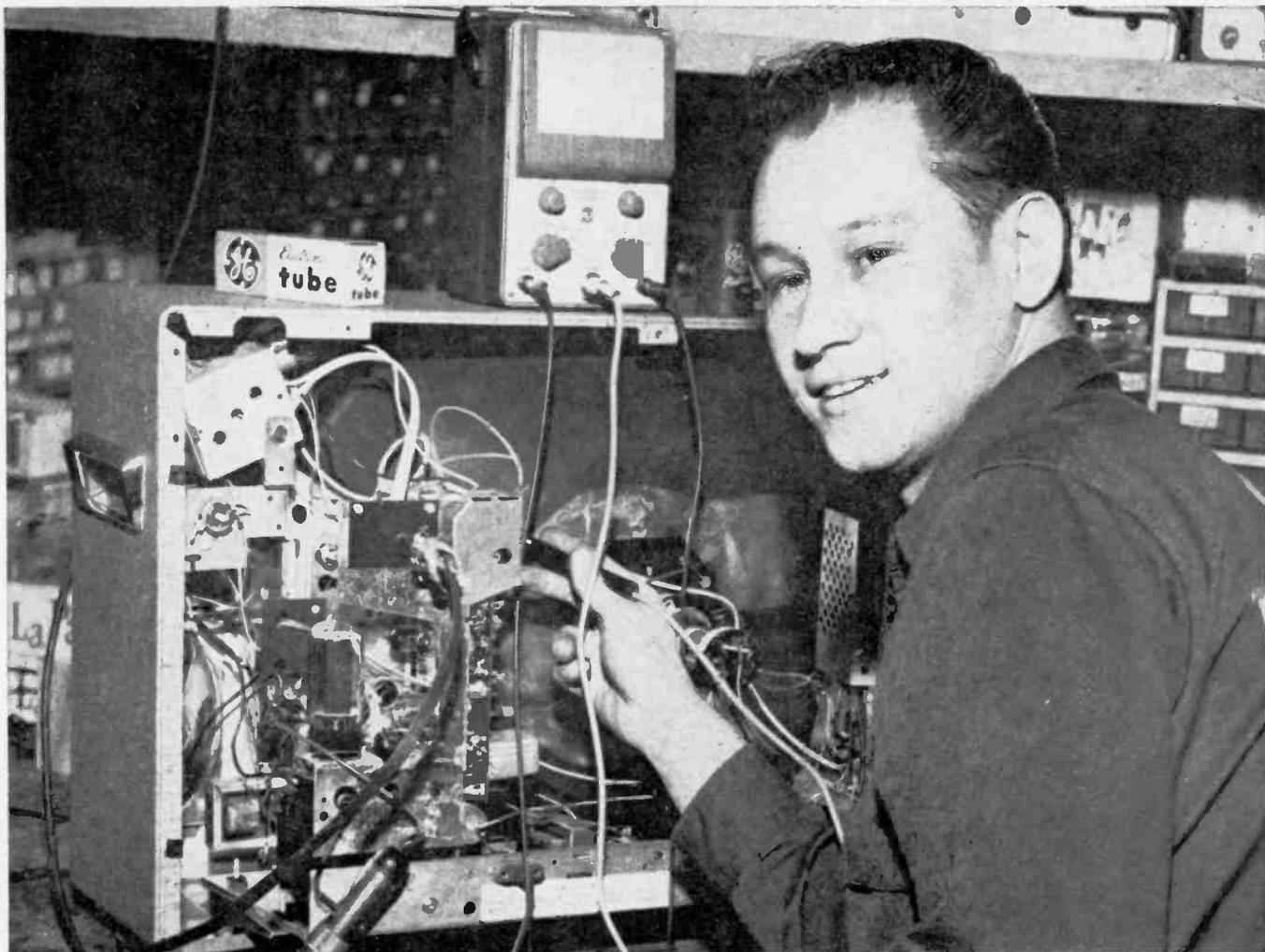
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**Demonstrating and Testing Auto Radios**  
TRANSISTOR OR VIBRATOR OPERATED  
6 Volt or 12 Volt!  
New Models ... Designed for testing D.C. Electrical Apparatus on Regular A.C. Lines. Equipped with Full-Wave Dry Disc Type Rectifier, Assuring Noiseless, Interference-Free Operation and Extreme Long Life and Reliability.

TYPE	INPUT A.C. Volts 50 Cycles	D.C. OUTPUT		SHIP. WT.	USER PRICE
		VOLTS	AMPERES Cont. Int.		
610C-ELIF	110	6	10 20	22	\$49.95
		12	6 12		
620C-ELIT	110	6	20 40	33	66.95
		12	10 20		

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**AMERICAN TELEVISION & RADIO CO.**  
Quality Products Since 1931  
SAINT PAUL 1, MINNESOTA, U. S. A.



*"The 'Designer' is the*

# LEAST TROUBLESOME SET

*we have ever serviced,"*

**says Bob Wauganman of Bob's Television, 9518 Madison Street, Cleveland, Ohio.**

"Speaking of the General Electric 'Designer,'" says Bob Wauganman of Bob's Television in Cleveland, Ohio, "there probably isn't an easier set on the market today to service.

"We can do 90% of shop work without removing the set from the cabinet, and we find that, because General Electric licked the heat dissipation problem, 'Designers' last longer and suffer less breakdown.

"We have very few service calls on 'Designers'. Those that we do have are easily corrected. This gives us lots of time to get in more calls per day and,

of course, it helps us to make more money, too."

"Designer" Tubes are directly replaceable, fuses accessible, and you easily get at the key check points. Another thing: the painted schematic on the boards helps you find your way around quickly. Again, more calls per day—and more money.

**Precision Etched Circuitry** is used in all "Designer" sets and is reliable and uniform so that when you have serviced one you will never have to puzzle over the next one.

"Designer" TV—called the easiest-to-service set in television! General Electric Company, Television Receiver Department, Syracuse 8, New York.

*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**



# ELECTRONIC TECHNICIAN 554

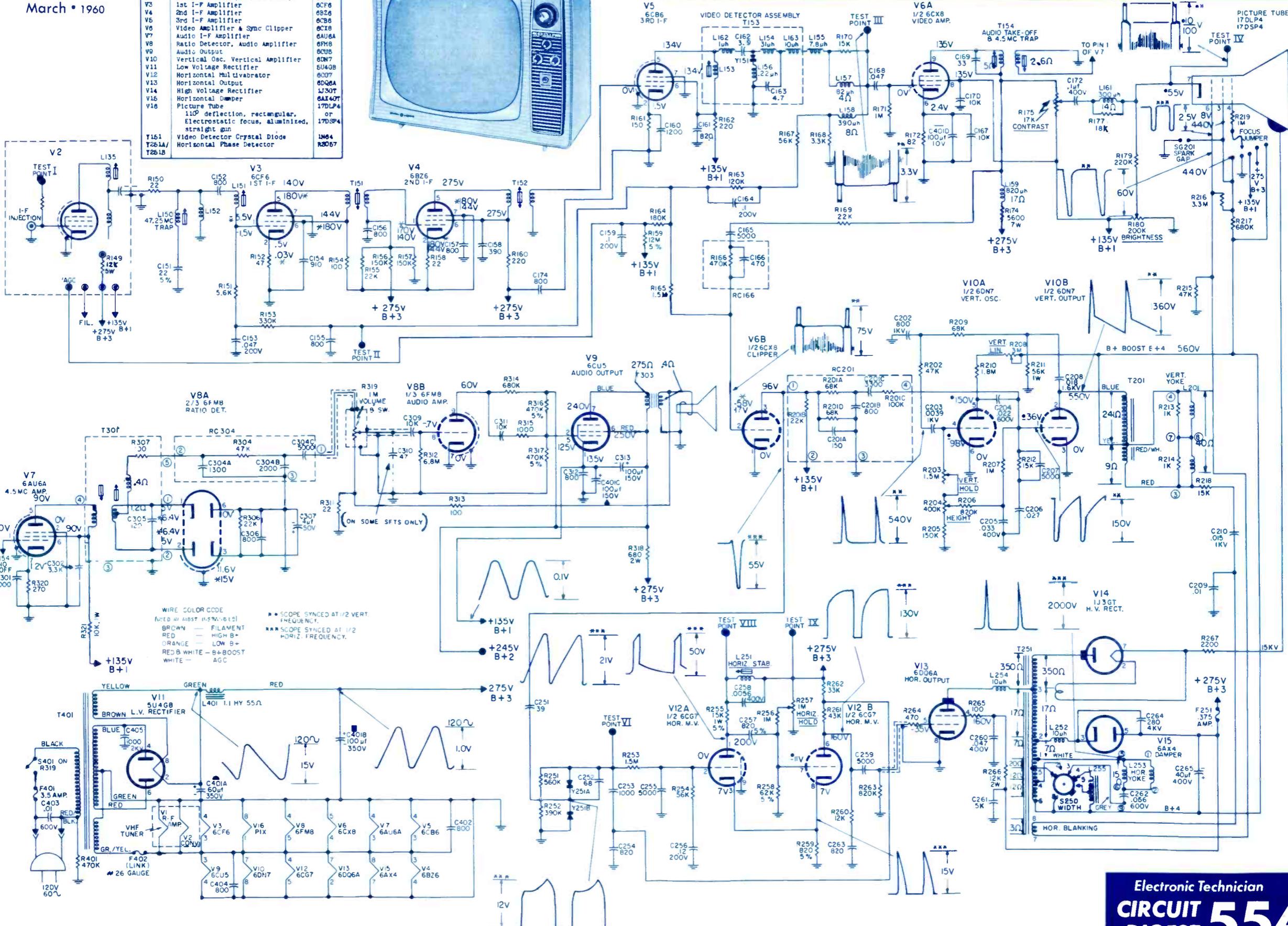
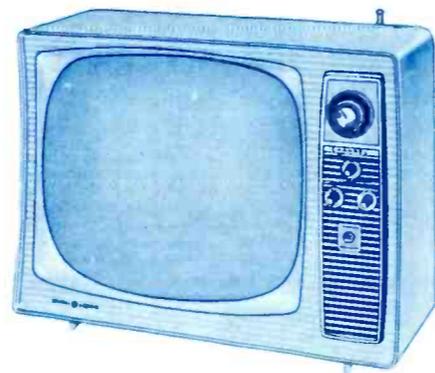
## CIRCUIT DIGEST

GENERAL ELECTRIC  
TV Chassis M569  
Models CS732M8V,  
CS732M9V

March • 1960

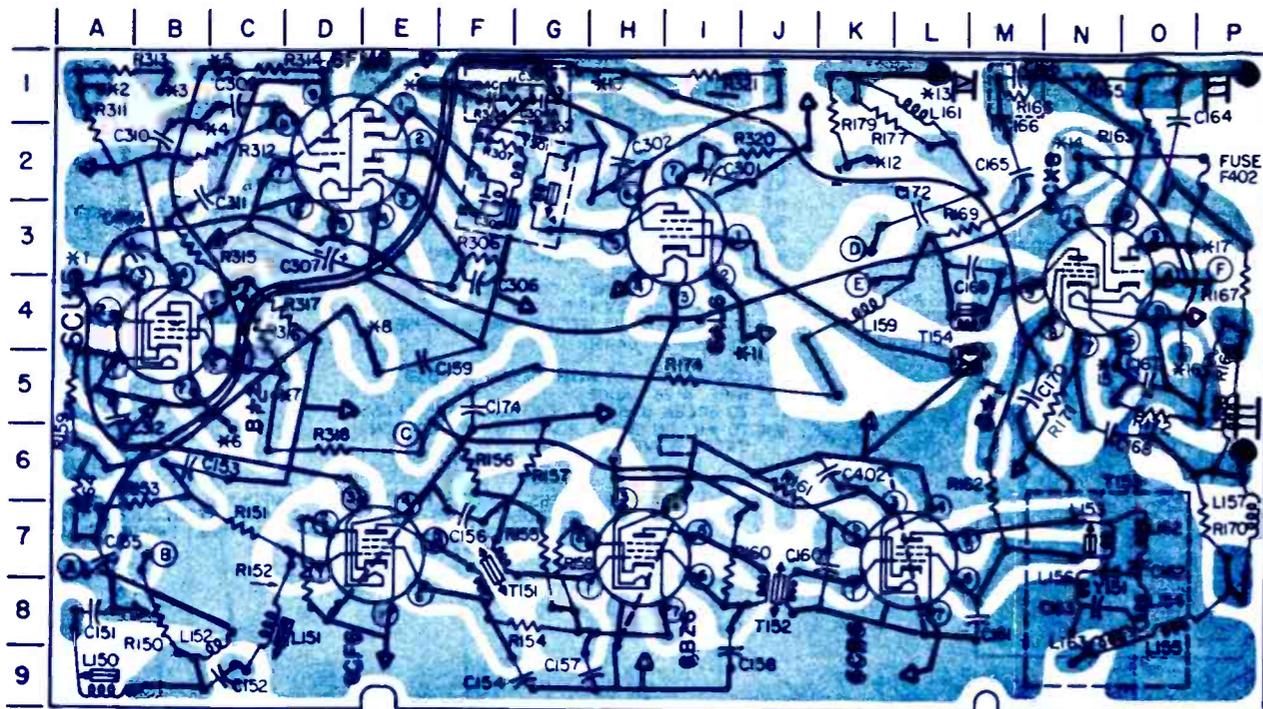
TUBE AND CRYSTAL COMPLIMENT

SYMBOL	PURPOSE	TYPE
V1	R-F Amplifier	6CT5
V2	VHF Mixer-Osc. (M76E180 Tuner)	6CL9/ 6CL8A
V2	VHF Mixer-Osc. (M76E181 Tuner)	6CL8A
V2	VHF Mixer-Osc. (M76E182 Tuner)	6EH8
V3	1st I-F Amplifier	6CF6
V4	2nd I-F Amplifier	6BZ6
V5	3rd I-F Amplifier	6CB6
V6	Video Amplifier & Sync Clipper	6CX8
V7	Audio I-F Amplifier	6AU6A
V8	Ratio Detector, Audio Amplifier	6PH8
V9	Audio Output	6CU5
V10	Vertical Osc. Vertical Amplifier	6DN7
V11	Low Voltage Rectifier	5U4GB
V12	Horizontal Full Wave Rectifier	6007
V13	Horizontal Output	6DQ6A
V14	High Voltage Rectifier	LJ30T
V15	Horizontal Damper	6AX4GT
V16	Picture Tube	17DLP4 or 17D5P4
V16	110° deflection, rectangular, or Electrostatic focus, aluminized, straight gun	
T161	Video Detector Crystal Diode	1M64
T261A/ T261B	Horizontal Phase Detector	R2067

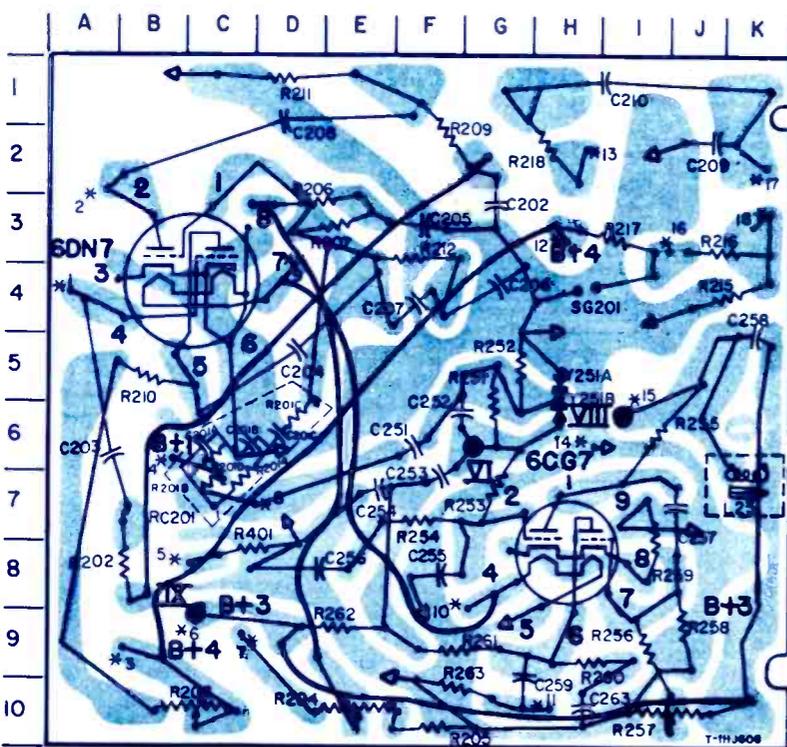


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Electronic Technician  
**CIRCUIT DIGEST 554**



I-F BOARD COMPONENT LOCATIONS AS VIEWED FROM COMPONENT SIDE



SWEEP BOARD COMPONENT LOCATIONS AS VIEWED FROM COMPONENT SIDE

**CIRCLED (A) LETTERS**  
 REPRESENT INTER-CONNECTING WIRES  
 SOLDERED INTO BOARD  
 (A) TO SHIELD OF (B)  
 (B) TO VHF TUNER - I-F OUTPUT SHIELD  
 (C) TO C401B  
 (D) TO R175 CONTRAST CONTROL  
 (E) TO R175 CONTRAST CONTROL  
 (F) TO #9 ON SWEEP BOARD (V10, PIN 7)

BY SYMBOL		RESISTORS		CAPACITORS		COILS & TRANSFORMERS	
R202	- B8	R253	- G7	C207	- F4	L251	- K7
R204	- E10	R254	- F7	C208	- D2		
R205	- F10	R255	- I6	C209	- J2		
R206	- D3	R256	- I9	C210	- I1		
R207	- D3	R257	- I10	C251	- F6		
R208	- B10	R258	- J9	C252	- F5		
R209	- F2	R259	- I8	C253	- F7		
R210	- B5	R260	- H9	C254	- E7		
R211	- D1	R261	- F9	C255	- F8		
R212	- F3	R262	- E9	C256	- D8		
R215	- J4	R263	- F9	C257	- J7		
R216	- J4	R401	- C8	C258	- K5		
R217	- I3			C259	- G10		
R218	- H2			C263	- H10		
R251	- G6						
R252	- G5						

SPARK GAP		RC NETWORKS	
SG201	- H4	RC201	- C7
TEST POINTS		DIODES	
VI	- G6	Y251A	- H5
VIII	- I6	Y251B	- H6
IV	- C9		

**ASTERISKED (\*) NUMBERS**  
 DENOTE WIREWRAP TERMINALS MOUNTED ON COMPONENT BOARD TO CONNECT WIRES FROM OTHER COMPONENTS.

- |                                                |                                             |
|------------------------------------------------|---------------------------------------------|
| *1. TO R203, VERT. HOLD CONTROL                | *10. TO V16, PIN 1                          |
| *2. TO T201 (BLUE LEAD)                        | *11. TO R264                                |
| *3. TO T201 (YELLOW LEAD)                      | *12. TO TERM. 4 OF YOKE, TO C265            |
| *4. TO C401C (+135V B+1)                       | *13. TO T201 (RED LEAD), TO TERM. 3 OF YOKE |
| *5. TO T401 (RED/BLACK LEAD), TO AC INTERLOCK  | *14. GROUND TERM. FOR FOCUS JUMPER          |
| *6. TO C401B (+275V B+3)                       | *15. +275V B+3 TERM. FOR FOCUS JUMPER       |
| *7. TO R203, VERT. HOLD CONTROL (CENTR. TERM.) | *16. TO V16, PIN 3                          |
| *8. TO #17 ON I-F BOARD                        | *17. TO TERM. 7 ON T251                     |
| *9. TO (C) ON I-F BOARD                        | *18. TO TERM. 8 ON T251 TO V16, PIN 6       |

BY SYMBOL		CAPACITORS		RESISTORS	
R150	- B8	C151	- A8	L151	- C8
R151	- D7	C152	- C9	L152	- D8
R152	- D7	C153	- B6	L153	- D7
R153	- B7	C154	- A9	L154	- C8
R154	- C8	C155	- B7	L155	- C8
R155	- C7	C156	- A9	L156	- C8
R156	- C7	C157	- B9	L157	- F7
R157	- C6	C158	- I9	L158	- P5
R158	- C7	C159	- B5	L159	- K4
R159	- A5	C160	- E7	L161	- L1
R160	- I7	C161	- M8	L162	- O7
R161	- J6	C162	- O7	L163	- M8
R162	- M6	C163	- M8	L152	- J8
R163	- O2	C164	- O2	T301	- L2
R164	- A6	C165	- M2		
R165	- T1	C166	- M6		
R166	- P3	C167	- M6		
R167	- P3	C168	- M6		
R168	- P4	C169	- M6		
R169	- L3	C170	- M5		
R170	- P7	C171	- L3		
R171	- R5	C172	- L3		
R172	- O5	C173	- P5		
R173	- I5	C174	- I2		
R174	- I5	C175	- P2		
R175	- K1	C176	- P2		
R176	- K1	C177	- P2		
R177	- K1	C178	- P2		
R178	- K1	C179	- P2		
R179	- P3	C180	- B2		
R180	- P3	C181	- B3		
R181	- A2	C182	- K6		
R182	- C2	C183	- K6		
R183	- A1	C184	- B3		
R184	- C1	C185	- B3		
R185	- B3	C186	- B3		
R186	- C4	C187	- B3		
R187	- D4	C188	- B3		
R188	- D6	C189	- B3		
R189	- J2	C190	- B3		

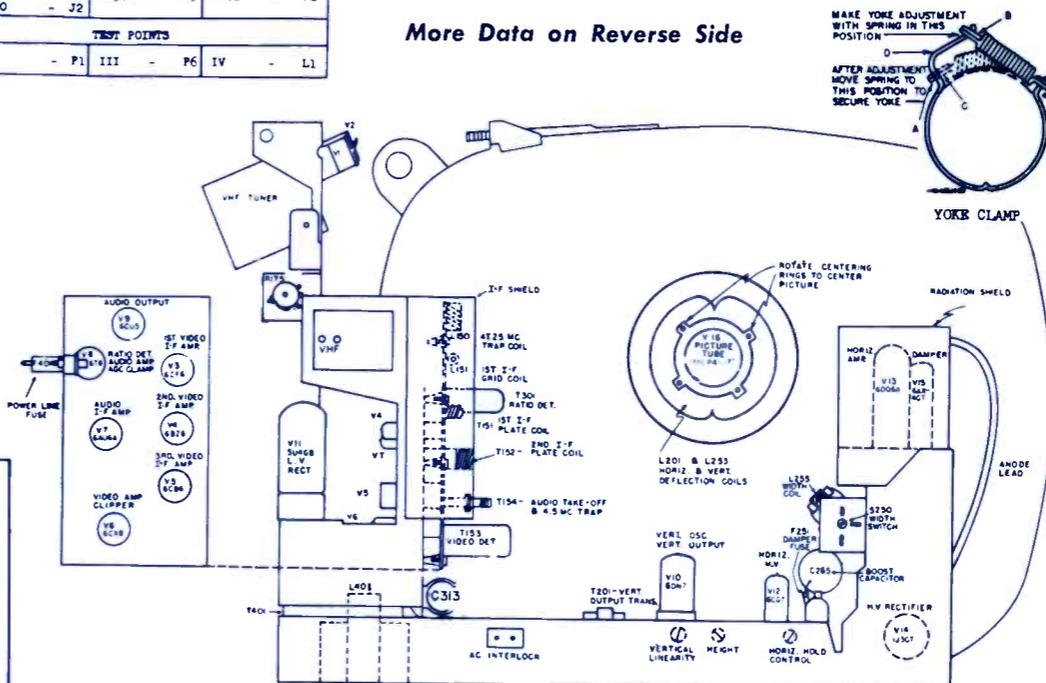
**ASTERISKED (\*) NUMBERS**

- DENOTE WIRE WRAP TERMINALS MOUNTED ON COMPONENT BOARD TO CONNECT WIRES FROM OTHER COMPONENTS
- \*1 TO VHF TUNER FILAMENTS
  - \*2 TO R319 VOLUME CONTROL
  - \*3 TO CONTRAST CONTROL TERMINAL BOARD, TERMINAL 1
  - \*4 TO R319 VOLUME CONTROL
  - \*5 TO C313
  - \*6 TO T303
  - \*7 FOR TESTING B+2 VOLTAGE
  - \*8 TO VHF TUNER, AGC TERMINAL
  - \*9 TO R319 VOLUME CONTROL
  - \*10 TO C313 GROUND TERMINAL, C401C, AND R180 BRIGHTNESS CONTROL
  - \*11 TO GREEN LEAD ON POWER TRANSFORMER
  - \*12 TO R180 BRIGHTNESS CONTROL
  - \*13 TO PICTURE TUBE SOCKET PIN 7
  - \*14 CONNECT TO #16 WITH FILAMENT FUSE WIRE, #26 GAUGE
  - \*15 TO C401D
  - \*16 CONNECT TO #14 WITH FILAMENT FUSE WIRE #26 GAUGE TO GREEN & WHITE LEAD ON POWER TRANSFORMER
  - \*17 TO #8 ON SWEEP BOARD (C) ON RC201

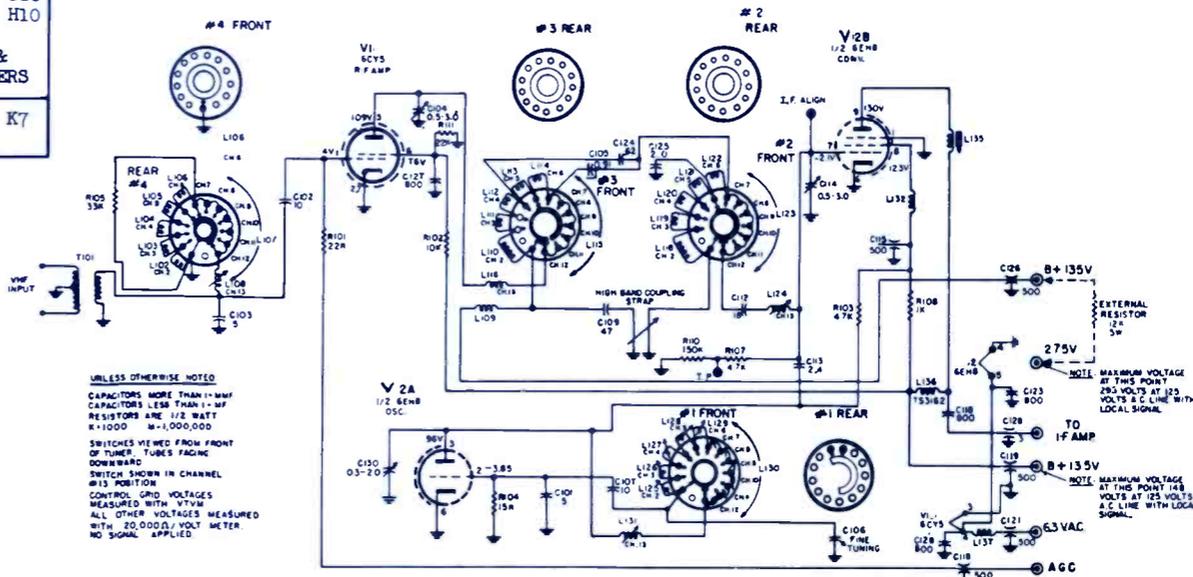
**TO REMOVE THE CHASSIS FROM THE CABINET**  
 Remove the knobs from the shafts on the front of the cabinet. Disconnect any antenna connected to the antenna terminal board. Remove the cabinet back by taking out the screws securing the back to the cabinet, the interlock bracket, and the antenna bracket. Remove the speaker leads from the speaker. Connect one end of a lead to the chassis and touch the other end to the anode of the picture tube to discharge it. Remove the anode lead from the picture tube by squeezing the anode clip and withdrawing it from the tube. Remove the screws from the bottom of the cabinet which hold the chassis. Remove the picture tube socket. Loosen the yoke clamp and slide the yoke back over the neck of the picture tube. Remove the chassis from the cabinet.

**TO REMOVE THE PICTURE TUBE**  
 Remove the chassis from the cabinet as described above. After removing the chassis, position the cabinet face down on a soft clean cloth. Loosen the two self tapping screws at the top and bottom of the picture tube sling. Disengage the sling from the four hooks and remove the picture tube. To reassemble the picture tube, reverse the above procedure making sure that the picture tube anode button is located at that end of the cabinet farthest from the control panel.

**More Data on Reverse Side**



TUBE AND ADJUSTMENT LOCATIONS

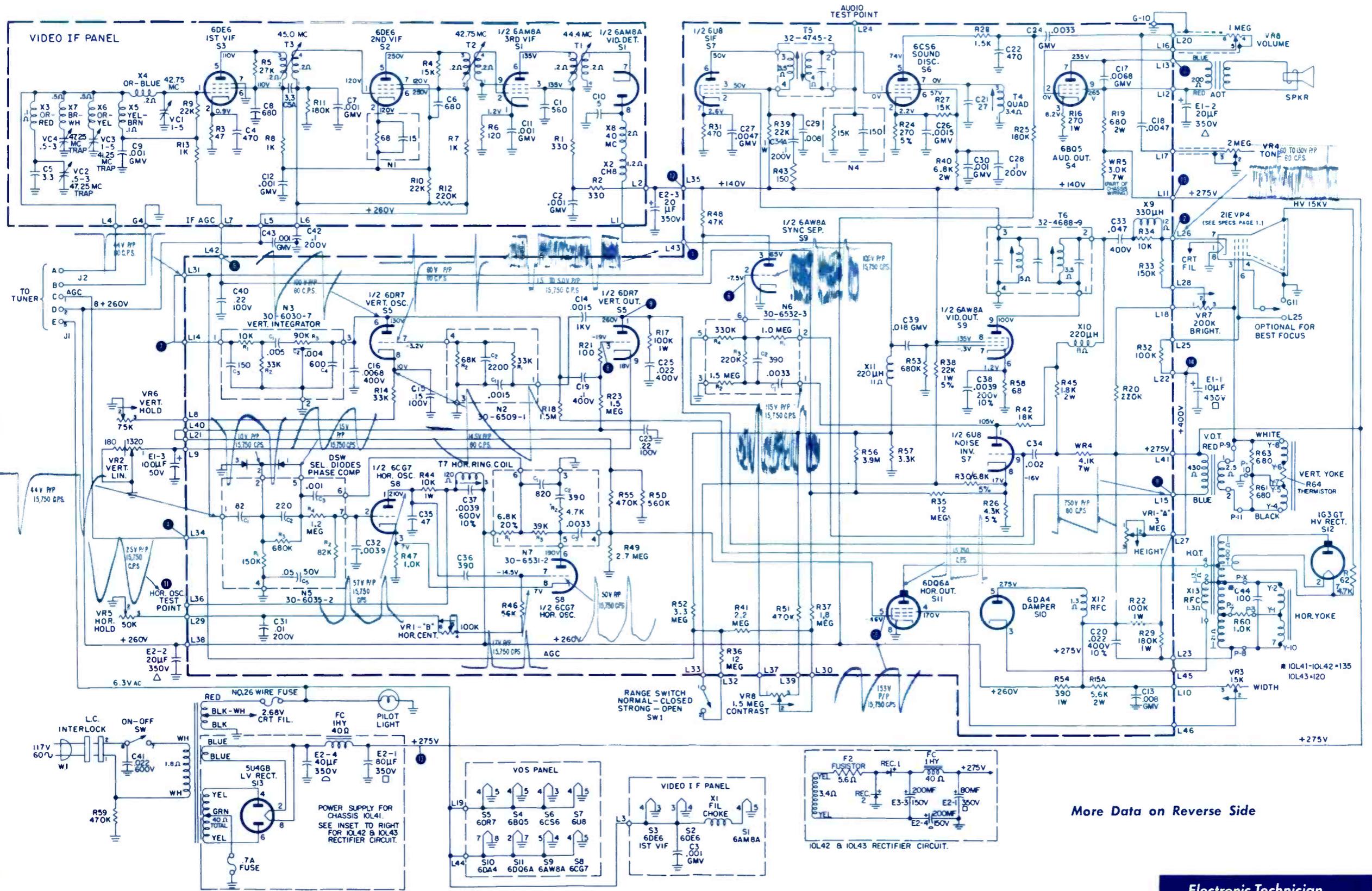


SCHEMATIC DIAGRAM WT86X82 VHF TUNER

GENERAL ELECTRIC  
 TV Chassis M569  
 Models CS732M8V,  
 CS732M9V

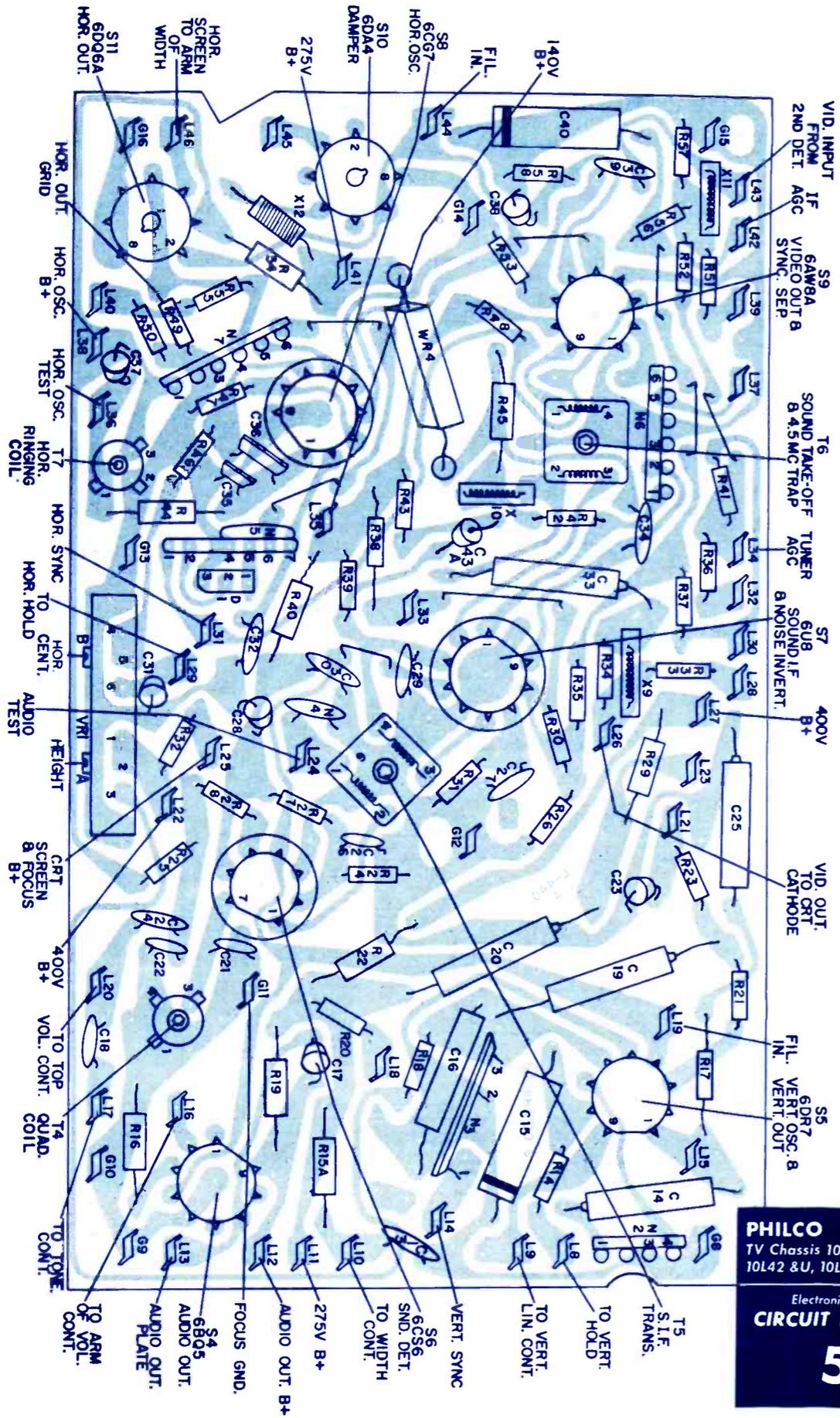
Electronic Technician  
**CIRCUIT DIGEST**

**554**

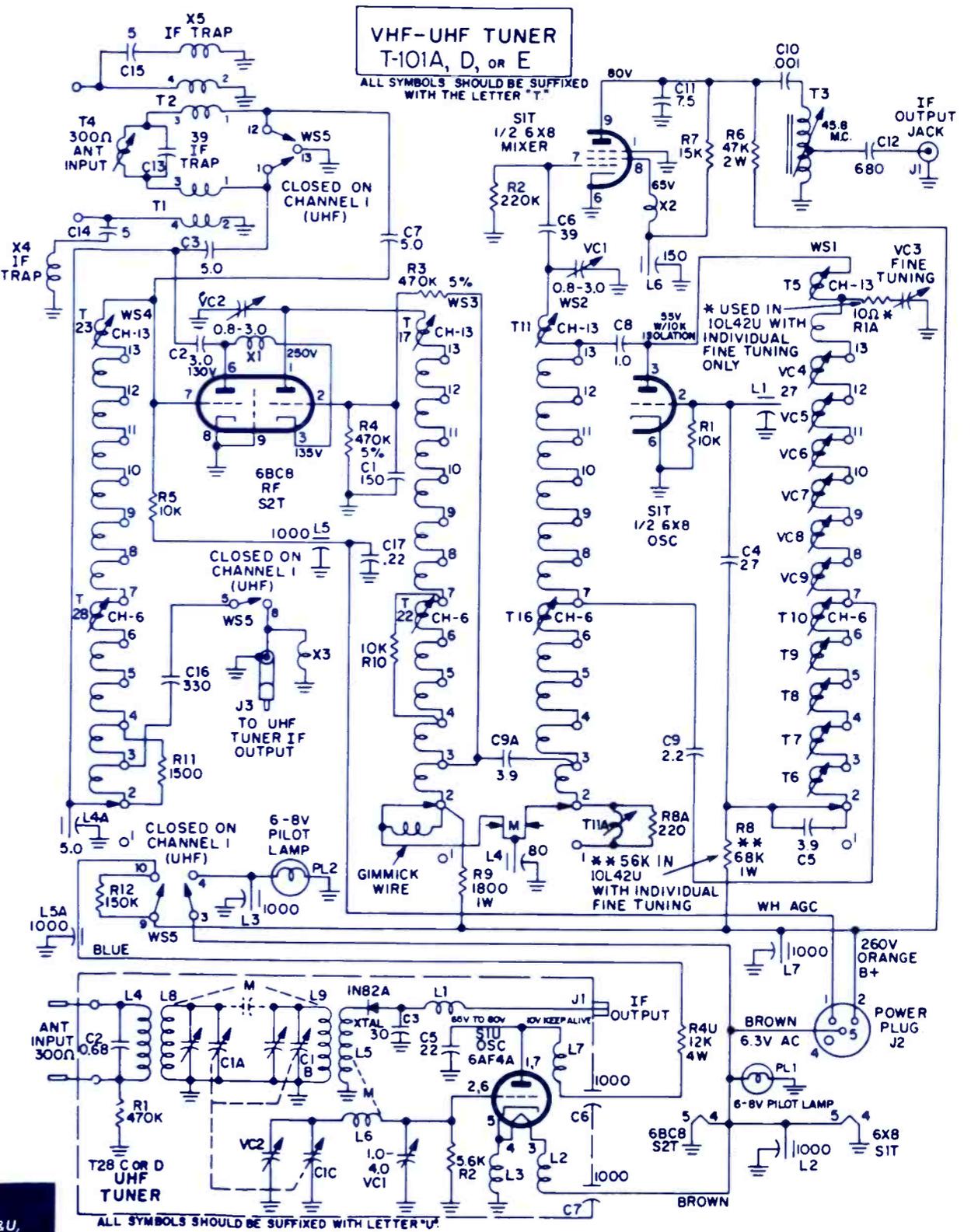


More Data on Reverse Side

10L41, 10L42, 10L43 Video-Oscillator-Sound Perma-Circuit Panel



**PHILCO**  
TV Chassis 10L41 & U,  
10L42 & U, 10L43 & U  
Electronic Technician  
**CIRCUIT DIGEST**  
**555**



More Data on Reverse Side

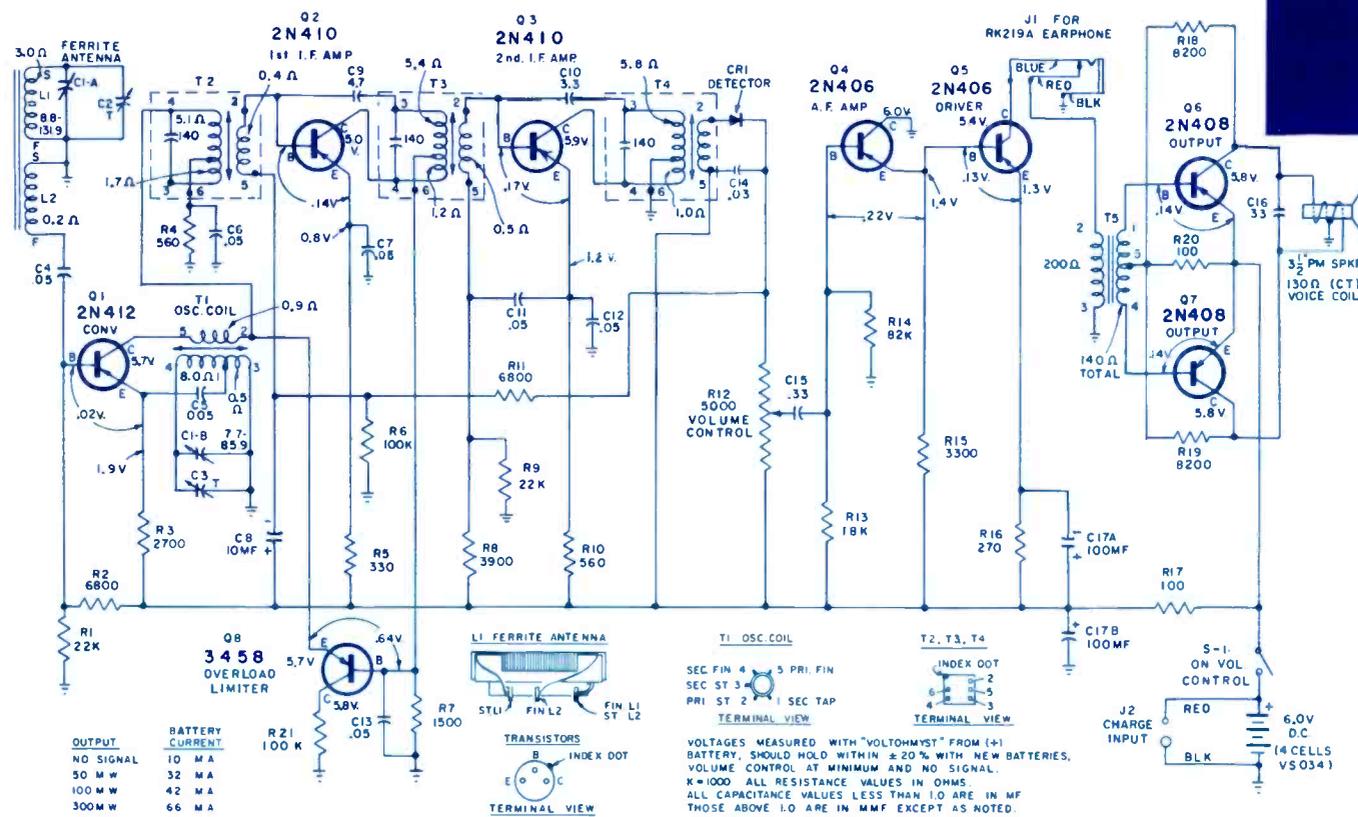
# ELECTRONIC TECHNICIAN 556

## CIRCUIT DIGEST

RCA  
Transistor Radio  
1-T-4 Series



1-T-4 Series — The "Hawaii"  
Model 1-T-4E — Antique White  
Model 1-T-4H — Light Turquoise  
Model 1-T-4J — Charcoal Gray



OUTPUT	BATTERY CURRENT
NO SIGNAL	10 mA
50 mW	32 mA
100 mW	42 mA
300 mW	66 mA

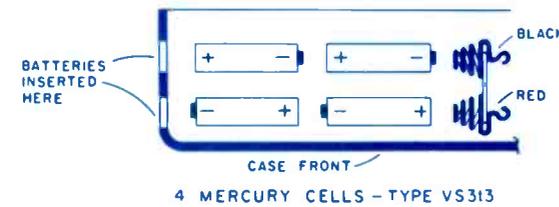
### TRANSISTOR COMPLEMENT

- (1) RCA 2N412 ..... Converter
- (2) RCA 2N410 ..... 1st I-F Amp.
- (3) RCA 2N410 ..... 2nd I-F Amp.
- (4) RCA 2N406 ..... A.F. Amplifier
- (5) RCA 2N406 ..... Audio Driver
- (6) RCA 2N408 ..... Push-pull Output
- (7) RCA 2N408 ..... Push-pull Output
- (8) RCA 3458 ..... Overload Limiter
- Type 1N60 Crystal Diode ..... 2nd Detector

### POWER OUTPUT

- Undistorted ..... 300 milliwatts
- Maximum ..... 400 milliwatts

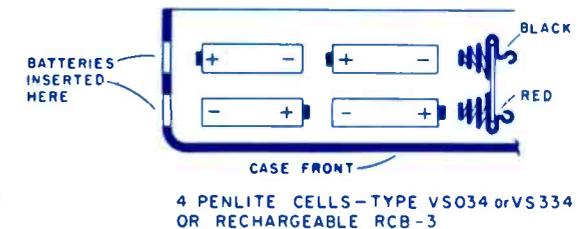
### BATTERY INSTALLATION



4 MERCURY CELLS — TYPE VS313

### CAUTION

The two insulating tubes used to hold the batteries must not have reversed contacts. The long PLASTIC LUG of the inner contacts must fit into the METAL GUIDE toward the CASE SIDE.  
The NEGATIVE CONTACT LEAD (BLACK) must be toward the CASE BACK.



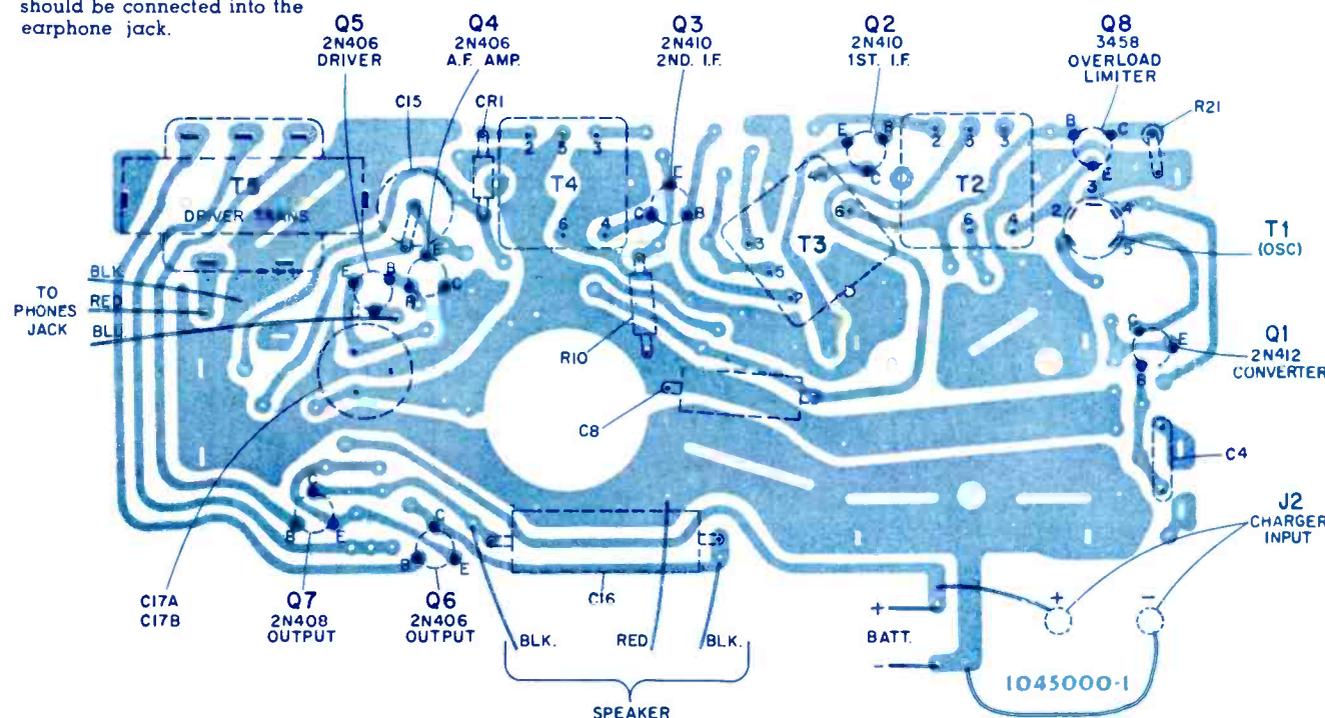
4 PENLITE CELLS — TYPE VS034 or VS334 OR RECHARGEABLE RCB-3

### EARPHONE CONNECTION

Only a high impedance earphone (approx. 2000 ohms) should be connected into the earphone jack.

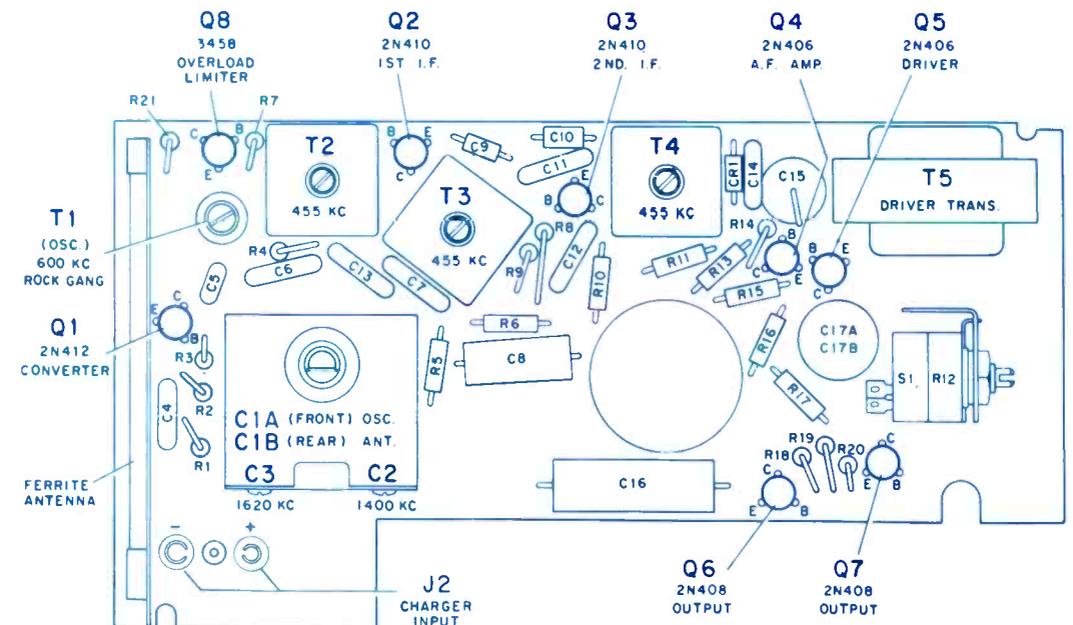
Schematic Diagram

March • 1960



Chassis Wiring and Components — View from Wiring Side

The assembly represented above is viewed from the wiring side of the board.  
The printed wiring, on the near side of the board, is presented in "phantom" view superimposed on the component layout of the reverse side.



Chassis Layout — View from Component Side

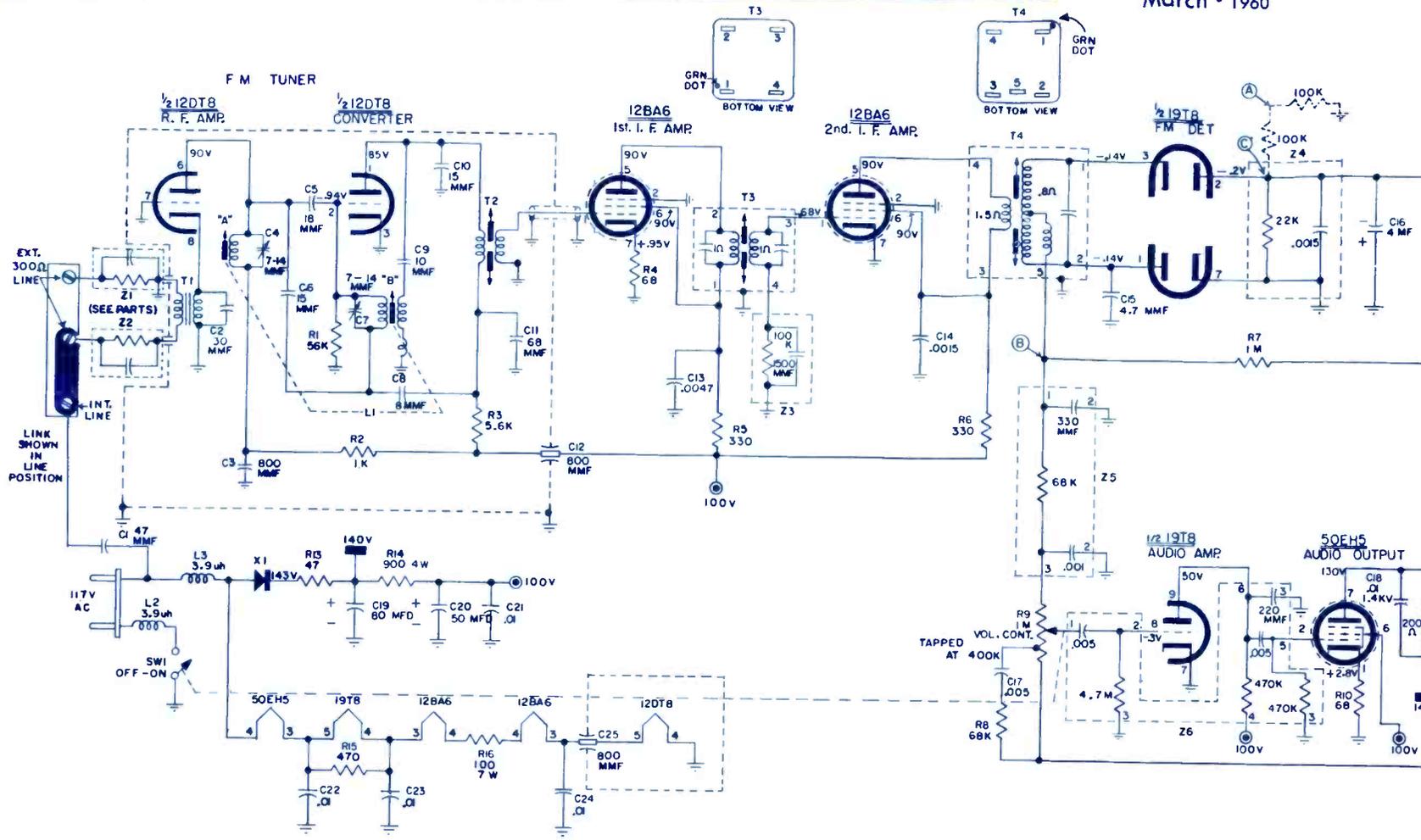
### CHASSIS REMOVAL

Care must be used when removing the dial knob to prevent damage to the circuit board.

The knob can be removed only by first removing the

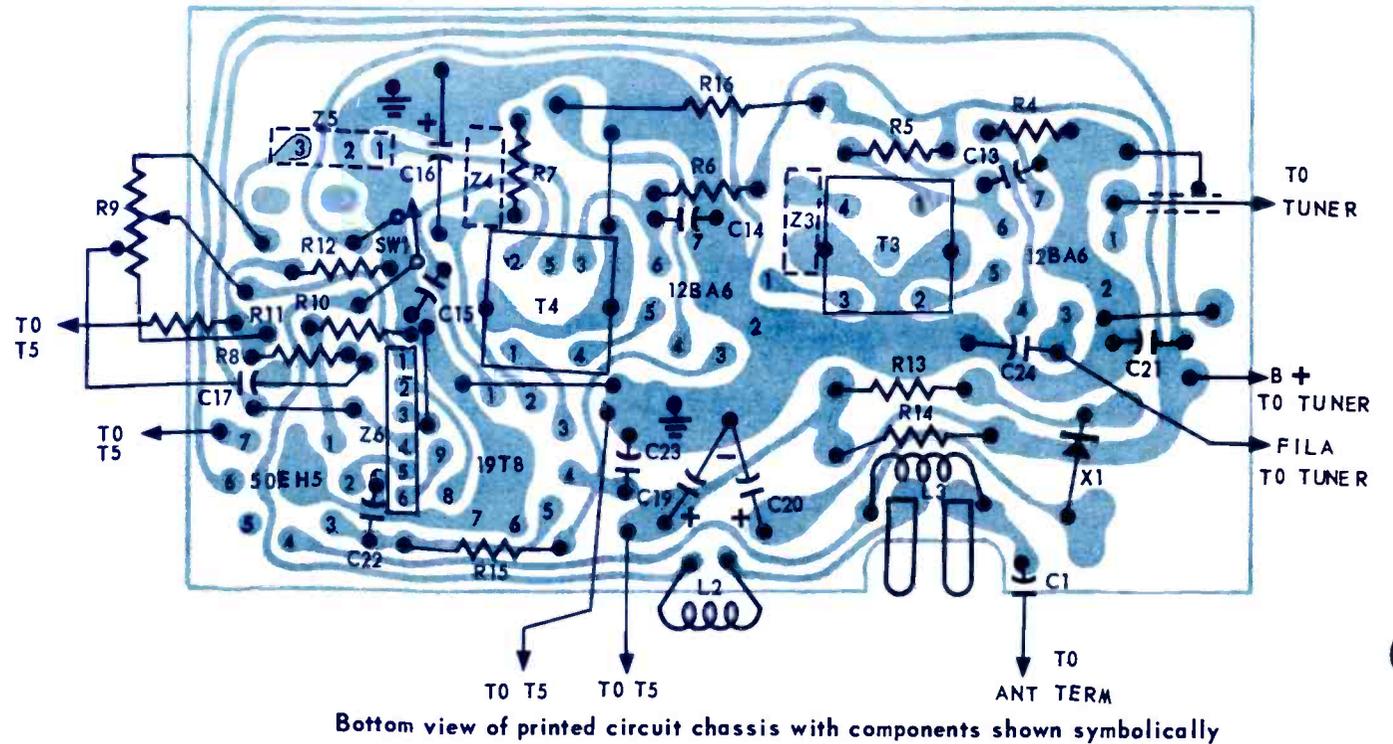
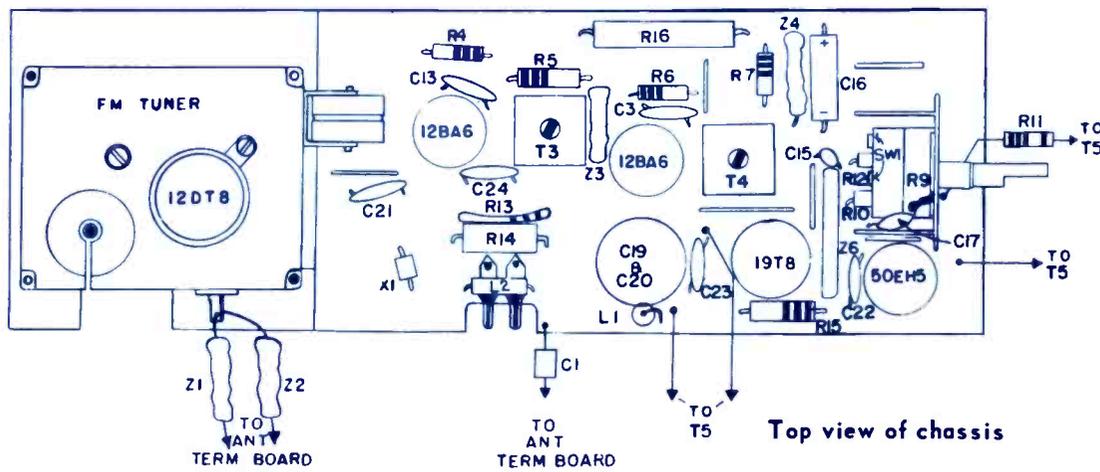
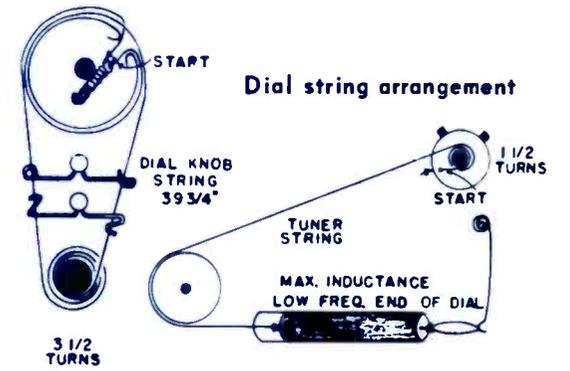
three chassis mounting screws and then gently pulling the chassis assembly away from the case front. Rock the chassis while pulling on the case and chassis assembly.

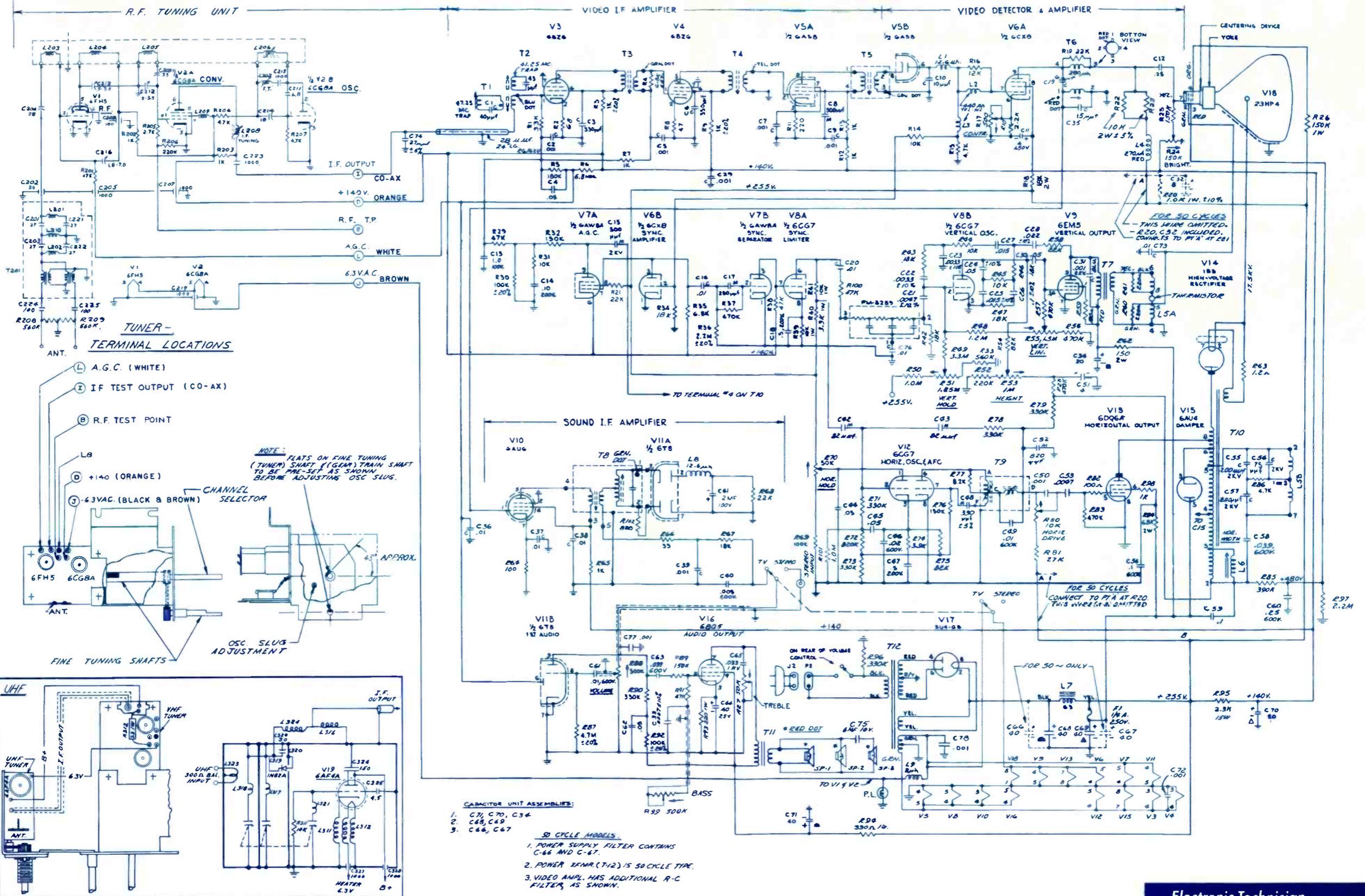
March • 1960



**SPECIFICATIONS**

Frequency Range	88 to 108MC
Intermediate Frequency	10.7MC
Tube Complement	
12DT8	RF Amplifier-Converter
12BA6	1st IF Amplifier
12BA6	2nd IF Amplifier
19T8	Detector-Audio Amplifier
50EH5	Audio Output
Power Consumption	35 watts
Audio Power Output	
Maximum	2 watts
Undistorted	1.3 watts
Speakers	2-4" PM
Operating Voltage	105 to 120 volts 60 cycles AC





**CAPACITOR UNIT ASSEMBLIES:**

1. C7, C70, C34
2. C68, C69
3. C66, C67

**50 CYCLE MODELS:**

1. POWER SUPPLY FILTER CONTAINS C-66 AND C-67.
2. POWER XFRM. (T-12) IS 50 CYCLE TYPE.
3. VIDEO AMPL. HAS ADDITIONAL R-C FILTER, AS SHOWN.

ANT. (L) A.G.C. (WHITE)  
 (2) I.F. TEST OUTPUT (CO-AX)  
 (B) R.F. TEST POINT

(D) +140 (ORANGE)  
 (J) 6.3VAC. (BLACK & BROWN) CHANNEL SELECTOR

**NOTE:** FLATS ON FINE TUNING (TUNER) SHAFT & (GEN) TRAIN SHAFT TO BE PRE-SET AS SHOWN BEFORE ADJUSTING OSC SLUG.

OSC SLUG ADJUSTMENT

FINE TUNING SHAFTS

More Data on Reverse Side

# ELECTRONIC TECHNICIAN

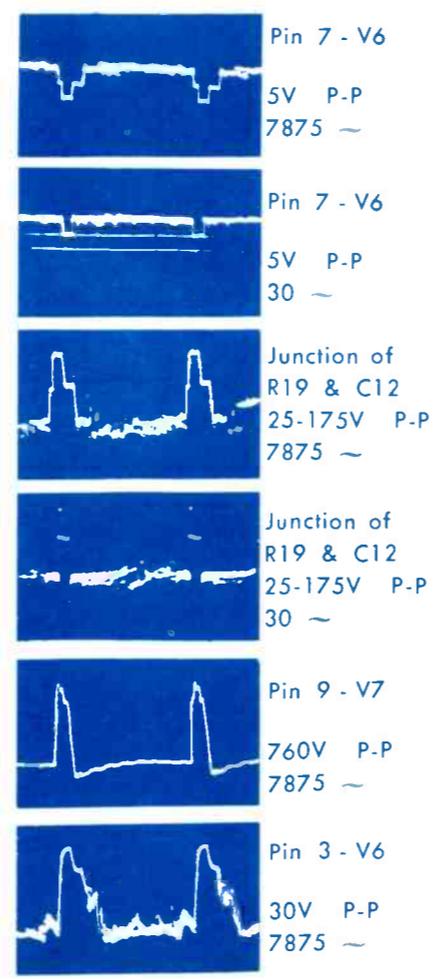
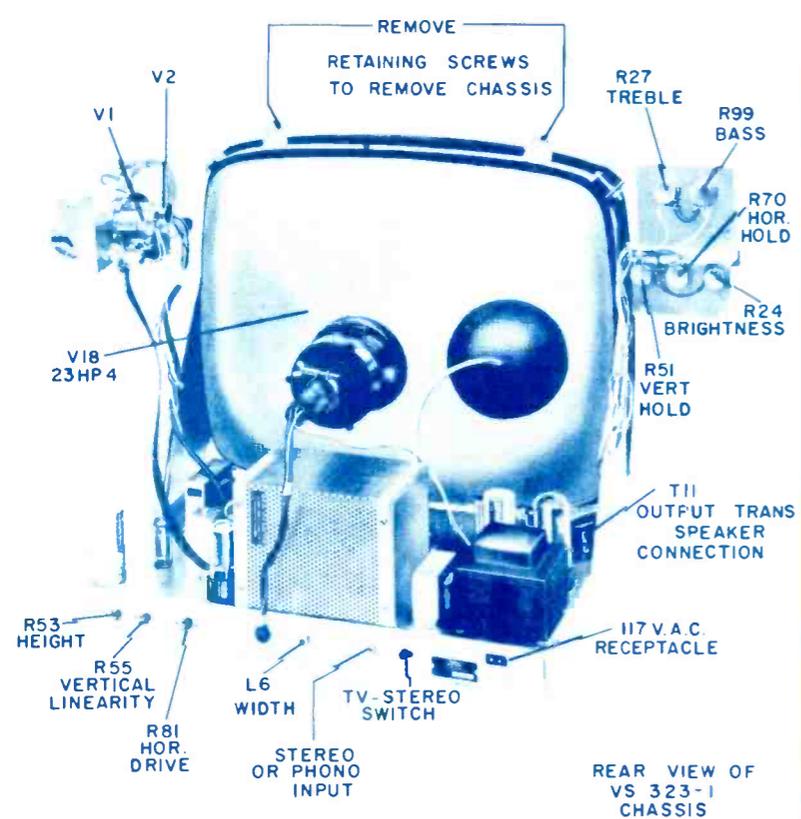
Trademark

## CIRCUIT DIGESTS

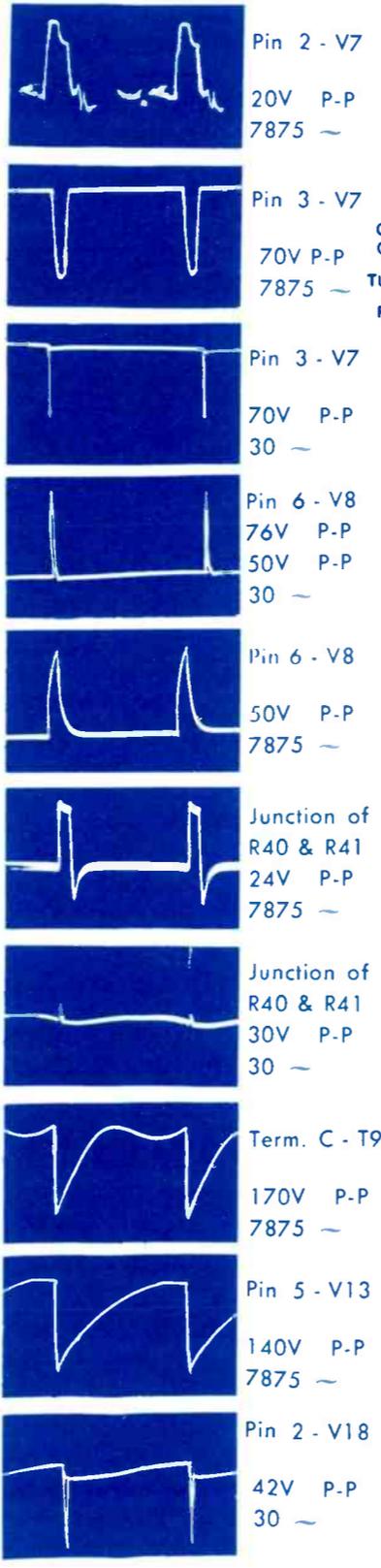
**In This Issue (No. 91)**

ANDREA TV Chassis VS-323 Series	Circuit Digest No. 558
GENERAL ELECTRIC TV Chassis M569 Models CS732M8V, CS732M9V	554
PHILCO TV Chassis 10L41 & U, 10L42 & U, 10L43 & U	555
RCA Transistor Radio 1-T-4 Series	556
WESTINGHOUSE FM Radio Chassis V-2400-1 Models H-715T5, H-716T5	557

# 91



### VS-323 WAVE FORMS

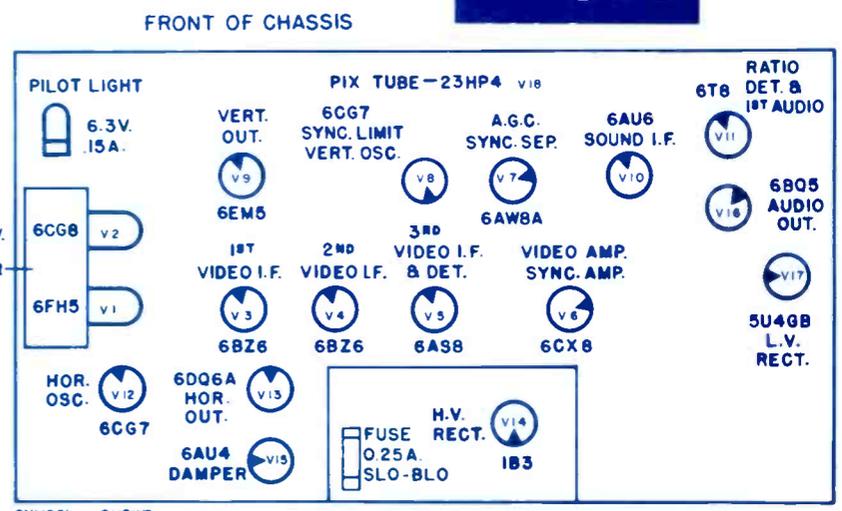


More Data on Reverse Side

**ANDREA**  
TV Chassis VS-323 Series

Electronic Technician  
**CIRCUIT DIGEST**

# 558



SYMBOL ▲ SHOWS SOCKET PINS OR KEY POSITION FOR CORRECT TUBE INSERTION.

### TUBE LOCATIONS TELEVISION VS-323-SERIES

### VS-323 VOLTAGE READINGS

TUBE REF. NO.	TUBE PIN NO.								
	1	2	3	4	5	6	7	8	9
V1 6FH5 *	0	—3	0	6.3A.C.	120	0	0		
V2 6CG8 *	0	105	0	0	6.3A.C.	105	105	0	0
V3 6BZ6	—5.8	.3	0	6.3A.C.	110	125	0		
V4 6BZ6	—6.5	.3	0	6.3A.C.	110	125	0		
V5 6A5B	115	0	1.8	0	6.3A.C.	—2.5	2	0	100
V6 6CX8	0	—2	105	0	6.3A.C.	1.5	—3	105	140
V7 6AW8A	0	—15	80	0	6.3A.C.	130	105	240	—20
V8 6CG7	90	—45	0	6.3A.C.	0	130	80	85	0
V9 6EM5	235		—17	6.3A.C.	0	—17	0	0	210
V10 6AU6	0	0	0	6.3A.C.	100	100	1.5		
V11 6T8	—15	—45	—23	6.3A.C.	0	—3	0	—6	56
V12 6CG7	145	—5	20	6.3A.C.	0	200	—65	0	0
V13 6DQ6A	370	0	—35	145	—35	560	6.3A.C.	0	
V14 1B3	PIN 2 and PIN 7 = 17.5 KV								
V15 6AU4GT	160	0	650	0	235	480	6.3A.C.	0	
V16 6BQ5	0	0	7	6.3A.C.	0	0	210	0	225
V17 5U4GB	220	260	0	270A.C.	0	270A.C.		260	
V18 23HP4	0	0	480	240	0	0	40	6.3A.C.	

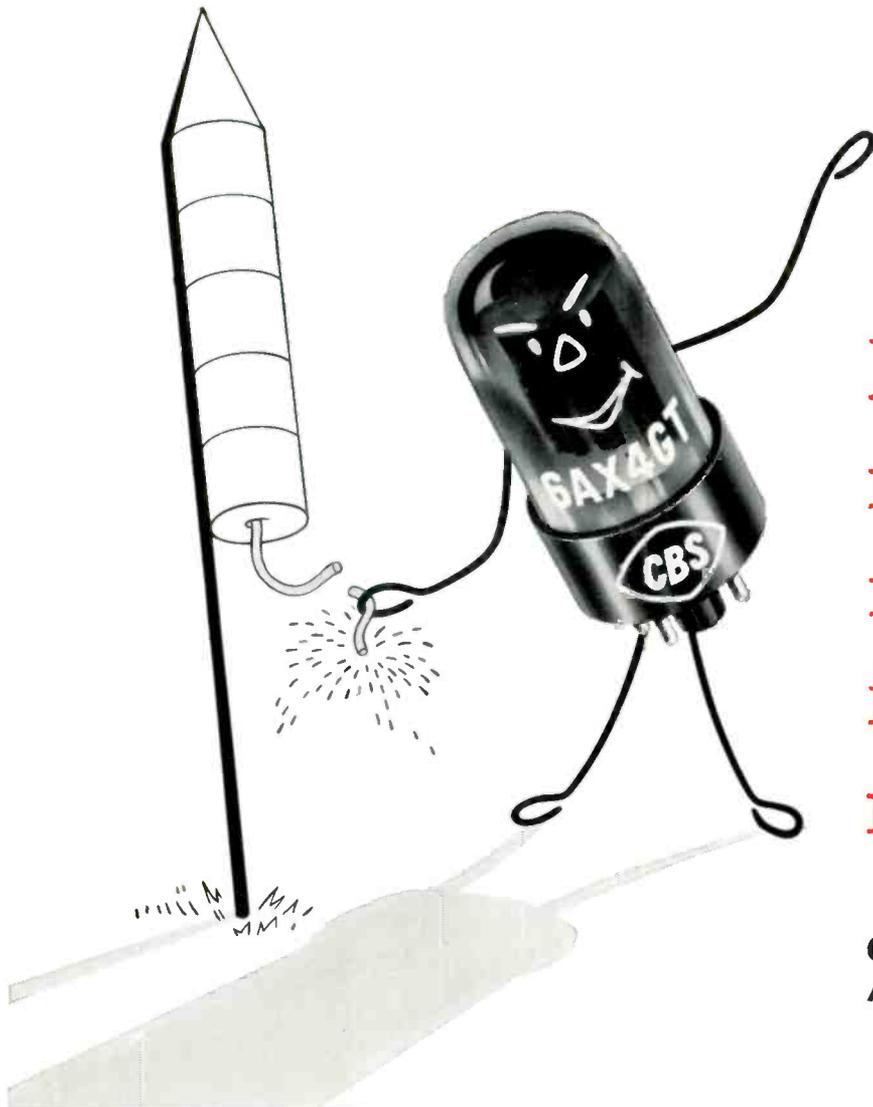
8+ AT C68 FIRST FILTER CAPACITOR = 260 V HIGH VOLTAGE AT 2nd ANODE OF PICTURE TUBE 17.5 KV  
\* = Readings on V1 & V2 taken from top of socket without tube in socket. All other tubes in normal operating condition.

**ANDREA**  
TV Chassis VS-323 Series

Electronic Technician  
**CIRCUIT DIGEST**

# 558

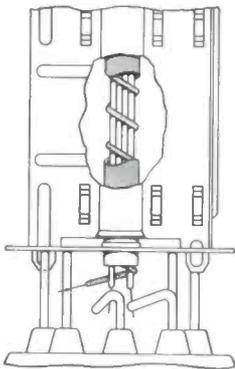
More Data on Reverse Side



No  
more  
fireworks  
for  
me!

(NO MORE DAMPER  
ARCING FOR YOU)

Typical of the many design features of CBS dampers is this new anchored heater-cathode insulator. Actually a tungsten coil coated with insulating material, it is mechanically anchored to prevent any movement that might lead to heater-cathode shorts. As a secondary precaution, the coil has fewer turns to minimize cathode-to-insulator contact, yet maintain perfect heater-cathode spacing.



"Damper diodes are prone to fireworks. Not me. I've been arc-proofed from heater to cathode to plate . . . and I'm blast-tested to insure it. That goes for my whole family of CBS damper tubes. Use us and relax."

It's true. CBS damper diodes have been completely redesigned to offer you *total reliability* . . . proved in performance by leading TV and radio set manufacturers. You, too, can profit more from the *total reliability* of CBS tubes. To prove it . . . just replace with CBS.

**TOTAL RELIABILITY...**  
proved in performance

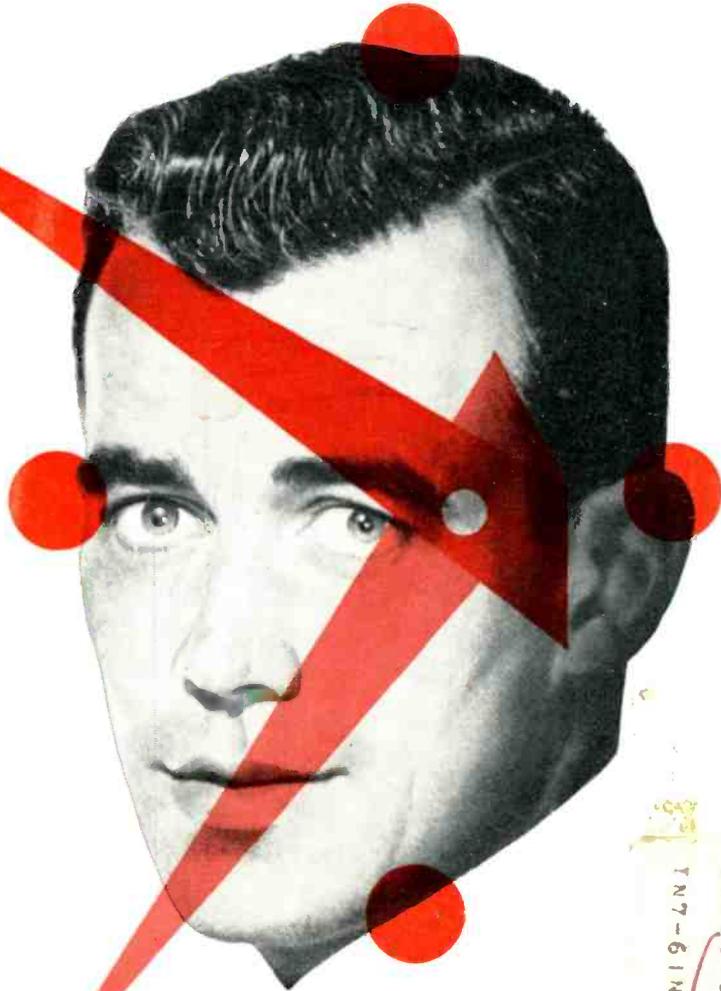


*Receiving, industrial  
and picture tubes  
transistors and diodes  
audio components  
and phonographs.*

**CBS ELECTRONICS**

Danvers, Massachusetts

A Division of Columbia Broadcasting System, Inc.



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*with the demands of your profession*

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