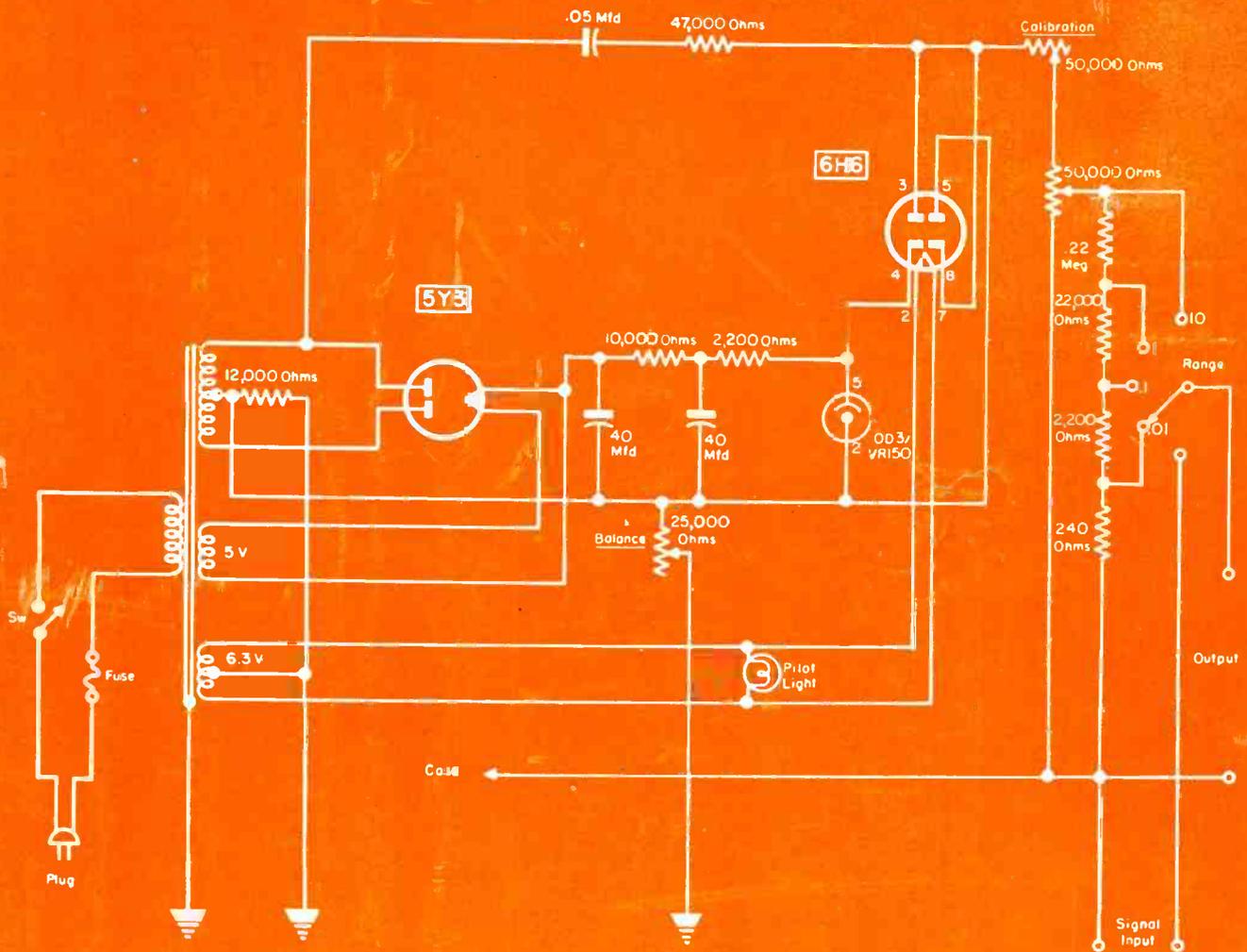
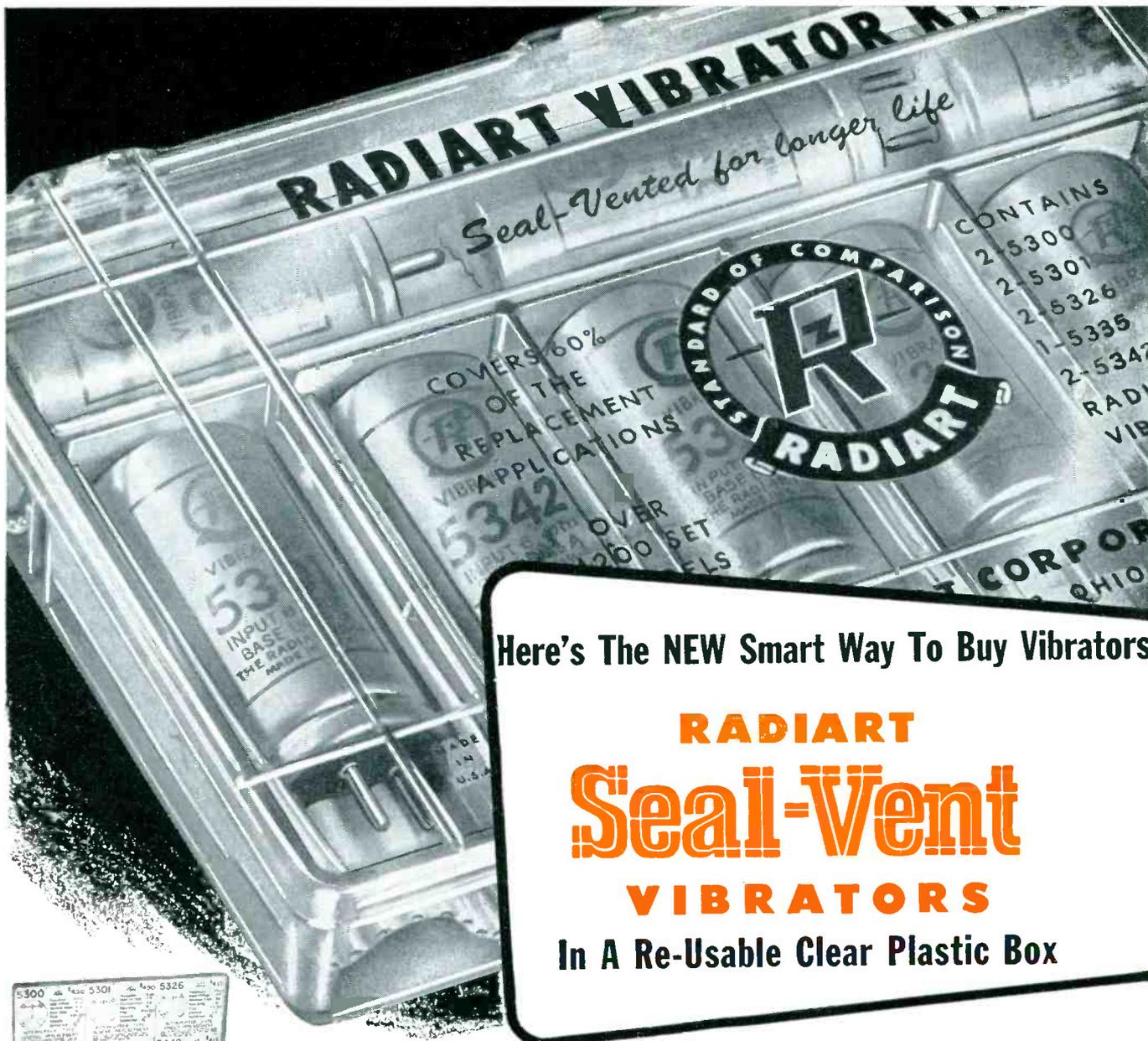


# SERVICE

OCTOBER  
1952



Circuit of a 'scope voltage calibrator featuring a voltage regulator.  
[See page 3]



Here's The **NEW** Smart Way To Buy Vibrators

**RADIART**  
**Seal-Vent**  
**VIBRATORS**

In A Re-Usable Clear Plastic Box



*this is the way it looks fully packed*



*here is the re-usable box with dividers for a hundred uses at home or work*

★ The BEST Vibrator Money Can Buy

★ A "BONUS" for You in the Re-Usable Plastic Box

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Here's another PLUS for you from Radiart — the RADIART VIBRATOR KIT! In this handsome plastic box with sturdy dividers and a hinged cover are these 9 vibrators . . . all yours for the price of the vibrators alone! You get these 5 basic types that serve 60% of replacement applications . . . 2-5300 . . . 2-5301 . . . 2-5326 . . . 2-5342 and 1-5335. These are all the famous quality . . . with the sensational! SEAL VENT. Original quantities are limited . . . so make sure of yours by seeing your RADIART jobber NOW!



**THE RADIART CORPORATION CLEVELAND 13, OHIO**

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

# BUSS FUSES

## Help Protect Your Product . . . Your Profit . . . Your Reputation



THE  
*Known* LINE OF FUSES

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38 year's service to American homes, farms and industry is behind every fuse that bears the BUSS trademark. Your customers have confidence in BUSS . . . they know the BUSS name represents fuses of unquestioned high quality.

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*Hypex*\* means  
**HIGH EFFICIENCY**



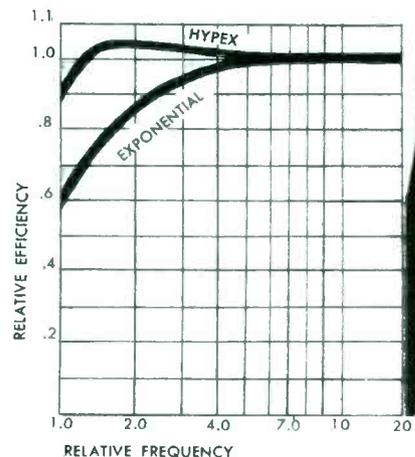
One of the many outstanding features of Jensen Hypex\* Projectors is the patented hyperbolic-exponential flare which gives improved low-frequency performance over the exponential type. Hypex\* by Jensen was the first basic improvement in horns since the exponential type was proposed in 1919.

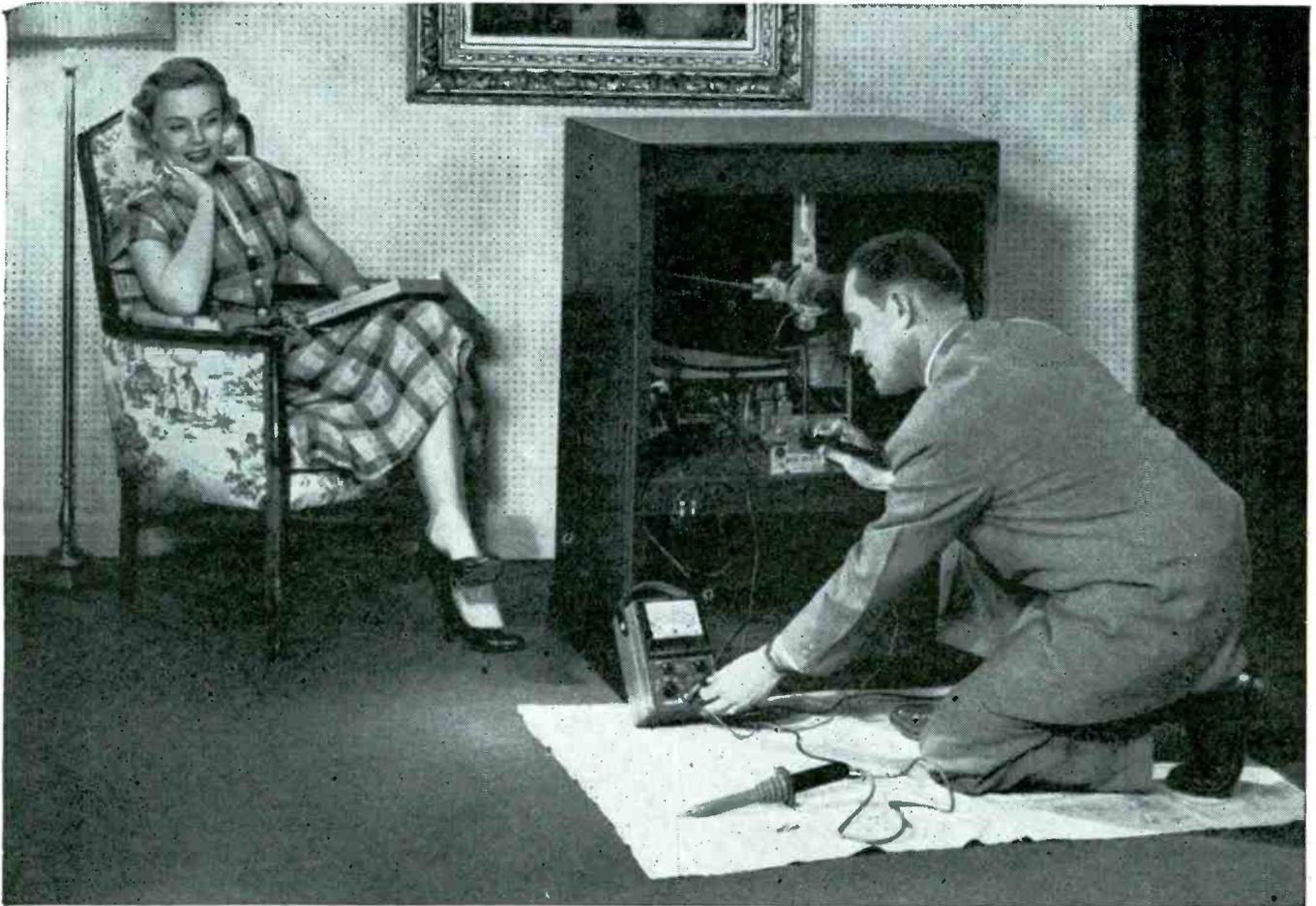
\*T.M.Reg.

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## Your best picture tube and set tester ... an RCA VoltOhmyst\*

Save time and money—be sure—by pre-checking TV chassis and picture tubes in the home with an RCA "VoltOhmyst". Here's how . . .

Bringing your RCA "VoltOhmyst" into the customer's home on every service call is more than good psychology—it's good business—because the features of an RCA "VoltOhmyst" permit you to make a rapid and systematic check of the chassis as well as the picture tube—right in front of the customer.

Here's how you go about it (no picture or a dim picture, but sound okay):

1. Turn on set and visually check that picture-tube heater is lighted. Check adjustment of ion-trap and focusing magnets.
2. If picture-tube heater is not lighted, remove the socket from the tube and check heater continuity with "VoltOhmyst". Also check heater-to-cathode leakage.
3. Measure socket-terminal voltages to ground with "VoltOhmyst." Note action of Brightness Control on grid or cathode voltage.
4. Check for video voltage at grid or cathode ter-

minial of picture-tube socket with "VoltOhmyst" AC Probe.

5. Replace picture-tube socket and measure high voltage with WG-289 High-Voltage Probe. Note effect of Brightness Control on high voltage.
6. If high voltage is lower than normal, measure "B plus" and "boosted B plus" voltages with "VoltOhmyst" DC Probe. If B-plus voltage is normal and boosted B-plus voltage is low, try a new damper tube.
7. If "B plus" and "boosted B plus" voltages are both normal, try new tubes in the horizontal output, horizontal oscillator, and HV rectifier.
8. If none of these tests indicate the trouble, then it may be concluded that the picture tube is at fault.

These simple tests permit you to give the customer an immediate and positive diagnosis of the trouble . . . and in many cases, permit you to correct the fault on the spot. Most important—you know immediately whether a new picture tube is needed, or whether it will be necessary to take the chassis to the shop.



WG-289 High-Voltage Probe with WG-206 Multiplier resistor, \$9.95 Suggested User Price.

WV-77A Junior "VoltOhmyst," only \$47.50 Suggested User Price.

Only RCA makes the "VoltOhmyst"

RCA "VoltOhmysts" measure DC voltages in high-impedance circuits, even with rf present, without the ill effects of heavy circuit loading, regeneration, or frequency shift. They also measure AC over a wide frequency range, even in the presence of DC . . . and detect leakage resistances as high as 1000 megohms.

See the WV-77A and the WG-289 as well as the WV-87A and WV-97A "VoltOhmysts" at your local RCA Distributor, or write for bulletins to Commercial Engineering, Section JX . . . Harrison, N. J.

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



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TEST EQUIPMENT

HARRISON, N. J.

# THE WORLD'S FIRST BROAD BAND YAGI!

## CHANNEL MASTER'S new futuramic

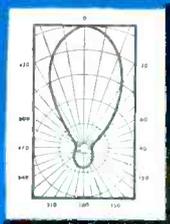


The first antenna ever built that combines . . .

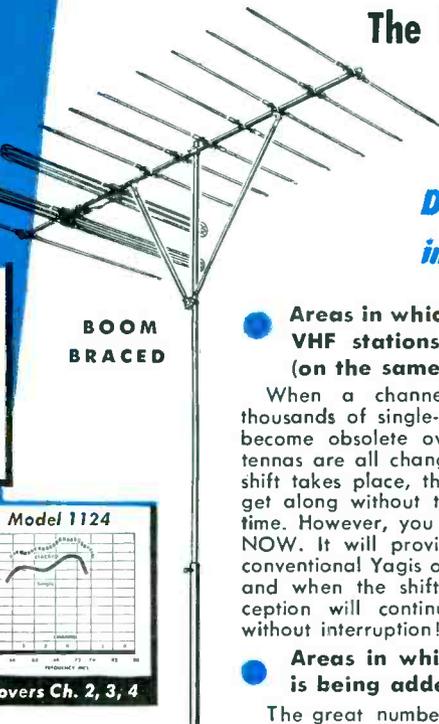
- ✧ Broad band coverage *with the*
- ✧ High gain and directivity of the Yagi

*Designed for service TODAY and TOMORROW . . . in these 3 booming VHF markets:*

Horizontal Polar Pattern



BOOM BRACED



- Areas in which the FCC has ordered VHF stations to change channels (on the same band).

When a channel-shift takes place, the thousands of single-channel Yagis in use will become obsolete overnight. Unless such antennas are all changed on the same day the shift takes place, the set owner will have to get along without television for a period of time. However, you can install the Futuramic NOW. It will provide better reception than conventional Yagis on the present channels — and when the shift occurs, this superior reception will continue on the new channel without interruption!

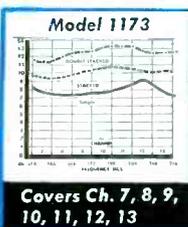
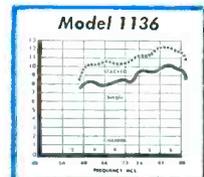
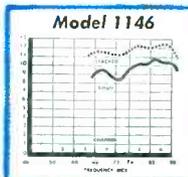
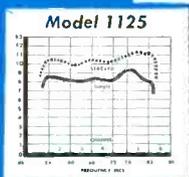
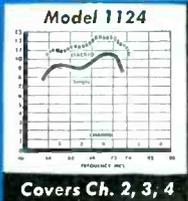
- Areas in which a new VHF station is being added to the present one.

The great number of single-channel Yagis

now in use will not bring in the new channel. If an additional Yagi is installed, it will have to be tied into the present installation with separate leads and a switching system. However, ONE Futuramic will do the job of BOTH antennas — at lower cost — with better results on both channels.

- Areas served at present by two or more VHF stations (on the same band).

In such areas, the installation man has had to compromise between conventional broad band antennas, and separate Yagis for each channel. Only the Futuramic will give you the full advantages of both. It combines highest gain and sharpest directivity with simple, economical installation.



Model No.	Channels Covered	List Price
1173	7, 8, 9, 10, 11, 12, and 13	\$20.83
1124	2, 3, and 4	\$40.97
1125	2, 3, 4, and 5	
1136	3, 4, 5, and 6	
1146	4, 5, and 6	

### SHATTERS all performance records!

- Channel for channel, the Broad Band Futuramic will outperform any conventional SINGLE-CHANNEL Yagi.
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- And the Futuramic uses Channel Master's famous Z-Match system for maximum stacking gain.

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This is not a contest . . . nothing extra to buy. Just watch for the 1,500,000th WALSCO antenna. Your jobber may have the lucky antenna *right now*. It will come in a regular carton, with no special markings.

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 Constellation to any  
 vacation spot in America . . .  
*all expenses paid!*

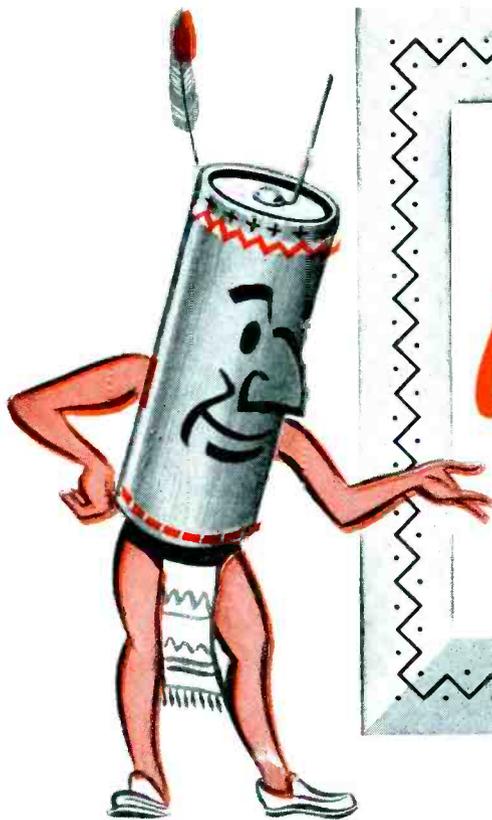


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*Those who know*



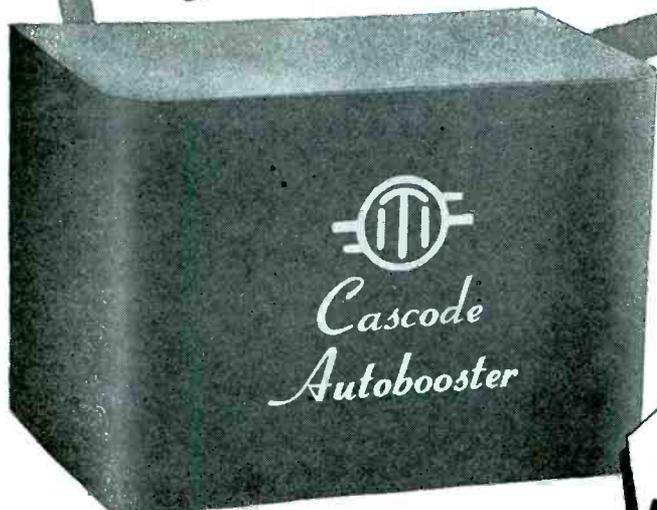
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## SANGAMO ELECTRIC COMPANY

MARION, ILLINOIS

Now...Where you want the

# MAST <sup>in</sup> BOOST



**Sub-Fringe Areas  
Community Antennas**

**Even Modern Low Noise Receivers**

## IT-90AB

**Low Noise Cascode Circuit**

## AUTOBOOSTER

### CONDENSED SPECIFICATIONS

	<b>IT-90AB Cascode Auto booster</b>
Channel Coverage	All VHF
High-Band Gain (DB)	26
Low-Band Gain (DB)	30
Approximate Noise Factor (DB)	7
Input Impedance	300 ohms*
Separate Hi-Low Inputs?	Yes
Output Impedance	300 ohms*
Tube Complement	1-6AK5 1-6CB6 2-6BQ7 1-6X4
Power Consumption	30W
Size	7 <sup>3</sup> / <sub>4</sub> x 6 x 5
Automatic Set Switch?	Yes

The New IT-90AB Cascode *Auto booster*—successor to the now famous IT-90A, with the improved low noise cascode circuit—is ideal for all applications where exceptionally high gain and low noise are desired. Extensive field tests show that only this new circuitry will give satisfactory performance with the modern low-noise front end receivers. Fully automatic—no tuning—no switching.

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359 LEXINGTON AVE., CLIFTON, N. J.

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List \$5.45



4 set coupler  
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4 set coupler      Old List  
Model 300-72      \$19.75

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Mul-Tel

# Brach

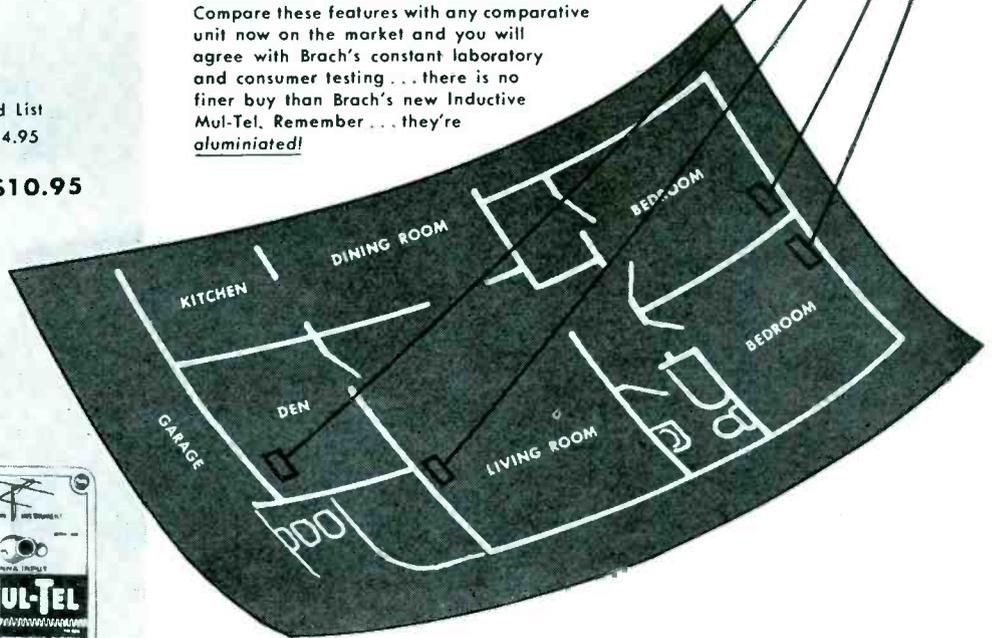
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- attractively boxed in shielded plastic housing
- complete filter action insured by Brach's factory-adjusted coils
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- high-pass filter action
- no loading effects between connected television sets
- the only 2-set coupler that works for 72 and 300 ohm antenna lines simultaneously

FREE Write for booklet "Preparing for UHF Television" by Ira Kamen, noted TV authority.

MANUFACTURING CORPORATION

Division of General Bronze Corporation

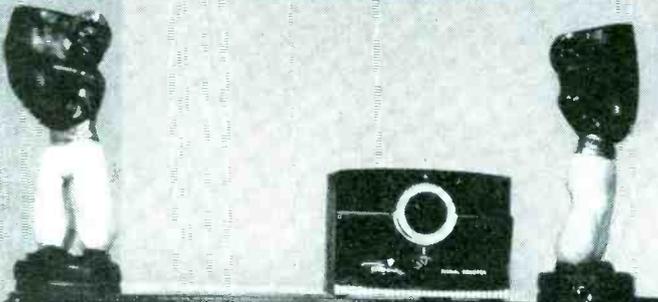
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BURTON BROWNE ADVERTISING



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Read what these satisfied Rider users say. These are men like yourself: professional service technicians who are faced with the same servicing problems as you. They found, just as you will, that tv servicing can be easy. Here's what they say:

" . . . 3 weeks ago I had a receiver in my shop for which there seemed to be no repair possible. According to the one schematic I had for this receiver, it should have operated perfectly. I was on the verge of returning the receiver to the customer and admitting defeat, when a technician friend suggested I check the receiver with Rider servicing data. I did; with the result that I found the trouble to be a production change which was not explained in the data I had been using. Needless to say, I'm a Rider user from now on!" John Ottenheimer, Radio Television Clinic, 137 Main St., Hempstead, L. I., N. Y.

" . . . and as a result of using your data, I haven't had a single callback in 9 months!" J. W. Scatbard & Co., 7135 Germantown Avenue, Philadelphia 19, Pennsylvania.

### WHAT'S THE SECRET?

It's simple! The one thing that Rider gives you is *all the facts*. That's the one big difference between Rider Servicing Data and any other kind. Rider Servicing Data is official, complete, factory-authorized data. Exactly as issued by the manufacturer who made the set . . . with all of his changes and modifications . . . organized into indexed, easy-to-follow style. This means that when you repair a set with Rider Servicing Data, you have everything in front of you. Everything that you must know in order to do a fast, accurate diagnosis and make a prestige-building, permanent repair!

In Rider Servicing Data you get all of the manufacturer's troubleshooting test patterns . . . schematics of all his productions . . . stage by stage alignment curves . . . clear, enlarged chassis views . . . the manufacturer's circuit changes . . . circuit explanations . . . voltage data, disassembly information and much, much more. For example: Rider Servicing Data has shown scope waveforms in TV receivers ever since the first TV receiver was made!

And Rider Servicing Data now has these important new features: manufacturers' trouble cures and guaranteed replacement parts listings. The manufacturers' trouble cures are standard (3 x 5") index cards, called Rider Handies, containing vital manufacturer-issued permanent trouble cures plus production changes. Each Handy is identified with a manufacturer and receiver model. With Rider Handies you save countless hours of diagnosis and repair time . . . because Handies contain the data you must have to make permanent repairs on many receivers.

The replacement parts listings are included in the latest Rider Servicing Data. All these replacement parts must meet the physical and electrical performance ratings of the original equipment.

### RIDER TV SERVICING DATA COMES IN TWO FORMS. MANUALS ■

The TV Manual form has nine volumes covering more than 4,200 models of television receivers. Each volume has over 2,000 (8½ x 11") pages of servicing data with an index covering the contents of all volumes. Each volume is attractively bound in a permanent hard cover. The Manual form is ideal for shop use and as a permanent reference.

### TEK-FILE ■

The Tek-File form now covers more than 2,200 models. Each Tek-File pack contains complete data for several of the most popular models . . . the ones you are called to work on every day. (Contents are clearly marked on the cover of each pack.) These models are bound in handy, standard file folders for easy home and shop use. In each Tek-File pack you get a special coupon. 15 of these coupons plus a small handling charge entitles you to a permanent, hard-cover manual binder for Tek-File shelf use. Or if you prefer, each coupon is worth five cents toward the purchase of any Rider book. Note: Get your free Tek-File indexes covering the contents of all packs at your jobber's. If he doesn't have them, write us.

For the complete servicing facts on radio get Rider Radio Manuals. In 22 volumes Rider Radio Manuals give you the complete, factory-authorized, official AM, FM radio servicing data for receivers manufactured over the past 22 years! Plus complete data on auto radios, record changers, tuners and recorders. Everything is organized and indexed to make radio servicing easy.

### DON'T BE SWITCHED

Remember, Rider Manuals and Tek-Files are the only source for complete published servicing data. If your jobber doesn't have them, DON'T BE SWITCHED! If he doesn't have Rider Manuals, write to us . . . we'll tell you where to get them. If he doesn't have Rider Tek-Files, write to us . . . we'll fill your order directly. (Please include your jobber's name.) Why not prove to yourself that Rider Servicing Data really makes servicing easy? Try one Rider TV Tek-File pack at our risk! Try a pack for the next receiver you repair . . . if you don't agree that it makes your servicing easier than anything you've ever used RETURN THE PACK TO US WITHIN SEVEN DAYS AND WE'LL SEND YOU A FULL REFUND! So act now . . . you have absolutely nothing to lose!

### RIDER "HOW-TO-DO-IT" BOOKSHELF.

#### 1. TV Troubleshooting and Repair Guide Book.

Save time! Loaded with troubleshooting charts and waveform pictures. 10 vital chapters. 204, 8½ x 11" pages. Paper cover \$3.90

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All the facts! Design, construction, testing, maintenance, applications, etc., of all types of VTVM's. 432 pages 5½ x 8½". 210 ill. Cloth cover \$4.50

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No mathematics! Easy to read facts. Complete data on 50 basic antenna types. 606 pages 5½ x 8½". 310 ill. Cloth cover \$6.60

### IT'S NEWS! TELL-A-FAULT

It's Rider's new monthly tv troubleshooting service. Save countless hours of diagnosis time. Rider experts do your trouble-shooting for you . . . in pictures, charts, and symptom and cure sheets. Monthly bulletins. Send coupon for complete story — no obligation.



**JOHN F. RIDER, Publisher, Inc.**  
 480 Canal Street, New York 13, N. Y.

Please send me book(s) circled. I understand, if not satisfied, I may return them within 10 days for full refund.

Send Free Data on Tell-A-Fault.

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(Please Print)

# NOW

## MORE TV SET OWNERS ENJOY BETTER TELEVISION with B-T UNIT SYSTEMS



More and more SERVICE TECHNICIANS are using the B-T UNIT SYSTEM to plan and install Master TV Systems for VHF and UHF, for 1 Set or for 2000, and without outside engineering assistance. And today hundreds of thousands of set owners enjoy the benefits of Better Television

The B-T UNIT SYSTEM was designed expressly for the Service-Technician to help him meet the various problems which arise in his work. The B-T UNITS are intended for use wherever the Technician finds any one or all of the following requirements to exist: Amplifying Weak Signals . . . Handling Multi-directional Signals without a Rotator . . . Multi-set Distribution from a Single or Multiple Antenna Installation. (See Typical Applications)

### B-T UNITS include:



#### MIXER AMPLIFIER MA-4

- Basic Chassis and Power Supply \$52.50
- Individual Channel Plug-in Amplifier Strips \$19.50
- UHF Conversion Strip To be announced

#### DISTRIBUTION AMPLIFIER DA-8

No Loss Distribution to 8 Sets \$87.50



#### DISTRIBUTION AMPLIFIER DA-2

No Loss Distribution to 2 Sets \$39.50

#### COMMERCIAL ANTENSIFIER CA-1

All Channel Line Amplifier—27db Gain \$77.50



The B-T UNIT SYSTEM is the result of exhaustive study projects conducted by Blonder-Tongue Laboratories, whose research facilities are entirely and continuously devoted to Better Television. All B-T UNITS are broad band, and require no channel tuning or band-switching.

### TYPICAL APPLICATIONS

FOR USE	MA-4 plus Individual Channel Strips	CA-1 All Channel Line Amplifier	DA-8 Each Feeds 8 Sets	DA-2 Each Feeds 2 Sets
WEAK SIGNALS	✓	OR ✓		
MULTI-SET DISTRIBUTION			✓	✓
MULTI-ANTENNA INSTALLATIONS	✓			
COMMUNITY TV SYSTEMS	✓	✓	✓	✓

NOTE: These Units may be used alone or in any number of combinations. See Your Distributor, or Write to B-T Service Department for full specifications of B-T Units and Accessories.



Standard RTMA Warranties Apply

**BLONDER-TONGUE LABORATORIES, INC.**  
Westfield, New Jersey



"WHY SHOULD I INSIST  
ON **CBS-HYTRON**?"

"**YOU PROFIT MORE!**  
HERE ARE  
**5 BIG REASONS WHY**"



**1. CBS-HYTRON IS FAMOUS . . . EASY TO SELL.** The magic letters "CBS" are plugged for you on radio and TV station breaks . . . 102 BILLION times a year! CBS is known and respected by *all* your customers. CBS-Hytron is the profitable brand with endless sales assistance.



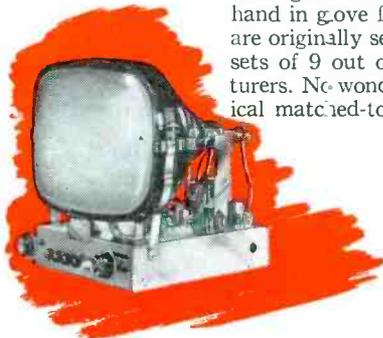
**2. CBS-HYTRON SPECIALIZES IN RECEIVING TUBES.** Since 1921, CBS-Hytron has concentrated on receiving types. Practice makes perfect. Put those years of know-how to work for you. Let time-proved CBS-Hytron dependability cut call-backs . . . make more money for you.



**3. CBS-HYTRON LEADS IN TV TUBES.** You know them. CBS-Hytron TV originals: 1AX2, 1X2A, 6BQ6GT, 12A4, 12B4, 12BH7, 12BY7, 12BZ7, 25BQ6GT, and the original rectangular 16RP4. Even CBS-Hytron standard TV tubes are designed-for-TV . . . tested-for-TV . . . to give you peak performance and profit.



**4. CBS-HYTRON IS ULTRAMODERN.** CBS-Hytron is the tube of the future. Made in the world's most modern plants. On manufacturing equipment years ahead of the rest of the industry. CBS-Hytron advanced design and precision construction keep you always ahead. Give you tomorrow's trouble-free performance today.



**5. CBS-HYTRON IS MATCHED-TO-THE-SET.** Combined engineering skills of leading set makers and CBS-Hytron work hand in glove for you. CBS-Hytron tubes are originally set-engineered right into the sets of 9 out of 10 leading set manufacturers. No wonder CBS-Hytron is your logical matched-to-the-set replacement tube.

**IT PAYS TO BE FUSSY!** Just any standard brand won't do. If you want: Trouble-free, advanced performance. Maximum customer satisfaction. Minimum call-backs. More profit. Five big reasons point the way: Insist on CBS-Hytron!



**CBS-HYTRON**  
Germanium Diodes

Complete data yours for the asking. Write  
CBS-Hytron, DANVERS, MASS., today.



# The Winning *COMBINATION* for a perfect *TV* picture!



Here's What You Get — ALL YOU NEED  
TO GET THE MOST OUT OF ANY TV SET!

- ★ CDR Rotor, Model TR-11 . . . . . \$44.95
- ★ Thrust Bearing, Model TA-6 . . . . . 4.95
- ★ Radiart Booster, Model TVB-1 . . . . . 29.95
- ★ Connecting Kit, Model TA-7 . . . . . 1.00

If Bought Separately . . . \$80.85

**SPECIAL RETAIL  
COMBINATION PRICE... \$74<sup>95</sup>**  
Model RAC-4497...  
*Regular Trade  
Discount Applies*

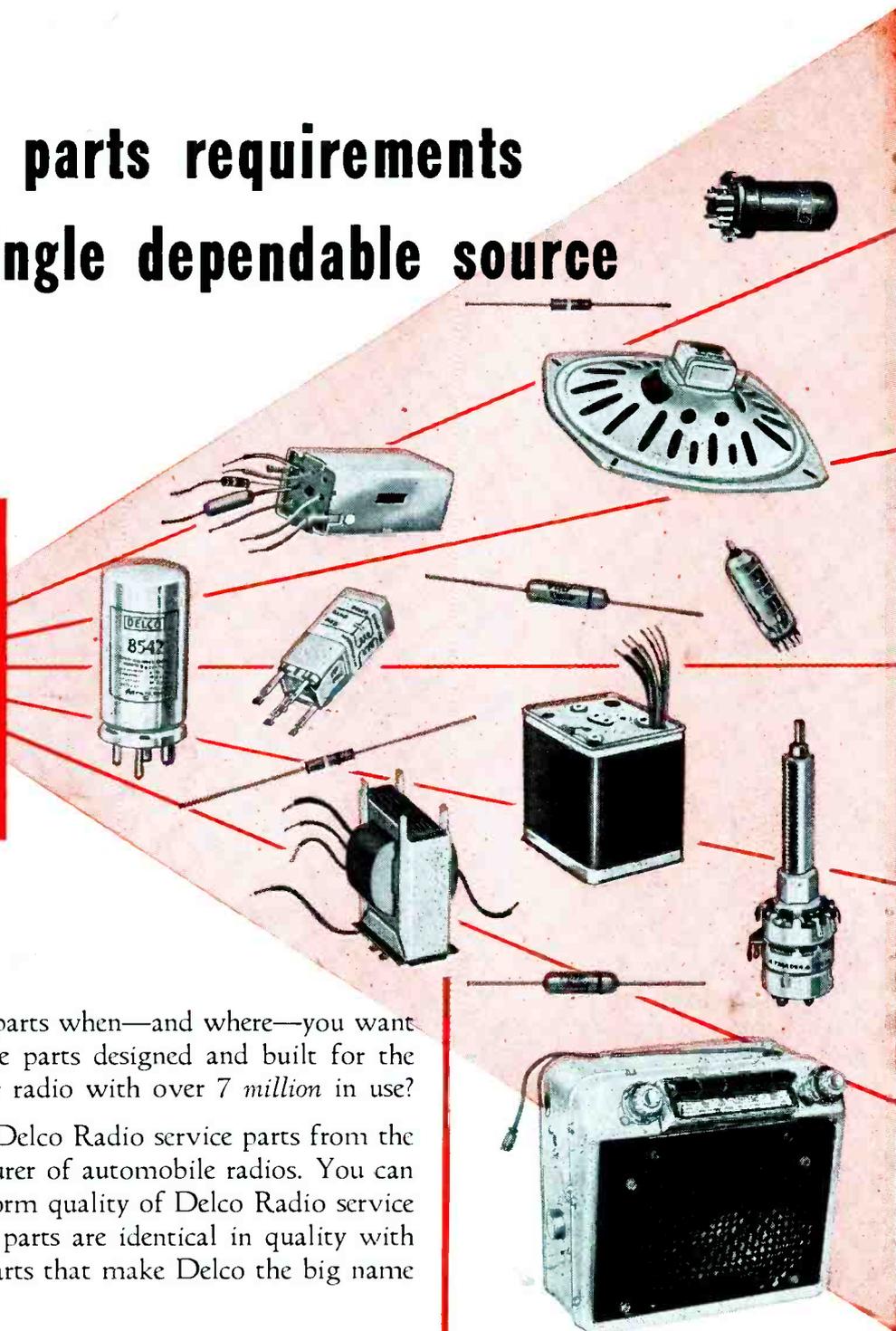
Here's a rare opportunity to really get the most out of any TV set—putting it to work at peak possible performance... and at a real savings! We have combined these 4 Radiart units into one package and at real savings! The quality can't be beat... and the two cabinets form a handsome piece of furniture for any home. Will handle any antenna array... meter dial on remote control cabinet... and the booster improves picture quality beyond compare! **ACT NOW!**



**THE RADIART CORPORATION** CLEVELAND 13, OHIO  
VIBRATORS • AUTO AERIALS • TV ANTENNAS • ROTORS • POWER SUPPLIES

# Fill your parts requirements from a single dependable source

**Delco  
Radio**



Want *good* radio service parts when—and where—you want them? Want radio service parts designed and built for the world's most popular car radio with over 7 million in use?

If you do . . . you want Delco Radio service parts from the world's largest manufacturer of automobile radios. You can depend on the high, uniform quality of Delco Radio service parts. These replacement parts are identical in quality with the original equipment parts that make Delco the big name in car radios.

Both Delco Radio original equipment and universal service parts are available promptly through United Motors wholesalers.

## **DELCO RADIO PARTS**

A GENERAL MOTORS PRODUCT   A UNITED MOTORS LINE

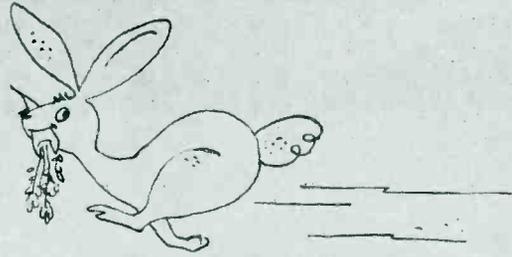
**DISTRIBUTED BY WHOLESALERS EVERYWHERE**

## **DELCO RADIO**

DIVISION OF GENERAL MOTORS CORPORATION  
KOKOMO, INDIANA

### THINGS TO REMEMBER ABOUT DELCO RADIO SERVICE PARTS

- 1 Offer largest market for original-equipment replacement parts.
- 2 Backed by world's largest factory devoted exclusively to automobile radios.
- 3 Designed by one of the largest and most forward-looking engineering groups devoted exclusively to automotive radio.



# FAST

## KESTER "RESIN-FIVE" CORE SOLDER

**FAST** . . . On Every Soldering Job

Kester has two Solders for you . . . Kester "Resin-Five" Core Solder, the newest development, and Kester Plastic Rosin-Core Solder, the old reliable.



Either product, but especially "Resin-Five," does the work fast, enables you to get the job out quickly and make room for more of that profitable servicing.

With Kester "Resin-Five" Core Solder, the flux being of the activated Resin-type, you can solder anything and everything . . . even those badly oxidized parts! Yet, "Resin-Five" Flux is absolutely non-corrosive and non-conductive.

- Diameters of 1/16 inch and smaller available, besides the 3/32 inch.

Your Jobber has Kester! Be sure to ask for "Resin-Five" or "Plastic Rosin" . . . they are the genuine Kester products.

**KESTER SOLDER COMPANY**

4248 Wrightwood Ave., Chicago 39  
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**KESTER  
SOLDER**

# Dealers Sell BAKER TOWERS

*because they're...*

- SOLD QUICKER
- INSTALLED FASTER
- BUILT BETTER

## OUTSTANDING ADVANTAGES

Specially engineered telescoping mast designed for economical, quick, simple, installation of tower 40 feet over roof. Exclusive telescoping mast joint is simple and strong. Safety catch holds 10 foot mast sections extended and firmly in place during erection—installer has hands free. Eliminates cumbersome tip-ups—and high climbing. Electricweld for strength and rigidity.

Tower fits any pitch roof. All steel parts heavily galvanized for long life. Designed to withstand 80 mile wind. Major assembly done at factory. Folded compact flat for easy shipment and storage.

## EASY TO INSTALL

*As easy as one, two, three*

- 1) Simply bolt the base level on roof and clamp readied mast in tower.
  - 2) Extend top 10' mast section until it stops automatically and is held temporarily by safety catch. Then lock in position. Extend middle section in the same manner.
  - 3) This done, just raise the complete mast, clamp in position, and the tower is up!
- No tip up, no trip up. No other tower is so easy to install.



RETAIL LIST PRICE      • BAKER OFFERS THE DEALER

Model 40 TK              • \* 10' fitted end masts.

Complete 40 ft.         • \* 20' telescoping masts.

    installation \$54.60    • \* 30' telescoping masts.

Shipping weight 80 lbs   • \* Roof mounts to fit any pitch roof.

**BAKER MFG. COMPANY**  
EVANSVILLE, WISCONSIN

BAKER MFG. COMPANY  
DEPT. A  
EVANSVILLE, WISCONSIN

Please send me information on the Baker 40 TK  
Tower and other Baker tower products . . . . .

Please have a Baker Tower representative call on  
me as soon as possible . . . . .

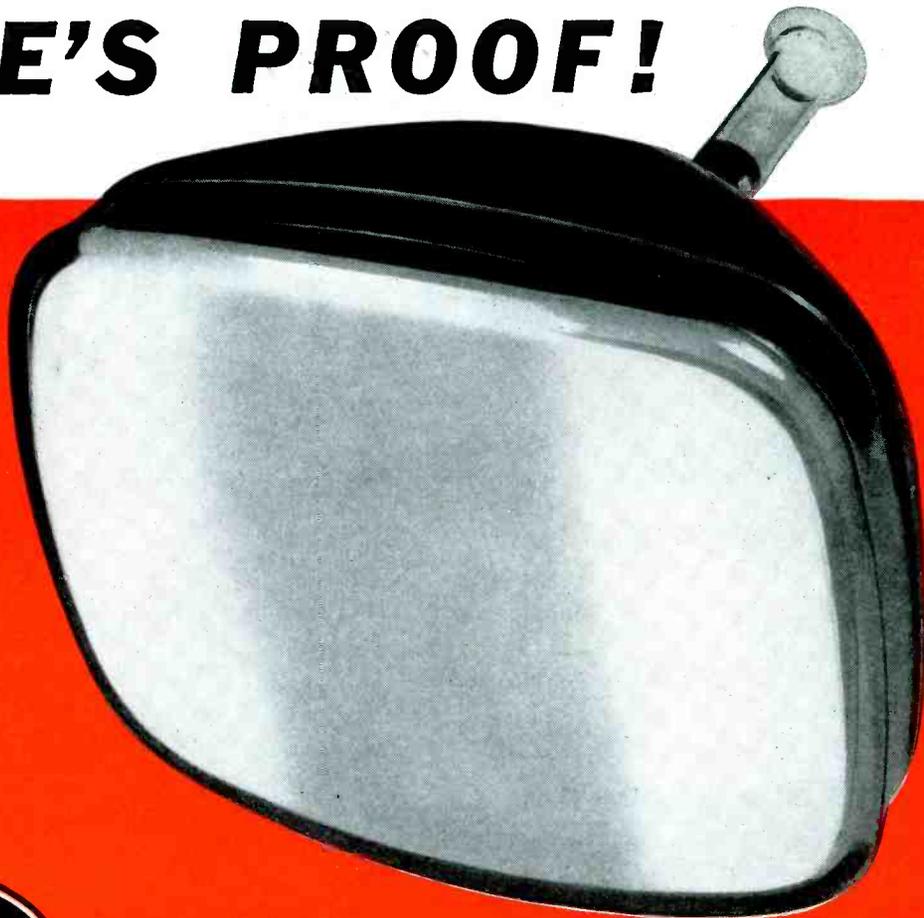
Name \_\_\_\_\_ Company \_\_\_\_\_

Address \_\_\_\_\_

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

# HERE'S PROOF!

**Glass used  
in second hand  
tubes is  
20% DIMMER  
than NEW  
GLASS used in**



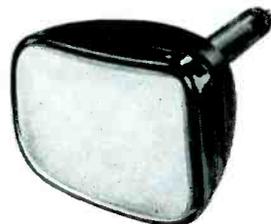
## PICTURE TUBES

**T**HE unretouched picture above demonstrates why you risk your reputation as a competent service dealer every time you sell your customers a second hand tube.

A standard Raytheon Tube was put on life test equipment and adjusted so that the raster did not cover the entire face of the tube. The tube was given the equivalent of 1000 hours of operation in a consumer set. The tube neck was then cut, the gun removed, the tube renecked and the screen washed out. The bulb was re-washed and rescreened and as you can see, the portion of the bulb that was scanned *is about 20% darker than the unscanned area.* In short,

scanning darkens glass and any used bulb that is rescreened will be 20% darker than a new bulb. The only way you can get new tube-brightness out of a second hand tube, is to increase the beam current. And since beam current comes from the cathode, increasing the beam current shortens tube life. For this reason, when you replace with second hand tubes your customer loses, and in the long run so do you!

It's good business to always replace with *new* tubes. And, of course, if you want the finest new tubes that money can buy...



... use **RAYTHEON TELEVISION PICTURE TUBES**   
They're Right for Sight... and Right for You... and Always New!

*Excellence in Electronics*

**RAYTHEON MANUFACTURING COMPANY**

Receiving Tube Division

Newton, Mass., Chicago, Ill., Atlanta, Ga., Los Angeles, Calif.

RAYTHEON MAKES ALL THESE:

RECEIVING AND PICTURE TUBES • RELIABLE SUBMINIATURE AND MINIATURE TUBES • GERMANIUM DIODES AND TRANSISTORS • NUCLEONIC TUBES • MICROWAVE TUBES

RADIO · TELEVISION · ELECTRONIC  
**SERVICE**

### Shrewd Merchandising

"TELEVISION is still pretty much of an infant, but few families now consider their home complete without a TV set . . . and therein lies our story."

Thus, is introduced a sharp, lively, hard-hitting plan to sell TV servicing, expounded in a keenly-prepared booklet, published by a progressive service-shop operator in the middle west.\*

In his unique story, this alert shop owner emphasizes a key factor in selling service—*training*. He notes that a uniform, campaign hat and a gun never made a soldier, but training does produce a good soldier. By the same token, we are told, a kit of tools and an instruction book does not make a TV Service Man. Here, again, training, in fact highly-specialized training, plus a natural aptitude for electronics, is a very definite requirement in making a good TV Service Man, continues this story. Regardless of size or make, TV receivers are delicate and complicated pieces of mechanisms, representing a substantial investment of money. Therefore, it is noted, one cannot afford to entrust repairs to an amateur, but rather to a well-trained, well-grounded specialist.

A frank discussion of what is done in this service shop to provide such talent is then thoroughly reviewed in the booklet. It is disclosed that every applicant is first, painstakingly screened. The shop's policy, it is said, requires every service-job applicant to have at least one year of field experience, be a graduate of a recognized TV school, and possess good personal appearance and character. Then, the brochure reveals, applicants undergo a special training program. Before being sent on any service calls, the applicant must attend daily classroom sessions. A teaching staff of three engineers are employed to keep students up to date on the most improved methods of servicing. This briefing period is followed by a session on bench instruction, with new Service Men being trained in bench-repair procedure so that not only can repairs be completed rapidly in the home, but in the shop if necessary. Finally, the booklet discloses, the new Service Man

is broken in as a helper. He must accompany an experienced Service Man on many home calls before being permitted to go out alone. And only after the new Service Man demonstrates that he is capable of operating on his own, does he receive outside assignments.

Service-call pricing is also highlighted in the booklet in a frank manner. Normal home calls, within 15 miles of City Hall, are charged at \$4.00. In an explanation of this charge, it is noted that it covers repairs made without removing the chassis from the cabinet. A maximum labor charge on any completed home call is quoted as \$5.50 total, exclusive of parts.

All service calls received before noon, the booklet says, are dispatched the same day, and afternoon calls are made the following day; whereas, service after 6 P.M. is by appointment only.

The earthy, sincere message contained in this booklet has impressed everyone, and attracted a continually growing family of set owners.

Here, truly, is a shrewd plan to merchandise TV servicing in a forthright manner. A salute to this enterprising shop owner!

### A Model Licensing Plan

IN AN EFFORT to guide those who are considering licensing, a national association of law officers has proposed an unusual, basic type of ordinance that might be followed to regulate those engaged in . . . "selling, distributing and servicing TV equipment."

In its preamble, the suggested bill declares that the legislation is designed to . . . "protect the public against incompetent, unqualified, unreliable and financially irresponsible persons who operate their business in such a manner as to cause damage or injury to the patronizing public." It is also noted that since there are hazards encountered in servicing radio and TV receivers, which under certain conditions might cause serious injuries, due to electrical shock, etc., protective measures must be provided.

Describing the written and oral ex-

amination that a board of examiners would be obliged to conduct, the proposal lists subjects on which questions would be based in an exam: fundamental electricity and electronics, receiving circuits, auto-radio and TV installation servicing, public address and sound-equipment service and installation, antennas, commercial AM and TV test equipment, and service methods and uses of commercial equipment. The suggested bill also indicates that a practical demonstration of skill should prevail to judge the applicant's ability to repair, install or service.

Provisions are also included for bonds, equitable advertising, possible exemptions, periods of suspension or revocation, and license fees.

The proposed format has intrigued many, who believe that such a standardized approach to licensing may solve a host of problems. What do you think?

### Our ABC Symbol

IN EVERY ISSUE, on the table-of-contents page, there appears three characters in a black field—*ABC*—signifying our membership in the Audit Bureau of Circulations, the nation's oldest and foremost circulation-auditing organization, who carefully review and audit our circulation annually.

Readers have often queried the true meaning of the symbol and its relationship to editorial content. Actually, the *ABC* audit represents a rigid circulation check that might also be considered as a behind-the-scenes force that makes for editorial quality. You indicate that we are helping you, by paying to read what we have to say. The *ABC* audit of our circulation shows us that you do, and it also tells us when we cease to serve you effectively. This constant check of your interest keeps us on our editorial toes, and has served to make us an editorial leader—not a follower.

Our very existence depends upon your continued acceptance.

SERVICE is proud to carry the *ABC* symbol, for it tells you that we have agreed to consider, first and last, your interests.—L. W.

\*L. Staich, Detroit, Mich.

# UHF-VHF

*you're prepared for everything with* **Trombone**



## **WARD'S** radically new all-channel antenna!

Open up new fringe areas! — Bring in markets you've never been able to touch before, with WARD'S radically new, all-channel "TROMBONE" Antenna. The unique three-bay "TROMBONE" delivers high gain on all channels . . . up to 16 db . . . on 2 to 83. Best of all, "TROMBONE" protects your customers against channel changes and new stations. It's the "plus feature" antenna you can sell with confidence . . . the antenna that gets the best in VHF today and the best in UHF tomorrow.

All-aluminum construction . . . completely pre-assembled . . . streamlined vibration-proof design . . . are added features of this outstanding antenna.

Cash in on WARD'S big promotion plan. Sell the complete WARD line for sales, profits and customer protection. See the TROMBONE and other Signaline Antennas at your distributor today.

The "TROMBONE" is but one of the excitingly new WARD\*Signaline Antennas; here are four more of them:



## **THE WARD PRODUCTS CORP.**

DIVISION OF THE GABRIEL COMPANY

1523 EAST 45 STREET • CLEVELAND 3, OHIO

IN CANADA: ATLAS RADIO CORP., TORONTO, CANADA

# SERVICE... *The National Scene*

COMMERCIAL UHF BOW IN OREGON ACCLAIMED-- Joyous news raced through industry circles a few weeks ago as commercial uhf telecasting became a reality in Portland, Ore., with the premiere of KPTV on channel 27; 548 mc. In an unexpected move, the Commission told the station's prexy, Herbert Mayer, that he had the green light and could begin TVcasting on his Bridgeport transmitter<sup>1</sup>, whose installation had only been completed a few days prior. . . . The opening impressed everyone, including newspapers who carried test-pattern pictures on page one, and congratulated the new station on its historic entry in TV broadcasting. . . . Currently, the output is 17.6 kw from the 1-kw transmitter and a 14-bay antenna. Effective reception has been reported in outlying cities of Vancouver, Wash., and St. Helens, Oregon City and Salem, Ore. . . . Eventually, KPTV will operate with a 5-kw rig which will have an output of 87.9 kw.

FIRST UHF/VHF MASTER-ANTENNA SYSTEM NOW IN USE IN NORTHWEST--The country's first multiple-outlet antenna system, designed for reception of both uhf and vhf-TV signals, has been installed in Portland, in the store of one of the city's leading dealers. The system features uhf corner-reflector antennas, as well as standard vhf units, mounted atop a pair of masts on the roof of the store. A novel uhf/vhf amplifier provides equalized gain to an assortment of outlets located throughout the store. . . . An exclusive report on this unusual installation will appear in an early issue of SERVICE.

EIGHTEEN MORE APPLICANTS WIN NEW TV CONSTRUCTION PERMITS--Fifty-nine have now been told that they can proceed with the building of TV stations as fast as they can. The latest to receive approval are: WKNX, Saginaw, Mich., who will operate on channel 57; WBRE, using channel 28 and WILK, using channel 34, both located in Wilkes-Barrie, Pa.; Atlantic Video, channel 58, Asbury Park, N.J.; Mississippi Publishers, channel 25, Jackson, Miss.; Winnebago TV, channel 39, Rockford, Ill.; WSLs, channel 10, and WROV, channel 27, located in Roanoke, Va.; WCOS, channel 25, and WNOK, channel 67, Columbia, S.C.; WCOV, channel 20, Montgomery, Ala.; Little Rock Telecasters, channel 17, Little Rock, Ark.; Mountain States TV, channel 20, Denver, Colo.; KMJ, channel 24, Fresno, Calif.; Polan Industries, channel 21, Youngstown, O.; WHP, channel 55, Harrisburg, Pa., and WPAG, channel 20, Ann Arbor, Mich.

MORE UHF-STATION INAUGURALS BEFORE CHRISTMAS PREDICTED--According to official estimates, included in the grants released by Washington, the next 60 days may witness several more TV-station inaugural ceremonies. New telecasters expected on the air before Christmas are WBRE (Wilkes-Barre, Pa.), WROV (Roanoke, Va.), WNOK (Columbia, S. C.) and possibly the channel 43 and 49 operators in York, Pa. As reported earlier, WHUM, Reading, Pa., is also expected to be on the air before Christmas on channel 21.

DENVER TELECASTING BOOMS SALES AND SERVICE--More than 23,000 TV receivers have been shipped into the Denver area since KFEL began transmitting in midsummer, and thousands more are being shipped and installed weekly. . . . As predicted, the signals have travelled far beyond the estimated primary zones, reaching such fringe points as Cheyenne, Wyoming, with consistency. Sets have been installed here in nearly a thousand homes, with many located in ranches, and installations are increasing daily. . . . Forecasts of improved reception from the transmitter are expected to broaden the receiving horizon very soon, and increase substantially the sales and service potentials in this area.

<sup>1</sup>Experimental transmitter used at Bridgeport, Conn., for nearly three years by RCA.

# SERVICE... *The National Scene*

INDUSTRY ASSOCIATION SERVICE COMMITTEE TO SPONSOR TRAINING COURSES--As one phase of an educational program for TV Service Men, the RTMA service committee has approved a plan featuring TV training courses, the first of which will be conducted in a trade school in New York City. . . . According to the proposal, an instructor, with a teaching knowledge and practical experience in the servicing industry, will lecture. Member manufacturers have agreed to furnish equipment and materials required for the program, and an advisory board, consisting of representatives from the service committee and sections of the parts division, will serve as counsel for the courses.

FIXED PRICES FOR SERVICING UNDER STUDY BY OPS--Radio-TV Service Men may soon find themselves faced with an industry-wide OPS ceiling-charge schedule. As reported in this journal months ago, the government agency has been probing the possibility of such a move, and has now reached the committee stage. An effort will be made to devise a fixed-rate manual, similar in principle to the flat-rate guides now employed by auto-repair shops. To assist OPS, an advisory committee has been set up. Among those who have been invited to serve are Max Liebowitz, prexy of NETSDA and ARTSNY, and Frank Moch, prexy of NATESA in Chicago.

STATE LICENSING WINS APPROVAL OF NEW YORK GROUP--The Empire State Federation of Electronic Technicians Associations passed a motion recently approving the merits of state licensing, and recommending that a bill be submitted to the legislature early next year. It is expected that the regents board in the state may play a prominent role in coordinating the proposed licensing measure.

ILLINOIS MEMBER OF NATIONAL ASSOCIATION TO ISSUE SHOP CERTIFICATION--A plan for qualifying service shops and Service Men is expected to be placed into operation soon by the TV Installation Service Association, Illinois affiliate of the National Alliance of Television and Electronic Service Associations. According to the proposition, a local committee, picked from the service association, distributors and BBB, will upon request from any service shop inspect the facilities and equipment of that shop. Before making an inspection, management will be obliged to furnish a statement detailing the approximate volume of gross service business during the previous 12 months, the number and classification of personnel, approximate dollar size of inventory of parts and tubes, and type and quantity of test equipment. It will also be necessary to submit a certificate of insurance. The committee will consider the following points before approving a shop: space, office facilities, test equipment, service data, parts stocks, insurance coverage, credit record, complaint record with distributors and BBB, and manpower. Applicants will be cleared with various local set distributors, the BBB and a commercial credit agency, and, upon passing the investigation, will receive a certificate and emblem, and be permitted to advertise as an approved service agency.

EXPERTS FORECAST 20-MILLION TV SETS IN USE NEXT YEAR--Members of the sales managers committee of RTMA informally polled themselves, during a recent meeting, on the quantity of sets that might be produced next year, and reported a guess-estimate consensus of 5,775,000 chassis. . . . At Atlantic City, during the NEDA meeting, these figures were confirmed by many. According to the renewal sales manager of a leading tube manufacturer, who appeared as a featured speaker, approximately 20,250,000 sets will be in use before the end of next year.

ASSOCIATION DIRECTOR APPLAUDS SERVICE--In a recent note to ye editorial desk, Tom Middleton, of RTTG in Miami, wrote that . . . "Our shop relies on SERVICE each month to keep us informed on the latest in servicing." Our deepest thanks, Tom, for this good news.--L. W.

# Everybody's talking about the new Pyramid Imp!



All over the country service-engineers are praising the newest and finest molded tubular paper capacitor—the Pyramid IMP!

*here's why—*



**IMPS ARE REALLY RUGGED!**  
The tough thermo-setting plastic will take an astounding amount of abuse—yet IMPS will still look and perform like new!



**IMPS WON'T FREEZE OR MELT!** They'll operate faithfully in temperatures ranging from  $-40^{\circ}\text{C}$ . to  $+100^{\circ}\text{C}$ . ( $212^{\circ}\text{F}$ .)—and that's the boiling point of water!



**IMP LEADS CAN BEND AND BEND!** Tinned leads that are really securely anchored—you'll be amazed at how much punishment they'll take without breaking!

**IMPS ARE MOISTURE-PROOF!** No moisture can get through the varnished plastic case, or even through the lead anchor-points.



IMPS are available in all popular ratings in 200, 400 and 600 volt ranges. See your local distributor.

If you haven't tried the new IMP, send for your free sample today—use this handy coupon



**PYRAMID ELECTRIC COMPANY**  
1445 Hudson Boulevard  
North Bergen, New Jersey

Name.....

Company.....

Address.....

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

# 'Scope Voltage

[See Front Cover]

by **RONALD L. IVES**

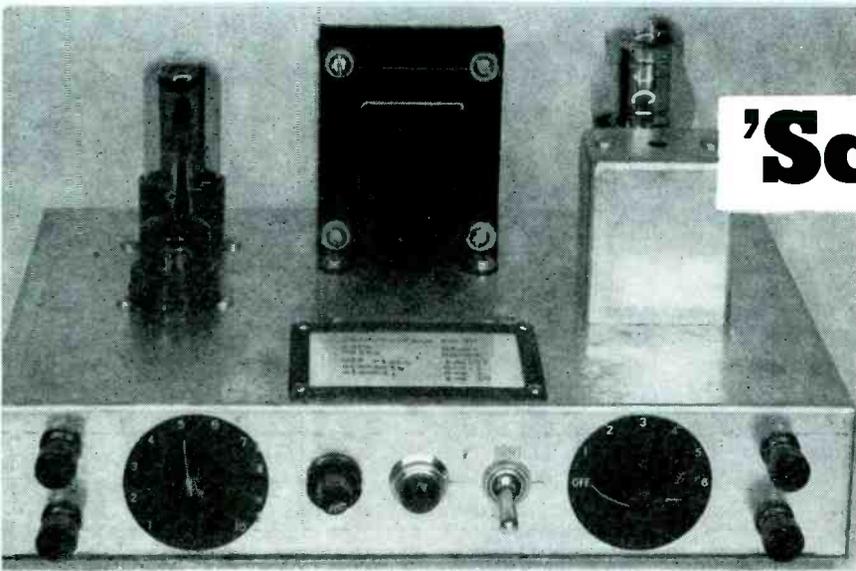


Fig. 1. Top view of voltage calibrator.

ALTHOUGH MOST SERVICE MEN own a 'scope, and make frequent use of it, it has been found that many lack equipment for making voltage calibrations. Without some sort of voltage calibrator, it is quite difficult to determine just how much output is available from a device under consideration. Use of a calibrated input attenuator is sometimes helpful for obtaining comparative voltages, but is of little assistance when instructions call for adjustment to a specific peak-to-peak voltage.

Commercial voltage calibrators consist of a voltage source, such as the power line, and a device for clipping the sine waves deeply, to produce semi-square waves.

## Operating Principles

Because only peak-to-peak voltages can be measured with any facility by use of a 'scope, most voltage calibra-

tors are calibrated in peak-to-peak volts. These are convertible into *rms* volts only if the waveform is known, and this conversion is simple in only a few cases. With sine waves, for example, peak-to-peak volts can be converted to *rms* volts by dividing by 2.828; and square waves by dividing the peak-to-peak value by 4.

'Scope voltage calibration, as commonly performed, is a method of substitution. A knowable voltage, having the same peak-to-peak value as the unknown, is produced on the screen, and later evaluated, usually by reading a dial on the calibrator.

## Circuits

Although more than 20 voltage calibrator circuits can be found in current literature, all are quite similar.

On the cover is the circuit of a popular type of calibrator<sup>1</sup> which has been

modified to include a voltage regulator. It differs from the circuit used in some lab instruments in that the balance is adjustable. Some of the more costly calibrators include a multivibrator to secure one or more frequencies unrelated to line frequency. This is a great convenience in some lab work, but is a needless embellishment in ordinary service work.

## Calibrator Operation

Operation of the voltage calibrator is quite simple. The regulated power supply produces 150 volts *dc*, the center tap of which is grounded, so that the plus terminal is +75 volts with respect to ground, and the minus terminal -75 volts with respect to ground.

The plus of the power supply is connected to cathode 4 of a diode (6H6), and the minus terminal to plate 5 of the same tube. If an *ac* signal, supplied from the power transformer through a capacitor and dropping resistor, is now applied to plate 3 and cathode 8 of this same diode, all positive half cycles will be clipped at +75 volts by diode conduction (across plate 3 and cathode 4), and all negative half cycles at -75 volts by conduction across plate 5 and cathode 8. Output of the clipper diode, then, will be a clean square wave, having a peak-to-peak amplitude of 150 volts.

## Output Feed

This output is now fed to two resistors, one screwdriver adjusting, and the other knob-controlled from the front panel. The first resistor determines the calibration, and is adjusted so that the peak-to-peak voltage between its low end and ground is exactly 100.

The second resistor, a high grade potentiometer, determines the voltage output in part, and is calibrated 0-10. The arm of this potentiometer feeds a decade voltage divider, which has out-

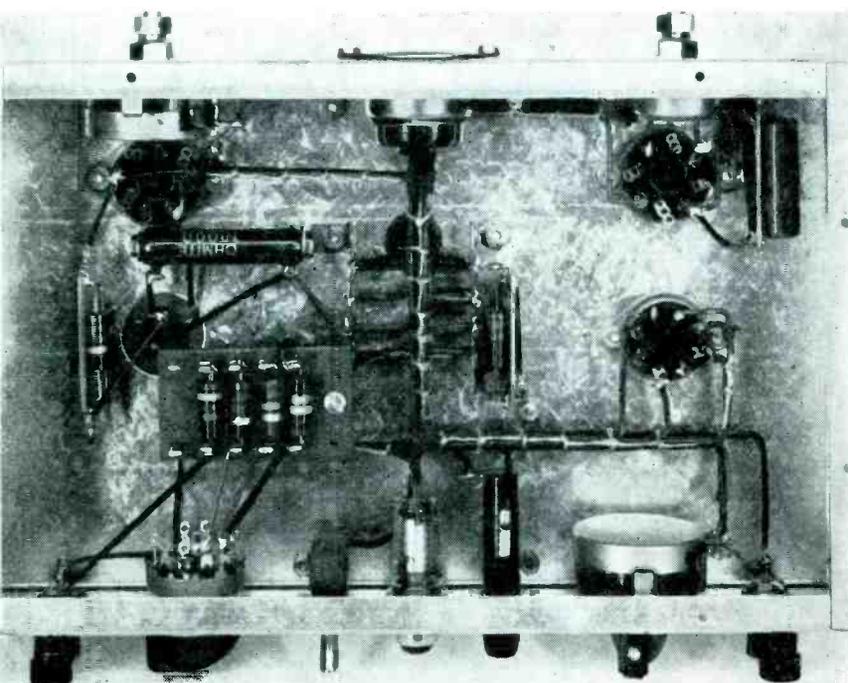


Fig. 2.

Under chassis view of calibrator unit.

<sup>1</sup>Heathkit VC-1.

# Calibration Circuitry

## Design and Application of System Which Features a Voltage Regulator and Adjustable Balance

puts of 1, 0.1, 0.01, and 0.001 times terminal voltage.

### Construction

Using standard full-sized components, a chassis about 7" by 11" by 2" is about 30% larger than necessary; and the same type of components can be installed easily in a standard 5" by 6" by 9" utility case.

Because the filter capacitor shell is hot to ground, a can is mounted over the filter to prevent shocks (Fig. 1, right). Beneath the chassis there is also ample space, so that all components can be reached with standard tools, as can be seen in Fig. 2.

To insure long trouble-free service oversized components were used in the model shown in most locations, and all items were mounted firmly by use of terminal strips. All wiring was cabled, and the ends of the lacing cord safed with coil dope. This type of construction does take a bit more time and care than the familiar *rat's nest* approach, but maintenance time is greatly reduced.

### Calibration

To calibrate an instrument of this type, a sine-wave source, a good *ac* voltmeter, and 'scope are needed. The sine wave source must be connected across the input terminals of the calibrator, and the 'scope to the output. The voltmeter is connected across the sine wave source, all equipment is turned on and allowed to stabilize.

Assuming that all resistors are of the correct value, and correctly connected, one adjustment will be found sufficient to calibrate the instrument. Maximum desired voltage output is 100 volts peak-to-peak. As peak-to-peak volts are 2.828 times the *rms* value indicated by a standard *ac* voltmeter, the sine wave input value for 100 volts peak-to-peak will be 100 divided by 2.828, or 35.36 volts. The sine wave source should be adjusted to

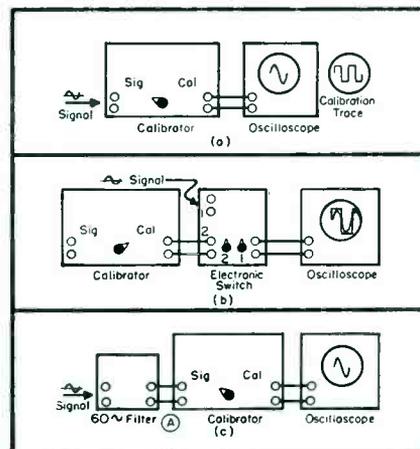
this value,<sup>2</sup> and the calibrator switch set to *signal-in* position. The 'scope input is then adjusted so that the sine wave input is at a convenient reproducible height, such as two inches, peak-to-peak.

Now the potentiometer of the calibrator is set at 10, and the switch at the upper position (*X 10*). A square wave, perhaps with some slope, will now appear on the 'scope. The balance resistor should be adjusted until upper and lower parts of the wave form are exactly equal, and locked in this position. Then the calibration resistor should be adjusted until the peak-to-peak value is exactly the same as when the sine wave input was used. This adjustment should be checked by switching back to signal input, and then locked in position. The calibrator is now adjusted for regular operation, and will retain its adjustment for the useful life of the voltage-regulator; usually in excess of 1,000 hours of operation.

### Input Value Checks

Before disassembling the calibration setup, it is advisable to check the adjustment for a number of input values, so that no wiring blunder escapes detection. Voltages corresponding to the various dial indications should be noted carefully, and typed on a label,

Fig. 3. Connections available for 'scope voltage calibrator: a, common series connection; b, electronic switch application; c, position of hum-reducing filter indicated by point A.



and firmly attached to the instrument, unless special dials, calibrated in peak-to-peak volts, are used; see Fig. 2.

### Use

A 'scope calibrator of this type is essentially a source of clipped sine waves (sometimes called semi-square waves) of knowable peak-to-peak amplitude. Its primary use is in 'scope voltage calibration, but it is sometimes useful for checking the approximate characteristics of amplifiers.

As most commonly used, the 'scope calibrator is connected between the signal and the 'scope, and voltages are determined by direct comparison of signal amplitude to calibrator amplitude. This arrangement is shown in Fig. 3a.

A more elegant connection, requiring more equipment, but making faster voltage determinations possible, uses an electronic switch between the calibrator and 'scope. One switch input is the signal, the other the calibrator output. It is important to be sure that both inputs have exactly the same attenuation, or determined voltage values may be meaningless. In this arrangement, the signal and calibration waves appear together on the screen, and the peak-to-peak signal voltage can be read from the calibrator when both waves have the same height.

When a hum-reducing filter<sup>3</sup> is used to clarify the signals, the filter must be placed ahead of the calibrator, and not between the calibrator and the 'scope; Fig. 3c. If placed between the calibrator and the 'scope, the calibration signal (clipped 60 cycle waves) will be very greatly attenuated, whereas the signal, unless also at 60 cycles, will pass through the filter at full strength, or nearly so.

### Limitations

Were the amplifiers in standard 'scopes absolutely flat from *dc* to 100 mc, voltages measured by use of a calibrator with a 60-cycle source would

(Continued on page 29)

<sup>3</sup>Such as K-Lab twin T.

<sup>2</sup>A variac is convenient if the supply line is used as a source.

# TV Horizontal-Oscillator

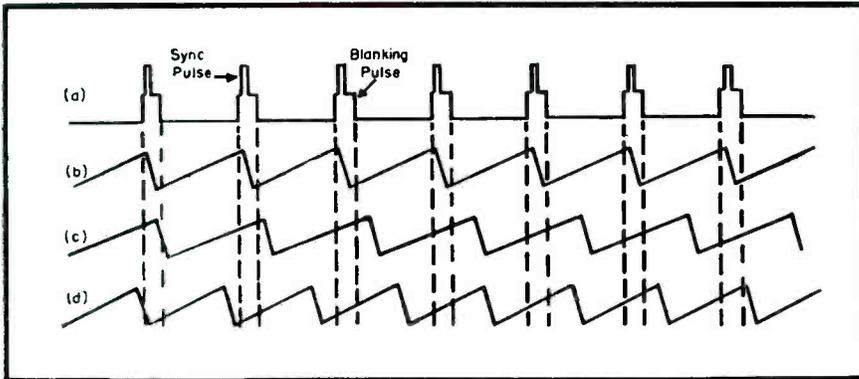


Fig. 1. Relationship of sync pulse to deflection waveform.

IN THE TV CHASSIS, there are many unusual circuit elements, such as horizontal oscillator *afc*. Of particular interest in this system is the horizontal locking-range control employed in a synchroguide circuit, whose performance and operation merit detailed attention.

To illustrate, let us consider the relationship between the horizontal sync pulses shown in *a* of Fig. 1 and the horizontal yoke sawtooth deflection current waveforms shown in *b*, *c* and *d*. In *a* the sawtooth is synchronized in phase and frequency with the sync pulses so that picture blanking occurs during each retrace period. This relationship between the sync and deflection signals results in a properly synchronized picture with the horizontal retrace lines blanked out.

In *c* the sawtooth wave has a lower frequency than that of the sync pulses. In this case, since the two frequencies are different, the sync pulse does not occur during the retrace period, but rather appears at a slightly different point on the sawtooth for each successive cycle. In other words, the sync pulse crawls down the sawtooth. The result of this frequency difference, as

seen on the TV picture, is shown in Fig. 2. The horizontal lines represent the horizontal raster-scanning lines and the break in each line represents the blanking period. The blanking period appears slightly earlier on each successive line as the sync pulse crawls down the sawtooth, thus causing the blanking bar to appear diagonally across the picture. It will be noted that a diagonal bar slanted to the right represents a horizontal-oscillator frequency lower than the required 15,750 cps.

Observation of the sawtooth of *d* in Fig. 1, with relation to the sync pulse, shows that for a frequency higher than that of the synchronizing frequency the sync pulses crawl up the sawtooth. The result of this frequency relationship is presented in Fig. 3, which shows two diagonal blanking bars representing a frequency of 15,810 cps. In this case the blanking period occurs slightly later in each successive scanning line, thus causing the blanking bars to slant toward the left.

The number of diagonal bars appearing on the picture is a direct indication of how far the horizontal-oscillator frequency is from the re-

quired 15,750-cps synchronizing frequency. Since one complete picture is formed every 1/30 second (frame frequency of 30 cps) each diagonal blanking bar present in the picture represents a 30-cps difference from the synchronizing frequency. In more detail, if in the 525 horizontal lines required for one complete picture frame (1/30 second), the sync pulse has crawled down just one sawtooth, a single diagonal blanking bar will be present. The frequency of the horizontal-oscillator is then  $524/525 \times 15,750 = 15,720$  cps, since in the time that 525 sync pulses were generated at 15,750 pulses per second only 524 cycles of the sawtooth deflection signal were generated. A single blanking bar slanted to the left would indicate that the sync pulse had crawled up just one sawtooth and that the horizontal-oscillator frequency was higher than the synchronizing frequency. The horizontal-oscillator frequencies represented by different numbers of blanking bars are listed in Table I, and in Fig. 4 appears an actual television picture which is out of horizontal sync. This picture shows  $3\frac{1}{2}$  diagonal blanking bars slanted to

Figs. 2 and 3. Fig. 2 illustrates result when the picture is out of sync because the horizontal oscillator frequency is too low. The condition in Fig. 3, also causing an out-of-sync picture, is due to the horizontal oscillator frequency being too high.

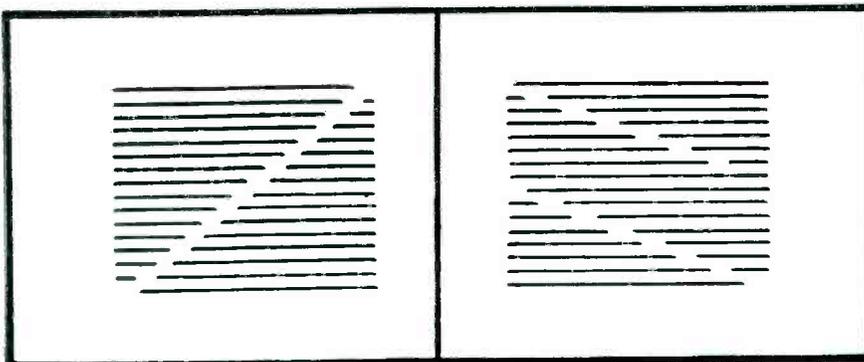


Table I

Blanking Bars	Horizontal-Oscillator Frequency	
	Bars Slanted to Right	Bars Slanted to Left
1	15,720	15,780
2	15,690	15,810
3	15,660	15,840
4	15,630	15,870
5	15,600	15,900
6	15,570	15,930
7	15,540	15,960
8	15,510	15,990
9	15,480	16,020
10	15,450	16,050

# Locking Range Operation

## A Detailed Report on the Control's Performance in the Synchroguide Circuit

by J. C. GEIST

the left and represents a horizontal-oscillator frequency of 15,855 cps.

### Horizontal AFC Performance

Now let us consider the significance of the foregoing discussion as applied to the horizontal locking range of a TV receiver. A commonly used method of describing proper horizontal *afc* performance, particularly for the synchroguide circuit, is based on the number of diagonal blanking bars present just before the picture locks in. In a particular case, as the horizontal hold control is advanced slowly from its counter-clockwise extreme, at least  $3\frac{1}{2}$  bars should be present just before the picture jumps into synchronization. In other words, the *afc* circuits in this receiver, when operating properly, should lock the horizontal-oscillator into synchronization with the received sync pulse when the oscillator is anywhere in the range of 15,645 to 15,750 cps.

It is normal for the hold-in range of an automatic control device of this type to be greater than the lock-in range. This inherent feature explains why it is normal for a picture, once synchronized, to remain in sync over

nearly the entire range of the hold control, even though a picture out of synchronization can be pulled into synchronization only over about the middle two-thirds to three-quarters of the control range. It is also normal for the picture to pull into synchronization only from the low-frequency side of the sync pulse frequency. A blocking oscillator is synchronized with positive pulses superimposed on the grid free-running signal. The free-running frequency must be slightly lower than the synchronizing frequency to allow synchronization. Therefore, the oscillator will lock-in only from the low frequency side of the synchronized frequency. This situation can be demonstrated by observing the number of bars present just before lock-in, as the horizontal hold control of a properly-operating television receiver is rotated first clockwise and then counter-clockwise. Normally, the picture will lock-in from two to three rightward slant-

ing (low frequency) bars, but will not lock-in from leftward slanting bars until the synchronized frequency is reached, as evidenced by a single, nearly vertical bar which may move across the picture as synchronization is accomplished.

### Locking Capacitor Function

The familiar synchroguide horizontal *afc* circuit is shown in Fig. 5.  $C_1$  is the locking or lock-in range adjustment. The function of this capacitor is particularly important. In Fig. 6 (p. 28) appears the proper waveform at the grid of the control tube, pin 4 of the 6SN7. The sync pulse is perched on top of the sawtooth, and in normal operation a varying portion of this pulse slides down the steep side of the sawtooth, as the hold-control is rotated through the lock-in range. As a result, the width of the portion of the

(Continued on page 28)

Fig. 4. Typical reproduction when picture is out of horizontal sync. (Courtesy Stromberg-Carlson)

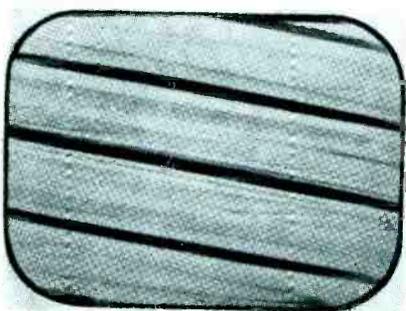
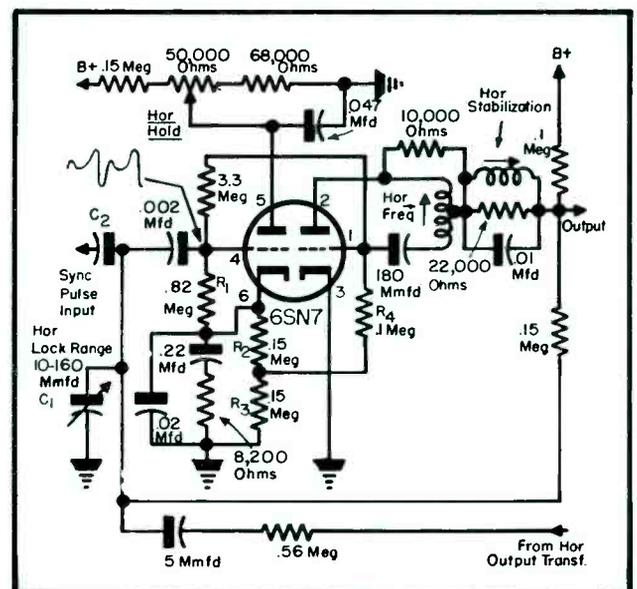
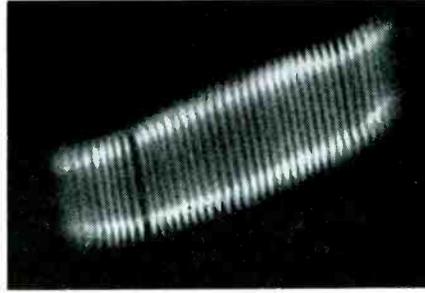
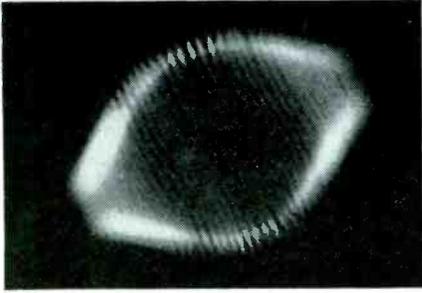


Fig. 5. Synchroguide horizontal oscillator *afc* circuit.

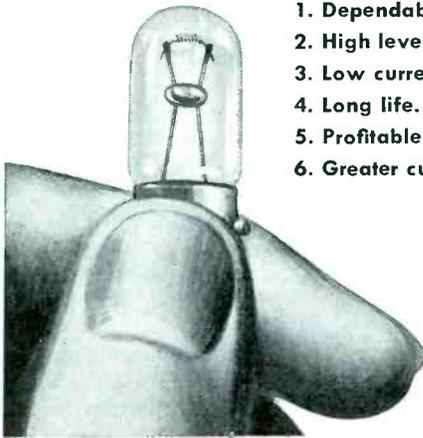




## Why General Electric dial lamps stand the high notes

THE high "C's" of a soprano often cause vibrations in the filaments and lead-in wires of radio dial lamps. In old-style lamps, these vital parts sometimes vibrate in different frequencies, setting up a whipping action (photo above, left) that eventually tears the filament apart.

But in G-E dial lamps, General Electric engineers have changed the filament supports so that the frequencies of the filament and lead-in wires match, thus greatly reducing the effect of the vibration (photo above, right). As a result, General Electric dial lamps give longer, more dependable service.



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

**Always replace  
with G-E dial lamps**

**GENERAL  ELECTRIC**

### HO Locking-Range

(Continued from page 27)

pulse on top of the sawtooth varies, and it is this varying pulse width which actuates the control tube, so as to synchronize the oscillator frequency.

#### Negative-Bias Operation

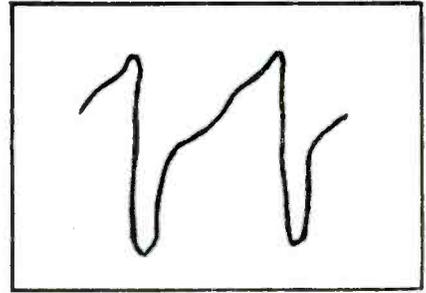
The control tube is operated with sufficient negative bias, so that plate current flows only during the peaks of the control-tube input represented by the sync pulse. The amplitude of the

control-tube plate current, therefore, depends on the width of the portion of the sync pulse perched on top of the sawtooth. (It has been found that in this circuit the amplitude of the sync pulse must remain constant since the control tube responds to a change in pulse area, regardless of whether that area is changed by a change in pulse amplitude or pulse width.)

#### Signal Amplitude Control

The function of  $C_1$  is to set the amplitude of the signal on the control tube grid at the proper level for opti-

Fig. 6. Input signal at synchroguide control-tube grid.



imum performance of the *afc*.  $C_1$  and  $C_2$ , in series, act as a voltage divider. Varying  $C_1$  varies the impedance of the bottom leg of the divider, so that decreasing the capacity of this capacitor increases the level of the signal applied to the control tube. The level of the input must be adjusted in relation to its bias voltage. The level of this voltage should be adjusted so that the proper amount of the sync pulse is above plate-current cut-off level to provide the proper lock-in range. If the amplitude of the control-tube input is too low, too small a portion of the sync pulse will be effective in controlling the plate-current and the lock-in range will be reduced. If the input amplitude is too high, too much of the pulse will be above the cut-off level and the lock-in range will be too great. Excessive lock-in range will result in poor noise immunity of horizontal sync, and insufficient pull-in range will result in reduced ability to follow transmitted phase variation in the sync pulse signal.

#### Adjustment Procedures

Normal adjustments of  $C_1$  can be made simply by observing the effect of the adjustment on picture synchronization, without worrying about the details of cut-off bias, grid-input level, plate-current variation, etc. Therefore, adjustment procedures in many TV service notes are based on the relationship of the blanking bars just before lock-in. Normally the synchroguide circuit should provide lock-in from two to three bars (15,680-15,690 cps). It is, of course, desirable to follow the procedures provided for the model of the receiver being adjusted.

#### TRANSVISION APPOINTED PREVIEW TV SETMAKER

A TV set, which provides a preview of a program without charge, turns itself off and lights a sign which instructs the user to deposit a coin if they wish to see the remainder of the program, will be manufactured by Transvision, Inc., New Rochelle, N. Y., for the Preview Corp.

A custom-built chassis has been developed for this application.

## Voltage Calibrator

(Continued from page 25)

all be correct. If the calibrating frequency is the same as the signal frequency, the calibration will be correct regardless of the amplifier characteristic.

With a 60-cycle calibrator input, and any ordinary 'scope, the calibration will be correct for 60 cycles, and will be consistent, but not necessarily correct, at other frequencies. To correct for this, the relative amplification at various frequencies can be determined (manufacturer's data will be found the easiest method), and a correction table prepared. If, for example, the amplification at 500 kc is 0.7 of that at 60 cycles, then the voltage indicated by the calibrator must be divided by 0.7 (multiplied by its reciprocal, 1.428) to determine the true voltage of the signal, at 500 kc.

### TV-Phono Promotion Programs



Ira Kamen (right), vice president, sales, of the Brach division of General Bronze Corp., who was stricken with polio recently, signing a two and four-set coupler distribution agreement with Ray Petersen, manager of the accessory division of Admiral, while hospitalized at St. Luke's Hospital in Chicago. Arrangement provides for the distribution of couplers through Admiral distributors, who will receive a comprehensive training on the application and installation of couplers from Brach's reps. Products will also be distributed through regular Brach jobbers.

Phono-cartridge promotion material issued by Electro-Voice. Based on theme, \$4.00 Opens up a New Business for You, promotion is said to provide the Service Man with sales ammunition to build a money-making professional phono service business. Included are a sales aid kit, manufacturer's set model replacement guide, direct mail campaign including post cards and stuffers, sales handbook on cartridge sales and service, professional phono service sign, window and wall streamers, service tags, etc.



## THE SIMPSON MODEL 260 VOLT-OHM-MILLIAMMETER

*outsells all others combined*

*because . . .*

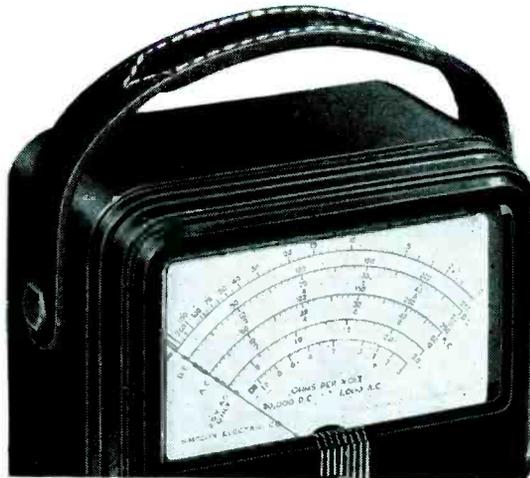
- A covers all ranges necessary for Radio and TV set testing
- B includes the Simpson 50 Microampere Meter Movement known the world over for its ruggedness
- C no bulky harness wiring, thus eliminating all intercircuit leakage at this high sensitivity
- D molded recesses for resistors, batteries, etc.
- E easy battery replacement
- all components—including case and panels—are specially designed and completely tooled for maximum utility . . . not merely assembled from stock parts

**ranges** 20,000 Ohms per Volt DC,  
1,000 Ohms per Volt AC  
Volts, AC and DC: 2.5, 10, 50,  
250, 1000, 5000  
Output: 2.5, 10, 50, 250, 1000  
Milliamperes, DC: 10, 100, 500  
Microamperes, DC: 100  
Amperes, DC: 10  
Decibels (5 ranges):  
-12 to +55 DB  
Ohms: 0-2000 (12 ohms  
center), 0-200,000 (1200 ohms  
center), 0-20 megohms  
(120,000 ohms center)

SIMPSON ELECTRIC COMPANY

5200 W. Kinzie St., Chicago 44 Phone COLUMBUS 1-1221

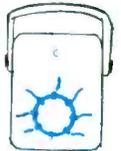
In Canada: Bach-Simpson, Ltd., London, Ont.



### PC Chassis Development

(Right)

Studying pilot model of Hallicrafters' recently developed pc receiver, left to right; Ray B. Cox, president of Horn and Cox, west coast distributor; William J. Halligan Jr., radio sales manager and William J. Halligan, Hallicrafters' president. In this model, the basic circuit is photographed on a copper plate and unwanted copper is then eaten away by an acid bath. Tubes and other components are then inserted and the chassis dipped for 2 or 3 seconds in a solder pot and the chassis is complete. (See page 44 for pc design review.)



### prices

Model 260 \$38.95;  
With Roll Top \$46.90.  
Complete with test  
leads and operator's  
manual. 25,000 volt  
DC Probe for use with  
Model 260, \$9.95.

BURTON BROWNE ADVERTISING

Fig. 1. Frequency response ranges of commercial reproducing apparatus. (Based on chart appearing in *Elements of Acoustical Engineering* by Harry F. Olson.)

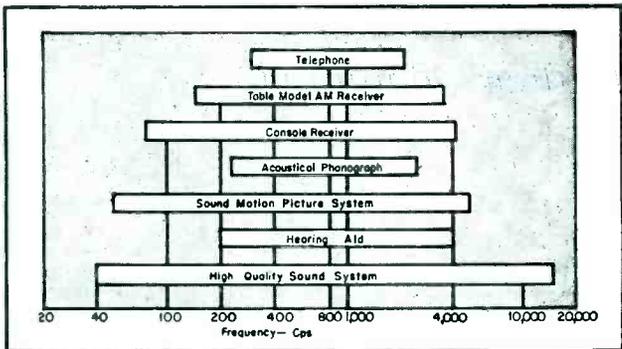
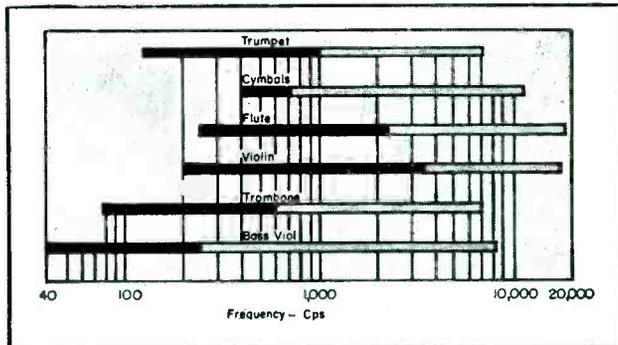


Fig. 2. Frequency range of various musical instruments; fundamentals represented by black bars and overtones by dotted areas.



# The Meaning of

IN THE EARLY 1900's the manufacturers of Edison cylinder players and Edison *Amberol* cylinders,<sup>1</sup> noted in a description of the performance of their equipment that:

"... (the record) reproduces the melody or voice so clearly and perfectly that the illusion almost defies detection."

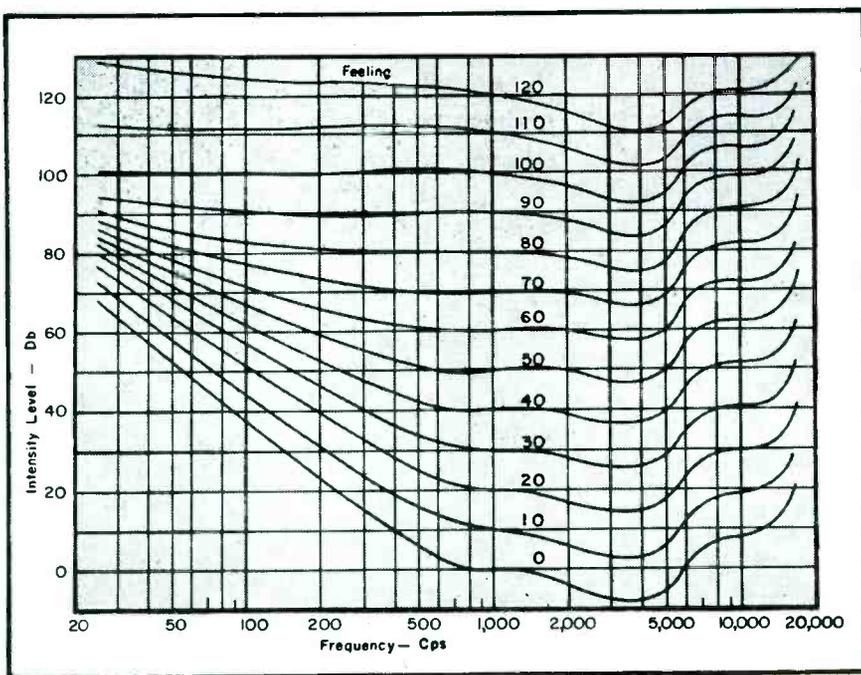
It is obvious that this manufacturer's standards of auditory illusion were quite different from ours, and that either the copywriter was given free reign to his imagination, or people were so amazed by the idea of a machine that could talk and sing that

they allowed themselves to be fooled a lot more easily. But the basic concept of *high fidelity* that was implied then is identical to that used today. High fidelity simply means that the music is reproduced in such a way that it sounds natural, as though it were being performed on the spot; not brilliant, mellow, crisp, or boomy, but simply natural.

It is not always an easy matter to judge whether the music does sound natural. We have been conditioned by juke boxes, personal radios, and consoles, and often musical reproduction is compared with the type of repro-

duced music that we are used to, rather than with the performance of the actual musical instruments, whose *live* sound we may not have heard for months. The current popular tendency is to favor an exaggerated upper bass and an attenuated upper treble, because generally that's the type of sound that the deficiencies of commercial electronic equipment create. Nevertheless, true high-fidelity reproduction is the easiest to listen to; one doesn't have to fill in psychologically the missing parts of the music, to blank out the noise and intermodulatory tones that don't belong, and to wince when a strong crescendo (and its attendant rattling and distortion) is anticipated.

Fig. 3. Fletcher-Munson equal loudness contours. Each curve shows the sound intensity required to produce a given sensation of loudness over the frequency band. At lower overall intensity levels (shown by the numbers next to the curves) a much higher bass intensity is required for the same loudness. (From *Bell System Technical Journal*.)



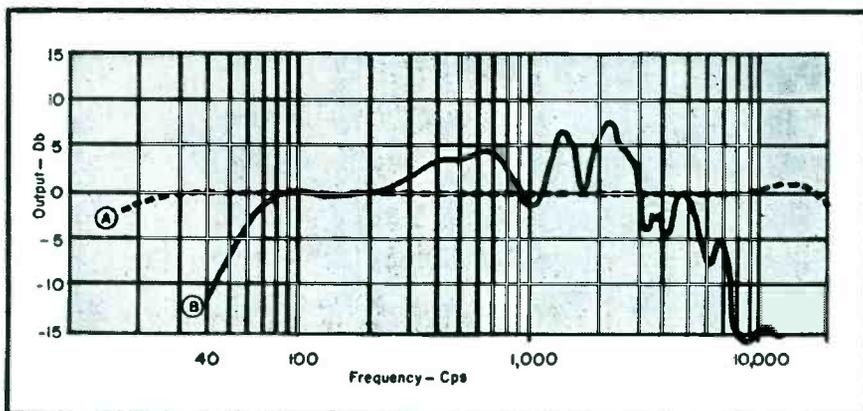
## Frequency Response

The frequency response of audio equipment refers to its relative handling of signals at different frequencies. Good *flat* response means that amplification does not vary significantly over the audio spectrum, and that the very high-frequency overtones are reproduced with the same efficiency as extremely low notes. Unfortunately this single factor is often mistakenly considered to be synonymous with over-all fidelity. Actually, there are other factors of at least equal importance, and audio equipment which is excellent in frequency response, but has poor performance ratings relative to other characteristics, such as distortion, will sound very unpleasant.

There are two aspects of frequency response: The extent of the limits at the extreme high and low ends of the reproduced frequency range, and the amount of variation within this range. The latter, which may be expressed in the number of decibels within which the variation is confined, is of prime

by MARK VINO

Fig. 4. Response curves (B) of typical medium-priced hi-fi speaker (manufacturer's rated frequency response) and typical amplifier of the same quality level (A).



# HIGH FIDELITY

## A Lucid Analysis of the Characteristics of Quality Systems and the Basic Elements That Must be Carefully Considered to Insure Best Results

importance. A rating in frequency extremes is meaningless without an indication of the amount of variation tolerated. Almost all audio equipment will show *some* response at extreme frequencies.

There has been a certain amount of controversy about the range of frequencies that must be reproduced for high-fidelity reproduction. Some writers, for example, have stated that audio equipment should be capable of reproducing subsonic and supersonic frequencies as well as the entire audible range; the audible range of sound frequencies is about 20 to 20,000 cycles for an average young person. According to the eminent audio authority, Harry F. Olson, in his text *Elements of Acoustical Engineering*, the faithful reproduction of speech requires a frequency range of 100 to 8,000 cycles, and the reproduction of orchestral music with perfect apparent fidelity re-

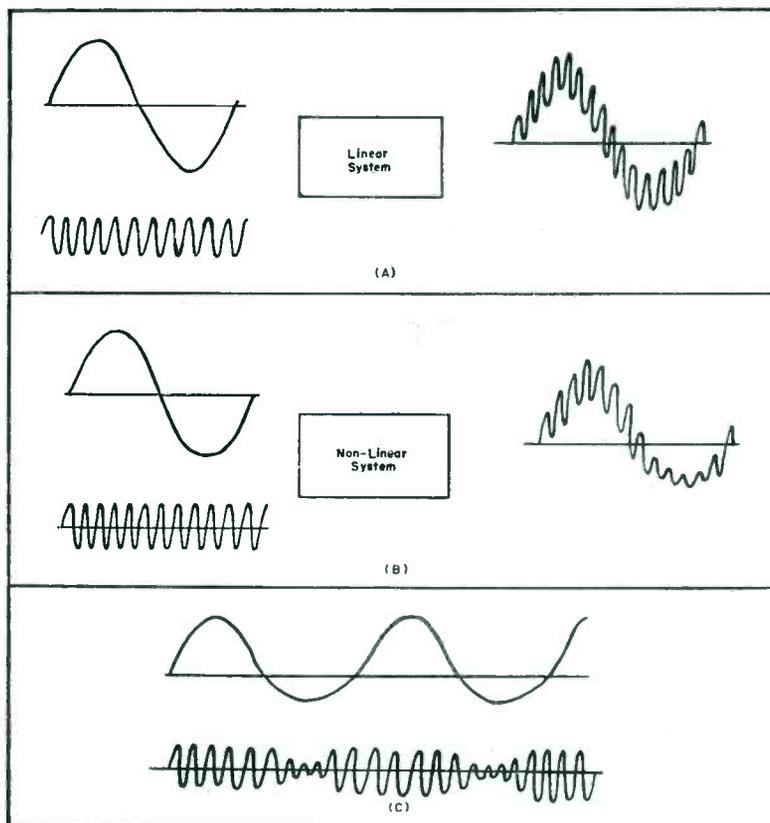
quires a range of 40 to 14,000 cycles.

A study of detectable differences in the frequency range of reproduced music, made by Gannett and Kerney,<sup>1</sup> indicates that the upper range of frequency response for orchestral music would have to be restricted to about 10,000 cycles before the reduction

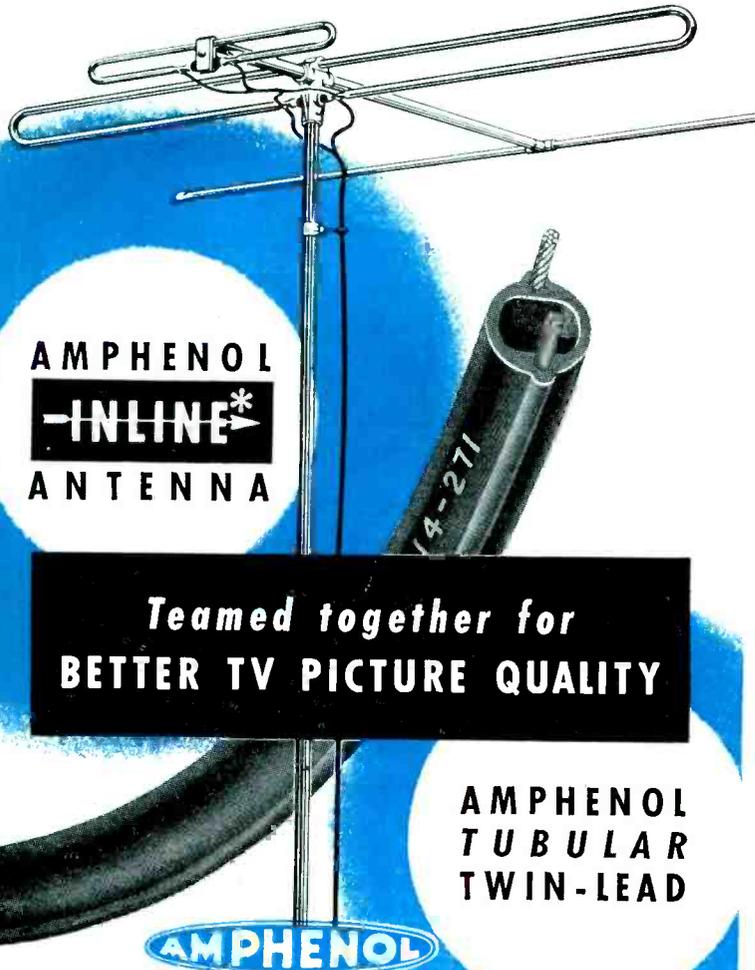
would be noticeable. On the basis of these figures the common sense *minimum* standard for the frequency limits of high-fidelity equipment may be considered to be about 65 to 10,000 cycles. Although much higher standards are sometimes suggested, and are desir-

(Continued on page 32)

Fig. 5. Curves illustrating formation of sum and difference intermodulation tones. In A we have results of the transmission of two frequencies through a linear system. In B appear plots resulting from transmission of a pair of frequencies through a non-linear system. Components of the output of the non-linear system appear in C: Upper curve represents the distorted low-frequency component, while the lower curve shows an amplitude modulated *hf* component containing sideband sum and difference frequencies.



<sup>1</sup>National Phonograph Co.  
<sup>2</sup>D. K. Gannett and I. Kerney, *The Discernability of Changes in Program Band Width*. Bell System Technical Journal; Jan., 1944.



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# High Fidelity

(Continued from page 31)

able in professional equipment, the performance of most commercial radios and phonographs falls far below this minimum, as indicated in Fig. 1. A restricted frequency range robs the sound of the rich timbres created by the low-frequency fundamentals and by the high frequency harmonics.

The variation of response that may be reasonably tolerated within this range depends upon the type of equipment being considered. Electronic units, like amplifiers or tuners, should and can be kept to a maximum variation of  $\pm 2$  db. Electroacoustic units such as loudspeakers and pickups exhibit a much greater variation because of various factors, which include mechanical resonances and the imperfect rigidity of parts which must transmit vibratory motion. Although the better pickups maintain a response within  $\pm 2$  db of variation, the level of response of some of the most expensive loudspeakers have been found to vary at least  $\pm 5$  db, and some quality loudspeakers have been found erratic in frequency performance to the extent of  $\pm 10$  db.

The frequency response of loudspeakers can change considerably when measured from different points of reception, because there is a frequency for the high frequency signals to be beamed directly ahead instead of spreading uniformly in all directions. A good speaker should maintain a wide radiation pattern which is as uniform with respect to frequency as possible.

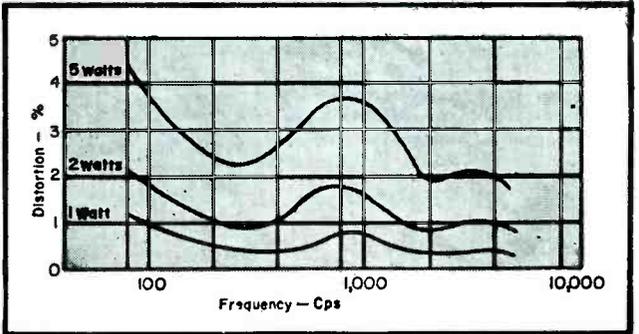
A set of curves revealing a phenomenon of hearing, known as the Fletcher-Munson effect, appears in Fig. 3. This phenomenon influences the shape of the ideal frequency response curve that we attempt to achieve. It was discovered that hearing sensitivity varies over the frequency spectrum, and that the curve of this sensitivity changes form at different overall intensity levels. The practical implications of these facts are that sound reproducing equipment requires some facility for boosting the bass frequencies at low volume. This facility may be in the form of a bass tone control, or it may operate automatically through a tone-compensated volume control.

The frequency response of audio equipment at high power levels may be far inferior to what it is when the unit is relatively unloaded. A reliable rating should therefore indicate the power level at which it was measured.

### Transient Response

The correct reproduction of momentary effects (effects such as those created when a cymbal is first deformed by the drum stick), requires a frequency response much greater than that demanded by the steady-state tone

Fig. 6. Plot of harmonic distortion versus frequency of hi-f speaker. (RCA 515S1; from RCA Review.)



itself. It is also important that the equipment is not stimulated to oscillate or *sing* at very high frequencies by transient phenomena, or does not continue to produce a low frequency note after the signal has stopped; a defect called *hangover*. Square waves are often used to test transient response. Good transient reproduction gives reproduced music a clean quality in the low notes and a clear, sharp quality in the highs that is very helpful in establishing a realistic illusion.

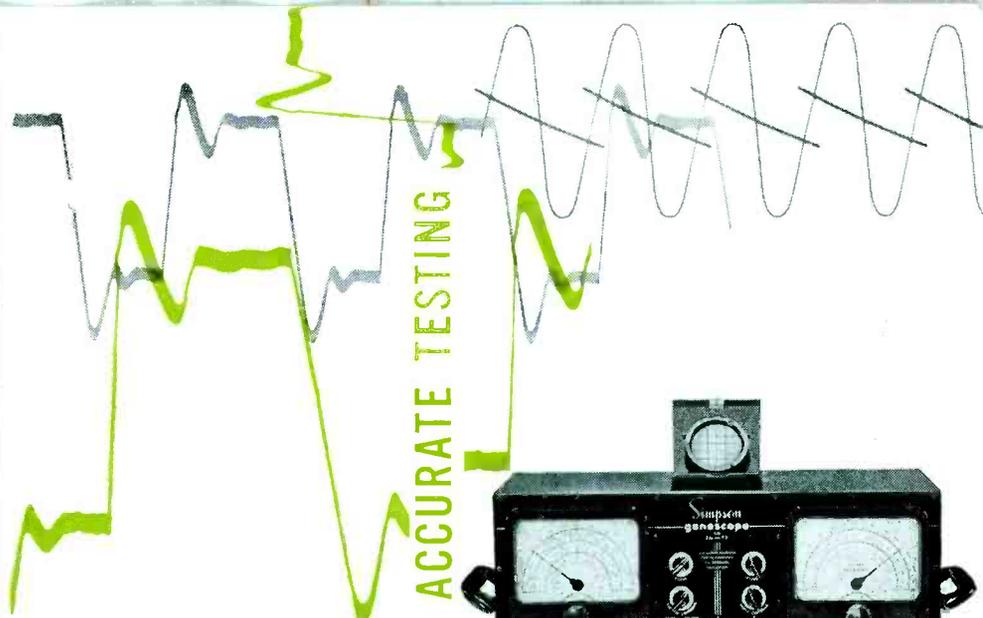
#### Harmonic Distortion

The waveform distortion associated with imperfect reproduction may be analyzed into harmonic components which have been added to the original sound. The percentage of distortion refers to the relationship between the amplitude of the spurious harmonics and the total signal amplitude. A few years ago 5% harmonic distortion at rated output was considered satisfactorily low for amplifiers, but today advances in electronic circuitry have made it possible to consider 2% as a reasonable maximum figure. Very good loudspeakers still exhibit distortions of the order of 5% at certain portions of the frequency range, and often loudspeakers have a much higher percentage of distortion. Loudspeaker distortion information is not often published, however, and the Service Man must usually rely on his ears alone.

Harmonic distortion increases with power output, and is usually especially prominent at frequencies of mechanical or acoustical resonance of the speaker system, unless special counteracting precautions are taken. Harmonic distortion is also made more apparent by wide-frequency response, so that it is especially important that extended range equipment have low distortion.

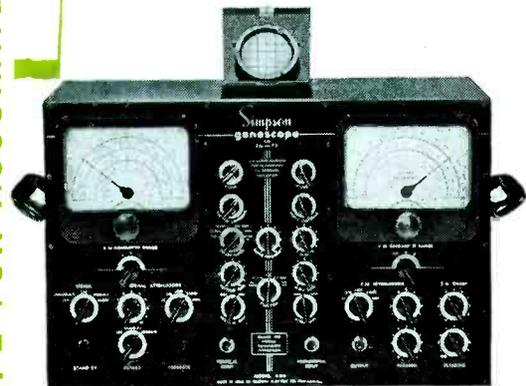
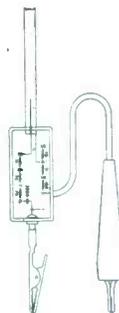
#### Intermodulation Distortion

When two or more signals of different frequency are passed through a distorting system, sum and difference frequencies are created, as illustrated in Fig. 5. This effect may be clearly visualized in the case of a single cone loudspeaker which distorts due to non-linear suspensions when the cone excursion is large. When the cone has undergone a large displacement by a low-frequency input, and is being restrained more than normally by its suspension, the bass signal will have its peak clipped. If a high-frequency signal is present at the same time, it will not be reproduced normally during the bass peaks. During the entire length of time that the cone is in its extremely displaced position the high-frequency signal will be reproduced with insufficient cone excursion. The



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treble signal is thus affected by low-frequency distortion and will be amplitude modulated, creating the familiar sum and difference sideband frequencies which accompany such modulation. These are also referred to as intermodulatory products.

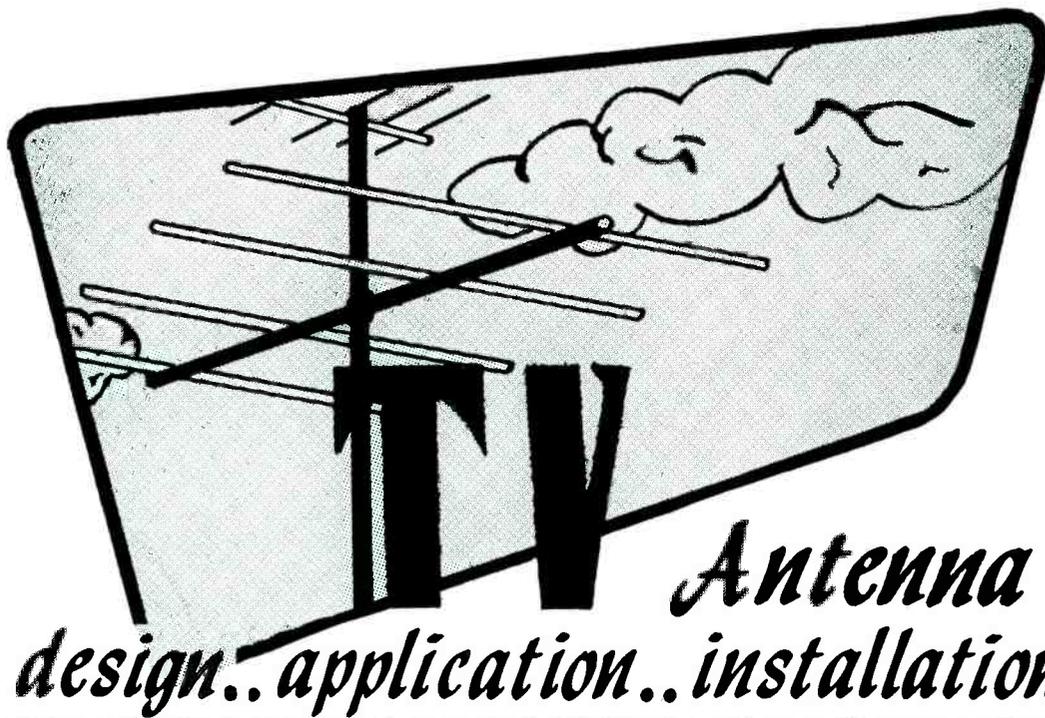
The additional frequencies are harmonically unrelated to the tones already present in the signal and are therefore entirely discordant. It is these intermodulation frequencies that make harmonic distortion so unpleasant.

Although the relationship between the percentage of intermodulation dis-

tortion and of harmonic distortion depends upon several factors, including the frequencies involved, a general rule-of-thumb does obtain: The ratio between intermodulation and harmonic distortion percentages is usually of the order of 3½ or 4:1, so that intermodulation distortion below 8% is ordinarily quite acceptable.

#### Power Capability

Early phono advertisements featured slogans such as *Loud Enough for Dancing!*, a feature which was considered remarkable in the days of  
(Continued on page 75)



# Antenna Digest

*design.. application.. installation.. service*

by RALPH G. PETERS

**Community TV Systems . . . Regenerative Effect TV Antenna Development Theory . . . UHF/VHF Field Strength Meters . . . Automatic Boosters UHF/VHF Antenna Systems . . . Towers . . . Installation Hardware**

IN VALLEY, ROUGH TERRAIN or highly industrialized areas where signal strength is low or noisy, or communities so distant from a transmitter that continuing reception is impossible, *community systems*, in which one master antenna serves an entire community, are being used in an increasing number.

There are about 75 operators of community systems today. The basic installation usually consists of a high gain directional antenna (yagis are used in most installations) installed atop a nearby mountain or hill, amplifiers on an antenna pole, coax cable from the antenna down the mountain-side to telephone or power poles also equipped with amplifiers, and feeders or tapoffs for subscribers.

In some installations, subscribers pay an installation charge and a monthly fee for service. In Pottsville, Pa., 1,500 viewers paid a \$135 installation fee and are paying the operators \$3.75 a month for servicing.

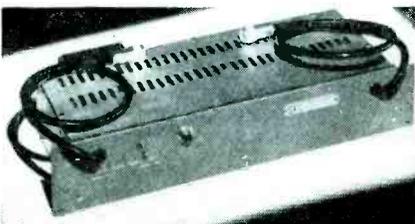
Recently mountain-locked Laconia, in New Hampshire, became a community system city. TV signals transmitted over mountainous terrain from

Boston, 120 miles away, became available for subscribers.

The system permits residents of Laconia to make cable connection to a central antenna installed atop Mount Belknap, six miles east of the city. The antenna tower rises 40' above the top of Mount Belknap, which has an elevation of 2,400'. More than 30,000' of coax cable was strung on 40 telegraph poles down the side of the mountain, five amplifiers on the poles serving to boost the signals.

A variety of novel components, accessories and antenna networks have

Two-stage wide-band chain amplifier which can be used with existing couplers in multiple installations as a booster at the antenna or in a distribution system when additional gain is required. Unit can be left unattended and for feeding long transmission lines used in community systems. Amplifier is said to have a gain of 21 db and a flat response characteristic from 40 to 225 mc. (Model 212TV; Spencer-Kennedy Labs. Inc., 186 Massachusetts Ave., Cambridge 39, Mass.)

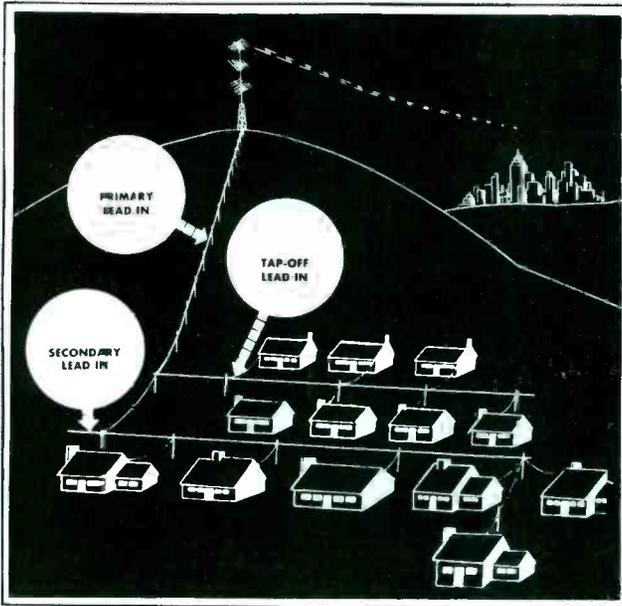


been devised for the community setups. For one, two, or three channel service, for instance, there is available a tower amplifier system.<sup>1</sup> The equipment is used specifically for boosting the incoming TV signals to a level sufficient for carrying them to the next amplifying station. Associated converter equipment is used with the tower amplifier system for conversion of the incoming frequencies to those used in the outgoing channels of the tower amplifier.

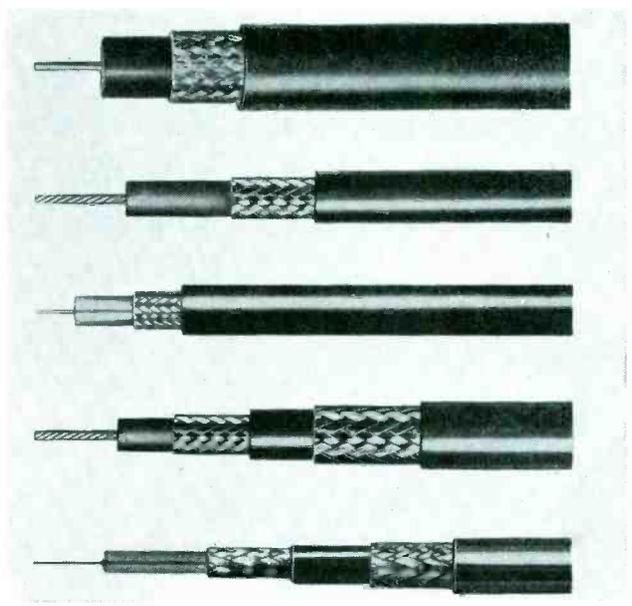
The equipment consists of an input and an output amplifier strip for each required channel; a total of six amplifier strips are used for three channel operation. The amplifiers, with associated power supply, are installed in a weather-resistant, ventilated cabinet designed to provide maximum outdoor protection and minimum maintenance for the system.

The input amplifier strips can be tuned to any of the present *vhf* channels, while the output amplifier strips are tuned to three specific channels. After passing through the input amplifiers, the incoming TV signals are

<sup>1</sup>RCA SX-8CT.



Community TV system layout, with primary, secondary and tapoff leadin provisions. (Courtesy FTR)



TV coax designed for community installations. From top to bottom: primary leadin; secondary leadin; tapoff leadin; and secondary and tapoff leadin used where radiation exists. (K-14, RG11/U, RG59/U, SP-75 and SP-76; FTR).

carried to the output amplifiers, or to converter equipment, which permits signals telecast in the high end of the spectrum to be received.

One output of 75 ohms and a test output are provided in the tower amplifier system. The system is said to have a frequency response within 3 db for a 6-mc bandwidth. It has a rated power output of 1.25 volts ac across 75 ohms in channels 2, 4, and 6.

#### Other Special CA Items

Other special items used in community work include receiver matching transformers, which provide a means of matching 75-ohm impedance sources to a 300-ohm impedance line or input or the reverse; as well as an-

tenna matching transformers, sometimes called elevator coils since they also afford a way to match 75-ohm impedance sources to 300-ohm inputs, as well 300 ohms to 75 ohms. In addition, there are extension units for running extension cable from the main feeder to the desired location of an outlet unit, attenuator pads (usually supplied in 1/2-watt style for 3, 6, 10 and 20-db), load resistors, and distribution networks for matching a single coax line to 4, 8, 12 and 16 distribution lines.

#### Isolation Couplers

Usually, it is necessary to use directional couplers to isolate one receiver from the other to prevent local oscillator interference, and minimize ghosts caused by the poor input impedance characteristics of the TV chassis. One model<sup>2</sup> employs a single piece of two-conductor coax and provides two outputs from one input, with terminals so arranged that resistive loss pads, if needed, can be installed. The directional coupler action is said to result in a very small forward or nominal insertion loss of 3.2 db, and provides an attenuation of reflections and local

<sup>2</sup>Spencer-Kennedy model 427 and 428 directional couplers. <sup>3</sup>FTR SP-75 and 76.

<sup>†</sup>Based on notes supplied by Leonard J. Lynch of Barb City Industries.

(Left)

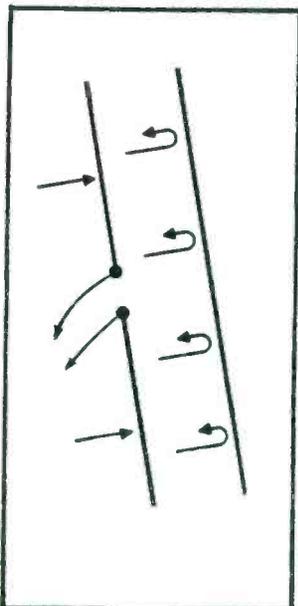


Fig. 1. Representation of concept that reflector is an element placed in a horizontal plane behind a dipole at the proper spacing and length to permit forward gain, a gain that is said to occur by waves inducing a current in the reflector element and radiating back to dipole in phase with incoming signal.

oscillator interferences, originating at the receiver, of about 14 db.

Several types of coax have also been developed for the ca systems for primary, secondary and tapoff leadin applications. In one line<sup>3</sup> lead has also been provided for installations where radiation exists, the lines being double shielded and double jacketed.

#### Regenerative-Effect Antennas<sup>†</sup>

It has been common knowledge to consider a reflector as being an element placed in a horizontal plane behind a dipole at the proper spacing and length to permit forward gain. This gain is supposed to occur because

(Continued on page 76)

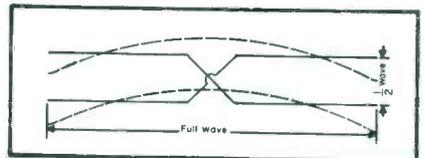
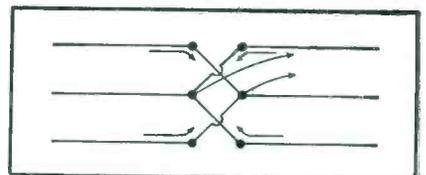


Fig. 2. When dipoles cut for a full wavelength are placed one above the other a half wave apart the incoming wave striking the dipoles will occur at the same instant; therefore the electrical charge on each element will be in the same phase, voltage and current.

Fig. 3. Drawing illustrating addition of third element and transposed wires which it is said add signal to center dipole by way of the transposed wires.



**A Monthly Review of Typical TV Problems Encountered During Daily Service Calls and On the Bench. Discussed This Month are Broad Marker Cures . . . Prevention of Waveform Clipping at Bottom . . . Securing Marks on High Channels . . . Curbing Vertical Distortion in Pictures**

# In The Field †

ON OCCASION, markers will look very broad and fuzzy, like *grass*, on the response curve. What causes this condition?

Narrow-band 'scopes, such as were used in the earlier days of TV service, served to filter out the higher-frequency beat components and developed a sharp marker. Present-day 'scopes with wide-band response do not filter out the higher-frequency beat components, but reproduce them. Accordingly, when a wide-band troubleshooting 'scope is to be used in visual-alignment work, the high-frequency response of the 'scope must be *killed* to get a sharp marker. This can be done easily by shunting capacitance across the 'scope terminals (a .0005-mfd unit can be used initially) or by inserting series resistance in the 'scope lead at the signal take-off point (a 50,000-ohm unit can be used as a starter).

WHEN TROUBLESHOOTING TV circuits the waveforms occasionally appear clipped along the bottom. Does this indicate that the 'scope is defective?

Probably not. An attempt should be made to advance the vernier control, and back off on the coarse step control. The vernier control operates

†Based on questions posed during meetings conducted by R. G. Middleton, senior engineer at Precision Apparatus Co., Inc., and author of *TV Troubleshooting and Repair Guide Book*, published by John F. Rider.

in the cathode circuit of the input cathode-follower circuit, while the coarse step controls operates in the grid circuit of the input cathode follower. It is easy to see that if the controls are set so that the signal overdrives the grid, clipping must take place. The safest rule is to work with the step control as low as practical at all times.

IN SERVICING, a *vvm* is used with a peak-to-peak voltage probe. Is it advisable to learn how to use a 'scope also?

Decidedly yes. Although a *vvm* will read the peak-to-peak voltage of a waveform, such as shown in Fig. 1, it will not disclose the presence of the minor peak, which is often an important factor in circuit malfunction.\* Furthermore, the *vvm* cannot respond correctly to very narrow pulses, such as shown in Fig. 2.

\*Zucconi, Bruno, *Use of 'Scope and Probe*, SERVICE, September, 1952.

Fig. 1. TV waveform having a major and a minor peak. 'Scope shows both peaks, but a peak-to-peak reading *vvm* measures only the major peak.

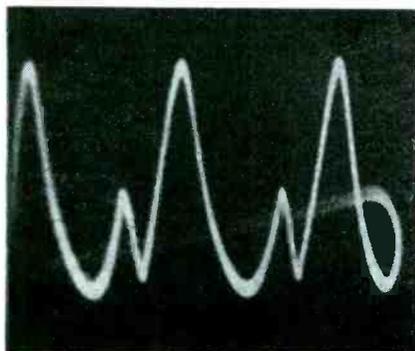
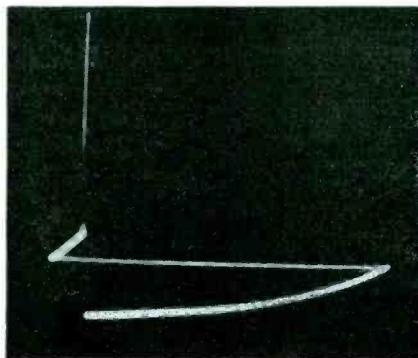


Fig. 2. Energy content of a very narrow pulse is small. The small energy requirement of a 'scope permits it to reproduce pulse correctly, but a peak-to-peak *vvm* will read a subnormal voltage.



DURING TEST WORK, it has been found that the marker generator does not mark the response curve on the high channels. Can anything be done?

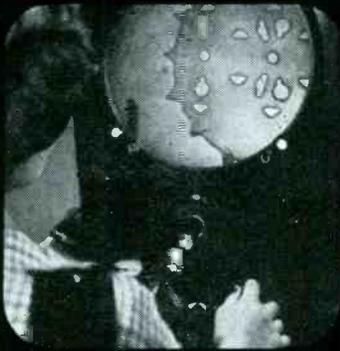
Yes. If it is not possible to secure a high-frequency marker generator, the TV station signal can be used as a marker. A couple of isolating resistors should be placed in series with the antenna lead, and the antenna signal mixed with the sweep signal; this will develop a marker at the picture-carrier and at the sound-carrier point on the curve. For best results, it is wise to experiment with various resistor values to get the right sized markers.

VERTICAL LINES in some sets tested have been found to be slightly curved. Is there a reason for this?

Yes. Curvature in vertical lines, such as the tall building shown in Fig. 3, are the result of spurious voltages present in sync circuits, especially in the phase detector circuit. This trouble can be traced with a 'scope; it may be found that there's a small amount of hum due to heater-cathode leakage in a tube, inadequate power-supply filtering, or stray-field pickup from some other receiver section.

Fig. 3. If vertical lines, as represented by the tall building in this reproduction, are not straight, there are spurious voltages present in the sync-control circuit.

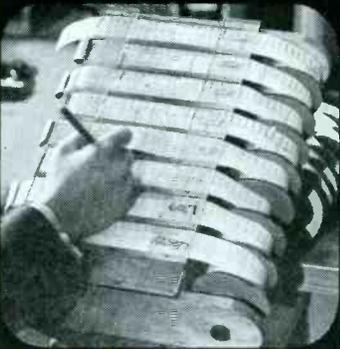




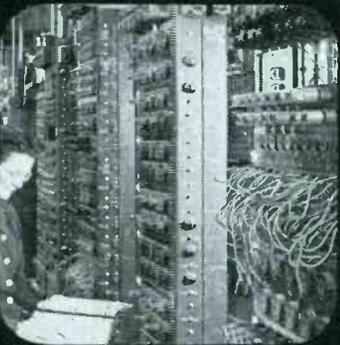
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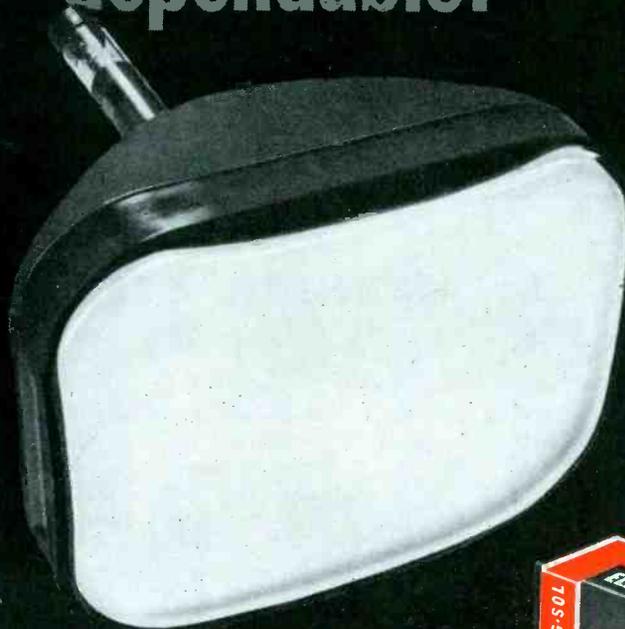


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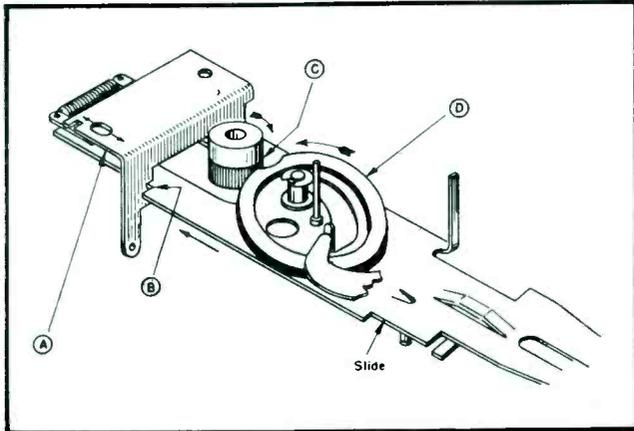
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Preamps . . . Miniature Mikes**

by **KENNETH STEWART**

IN ANALYSES OF PHONO SYSTEMS, it is usually noted that there are several related key components, whose performance must not falter if the desired ideal results are to obtain. In reviewing these segments, attention normally is centered on the cartridges, needles, amplifiers, changers, and so on, all of which are admittedly important. However, little or no reference is usually made to one particular item, without which there would be no phono system to discuss. We refer to the disc.

If the disc becomes defective through warpage or damage to the grooves, it is practically impossible to secure any acceptable performance from any system. In the main, these problems can be avoided if the recordings are carefully protected. During the past few years several effective *care* programs have been evolved to preserve all types of discs.

In an excellent commentary on one such program, in a recent issue of the transactions of the IRE *Professional Group on Audio*,<sup>1</sup> L. A. Wood and R. C. Moyer\* declared that there are several basic facts which must be considered: storage temperature, position during storage, presence of dust and dirt, and record wear.

Discussing storage temperature, these experts revealed that when prop-

erly stored, all types of records are capable of withstanding reasonable temperatures, even up to 120° F, if they are properly supported.

It is the excessively high temperatures that can permanently damage records. Storage near registers or radiators, or exposure to direct sunlight, when records are left on window sills or in parked automobiles, can seriously damage the discs, it was noted. Another dangerous source of heat was said to be lamp bulbs when placed too near records.

#### **Low Temperature Problems**

In a review of low temperature problems, it was pointed out that if records have been allowed to reach zero temperature, they should be brought back to normal temperature slowly. If records are excessively cold they should be handled gently,

\*RCA Victor Division, RCA, Indianapolis, Ind.

<sup>1</sup>July, 1952.

Above: Cam cutout and knurled roller of 45 changer whose adjustment for proper clearance will improve operation. At A is the slide mount-bracket, which must be moved backward or forward for proper clearance. At B is point where spacing must be adjusted for .010" clearance with feeler gauge. C illustrates the knurled roller. Turntable must be rotated until knurled roller is just ready to enter cutout on cycling can shown at D.

since they may be slightly brittle until they are warmed up again.

#### **Storage Position**

Generally, it was said, records should never be stored so that their own weight or pressure of other objects will tend to warp them out of shape. Phono records, of plastic composition, are subject to warping or bending if they are left under mechanical stress for a sufficiently long time.

Two types of storage were described as suitable. The 10" and 12" records, 78 or 33 $\frac{1}{3}$  type, should be stored vertically on edge in their original containers or in suitable storage albums. These records must never be piled flat, stored at an angle, or left on the supports of a changing mechanism.

However, the audio experts continued, the 45 type records can be stored either vertically or piled flat. Flat storage is possible because of the raised label area of these records and their extremely light weight.

Like the 78s and 33 $\frac{1}{3}$  types, these records should never be allowed to lean at an angle against the end of a storage cabinet.

#### **Dust and Dirt**

Noting that all records should be protected from accumulation of lint,

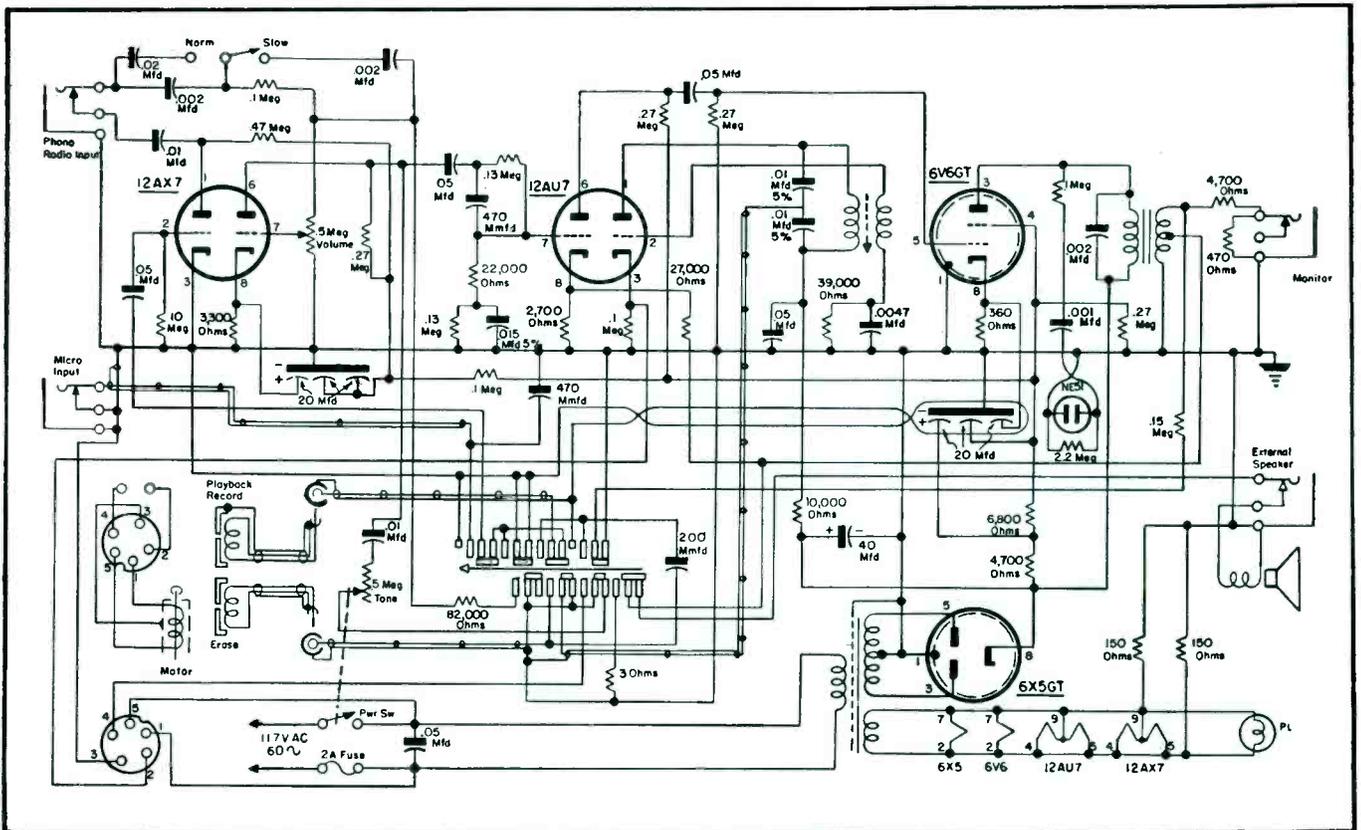


Fig. 1. Circuit of three-speed dual-track tape recorder; Bell Sound System model RT65B.

cigarette ashes, or dust of any kind, the disc experts added that normally, the sleeves or folders supplied with the records will provide adequate protection while the records are in storage cabinets. However, dirt and dust do collect when the records are removed from the cabinets.

In a discussion of the procedures that should be followed to prevent dust collection, it was said that records should never be removed from their folders until they are actually placed in a turntable to be played, and then they should be returned to their folders immediately after use. It was also emphasized that care should be taken to avoid leaving fingerprints or other oily smears on the record playing surface. Such deposits cause dust and lint to adhere to the record surface and work into the grooves where it is difficult to remove.

While the presence of loose dust and lint on a playing surface will not, generally, seriously interfere with high quality reproduction or add noise, because the dust is usually brushed aside by the stylus as the record is played, serious noise in the form of clicks or static can result, if a dusty record is scuffed or rubbed against another record or against an envelope with some pressure applied. It has been found that microscopic particles can become imbedded in the record compound and

can scratch the groove walls sufficiently to form slight projections or holes which cause noise. Once such damage exists, no amount of cleaning will restore its original quiet reproduction.

Describing cleaning techniques that can be used, the audio men noted that it is desirable to use a soft cloth which has been dipped in a dilute room temperature solution of a soapless detergent. If the detergent solution is not

Sound equipment console, designed to house tuner, amplifier and record changer. Pivoted, tilting top panel opens with brass pull and mounts all conventional tuners. In open position, controls are at a 65° angle. Amplifier can be mounted on back panel which can be removed. Changer drawer is directly below tuner panel and mounted on roller slides for smooth operation. Console, 29 3/4" h x 20 1/2" w x 18 3/4" d, complements the E-V Aristocrat folded horn enclosure. (Peavey: Electro-Voice, Inc., Buchanan, Michigan.)



available, the soft cloth should be dampened with plain cool water. Static charges can be removed by wiping the surfaces with a damp cloth; this will not prevent build-up of a charge the next time the record is used. The use of soapless detergents for cleaning leaves an invisible film on the surface which it has been found has a definite antistatic effect for a short period of time. A more lasting, but not necessarily permanent effect, can be obtained with the currently available antistatic disc-record preparations.

Noting that record grooves are extremely accurately prepared surfaces, which must be maintained in their original condition if the highest fidelity of reproduction is to be obtained, Wood and Moyer said that it is essential therefore to use care in rubbing or wiping the surfaces so that the grooves will not be scratched or scuffed. All wiping must be in the direction of the grooves and not across the grooves. Rough brushes, dusty cloths or excessive pressure in wiping can produce serious scratches.

The specialists warned that records should never be cleaned with alcohol, naphtha, or other household cleaning fluids, since many of these cleaning materials will dissolve some of the record surface.

Even with the best of care, it was brought out, records eventually wear

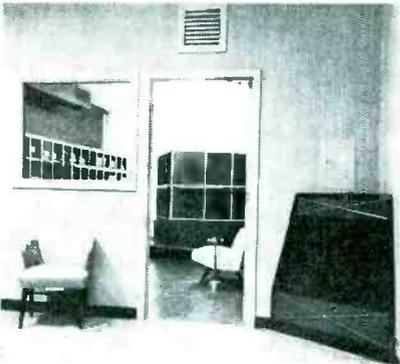


(Above)

Chromium-plated display stand, which can be used as a space-saving counter, shelf or window display for public address and intercommunication speakers, and for line matching transformers. (Atlas Sound Corp., 1451 39th St., Brooklyn 18, N. Y.)

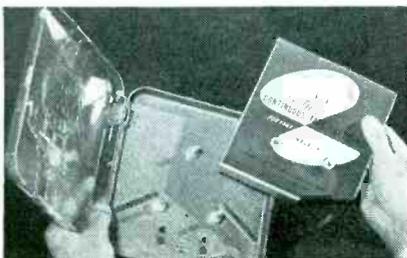
(Below)

Sound studio recently opened at Arrow Audio Center in N. Y. City. Shown through open door is a revolving speaker unit housing 24 different loudspeakers for customers' comparative selection. Racks on the left contain a variety of tuners, amplifiers, etc., which are connected to a comparator control board to combine with speakers and turntables.



(Below)

Repetitive Impact adapter magazine which is said to permit use of continuous tape cartridge on any make recorder or playback. Cartridge (at right) is claimed to be a new development in tape recording. By means of a patented helical or mobius twist, a 100' double-coated tape will record and playback both sides without interruption, providing 200' of continuous recording track. It will repeat this message continuously, as many times as desired. Cartridge has a sealed-in feature to facilitate handling and loading, and eliminates rewinding or tangling of tapes. Recorded cartridges can be duplicated, erased and rerecorded as desired. (Connecticut Telephone and Electric Corp., Meriden, Conn.)



out in usage. However, dust particles do represent one of the leading causes of such wear. It is not difficult, it was said, to envision a gouge or tear in a groove wall, started by a dust particle between groove wall and stylus, and spread and extended by subsequent passages of the stylus.

Chipping away (failure in shear) of portions of the groove wall, described as the primary cause of wear on rigid shellac-type pressings, can be caused by dust; dust developed offers visible evidence that material has been bodily removed from the groove.

The symptoms of wear were noted as: an increase in background noise; an increase in distortion; and a change, either increase or decrease, in output.

#### RCA Phono Service Notes

*Slide Assembly Mounting Bracket Adjustment . . . RP-190 (45 rpm) record changer:* Proper clearance must be obtained between the knurled roller, on the turntable spindle shaft and the curved cutout section in the cam wheel and tire, when the changer is in its playing position. If this clearance is too small, the change cycle may start immediately after landing (continuous tripping), or it may start occasionally while playing a record (pre-tripping). If this spacing is too wide, the knurled roller may not contact the cam wheel and tire, resulting in failure to trip. The correct adjustment should be made by positioning properly the slide mounting bracket, so that it stops the slide assembly at the position which gives correct spacing between the knurled roller and cam.

In making the adjustment, the turntable should be rotated by hand in the normal clockwise direction until the change cycle is nearly completed, carefully stopping the turntable while the knurled roller is still engaged with the rim of the cycling cam, but just prior to entering the cutout section in the cam wheel. With the knurled roller and cam in the position indicated in Fig. 1, (p. 38), the spacing between the slide mounting bracket and the notched edge of the slide that stops against this bracket should be checked; the spacing should be .010", checked with a feeler gauge. The bracket should be adjusted to obtain this spacing, if required, by loosening the hex head screws holding the mounting bracket to the motorboard and moving the bracket slightly to give the correct spacing. If a tripping malfunction is still encountered with the correct spacing, other causes should be looked for, such as: worn

(Continued on page 82)



Miniature microphone, employing crystal element, which is said to have an output of -51 db below 1 volt per microbar. Top grille, a circular metal stamping, is 1 3/4" in diameter and 1/2" deep. Microphone locks in base with a half-turn of a pin-equipped, gold finished base adapter, which also is threaded to fit standard floor stands. Mike is non-directional when mounted in its base. Recommended for recorder, pa, conference and other uses. Response is said to be 30 to 10,000 cps, flat to 1,000, gradually rising to 6,000. (Model 54M3; Astatic Corp.)

(Below)

Phonostrobe disk, which when used with a 60-cycle stroboscopic light source, permits a rapid determination of the three standard phonograph turntable speeds. At 78 rpm, the outer ring of marks appears stationary. If the speed is too high, it will appear to rotate forward; if too low, the apparent rotation is backward. The inner ring is used when 33 1/3 rpm records are to be played. For 45s, the middle ring is used and the adapter is removed from the center hole to accommodate the larger sized spindle. (Model 18D; Berkshire Laboratories, 596 Beaver Pond Road, Lincoln, Mass.)



(Below)

Equalizer-preamp which features five-position low and high record equalization, five-position low and high sharp frequency cut-off filters for reduction of rumble and record scratch, respectively, choice of loudness or straight volume control action, continuously variable bass and treble controls, and five different audio inputs. Other features include a self-contained shielded power supply, tube filaments powered by dc, tubes mounted on a shock-mounted sub chassis, and all triode circuit with cathode-follower output. (C300; The Radio Craftsmen, Inc., 4401 N. Ravenswood Ave., Chicago 40, Ill.)



**GEMCO**

The COMPLETE Line

**GIVING  
BUSINESS  
A SHOT  
IN THE  
ARM-**



**Gemco Ellenbagen Re-fracors**

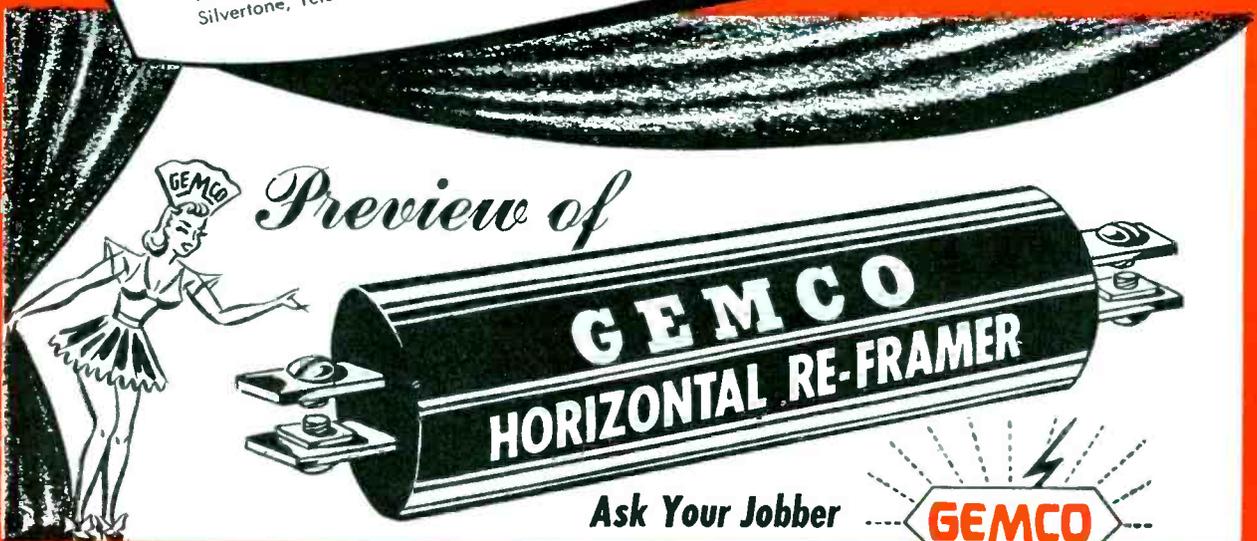
The most popular C.R.T. booster in use today!

- No. 23 for correcting "Soft", weak or dark C. R. T. in conventional parallel circuit.
- No. 25 for correcting "Soft", weak or dark C.R.T. where pin No. 6 on the C.R.T. is the extra grid — Electrostatic focus picture tubes parallel circuit.
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**Gemco Isolation Units**

These units are designed to enable a C.R.T. with a filament to cathode short (no control of brightness or no video on cathode injector circuits) to function perfectly.

- No. 24 for conventional parallel C.R.T. filament circuits.
- No. 26 for use on C.R.T. where filament is a series circuit arrangement.



Preview of

**GEMCO  
HORIZONTAL RE-FRAMER**

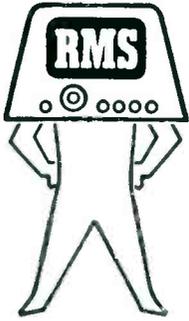
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**GREAT EASTERN MANUFACTURING CO.  
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A properly selected **RMS** antenna helps you do...

# THE BEST JOB IN YOUR AREA

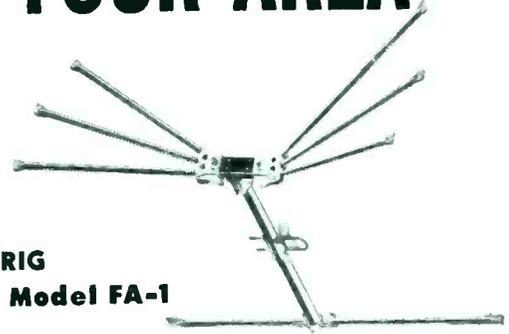
## HOW TO SELECT THE PROPER RMS ANTENNA FOR YOUR PARTICULAR INSTALLATION

• up to 25 miles — FA-1 OR YA-100

• up to 60 miles — FA-2, CVA-500, STY (5 element yagi)

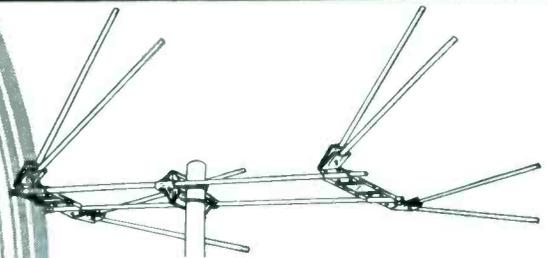
• up to 85 miles — FA-4, CVA2-500

• over 85 miles — CVA4-500, STYL8 —, STYL10 —



### REDI-RIG RMS Model FA-1

- Completely preassembled — no loose parts or hardware.
- Exceptionally flat response across entire tv band.
- 3/8" dowel-reinforced aluminum elements.
- Plus six other distinctive mechanical and structural advantages!



### FRINGELEADER END-FIRED ARRAY RMS Model CVA-500

- Completely preassembled.
- High gain on all channels.
- 3/8" dowel-reinforced aluminum elements with unique double U-bolt attachment to the mast.



### SUPER STEEL-BRACED YAGIS

#### RMS Model STYL8-

- Cut for specific channel — one of the highest gain antennas in use today.
- Steel brace assures permanent orientation.
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## NO INTEREST!! - NO CARRYING CHARGES!!

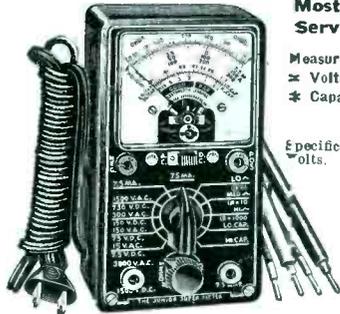
USE CONVENIENT TIME PAYMENT ORDER BLANK BELOW

### Superior's New JUNIOR SUPER-METER

Most Complete and Compact Multi-Service Instrument Ever Designed

Measures:  
 \* Voltage \* Current \* Resistance  
 \* Capacity \* Reactance \* Inductance  
 \* Decibels

Specifications: D.C. Volts: 0-7.5/75/150/750/1500  
 Volts. A.C. Volts: 0-15/150/300/1500/3000 Volts.  
 Resistance: 0-10,000/100,000 ohms.  
 0-10 Megohms. D.C. Current: 0-  
 7.5/75 Ma. 0-7.5 amps. Capacity:  
 .001 Mfd.-2 Mfd. 1 Mfd.-20  
 Mfd. Electrolytic Leakage: Reads  
 quality of electrolytics at 150 Volt  
 test potential. Decibels: -10 Db  
 to +18 Db. +10 Db to +38 Db.  
 +38 Db to +58 Db. Resistance:  
 15 ohms-25 K ohms. 15 K ohms  
 -2.5 Megohms. Inductance: 5  
 Henry-50 Henries. 30 Henries-  
 10 K Henries. Plus Good-Bad  
 scale for checking the quality of  
 electrolytic condensers.



Handsome round cornered  
 molded bakelite case 3 1/2"  
 x 5 7/8" x 2 1/4" complete  
 with all test leads and  
 instructions .....

**\$21.40**  
NET

### Superior's New Model TV-11 TUBE TESTER



Operates on 105-130 Volt  
 60 Cycles A.C. Hand-  
 rubbed oak cabinet com-  
 plete with portable cover.

**\$47.50**  
NET

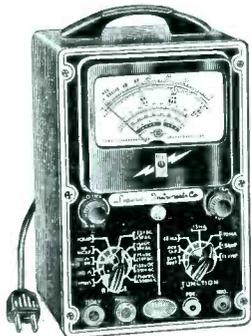
• Uses the new self-cleaning Lever  
 Action Switches for individual element  
 testing. Because all elements are  
 numbered according to pin number in  
 the RMA base numbering system, the  
 user can instantly identify which  
 element is under test. Tubes having  
 tapped filaments and tubes with  
 filaments terminating in more than  
 one pin are truly tested with the  
 Model TV-11 as any of the pins may  
 be placed in the neutral position when  
 necessary. • Uses no combination  
 type sockets. Instead individual  
 sockets are used for each type of  
 tube. Thus it is impossible to  
 damage a tube by inserting it in the  
 wrong socket. • Free-moving built-in  
 roll chart provides complete data for  
 all tubes. • Phono jack on front  
 panel for plugging in either phones or  
 external amplifier detects microphonic  
 tubes or noise due to faulty elements  
 and loose external connections.

### Superior's New Model 670-A SUPER-METER

A combination volt-ohm milliammeter  
 plus capacity reactance inductance  
 and decibel measurements

#### SPECIFICATIONS:

D.C. VOLTS: 0 to 7.5/15/75/150/750/1,500/7,500  
 Volts.  
 A.C. VOLTS: 0 to 15/30/150/300/1,500/3,000  
 Volts.  
 OUTPUT VOLTS: 0 to 15/30/150/300/1,500/3,000  
 Volts.  
 D.C. CURRENT: 0 to 1.5/15/150 Ma. 0 to 1.5/15  
 Amperes.  
 RESISTANCE: 0 to 1,000/100,000 Ohms 0 to 10  
 Megohms.  
 CAPACITY: .001 to 1 Mfd. 1 to 50 Mfd.  
 (Quality test for electrolytics.)  
 REACTANCE: 50 to 2,500 Ohms 2,500 Ohms to  
 2.5 Megohms.  
 INDUCTANCE: .15 to 7 Henries 7 to 7,000  
 Henries.  
 DECIBELS: -6 to +18 +14 to +38 +34 to +58



Comes housed in rugged,  
 crackle-finished steel cabi-  
 net complete with test  
 leads and operating in-  
 structions. Size 6 1/2" x  
 9 1/2" x 4 1/2" .....

**\$28.40**  
NET

ADDED FEATURE  
 The Model 670-A includes a special  
 GOOD-BAD scale for checking the  
 quality of electrolytic condensers at  
 a test potential of 150 Volts.

### Superior's New TV BAR GENERATOR

**THROWS AN ACTUAL  
 BAR PATTERN ON ANY  
 TV RECEIVER SCREEN!**



Power Supply: 105-125 Volt 60 Cycles. Power  
 Consumption: 20 Watts. Channels: 2-5 on  
 panel, 7-13 by harmonics. Horizontal lines:  
 4 to 12 (Variable). Vertical lines: 17  
 (Fixed). Vertical sweep output: 60 Cycles.  
 Horizontal sweep output: 15,750 Cycles.

Two Simple Steps

1. Connect Bar Generator to Antenna Post of any TV Receiver.
2. Plug Line Cord into A.C. Outlet and Throw Switch.

RESULT: A stable never-shifting vertical or horizontal pattern projected on the screen of the TV receiver under test.

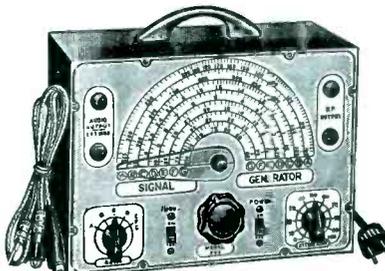
TV Bar Generator comes complete with shielded leads and detailed operating instructions. Only..

**\$39.95**  
NET

New Model 200—AM and FM

### SIGNAL GENERATOR

Provides complete coverage for A.M.-F.M. and TV alignment



\* Tubes used: One 954 as oscillator;  
 One 954 as modulated buffer amplifier;  
 T-2 as modulator; 7193 as rectifier.

The Model 200 comes complete with output cable and instructions.....

**\$21.85**  
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### NEW TIME PAYMENT PLAN ORDER BLANK

MOSS ELECTRONIC DISTRIBUTING CO., INC.  
 Dept. B-33, 38 Murray Street, New York 7, N. Y.

Please send me the units checked below. I am enclosing the down payment with the order and agree to pay the monthly balance as shown. It is understood there will be no carrying, interest or any other charges, provided I send my monthly payments when due. It is further understood that should I fail to make payment when due, the full unpaid balance shall become immediately due and payable.

- JUNIOR SUPER METER..... Total Price \$21.40
- \$5.40 down payment. Balance \$4.00 monthly for 4 months.
- MODEL TV-11..... Total Price \$47.50
- \$11.50 down payment. Balance \$6.00 monthly for 6 months.
- MODEL 670-A..... Total Price \$28.40
- \$7.40 down payment. Balance \$3.50 monthly for 6 months.
- TELEVISION BAR GENERATOR..... Total Price \$39.95
- \$9.95 down payment. Balance \$5.00 monthly for 6 months.
- MODEL 200..... Total Price \$21.85
- \$5.85 down payment. Balance \$4.00 monthly for 4 months.
- I enclose \$..... as down payment.
- Ship C.O.D. for the down payment.

Signature.....

Name.....

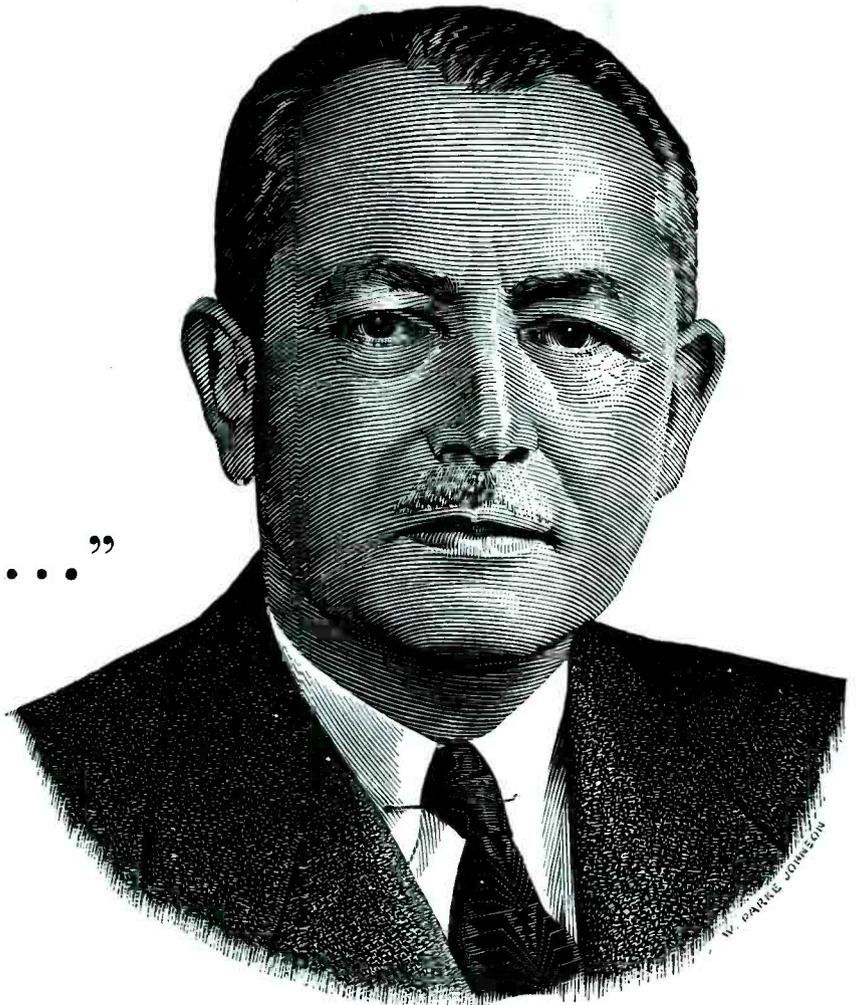
Address.....

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

*“... opportunity  
is freely given...”*

**PAUL M. HAHN**

President, The American Tobacco Co.



*“Our nation has grown great largely because opportunity is freely given. Only very few people actually make their own ‘breaks.’ Today, millions of Americans are providing for their personal financial security and at the same time helping in the building of our national defenses. The opportunity to do so is given by business management which affords employees the means of practicing systematic thrift through the Payroll Savings Plan for the purchase of U. S. Defense Bonds.”*

Nearly seven million employees of industry are “providing for their personal security and at the same time helping in the building of our national defenses.”

- they are the men and women who availed themselves of the opportunity referred to by Mr. Hahn—the opportunity to enroll in the Payroll Savings Plan for the systematic purchase of U.S. Defense Bonds.
- they represent a high percentage of their companies’ employees—in plant after plant, the averages are climbing to 60%, 70%, 80%—even higher.
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**SERVICE**



# TV TROUBLESHOOTING

## With Voltage-Readings

by CYRUS GLICKSTEIN

### Part II . . . Locating and Curing Voltage-Distribution Problems in LV Supplies Using Resistive and Series-Parallel Systems

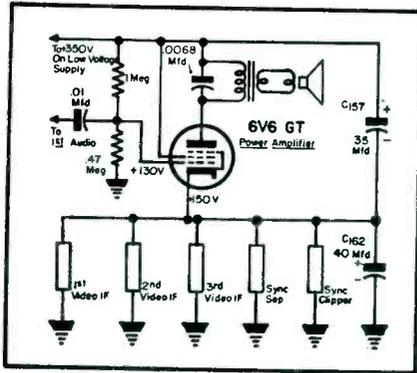


Fig. 2. An example of tube voltage-divider circuitry; a  $\mu a$  stage in series with a parallel group of three video *if* stages and two sync stages.

SOME COMPLEX CHANGES in voltage can occur when trouble develops in TV receivers using voltage divider circuits across the low-voltage power supplies. There are two main types of voltage dividers in use: (1) resistive dividers, using a string of resistors across the output from which are tapped off various voltages; and (2) a series-parallel arrangement of tubes, arranged so the correct voltage distribution is obtained across the different stages.

Many older models of TV receivers and some recent models use conventional voltage divider networks to obtain the different voltages needed for the various stages in the receiver; Fig. 1. An open or change in value in one of the voltage divider resistors, a leaky or shorted filter capacitor, at one of the voltage divider junctions, or shorted capacitors at some points in the load may upset the voltage distribution at many points in the receiver.

Many chassis use a voltage division obtained by a series-parallel arrangement of various stages. This is done

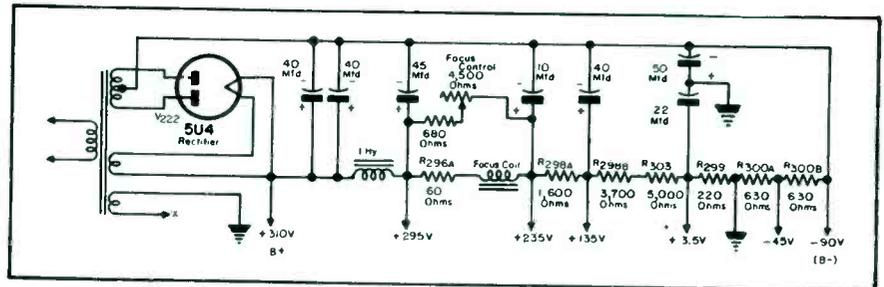


Fig. 1. Low-voltage power supply used in Capehart CX-33, showing resistive voltage divider employed to obtain different voltage outputs.

to eliminate the heavy wattage resistors required in resistive voltage dividers. In one widely-used circuit arrangement, a certain amount of voltage regulation is also obtained by connecting the audio output stage in series with the video *if* stages, the sync separator and the sync clipper stages; Fig. 2. This provides the 150 *v* needed for the *if* stages and 200 *v* for the  $\mu a$  stage when the B- to B+ output is 350 *v*. In addition, any variations in the source voltage cause corresponding variations in the current through the  $\mu a$  stage. For example, if the source voltage increases, more current through the  $\mu a$  stage loads down the power

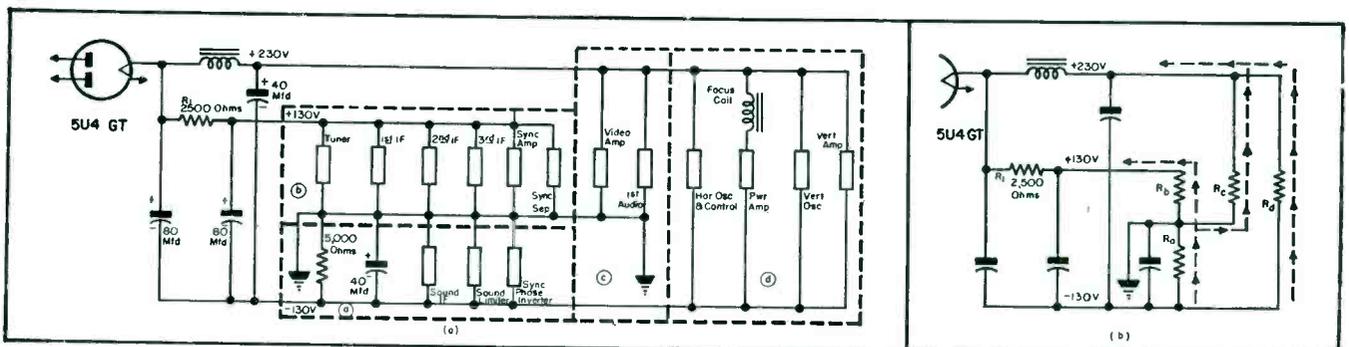
supply and the output voltage does not change as much as it otherwise might.

Other models of TV receivers have a complex series-parallel arrangement of tubes. An example of this is Emerson model 662B; Fig. 3.

When trouble develops in the low-voltage supply, there usually is more than one indication. When the low-voltage supply is completely dead, for example, there is no sound, no picture, and no raster. In the same way, when a trouble develops that causes a redistribution of voltage in some or most of the stages, several indications of

(Continued on page 91)

Fig. 3. Voltage distribution across stages in Emerson 662B, showing series-parallel network, is illustrated in A. In B appears a further simplification of the system, showing each group of stages across a given potential as one resistor; dotted lines indicate direction of the *dc* flow.



# Auto Radio Vibrator Servicing

by SOLOMON HELLER\*

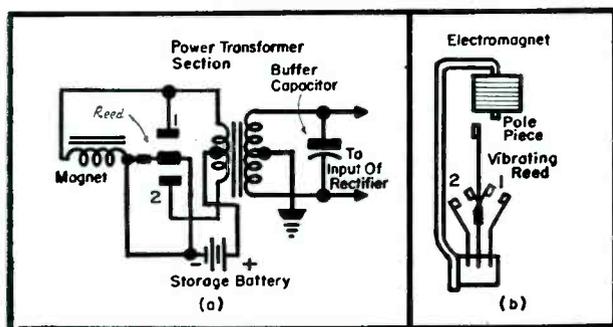


Fig. 1. At left, schematic of simple vibrator circuit. The vibrator is a shunt-fed one. At right appears a pictorial sketch of the vibrator shown at left.

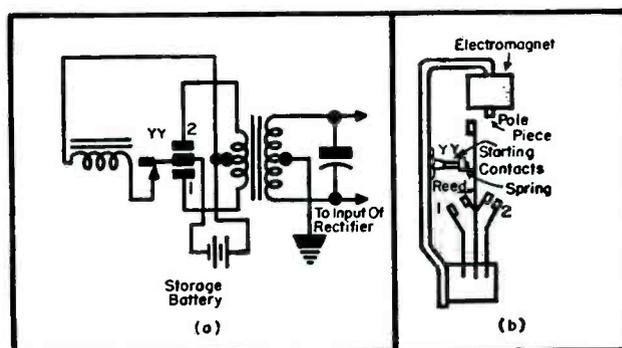


Fig. 2. At left, series-fed vibrator schematic. At right, a pictorial sketch of the vibrator.

## Simplified Techniques Now Available to Locate Troubles and Eliminate Them in Series and Shunt-Fed Non-Sync and Sync Vibrator Installations

ERRORS ARE often made in servicing vibrator circuits in auto receivers, due to an insufficient knowledge of how they work.

The vibrator's job is to change the *dc* voltage supplied by the storage battery into *ac*, which is then stepped up by a transformer and converted into a high *dc* voltage required by the *B* section of the receiver.

The vibrator acts as an electronic switch. By interrupting a direct current, it changes it into an alternating one.

In Fig. 1, we have a basic vibrator circuit. Direct current from the battery flows through the upper half of the primary and through the electromagnet back to the battery, energizing the magnet. The magnet attracts the reed, causing it to move to contact 1. The electromagnet is now short-circuited.

Since the shorted electromagnet no longer exerts any attracting force, the reed falls away from it. Due to its inertia and elasticity, the reed moves past its original position to contact 2. The direct current in the upper half

of the primary has been changed to *ac* by this interruptive action.

The *dc* battery current now flows through the lower half of the primary and the electromagnet, back to the battery. The activated magnet, no longer shorted, attracts the reed again to contact 1, breaking the circuit and causing the *dc* current through the lower half of the primary to be changed into *ac*. As soon as the reed strikes contact 1, the magnet coil is short-circuited again, and the cycle repeats.

### Full-Wave Vibrator

The vibrator circuit shown in *a* of Fig. 1 is a full-wave type, since it has output throughout the entire cycle. The voltage developed across each half of the primary is stepped up by auto-transformer action and applied across the whole primary, stepped up still further in the secondary, and rectified

either by a tube, or the vibrator itself (when a synchronous vibrator is present).

The vibrator circuit shown in Fig. 1 *a* is called a *shunt-fed* type, since the magnet coil is in shunt with the primary. A variation of this circuit, where the vibrator is *series-fed*, appears in Fig. 2. Here the magnetic coil and the primary are in series with each other, as far as battery current flow is concerned.

In operation, the normal or resting position of the reed is against contact YY. When current from the battery flows through the magnet coil, the latter is energized and causes the reed to be attracted to contact 2. The moment the reed is attracted to contact 2, the circuit is broken at contact YY, causing the magnet to be deactivated, and the reed to fall to contact 1.

The YY contact *makes* in this position, activating the magnet, and causing the reed to be attracted to position 2 once more. The cycle repeats in this

\*Co-author of *Television Servicing*.

(Continued on page 84)

# Westinghouse

announces a great new division to  
manufacture a full line of  
**RELIATRON™ TUBES**

Receiving Tubes —  
Television Picture Tubes —  
Power Tubes

Westinghouse proudly announces a completely new division—*THE ELECTRONIC TUBE DIVISION*. Its aim is this: To become the leader of the industry in providing better electronic tubes and better service to all tube users.

To provide this new standard of service to all branches of the electronic tube industry, Westinghouse has equipped its new tube division with completely new production, research, and distribution facilities.

*Westinghouse RELIATRON Tubes are now available; many types are on their way at this moment to distributors, dealers, equipment manufacturers, government, government contractors.*



# THE Westinghouse

## ELECTRONIC TUBE DIVISION

- Experienced Personnel
- Modern Facilities
- Rigid Standards

Westinghouse offers the electronics industry thirty years of experience in tube development, application, and manufacture. From this experience have come many of the tube innovations that today are the basis for the electronics industry. In all cases, Westinghouse customers benefited by being first with new types. The list at the right indicates a few Westinghouse contributions.

The personnel of the new Westinghouse Electronic Tube Division comprise a brilliant engineering, production and sales team—recruited from Westinghouse's 46 manufacturing divisions and key experts from throughout the industry.

Tubes produced by Westinghouse will bear the name . . .

## RELIATRON

. . . an unbreakable bond of reliability and electronics. It indicates performance and dependability on a new scale for the electronic tube industry.

## Look at This Brilliant History of Westinghouse Electronic Tube Achievements:

- ★ The Westinghouse-designed WD-11 tube was the first dry battery type and was part of the first commercial radio receiver ever produced in America.
- ★ Westinghouse was the first manufacturer to develop and mass-produce tubes utilizing an indirectly heated cathode.
- ★ Westinghouse designed and produced the first ac-operated detector tube, the Type 27.
- ★ Westinghouse established the first commercial radio broadcast station, KDKA, in 1920 and thus opened the mass market for home radios.
- ★ Basic development and demonstration of the cathode ray television system was performed in Westinghouse laboratories and patented in 1929.
- ★ Westinghouse developed and introduced both electromagnetic and electrostatic types of cathode ray tubes in 1930.
- ★ Westinghouse design engineers invented the Ignitron, which solved long-standing problems of precise, high-speed switching of heavy electric currents.
- ★ Westinghouse pioneered in high-powered transmitting tubes for use in both pulsed and CW radar applications. The famous Westinghouse Type WL-530 was in the Pearl Harbor radar set which gave the warning of the approach of Japanese planes in 1941. This tube led the way to all subsequent radars.

### THESE MEN LEAD THE WESTINGHOUSE ELECTRONIC TUBE DIVISION TEAM

**HAROLD G. CHENEY,**  
General Sales Manager:

A Westinghouse tube and lamp sales executive for 31 years, Mr. Cheney was appointed General Sales Manager of the Electronic Tube Division in August, 1951. Prior to his appointment he was assistant to the general lamp sales manager and supervisor of lamp sales contracts. He was a key factor in giving to the lamp industry the stabilizing influence of Westinghouse's fair, sound business and sales policies.



**JAMES L. BROWN,**  
Manager, Receiving  
and  
Cathode Ray Tube Sales:

For 14 years Mr. Brown was an electronic tube and apparatus sales executive and engineer for the General Electric Company—on the West Coast for 7 years and later as central regional sales manager for receiving and television picture tubes. He is a former purchasing agent of Hoffman Radio Company.



**JOHN J. DOYLE,**  
Manager, Power Tube Sales:

A veteran of 25 years' Westinghouse service, Mr. Doyle was manager of electronic tube sales to distributors prior to his present appointment. Previously he was manager of electronic tube parts sales and has held various sales executive positions in the Lamp Division.

**EUGENE W. RITTER,**  
Vice-President and Manager:

For eight years he was with the Corning Glass Works as vice-president and director, later president of the Corning Glass Works of South America. Previously he had been employed by the Radio Corporation of America for 12 years as a member of the Radio Tube Design and Development Division, manager of the Radiotron Company, later vice-president of the RCA Manufacturing Company.



**DR. E. A. LEDERER,**  
Manager of Engineering:

He was formerly chief engineer for National Union Radio Corporation and for 17 years was a member of the tube development staff of Radio Corporation of America. He participated in early vacuum tube development work with the Westinghouse research and engineering staffs from 1923 to 1930.





#### **WESTINGHOUSE IN ELMIRA, NEW YORK**

360,000 square feet of steel, glass and brick designed for one thing—to house the most efficient electronic tube production in the world. Here, completely modern straight-line exhaust, Lehr, and screen settling equipment produce Westinghouse RELIATRON Television Picture Tubes of unsurpassed quality. Here also are produced the famous Westinghouse line of power, transmitting, industrial and special purpose tubes. Plant layout is designed around efficient, straight production lines. Into them feed raw materials and sub-assemblies. From them, tubes enter an exacting testing cycle. To assure prompt delivery, tubes are loaded directly into trucks or railroad cars waiting on Westinghouse's own spacious rail siding. Here at Elmira, too, is located the headquarters of the Westinghouse Electronic Tube Division with sales, engineering and production management ready to extend a warm welcome to you.

#### **WESTINGHOUSE IN BATH, NEW YORK**

Located at Bath in the scenic Finger Lakes region of upstate New York, this Westinghouse Receiving Tube Plant is another 220,000 square feet of modern production efficiency. It lies only a few miles from a major source of glass tube envelopes. It is served by sidings of one of the nation's leading railroads—only hours away from all principle markets. It is less than one hour from the Elmira factory and the advice and supervision of the Division's headquarters staff. Here at Bath, the most modern cathode-coating, grid-winding, spot welding and sealax equipment is operated by the industry's leading craftsmen. Famous Westinghouse quality control standards rule from raw material to testing of finished tubes. From this plant are shipped the finest receiving tubes in the industry—Westinghouse RELIATRON Tubes.



# RELIATRON TUBES are backed by Westinghouse reliability

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The Westinghouse position of leadership in electrical and electronic manufacturing is founded on the untiring efforts of its research staff. The Electronic Tube Division is already at work improving present tube types and developing new types for superior service and new applications, including UHF.

## QUALITY CONTROL

RELIATRON tube performance is assured by an exacting program of quality control. Every step in the manufacture of RELIATRON Tubes—from raw materials to finished product—must meet standards which are the toughest in the industry.

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Whatever your problem, whether you are an equipment manufacturer, government laboratory, or parts distributor, you will find Westinghouse sales representatives and application engineers in your area at your service. Sales and engineering offices are located strategically throughout the country to serve you.

## ADVERTISING

Trade acceptance of Westinghouse RELIATRON Tubes will be supported by a nationwide advertising campaign second to none. Technical data, pricing service and application information are available to all tube users. Sales promotion programs for distributors and service dealers will be hard-hitting, sure sales builders. Your product or service will profit from consumer acceptance built by the tremendous national advertising of the name "Westinghouse."

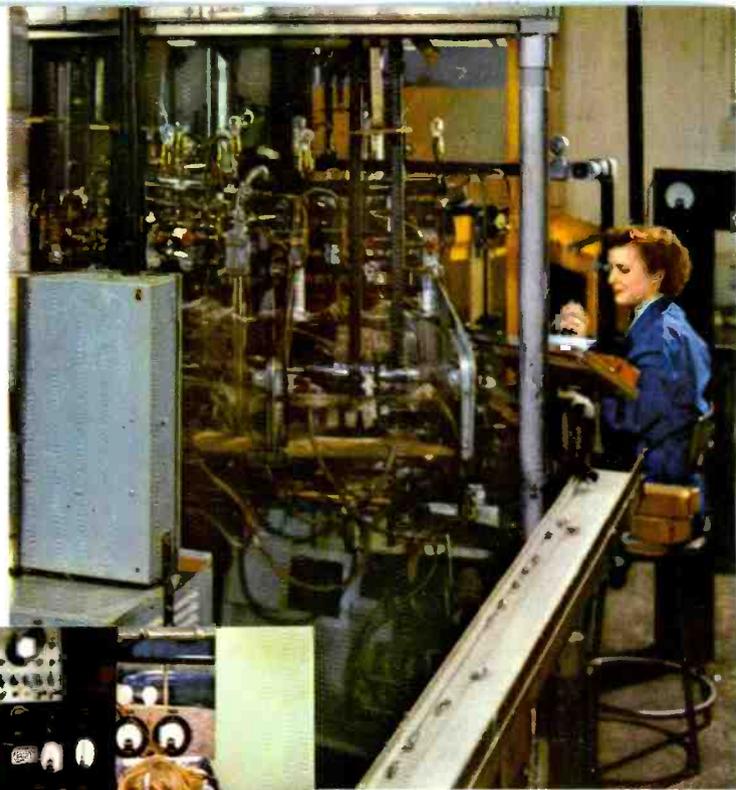
## DISTRIBUTORS, EQUIPMENT MANUFACTURERS, WRITE NOW

For complete information on the Westinghouse line of RELIATRON Receiving Tubes, Television Picture Tubes, and Power Tubes, write or wire Westinghouse Electric Corporation, Dept. 101, Elmira, New York. Or call your nearest Westinghouse Electronic Tube Division Sales Office.

**YOU CAN BE SURE...IF IT'S**

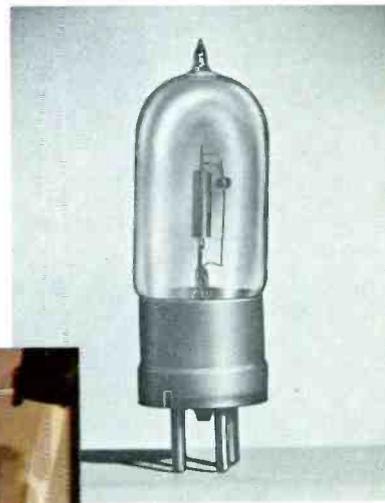
# Westinghouse

WESTINGHOUSE ELECTRIC CORPORATION, ELECTRONIC TUBE DIVISION, ELMIRA, N. Y.



Sealoz units at Bath, New York, turn out miniature tubes for government and commercial use. From here, tubes enter a rigorous program of checks and testing.

Here, an early Westinghouse WD-11 tube, one of the earliest types ever made, is shown just as it was used in the first commercial radio receivers.



This exclusively Westinghouse quality control test set is one of a large battery of equipments which provide you with tubes of the highest quality and reliability.

Basic and application research are of prime importance in the Westinghouse Electronic Tube Division's plans. Such research has helped build the tube industry and has made Westinghouse dominant in development.



# Servicing Helps

by M. A. MARWELL

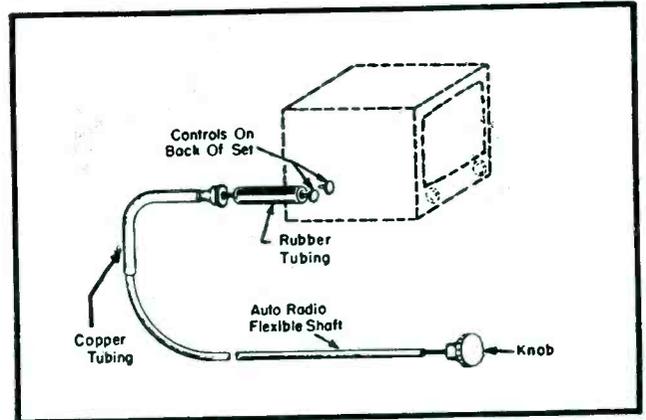


Fig. 1. Flexible shaft extension designed to permit adjustment of rear controls on TV receivers. Copper tubing is helpful in controlling degree of bend to prevent binding. Short length of rubber tubing can be cut from windshield wiper hose. (Courtesy Motorola.)

## Eliminating Buzz in Intercarrier TV Chassis . . . Halting Horizontal Sweep Interference in Broadcast Receivers . . . Modifications To Insure Weak Signal Area Operation

TV CHASSIS, particularly intercarrier models, often have an *audio buzz*, which might be caused by an interruption of the audio *if* at sync pulse rate (*sync buzz*) or actual vertical scanning frequency pickup by some part of the audio circuit.

In intercarrier models, it is possible to determine which type is the offender by disabling the vertical oscillator with the buzz present in the speaker. If the buzz disappears with a stoppage of the vertical oscillator, it can be assumed that coupling of

the vertical scanning frequency into the audio circuits is taking place.

In the early versions of the Motorola TS-216 models, it was found that some coupling of vertical scanning frequency into the grid of the first audio amplifier took place, from the blue plate lead of the vertical output transformer. Field checks have disclosed that in extreme cases, the best remedy is to unsolder the blue vertical output transformer plate lead from pin 1 of the 12BH7 vertical output tube. This lead should be pulled back up to

the top of the chassis, and then run on top of the chassis to one of the grounding knockout holes near the vertical output tube socket, and dressed through this hole down to the socket. The lead should then be resoldered to pin 1, being careful that the lead is kept away from the audio tubes.

On some of the early Motorola TS-216 and TS-275 chassis, the lead connecting the volume control to the grid of the first audio amplifier was routed too close to the vertical saw-forming network, consisting of a charge capacitor,  $C_{68}$  (TS-216) or  $C_{267}$  (TS-275), and the accompanying peaking resistors. This network was mounted on a terminal strip adjacent to the 4.5-mc trap. It was noted that the 60-cycle saw voltage was picked up by the lead and applied to the audio grid. To remedy, this lead should be dressed as far as possible away from the saw-forming network.

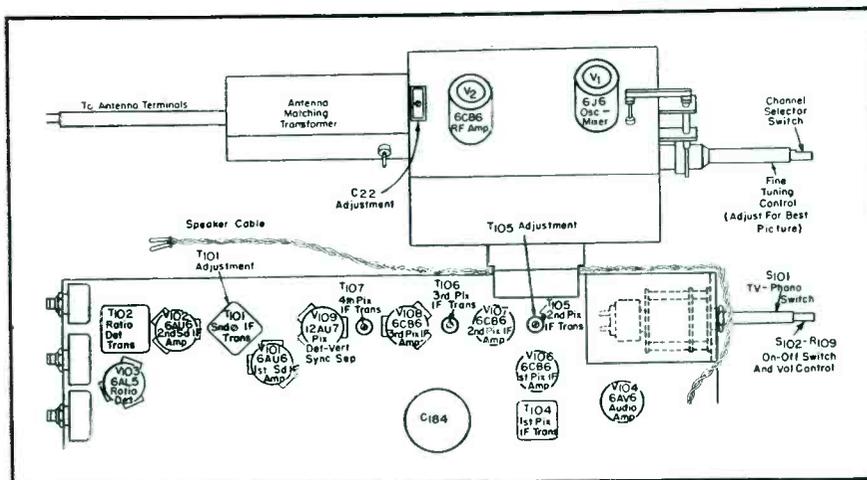
In the Motorola TS-325, TS-326 and TS-351 series of chassis, pickup of the vertical scanning frequency, by the grid of the first audio tube, can occur if the lead connected from pins 6 and 2 of the 12BH7 vertical output to the charge capacitor,  $C_{267}$ , is dressed too close to the grid (pin 1) of the first audio tube. The lead should be redressed as far as possible away from pin 1.

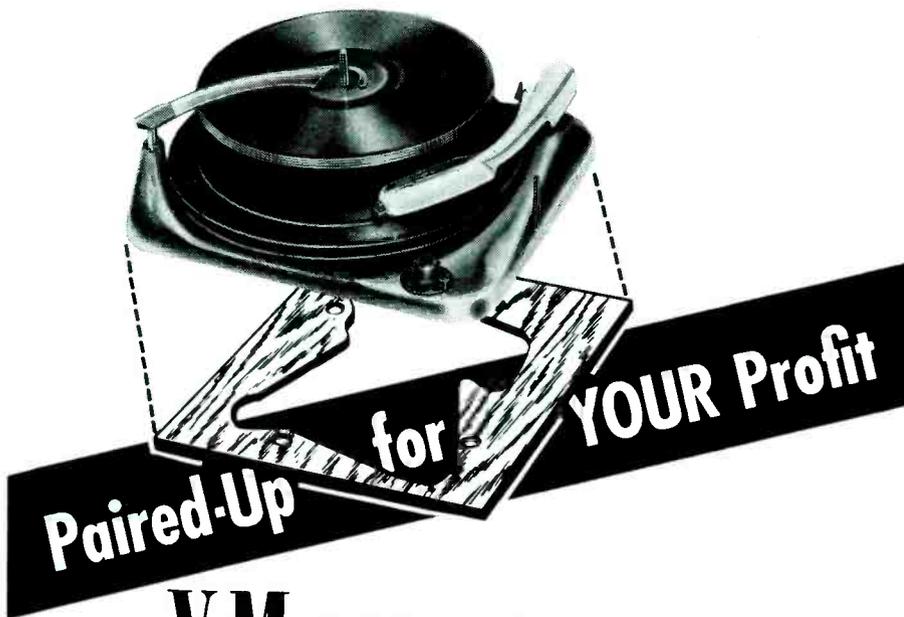
### Buzz From Overload Condition

Another cause of audio buzz, which cannot be eliminated when the verti-

(Continued on page 54)

Fig. 2. In weak signal areas, noisy sound may be experienced when receiving signals of 20 microvolts or less. To eliminate this condition, in RCA KCS72 series chassis, the picture should be watched closely and from the top of the chassis, the second picture *if* transformer adjustment should be turned one-half to one turn clockwise to improve sound. This adjustment should not weaken or decrease the picture contrast. On high channels, a slight improvement in both picture and sound may be obtained by retouching the *rf* tuner antenna trimmer ( $C_{22}$ ) which is located between the 6CB6 *rf* tube and antenna matching transformer unit. In some cases, retouching the tuning of the sound *if* transformer may improve sound.





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This pair helps you make the kind of installations you like . . . the profitable kind. Pre-cut mounting board saves work and time in changer replacements — helps you make more money per job. Best of all — V-M 951 changers have *ALL* the top quality features that make satisfied customers: play records of any size, any speed automatically and shut off after last record; simple, *absolutely jamproof* mechanism; patented tri-o-matic spindle that gently *lowers* records to spindle shelf to protect them from center-hole wear and chipping; plus all the other famous tri-o-matic features that have made V-M changers the most popular in the world today! Minimum mounting space, 13 $\frac{3}{16}$ " wide, 11 $\frac{7}{8}$ " deep, 7 $\frac{1}{4}$ " overall height. SEE YOUR V-M JOBBER FOR FULL DETAILS.

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**V-M CORPORATION** BENTON HARBOR, MICHIGAN



### Servicing Helps

(Continued from page 53)

cal oscillator is disabled, can be due to an overload condition which leads to limiting in the video *if* strip or, more often, in the video amplifier. The maximum amplitude of the composite signal is represented by the sync pulse level. If this level of signal causes a tube in the *if* strip to limit, it will mean that the video carrier is interrupted at sync frequency because the tube is periodically cut off at this rate. If the limiting is taking place

in the video amplifier, the 4.5-mc beat frequency, which has become the new audio *if*, will be interrupted at sync pulse rate. The latter is by far the common occurrence but, in either case, the buzz heard in the speaker is caused by this interruption at the vertical sync pulse rate of 60 cycles. The interruption, of course, happens also at the horizontal sync pulse rate but, since this is at a rate of 15,750 cycles, it is less likely to be heard.

Limiting in the *if* amplifier is usually caused by loss or marked reduction of the *agc* voltage. Generally, a gassy or leaky *if* tube, which allows grid

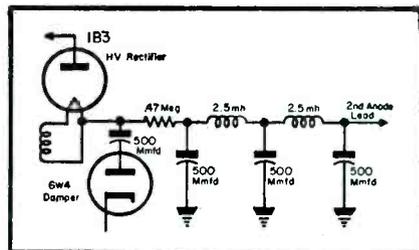
current to flow, will be responsible for this. To check for this condition a voltage drop across the 1.5-megohm resistor,  $R_{224}$ , in the *agc* line should be measured. If a voltage drop exists, some of the controlled tubes can be suspected of leakage. Another possibility is a bad germanium crystal. A defective crystal will usually also be accompanied by some degree of sync pulse compression, which leads also to poor sync stability.

In the Motorola TS-325, TS-326 and TS-351 chassis series, the operating point of the video amplifier tube has been shifted slightly by returning the grid resistor to a positive 5-volt source, the cathode of the first audio amplifier. In a normal to strong signal area, the probability of limiting in the video amplifier is greatly reduced by this means because the negative signal applied to the video amplifier grid must first balance out this positive voltage and the likelihood of strong signals being able to drive the tube to cut off is greatly reduced.

It is also possible that a poor picture tube can be responsible for sync buzz because the operator would have a tendency to set the contrast level too high to compensate for the poor tube. If the level is set at such a level that the video amplifier operates just on the threshold of limiting, it is quite likely that a change in camera or in modulation at the transmitter will result in sync buzz.

Another buzz possibility is in the incorrect operation of the area selector switch, especially in the case of the early versions of this circuit. In the later or *B* versions of the TS-325, TS-326 and TS-351 area selector switch circuit, the grid resistor of the video amplifier is returned to ground only in the fringe position. In the early version, this grid resistor was returned to ground also in the suburban position. Those located 30 or 40 miles from transmitters have been found to be inclined to operate the receiver with the area selector switch in the suburban position. Unfortunately, at this distance, signal level

Fig. 3. Circuit illustrating changes to be made in Admiral metal picture-tube chassis, to halt oscillator radiation, when it is not practical to install a glass tube. Additional filtering is introduced in the second anode lead, as shown. (See page 96 for further details.)



is quite often high enough to cause the video amplifier to limit with attendant sync buzz. To remedy this condition in the earlier sets the video-amplifier grid-resistor return must be rewired, in the suburban position of the switch, to the cathode of the first audio amplifier. This will permit operation of the switch in the suburban position without incurring sync buzz.

The misalignment of the video *if* or of the sound *if* has been found to be another possibility of sync buzz. Sometimes a relatively small readjustment of the sound take-off coil, or of the ratio-detector transformer primary or secondary tuning plugs can cure a buzz problem. Just as the vertical scanning frequency can be picked up by the audio tubes or circuits, it is also possible that the sync pulses themselves may be picked up in the same manner. An example of this is the first audio tube picking up the sync pulses from the cathode lead of the picture tube. To remedy, the lead should be dressed away from the tube, or the tube should be shielded. Shields have been added to the tube in later production.

#### Lamination Buzz

Often a mechanical 60-cycle buzz appears in the chassis. This is sometimes caused by loose lamination in a transformer; power or filament, the separate filament transformer used on some chassis for the heater supply of the damping diode, or the vertical output transformer. If caused only by loose laminations, the nuts on the clamping bolts should be tightened. Sometimes the entire winding will be found loose on the core. This can be cured by the careful insertion of wooden wedges between the winding and the core.

#### Admiral Service Data

*Eliminating Horizontal Sweep Interference in Broadcast Receivers:* As noted on several occasions<sup>1</sup> radiation of harmonics of TV horizontal sweep circuits will sometimes cause whistles or buzz to be heard on AM sets, particularly when the stations are weak. If the input signals to the broadcast receiver can be increased, by connecting a long wire antenna (at least 20' of wire) to the antenna terminal, the whistle may disappear.

If the interference cannot be eliminated with a longer antenna, trouble

(Continued on page 94)

<sup>1</sup>Kamen and Winner, *TV-FM Antenna Installation; Servicing Helps*, SERVICE, September, 1952.



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These features make American Beauty the Standard-of-Perfection on the world's production lines . . . where dependability, long life and efficiency are demanded.



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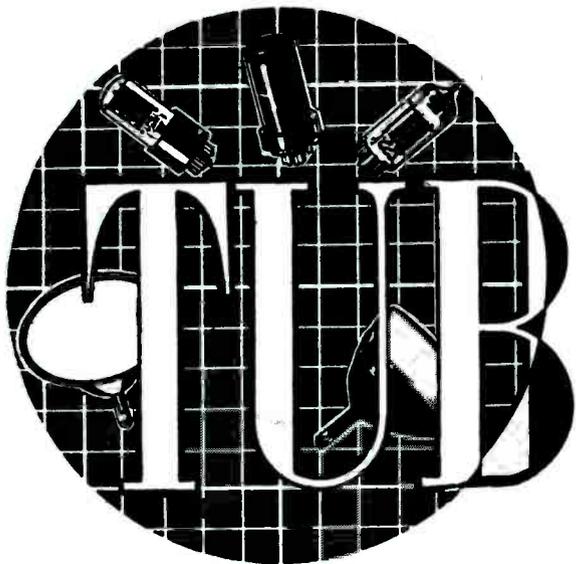
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# TUBE

## News

by L. M. ALLEN

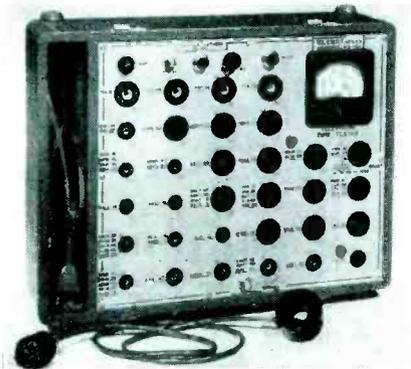


Above:

Receiving tubes designed for reception of present vhf and ultrahigh channels. (Courtesy G. E.)

Below:

Tube tester, model T-32 *TelcTest*, that it is said can test an entire set of TV tubes quickly, introduced by Anko Manufacturing Co., 7311 W. Burleigh St., Milwaukee 10, Wis. Tester is also provided with a picture tube adapter to check for picture tube emission and gas, heater cathode and leakage, without removing tube from the chassis. Tube sockets are marked; feature is claimed to eliminate need for tube selector scales or switches.



### **Transistor Design and Application . . . Characteristics of 27-Inch All-Glass Picture Tubes, TV Damper-Service Tubes and Twin-Diode Medium-Mu Triode for Auto Radios**

THE INCREASED USE OF TRANSISTORS by government, labs and commercial communication organizations, and a wave of publicity announcing that within a few months, practically all chassis would include these crystal components, has stirred up a hornet's nest in the servicing world. For dealers and consumers have been hammering away at Service Men asking if they knew when these sets would become available, and the only reply that appears to be available is . . . "next year. *maybe*."

Some manufacturers have indicated that they would announce soon lines of transistors for certain replacement purposes. But it will be a long, long time, before complete transistorized chassis start pouring off the production line. Since, however, the crystals will become available for some applications, Service Men should begin to familiarize themselves with their properties.

The transistor was born several years ago. It was discovered then that current through a *cat whisker*, in contact with a piece of germanium, could be changed by passing a smaller current through another nearby *cat whisker*. In fact, voltage, current,

and power amplification could all be achieved with this simple device consisting only a small germanium wafer and two pointed wires. Actually, the transistor can be compared roughly to the triode vacuum tube.

Germanium, a grayish-white, brittle, metallic element resembling carbon and silicon in some respects and tin in others, is the all-important material of which transistors are made at present. Electrons are controlled in the germanium in a fashion similar to that in which they are controlled in a triode.

#### **Two Types of Transistors**

There are two types of transistors: the point contact and the junction. Each has its own particular characteristic, and there are and will be applications for both.

The point contact type consists of a block of germanium upon which are affixed two close-spaced electrodes. The germanium block forms the base electrode and the two point contact electrodes are given the names *emitter* and *collector*. The transistor may be made to have a reversible property. That is, with reversal of bias voltages on the collector and emitter electrodes, the device may be made to amplify a signal in the opposite direction, a fea-

(Continued on page 58)

\*Based on notes prepared by John S. Saby, published in the *G. E. Review*, and a report appearing in the Stanford Research Institute bulletin.

# THE NEW **Webcor**<sup>®</sup> HF SERIES



## *America's Newest High Fidelity Diskchanger*

From the research laboratories of Webster-Chicago comes the new HF series Diskchangers—designed and engineered especially for the challenging task of gently, quietly and quickly changing records in the finest high fidelity installations.

Wherever one sees the handsomely designed Webcor HF Diskchanger, it is the symbol of both quality and luxury. No other changer made delivers the satisfaction that comes with the trouble-free operation of the master mechanical part of any HF installation.



- Webcor HF is a "push-off" type changer considered by experts to be the most gentle method of changing records.



- Webcor HF features the new Webster-Chicago Velocity Trip mechanism for fool-proof, jam-free operation with a minimum of lateral needle pressure.



- Webcor HF has one simple speed control, conveniently located. It is easily accessible in all types of installations.



- Webcor HF has an exclusive "muting switch" for silencing the amplifier during the record changing.



- Webcor HF series has the Webcor exclusive electrostatically flocked turntable which forms the thickest carpet to provide the softest cushion for record drop.



- Webcor HF series has an extra heavy mainplate made of 18 gauge steel. A bridge-like construction assures that the mainplate will never warp.

### The HF series is available in five models:

Webcor 127-HF—a base pan model equipped with turnover crystal cartridge.

Webcor 127-27-HF—a base pan model equipped for use with individual plug-in magnetic or variable reluctance cartridges.

Webcor 127-270-HF—a base pan model equipped with a G.E. Triple Play variable reluctance cartridge.

Webcor 126-HF—a replacement Diskchanger equipped with turnover crystal cartridge.

Webcor 126-27-HF—a replacement Diskchanger for use with individual plug-in magnetic or variable reluctance cartridges.

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by WEBSTER-CHICAGO

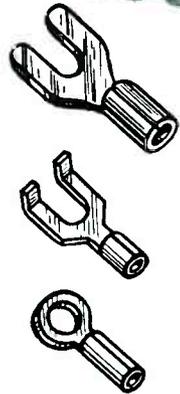
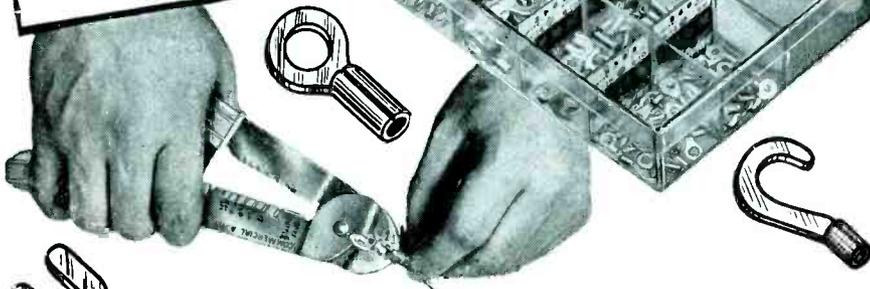


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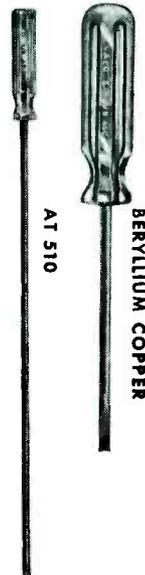
Now you can get a positive, trouble-free connection on every terminal... as fast as you can close your hand. No messy soldering or waiting for an iron to heat! With a Lynn *Lightning* service kit you just strip primary wire from 10 to 22 gauge with handy, combination stripping and crimping tool... select the proper terminal... then *crimp* it on. Every job quick, clean, professional-looking! Kit comes complete with crimping tool, 10 different types of terminals in 11-bin, clear plastic box. Only \$8.50

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Watching delivery of carload of Sylvania picture tubes to Pioneer Radio and Supply Company in Cleveland. Left to right: Ralph Fuller, store manager; Phillip Jeffrey, sales manager; Curtis Marling, manager of replacement parts; Herbert J. Farr, company president; Dan Wachter, Sylvania district manager; John Williams, purchasing agent; and Jack Whightman, service manager.

eration. Extremely high efficiencies are attainable with low distortion. However, its higher inter-element capacities may make it less useful as an amplifier at high frequencies than the point contact type.

Intensive studies in several directions have substantiated the existence of certain serious limitations, but at the same time have indicated that many may be overcome. Frequency and temperature limitations are among the most serious. Heating causes quite a shift in certain critical characteristics. The maximum operating temperature appears to be in the neighborhood of 60° C at this stage in transistor development. Circuit techniques incorporating the new types of operating characteristics introduced by the transistor are in the initial development stages.

Several developmental point-contact transistors have been made to oscillate at frequencies well up to 100-to-200 mc, and recently one reached a high of 225 mc.†

Tests conducted at transistor laboratories‡ have indicated that there is a definite correlation between the spacing of a transistor's contact points and frequency response. Generally speaking, it was found the closer the spacing, the higher the frequency.

Further tests have established that a transistor's frequency response and stability are also determined to a large degree by the resistivity of its germanium crystal.

### 27-Inch Rectangulars

A 27-inch all-glass rectangular television picture tube, featuring magnetic-focus and magnetic-deflection, and an aluminized backing on the screen is now available.\*\*

The tube, 27EP4, provides a 24 by 18½-inch picture. The length of the

## Tube News

(Continued from page 56)

ture which the vacuum tube does not have.

The junction transistor is an area-contact device. In its simplest form it consists of a single block of one type of germanium between two blocks of another type of germanium. Two features of the junction transistor are its low power requirement (1 microwatt to 100 microwatts, although power in the neighborhood of 100 milliwatts

may be tolerated) and the possibility of linear operation down to extremely low voltage and current levels. Oscillators using this transistor have been made to operate with the only source of power a small battery composed of a saliva-moistened piece of paper between a copper and silver coin. This has never been accomplished with vacuum tubes, nor is it likely, for the power required for a vacuum tube oscillator may be several million times that for a transistor oscillator.

The junction transistor characteristics are close to ideal for amplifier op-

†RCA \*\*G.E.

tube, from front to back, is less than 23 inches, about one inch shorter than 24-inch tubes introduced in '50. The space saving is said to have become possible by use of a 90° diagonal deflecting angle.

Recommended operating conditions for the 27EP4 are: Anode voltage, 16,000; grid No. 2 voltage, 300; grid No. 1 voltage, -33 to -77; ion-trap field intensity, 38 gauss.

#### Half-Wave Rectifier for TV

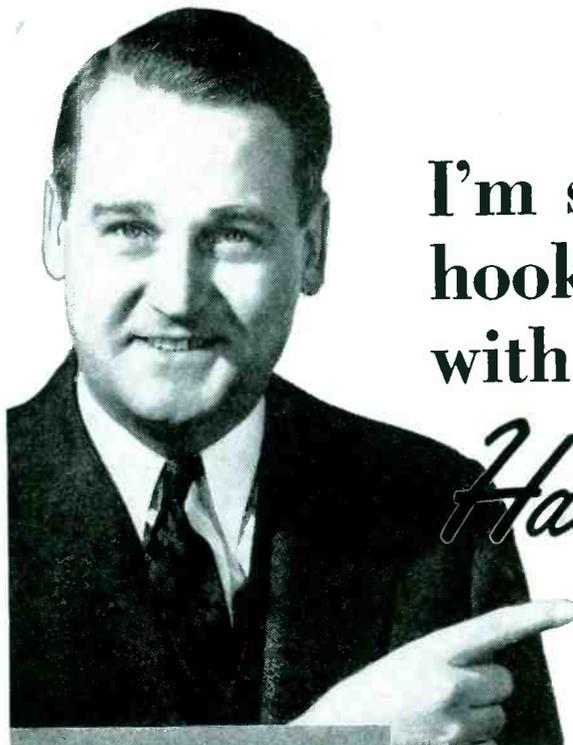
A half-wave vacuum rectifier<sup>‡</sup> of the heater-cathode type (6AX4GT) intended particularly for use as a  
(Continued on page 93)



(IN THE September issue, the captions for the picture-tube tester and rejuvenator, illustrated, were inadvertently reversed. The correct captions and illustrations appear above and below.) Above: Picture-tube tester which determines tube defects and also checks filament voltage, first anode voltage, bias voltage and the video signal. With the unit, the TV picture tube can be checked without removing it or the chassis from the cabinet. (Kine-Test; Vidair Electronics Manufacturing Co., Lynbrook, N. Y.)

(Below)

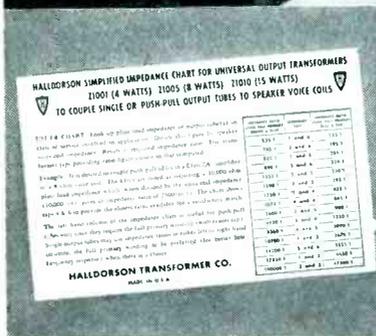
Picture tube rejuvenator which it is said can be used on all standard picture tubes. Rejuvenator is a plug-in unit which can serve a dual purpose: it can be used either as a flasher type reactor or as a permanently installed rejuvenator. (Model C; Crest Laboratories, Inc., Whitehall Building, Far Rockaway, N. Y.)



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This impedance chart, for example, is a marvel of condensation and simplification. When installing a universal output, I don't have to wade through a lot of useless figures to get the right coupling data. This short-cut saves my time and my temper.

Only Halldorson has permanent specification and hook-up data on each component, giving me complete data where I need it, when I need it. No more halted work, no more call-backs or writing for missing instruction sheets. It's the slickest idea I've seen.



Halldorson means more money in my pocket because I can do more servicing in less time, with the assurance that a job done will "stay-put," and with a feeling of confidence backed by Halldorson's 40-year reputation for quality plus. Now's the time for everyone to Hook Up with Halldorson . . . for one of the most diversified lines in America . . . staying ahead with new component additions that you'll need. Send for the Halldorson Catalog and regular bulletin releases . . . and be convinced!

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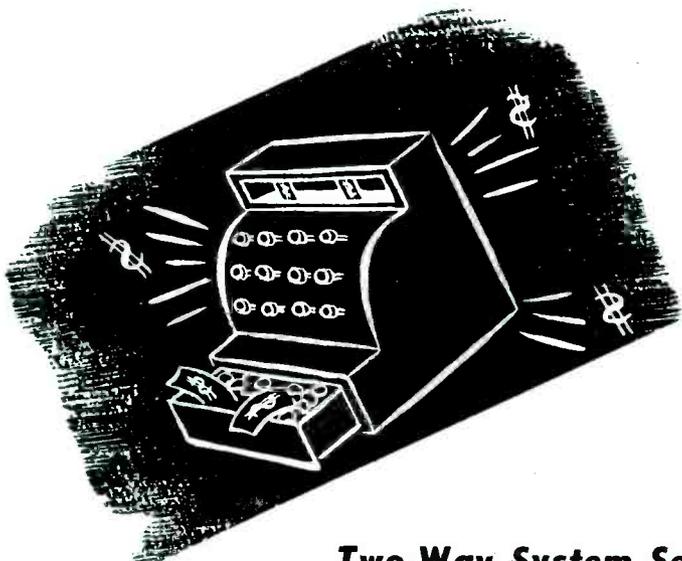
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# Business

## Aids . . .



### Two-Way System Servicing Possibilities\*

Dear Don Kay:

I've heard quite a bit about the possibilities in two-way equipment servicing, and would appreciate a discussion of these views. —M. T.

Dear M. T.:

Yes, the two-way field is a very lucrative one. To enter, though, it is necessary to have a Commercial Radiotelephone or Radiotelegraph operator's license, either first or second class, issued by the FCC upon the passing of an examination.†

Taxicabs, police, fire departments, power companies, REA cooperatives, pipe-liners, forestry men, and even the fish-and-game warden's cars are equipped with two-way systems.

Usually FM is used, and the equipment operates either in the 42-50 or the 152-162 mc bands. Installation is not too involved. In servicing, the usual troubles will be found in loose crystals, bad tubes and vibrators.

Often, it will be found possible to get a contract to maintain the equipment for a fixed fee, plus parts charged out at a discount.

One thing that will have to be tolerated, if you accept the responsibility for this type of station; paper work! The FCC demands records of all maintenance jobs work completed on transmitters. Checks must be made every six months, for frequency, deviation, modulation and plate power. One way to secure these data, unless there are many sets under contract, is to work with one of the test companies who specialize in this type of work. They will supply you with a modulation monitor, which will also check

[If you have a business-aid problem, send it to ye editor, and every effort will be made to publish a solution in an early edition of SERVICE.]



Micrometer frequency meter which measures center frequency deviation on any number of FM or AM transmitters, throughout a continuous range of frequencies, 0.1 to 175 mc. Features a micrometer capacitor, Cady crystal oscillator circuit, a stage of audio amplification and a function selector switch. (Model 105-B; Lamkin Laboratories, Inc., Bradenton, Florida.)

center frequency and deviation, for a small fee, which is charged to the owner of the system. Such equipment-supply companies can be contacted through any broadcast station.

Another profitable source of two-way income appears in aircraft radio. If you work on the transmitters, you

First in a series of billboard advertisements made available by the G. E. tube department through its distributors to television Service Men. On hand for the posting of the display for C. B. Klinedinst, York TV Service Shop operator, were, left to right: G. A. Bradford, manager of advertising and sales promotion for the G. E. tube department; Leo Hochberger of York Radio and Refrigeration Parts Company, G. E. distributor; Henry E. Plath, Jr., of the Klinedinst firm; C. B. Klinedinst; and Joe Hochberger of York Radio.



must have an FCC license, but receivers may be serviced by anyone. Quite a few light planes are equipped with one-way or two-way radio, and they aren't at all hard to service. Getting to the equipment after it's installed in the ship is usually the most difficult part of the job. Technically, loading the transmitter antenna properly, with the tiny antennas found on the grasshoppers presents the toughest assignment. A handy gadget for this can be made up using a germanium crystal, a small coil and capacitor, and a 0-100 microammeter meter. The crystal should be hooked up in series with the coil and capacitor, the combination roughly tuned to the transmitter frequency, and a short piece of wire, three feet or so attached to the unit, thrown over the fuselage, near the antenna. Then you should tune for maximum meter deflection. You're actually reading the *rf* output of the transmitter, without the decoupling effect of other kinds of resonance indicators. You can get along without the coil and capacitor, if the transmitter has enough output to give you a readable deflection without it. If you get too much pickup, the pickup wire should be moved farther away from the antenna.

You will find two-way servicing interesting and profitable, if the government's operational rules and regulations are studied carefully, and you become thoroughly familiar with the circuitry employed.\*\*

Sincerely,

DON KAY

\*Based on data prepared by Jack Darr.

\*\*In preparation, for early presentation in SERVICE, are a series of installation and servicing notes on two-way gear, based on actual shop and field experiences.

# What Rauland means by "Perfection Through Research"

Rauland is one of the few companies devoting so much top engineering talent full time to picture tube improvement and perfection.

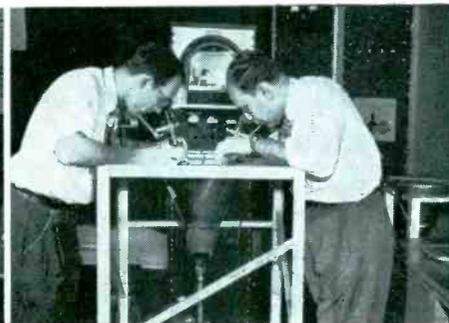
The result of this painstaking research has been to give you many more picture tube advancements since the war than has any other manufacturer . . .

more dependability and faster installation in the field for service dealers and service men . . . and greater assurance of customer satisfaction when you install Rauland replacement tubes.

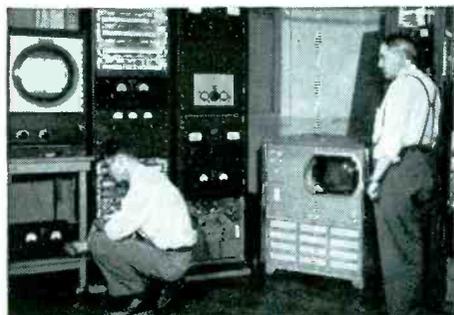
That's why more and more jobbers, dealers and service men are standardizing on Rauland replacement tubes.



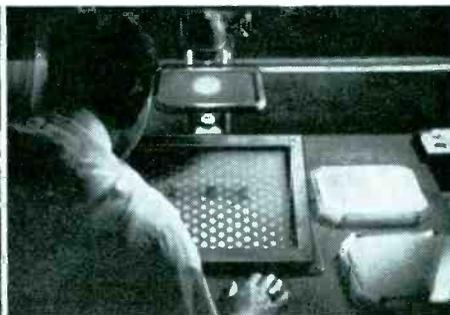
Rubber model for studying electron optical designing—basis for Rauland's exclusive Indicator Ion Trap.



Alignment of the screen and parallax mask of tri-color tube containing approximately a million fluorescent dots.



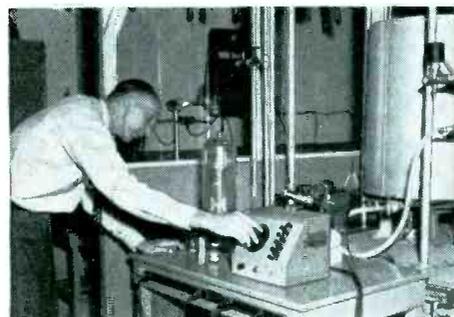
All-electronic tri-color tube in electronic receiver system (left) in comparison with mechanical system (right).



Inspection and checking of perforations .0075" in diameter in masks of tri-color picture tubes.



Rauland large-screen projectors using three different optical systems, all of which give theater-size pictures.



Careful study of the formation of thin metallic films in a vacuum . . . basis for the aluminizing of tubes.



Examination with polarimeter permits careful control of strains for superior glass-to-metal sealing.



A physicist using a Rauland-developed radiation meter in checking X-ray radiations from cathode ray apparatus.

## THE RAULAND CORPORATION

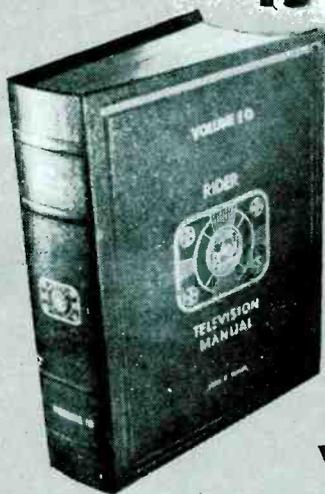


*Perfection Through Research*

4245 N. KNOX AVENUE • CHICAGO 41, ILLINOIS



# ANOTHER RIDER SMASH HIT is on its way!



## RIDER TV MANUAL VOL. 10

with replacement parts

Featuring a listing of dependable replacement parts. A FEATURE THAT CAN'T BE BEAT! In Rider's TV 10 you will find a reliable parts listing made up entirely of name-brand products. Products of such manufacturers as: Aerovox, I. R. C., Mallory, Sprague, Jensen, Clarostat, Ram, Stancor, Triad. Rider TV 10 selects correct replacement parts for you!

Rider Manual TV 10 is scheduled for Nov. delivery. It contains ap-

proximately 2000 (8 1/2 x 11) pages of complete authorized, factory-issued servicing data... covering TV receivers manufactured from March to September 1952. Make sure to order your copy today... it's \$24.00.

John F. Rider, Publisher, Inc., 480 Canal Street, New York 13, N. Y. West Coast Office: 4216-20 W. Jefferson Blvd., Los Angeles, Calif.

## Rep Talk

WARREN L. LOOSE has joined the staff of Harry Estersohn and Co., 7135 Germantown Ave., Philadelphia 19, Pa. Loose will call on distributors and industrials in eastern Pennsylvania (excluding Philadelphia) and western Maryland... *A. H. Bruning Co.*, 208 N. Wells St., Chicago, Ill. (Indiana, northern Illinois and southeastern Wisconsin) and the *M. B. Squires Co.*, 1202 Grant Bldg., Pittsburgh, Pa. (western Pennsylvania, southeastern Ohio and northern West Virginia), have been appointed reps for the Cornish Wire Co... *Lee B. Naylor*

*Co.*, 1250 First Ave. S., Seattle, Wash. (Pacific northwest); *Albert Leban Co.*, 218 Lloyd Lane, Philadelphia, Pa. (eastern Pennsylvania, Washington, D. C., Maryland, Delaware, southern New Jersey, Virginia); *Hy Mates*, 5510 Market St., Pittsburgh, Pa. (western Pennsylvania, West Virginia); *Grady Duckett Sales Co.*, 1145 Peachtree St. N.E., Atlanta, Ga. (North and South Carolina, Tennessee, Georgia, Florida, Alabama, Mississippi); *David H. Ross Sales Co.*, 1355 Market St., San Francisco, Calif. (northern California); and *Lawrence F. Zaffina*, 16717 Juliana, E. Detroit, Mich. (Michigan), have been named reps for Ram Electronics... Twenty-two new members have been elected to the Reps: *Buckeye* chapter—Seniors... *Frank A. Daugherty*, 100 Woodrow Ave., Bedford, O., and *Neil K. Hoskins*, 210 S. Frank-

lin, Chagrin Falls O.; associates... *James D. Toohig*, F. A. Daugherty Co.; *William Potapchuk*, Edwards-Lohse and Co., 2123 E. 9th St., Cleveland 15, O., and *Henry J. Schroeder*, A-N-B Specialties Co., P. O. Box 518 West Richfield, O. *Dirie* chapter—*H. J. Odom*, Stanley K. Wallace Associates, 2151 Beecher Rd., Atlanta, Ga., and *Harry A. Cole*, P. O. Box 6376, Jacksonville 5, Fla., seniors; *A. S. Engleman*, Murphy & Cota, 1409 Peachtree St., Atlanta; *Hoyt I. Giddings*, Grady Duckett Sales Co., and *Norman D. Williams*, Hollingsworth and Still, 407 Whitehead Bldg., Atlanta 3, Ga., associates. *New York* chapter—Seniors... *Jack Brown*, Jack Brown Associates, 25 Beaumont Circle, Tuckahoe, N. Y.; *Benjamin W. Gelb*, B. W. Gelb and Co., 1777 Grand Concourse, Bronx 53, N. Y., and *Frederick C. Spellman*, 206 E. 4th St., Brooklyn 18, N. Y. *Gerald M. Moch*, Wally Shulan Co., 136 Liberty St., New York 6, N. Y., was elected an associate. *Wolverine* chapter... *Albert C. Olsson*, 22111 Cleveland St., Dearborn, Mich., *Wilfred L. Kelley*, 7800 Intervale, Detroit 4, and *W. G. Henschen*, H. E. Walton Co., 128 Kercheval, Grosse Pointe Farms 30, Mich., have been elected associates... Los Angeles chapter has elected one new senior member: *Wedge Weber*, 1206 Long Beach Ave., Los Angeles 21... *Mid-Lantic*, *Hoosier* and *Southwestern* chapters have elected new associates: *C. William Frederick, Jr.*, Technical Representation, 506 Wyndmoor Ave., Philadelphia 18, Pa. (Mid-Lantic); *Milton E. Gamble*, Robert O. Whitesell and Associates, 2208 E. Washington, Indianapolis, Ind. (Hoosier); *R. J. Willison*, G. G. Willison Co., 1821 W. Alabama, Houston, Texas, and *E. P. Smith*, Edward F. Aymond Co., 4308 Maple Ave., Dallas 9, Texas (Southwestern)... *Earl K. Moore Co.*, 562 Sizeler St., New Orleans 21, La. (Louisiana, Arkansas, Mississippi, west Tennessee, Mobile, Ala.; Pensacola, Fla.); *Don H. Burcham Co.*, 917 S. W. Oak St., Portland 5, Ore. (Oregon, Washington, Idaho, Montana); *Berthold Sales Co.*, 4411 Maple Ave., Dallas, Texas (Texas, Oklahoma), and *Mel Pearson and Co.*, 1011 S. Josephine St., Denver 9, Colo. (Colorado, Utah, Wyoming, New Mexico), have been appointed reps for Standard Wood Products Corp... *Conrad R. Strassner Co.*, Los Angeles, Calif., now represent *El-Tronics, Inc.*, Ozark Wood Products Co., Pilot Radio Corp. and Premier Metal Products Co., in a four-state area... *G. S. Marshall Co.*, Pasadena, Calif., has added *William J. Enright*, formerly with Kierluff, and *Paul Butcher*, recently with Empire Electronics, to its staff... *Leonard L. Minthorne Co.*, Portland, Ore., has been named rep for Tricraft Products Co., in Oregon, Washington, Idaho, Montana and British Columbia... *Cobb Sales Co.*, 1629 Portland Ave., Louisville, Ky. (Indiana, Kentucky, Tennessee and Illinois, south of Bloomington); *Clyde H. Schryver Sales Co.*, 4550 Main St., Kansas City, Mo. (Missouri, Kansas, Iowa, Nebraska); *L. A. Nott and Co.*, 1601 Howard St., San Francisco, Calif. (northern California and northern Nevada), and *R. A. Stang Sales Co.*, 509 Fifth Ave., New York City (metropolitan New York, New Jersey north of Trenton), have been appointed reps for National Electric Products Corp.

# CATALOGS, BULLETINS ETC.



**Allied Radio Corp.**, 833 W. Jackson Blvd., Chicago 7, Ill., has published a 236-page catalog, *131*, listing 18,000 electronic, radio and TV components. Featured are hi-fi components and systems, TV chassis, boosters, rotators, *uhf* converters, antennas, recording equipment *pa* systems, builders' kits and supplies, books, manuals, diagrams, tools and hardware.

\* \* \*

**Heath Co.**, Benton Harbor, Mich., has released a 12-page catalog, describing nine new kits, four new models and two new probe kits. New kits include a  $Q$  meter, voltage calibrator, grid dip meter, vibrator tester, audio generator, audio oscillator, decade capacitor, battery tester and resistance substitution box, plus a 'scope demodulator probe and peak-to-peak voltage probe kit.

\* \* \*

**National Appliance Guide Co.**, 2132 Fordem Ave., Madison 1, Wis., has prepared a TV set trade-in guide, *TV Blue Book*, listing chassis of 30 manufacturers, and covering models from '47 through '52. Guide is said to disclose how to evaluate trade-ins, how to service them, and how to re-sell them. Book is expected to be available in November.

\* \* \*

**John F. Rider Publisher, Inc.**, 480 Canal St., New York 13, N. Y., has announced that TV Manual 10 will soon be available. Featured are replacement parts listings which check with the physical and electrical requirements of the original equipment used in the receiver. Manufacturers participating in Rider's replacement parts program include Aerovox, Clarostat, IRC, Jensen, Mallory, Ram, Sprague, Stancor and Triad.

Rider has also revealed that he will publish *High Fidelity Simplified*, described as the story of high fidelity from the point of origin, through the tuner or record player, into the amplifier, and then into the loudspeaker, and finally into the human ear.

\* \* \*

**Beam Instruments Corp.**, 350 Fifth Avenue, New York 1, has prepared a two-color leaflet describing the physical and electrical characteristics of the *Cossor 1039* portable 'scope.

\* \* \*

**Eagle Electric Manufacturing Co., Inc.**, 23-10 Bridge Plaza South, Long Island City 1, N. Y., has prepared a 48-page catalog detailing 1400 electrical wiring devices. Included are extension and cord sets, fuses, lamps, wall plates, push buttons, range cords and outlets, etc.

\* \* \*

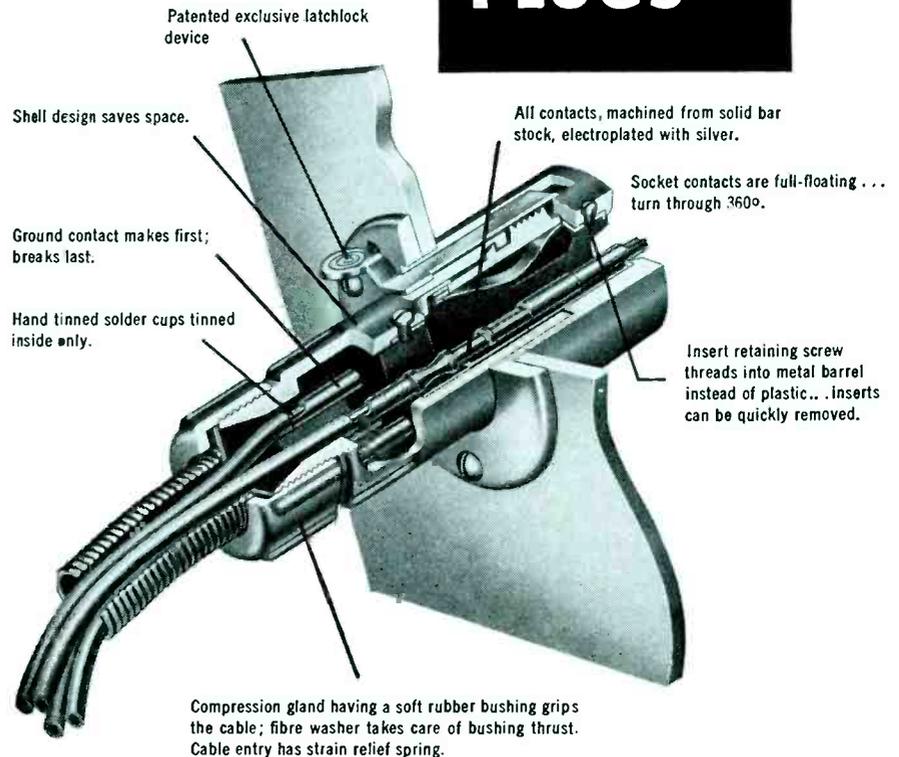
**Ward Products Corp.**, Division of The Gabriel Co., 1523 E. 45th St., Cleveland 3, Ohio, has made available a booklet, *Ward For You in '52*, which includes technical information on new antennas, plus descriptions of a number of merchandising aids available to the Service Man.

[Additional literature news on page 96]

Here's why those in the know

-demand

## CANNON PLUGS



No corners are cut... nothing is overlooked to assure you outstanding performance with Cannon Plugs. So long an engineer's choice, the words "Cannon Plugs" have become part of our electrical language. Continued excellence of design... ability to meet your changing requirements... are good reasons why the Cannon line of connectors continues to excel where specifications must be met. XL Connector Series is just one of the many Cannon types—world's most complete line. Request bulletins by required type or describe your needs.

## CANNON ELECTRIC

DEPT. J-135

Since 1915

LOS ANGELES 31, CALIFORNIA

REPRESENTATIVES IN  
PRINCIPAL CITIES



In Canada & British Empire: Cannon Electric Co., Ltd., Toronto 13, Ontario. World Export (Excepting British Empire): Frazer & Hansen, 301 Clay St., San Francisco.

There are 12 items in the XL line. Insert arrangements available: 3-15 amp. contacts, 4-10 amp. contacts—working voltage 250 volts. Zinc and steel plugs with bright nickel finish are standard. Satin chrome finish also available on steel plugs.

# ASSOCIATIONS



all the many trades and crafts . . . only one intelligent group today remains a slave in shackles, vilified, despised, disrespected and weak. . . . This group is the radio-TV Service Man . . . who has no one to blame but himself, since he will make no effort to unite with his fellow man, so that he can have his place in the sun."



Executive group of the Orange County chapter of the Long Beach (Calif.) Radio Technicians Association. left to right: Lyle Hansen, treasurer; Garry Austin, president; Russell Murrey, secretary; and Pop Menzie, vice president

## RTTG, Miami, Florida

AT THE COLUMBUS HOTEL, Biscayne Boulevard and N. E. First Street, in Miami, Florida, a novel display of a modern service shop was set up recently in the ticket office window of the Eastern Airlines, by the members of the Radio and Television Technicians Guild of Florida. Describing the unique exhibit in a recent issue of the RTTG bulletin, Tom Middleton noted that the boys designed and installed the display, and all of the distributors in the city contributed the equipment on view.

## TSA, Detroit, Mich

CONTINUING ITS excellent public relations program, through the medium of the *TSA News*, the Television Service Association of Michigan published a special *State Fair* edition of their organ, with articles on the threat of bait advertising by a BBB representative, activities at the recent TSA rally, preventive maintenance, TV bargain home calls and a primer of facts for the home TV set owner.

In a heartwarming report on the spirit of Service Men, it was revealed that TSA had voted unanimously, during one of their meetings, to take on

the servicing of 24 TV sets located in the Veterans Hospital at Dearborn and furnish all replacement parts, free of charge. Commenting on this generous move, TSA declared that they felt that this was the least they could do for those who had fought for them.

## ARTSNY, New York City

IN A SIZZLING COMMENTARY on the unfortunate laxity exhibited by some Service Men, the prexy of the Associated Radio-Television Servicemen of New York, Max Liebowitz, declared in an issue of their journal that "... of

## TRT, Kansas City

REPORTING ON the inauguration of a new training course on *basic circuits and the TV synchronizing generator* for members of the Television and Radio Technicians of Kansas City, in the 'scope section of the Electric Association of Kansas City bulletin, A. M. Bullock, association news editor, said that the course has been widely heralded.

Classes are 2½ hours in length, and the tuition fee for sixteen sessions is \$20, plus \$2 for eight printed pamphlet texts. Subjects to be covered include: *time constant of an r-c cir-*

Eastern Airline ticket office window in Miami, featuring service shop exhibit designed by members of the Radio and Television Technicians Guild of Florida, Inc., which was on view for three weeks. Spot announcements describing the unique display were provided by WTJV.



Viewing recent Capehart-Farnsworth president's cup presentation (presented to distributor whose service department excels in its execution of the distributor's service obligations, and who, in addition, accomplishes the most to raise television service standards for Service Men serving the general public) left to right: Al Haas, president of the Joint Electronics and Radio Committee on Service of Philadelphia; Ed Denham, Capehart regional sales manager; Ted Oestman, Capehart director of service, awarding trophy to Dave Trilling of Trilling and Montague; Jim Dailey, president PRSMA, and Ed Haugh, service manager for Trilling & Montague.

(Continued on page 94)

# Insist upon

## ELECTRONIC HARDWARE IN HANDY RE-USABLE HINGED COVER PLASTIC BOXES

it's the new

# G-C 50 LINE

NOW YOU CAN BUY all your radio-TV hardware—240 different items—in sturdy, re-usable *Hinged Cover* plastic boxes. Make your work bench neater and handier. Look for . . . ask for . . . the *Hinged Cover* hardware in the G-C self-service display at your distributor.



LIST PRICE 50c  
Subject to  
Dealers Discount



BUY WHERE YOU SEE THIS DISTRIBUTOR'S DISPLAY — HE HAS THE COMPLETE STOCK

**SPECIAL OFFER TO SERVICE MEN** — Handy steel rack for your bench or shop wall . . . holds 30 G-C Hinged Cover hardware boxes. See your distributor for details.



**GENERAL CEMENT MFG. CO.**  
ROCKFORD, ILLINOIS, U.S.A.

**NEW**  
**PROTECTIVE**  
**and NECESSARY**

\* **GOODLINE**  
*Sheath-Leed*

**FOR FINEST TV RECEPTION**

**FOR USE WHEREVER TOUGH WEATHER CONDITIONS PREVAIL  
TESTED AND RECOMMENDED FOR FINEST UHF—VHF RECEPTION**

**GOODLINE SHEATH-LEED**—a NEW DON GOOD PRODUCT—is our fine Standard \*GOODLINE AIRLEAD encased in a tubing of pure polyethylene of finest quality to protect it under all-weather and all-climatic conditions. It is especially recommended for use in coastal areas where salt spray encrusts the regular leadline, in hot humid areas, where much alternate rainfall and strong sunlight prevails and where leadlines are subjected to frost, snow and icy conditions.



Exhaustive tests made after two years have shown that the average flat or round 300 ohm leadline installed within two blocks from the ocean will give but 2 to 4 weeks of satisfactory operation due to salt spray deposits encrusting the leadline. With **GOODLINE SHEATH-LEED** protection, the product gives highly satisfactory service for a year and more.

For finest trouble-free reception—even in areas where more favorable weather Prevails—INSIST UPON HAVING **GOODLINE SHEATH-LEED** INSTALLED FOR YOUR LEADLINE.

**NO. 803-GS SHEATH-LEED:** STANDARD BROWN GOODLINE AIRLEAD. Sheathed in pure Polyethylene Standard Brown LEED-SHEATH (another new Don Good product). For 300 ohm use. 1,000 foot reels—standard length... Shorter lengths available.

**NO. 823-GS SHEATH-LEED:** Color—Golden-Clear Goodline Air Lead. Sheathed in Silver-Gray Pure Polyethylene LEED-SHEATH (another new Don Good Product). **GOLDEN-CLEAR GOODLINE AIRLEAD** is electronic polyethylene in its purest form, and when shielded from ultra-violet light with Silver-Gray LEED-SHEATH, the installation will give years of trouble-free service. For 300 ohm use. 1,000 foot reels—standard length... Shorter lengths available.

**NO. 733-GA: \*GOODLINE AIRLEAD. THE BASIS OF FINEST TV RECEPTION.**  
FEATURES: 1—Sharp, clean, "snow-free" pictures—with 80% of loss producing dielectric web removed. 2—Correct impedance for "ghost-free" reception. Nominal 300 ohms. 3—Lower in cost than other leadlines purported to accomplish same results. 4—Correct spacing for minimum radiation loss. Less than 1% of operating wave length. 5—Fully insulated—approved by safety experts. 6—Pure, electronic polyethylene insulation—specially treated by our chemists for extreme weather. 7—Highly efficient conductors: Flexible, stranded—to insure long life. 8—Easily installed with standard insulators. 9—Packaged: 100'—250'—500'—1,000'—2,500'. Colors: Standard Brown, Golden-Clear and Silver-Gray.

IF YOUR JOBBER or TV DEALER CANNOT SUPPLY, WRITE FOR SAMPLES AND NEW LITERATURE

\*Patent Pending. \*Trade Mark. U.S. and Foreign Patents Pending

**EXCLUSIVE LICENSEE AND SOLE MANUFACTURER**

*Don Good, INC.*

1014 FAIR OAKS AVENUE  
SOUTH PASADENA, CALIFORNIA

**OUTSTANDING GOODLINE PRODUCTS:**

DON GOOD, INC. Manufacturers: Sheath-Leed & Leed-Sheath Protection. Goodline Airlead.

**COTSEN AND OHLSEN WIN TUNG-SOL  
PROMOTIONS**

L. E. Cotsen has been appointed manager of renewal sales for Tung-Sol Electric, Inc., 95 Eighth Ave., Newark, N. J. Cotsen was formerly manager of the eastern division sales office.

Walter R. Ohlsen has been appointed sales manager of the eastern division. Ohlsen was previously a salesman in the metropolitan area.



Walter R. Ohlsen

L. E. Cotsen

\* \* \*

**TV ANTENNA SOUND FILM PRODUCED  
BY CHANNEL MASTER**

A film in sound and color entitled *The Antenna Is the Payoff*, narrated by Ed Thorgerson, is now available from Channel Master Corp., Ellenville, N. Y.

Covering basic and advanced antenna theory, the movie answers the questions most frequently asked about TV antennas, such as: How are antenna measurements made?; How accurate are the claims made for antenna performance?; What are the true characteristics of the basic antenna types?; What do antenna performance data, such as gain curves and polar diagrams, really mean?; How can the installation man best use this information for his own benefit?

Film is available for free showings at accredited schools and service associations.

\* \* \*

**G-C SELF-SERVICE PACKAGED  
HARDWARE**

A line of 240 packaged hardware items, *G-C50*, in hinged plastic boxes on self-service racks, has been announced by the General Cement Manufacturing Co., 919 Taylor Ave., Rockford, Ill.

Line will be found at jobbers on either a rotary, counter or floor-type display.

S. B. Valiulis, president of General Cement with G-C radio-TV parts merchandiser.



**NEWS**

**MILLER NEEDLE SALES AID**

Front end labels for replacement needle counter dispensers with illustrations of leading needle designs, arranged according to cartridge manufacturers, have been announced by the M. A. Miller Manufacturing Co., 1165-69 East 43rd St., Chicago, Ill.

**SPRAGUE TUBULAR CAPACITOR  
MAILER**

A mailing piece, designed to increase sales of *Telecap* molded tubular capacitors, is now available from the Sprague Products Co., 61 Marshall St., North Adams, Mass.

Mailer contains an illustrated sales story on the features of the capacitors, and complete listings, as well as a self-mailing return order blank for customer use, and comes with the distributor's name and address printed on the business reply flap, ready to mail to service customers. Quantities of the new mailing piece are available from Sprague by requesting Form M-482.

### LITTELFUSE IN NEW PLANT

A one-story plant, at 1865 Miner St., Des Plaines, Ill., has been opened by Littelfuse, Inc.



\* \* \*

### AEROVOX RESEARCH ACTIVITIES EXPANDED

Nine specialists have been appointed to new posts in the recently expanded research division of Aerovox Corp., New Bedford, Mass.

Henry Taylor has been promoted to assistant to the director of research.

Peter P. Grad has joined the company as technical director. He was formerly associated with the Borden Company as chief analyst. Rex Nicholson has been appointed research engineer. He served as technical superintendent for twelve years with Sangamo Electric.

Lenine Gonsalves has joined the research department in the capacity of electrical engineer. William B. Atchinson, Arthur Cattoti and Dr. Hans Cohn have been appointed senior chemists.

### ELECTRICAL TOWER PLANT EXPANDS

An expansion plan and incorporation, resulting in the addition of several new officers and enlarged facilities, has been announced by the Electrical Tower Service, Inc., Peoria, Ill.

Merle Cupp, original founder of the succeeded company, has been named president. Stanley Bernstein has been named executive vice president and general manager. Bernstein is also owner of Aerco Engineering Co., Peoria.

Other corporation officers include: Walter Greenberg, vice president; Bettye Bernstein, secretary, and Louis Glass, treasurer. Greenberg and Glass are connected with Electrow Supply Co., Madison, Wisconsin, a supply house for electronic and communication equipment. Louis Paley, a director, is associated with Magnecord, Inc., Chicago, as well as with the Madison firm.



Stanley Bernstein



Edgar Dailey

### SNYDER APPOINTS EDGAR DAILEY CHIEF ENGINEER

Edgar Dailey has been appointed chief engineer of Snyder Manufacturing Co., Philadelphia, Pa.

Dailey will be in charge of engineering in both the TV and radio antenna division and the automotive accessory division.

\* \* \*

### STANDARD COIL TO EXPAND

A 70,000-foot addition to the present building of over 40,000 square feet in Melrose Park will soon be built by Standard Coil Products, Inc., on a recently purchased 4-acre tract.



Vertical Sensitivity  
.018 RMS v.p.i.

Stable Band Width  
Thru 4.5 Mc

# JACKSON Oscilloscope gives you "dual service"

This is a high-quality, laboratory-grade 5" Oscilloscope that provides the "dual service" of both high sensitivity and wide band width.

## s p e c i f i c a t i o n s

**Vertical Amplifier**—Video-type frequency compensation provides flat response within 1.5 db from 20 cycles thru 4.5 Mc, dropping smoothly to a still useful value at 6 Mc.

**Sensitivity Ranges**—With a band width of 20 cycles thru 100 Kc, the sensitivity ranges are .018, 18, 1.8 RMS volts-per-inch. The wide band position 20 cycles thru 4.5 Mc has sensitivity ranges of .25, 2.5, 25 RMS volts-per-inch.

**Horizontal Amplifier**—Push-pull with sensitivity of .55 RMS volts-per-inch.

**Input Impedances**—Vertical: 1.5 megohms shunted by 20 mmfd. Direct to plates, balanced 6 megohms shunted by 11 mmfd. Horizontal: 1.1 megohms.

**Linear Sweep Oscillator**—Saw tooth wave, 20 cycles to 50 Kc in 5 steps. 60 cycle sine wave also available, as well as provision for using external sweep.

**Input Voltage Calibration**—Provides a standard voltage against which to measure

voltages of signal applied to vertical input.

**Vertical Polarity Reversal**—For reversing polarity of voltage being checked or for choosing either positive or negative sync. voltages.

**Return Trace Blanking**—Electronic blanking provides clear, sharp trace to prevent confusion in waveform analysis.

**Synchronizing Input Control**—To choose among INTERNAL, EXTERNAL, 60 CYCLE, or 120 CYCLE positions.

**Intensity Modulation**—60 cycle internal or provision for external voltage for intensity modulation uses.

**Additional Features**—Removable calibration screen—Accessory Model CR-P Demodulation Probe for Signal Tracing—All-steel, gray Ham-R-Tex cabinet. Total net weight only 26 pounds. Same height as other Jackson TV instruments: 13" H x 10 1/4" W x 15 1/8" D.

**Prices:** Model CRO-2, Users' Net \$197.50. Model CR-P Probe, Users' Net \$9.95.

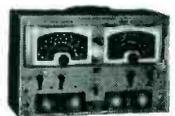
### TWO OTHER FINE JACKSON INSTRUMENTS

#### Model 655 Audio Oscillator



Sine-wave 20 cycles to 200,000 cycles. Less than 5% harmonic distortion between 30 cycles and 15,000 cycles. Frequency calibration accurate within 3% or 1 cycle. Hum level down more than 60 db of maximum power output. Output impedances of 10, 250, 500, 5000 ohms or HI Z resistive output.

#### Model TVG-2 TV Generator

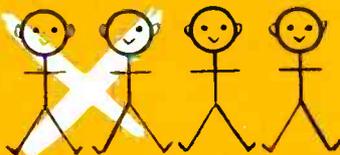


Sweep Oscillator in three ranges from 2 Mc thru 216 Mc, all on fundamentals. Reversible sweep direction. Sweep width variable .1 Mc thru 18 Mc. Marker covers 4 Mc thru 216 Mc. Crystal Oscillator to use as Marker or Calibrator. Video Modulation, from external source for using actual video signal for check, or for use with Audio Oscillator to produce bars for linearity checks.

See your electronics distributor for more information, or write

**JACKSON ELECTRICAL INSTRUMENT CO. • DAYTON 2, OHIO**  
"Service Engineered" Test Equipment  
IN CANADA: THE CANADIAN MARCONI CO.

it takes  
half the time  
and  
half the manpower



to install  
**Alprodco**

AIRCRAFT  
ALUMINUM TOWERS

**TO YOU, THAT MEANS . . .  
MORE PROFIT PER INSTALLATION!**

**Alprodco, Inc.**

Dept. E

KEMPTON, INDIANA  
MINERAL WELLS, TEXAS  
DUBLIN, GEORGIA

**INSULINE TV TOOL COUNTER DISPLAY**

A counter display cabinet of TV servicing tools, *Tele-Bin*, for parts distributors is now available from the Insuline Corporation of America, 36-02 35 Ave., Long Island City 1, N. Y.

Measuring 13 1/4" x 13 1/4" x 13 1/2", display contains an assortment of 165 various alignment and adjusting tools.



**BARAF NAMED CHICAGO PARTS SHOW PREXY**

Samuel Baraf has been elected president of the 1953 Electronic Parts Show which will be held at the Conrad Hilton Hotel in Chicago, May 18-21. Arthur Stallman will serve as vice president; Matthew Little, secretary, and Jack A. Berman, treasurer.

**ROBERT GRAY NOW RCA SERVICE COMPANY AREA MANAGER**

Robert C. Gray has been appointed area manager of the RCA Service Company in the northeast area.

Gray was formerly manager of TV technical operations in the company's home office in Gloucester, N. J. In his new post he will direct the activities of company branches in the New England, New York, and north Jersey territories. His headquarters will be in the RCA Building, Rockefeller Center, N. Y. C.

**G. E. APPOINTS NORMAN PICTURE TUBE MANUFACTURING MANAGER**

Richard A. Norman has been appointed manager of manufacturing for the G. E. picture tube operations at Electronics Park, Syracuse, N. Y.

Norman has been superintendent of subminiature tube manufacturing at the company's Owensboro Tube Works since last year.

**FRED R. ELLINGER ELECTED WALDOM PREXY**

Fred R. Ellinger has been elected president of Waldom Electronics, Inc., 911 N. Larabee St., Chicago, Ill.

Ellinger, who succeeds the late Jerome Prince, will also continue the operation of Ellinger Sales Co., midwest sales reps.

**MAURICE J. HAMMER NAMED GREAT LAKES AERIAL PREXY**

Maurice J. Hammer, formerly general manager of Ward Products Corp., has been named president and general manager of the Great Lakes Aerial Co., Inc., Detroit, Mich.

**J. A. MILLING TO HEAD AEPEN GOVERNMENT COMMITTEE**

J. A. Milling, executive vice president of Howard W. Sams and Co., Inc., Indianapolis, has been named chairman of the government relations committee of the Association of Electronic Parts and Equipment Manufacturers, Chicago, Ill.

As chairman of the committee, Milling will be in charge of the association's program in behalf of maintaining the mid-west's position as suppliers of military communications equipment during the present emergency.

\* \* \*

**HICKOK PROMOTES THREE**

Herb Johnson, sales manager, George Greer, works manager, and Frank Sawonik, director of purchases, have been named vice presidents of the Hickok Electrical Instrument Co., Cleveland, Ohio.

\* \* \*

**CHARLES F. ADAMS, JR., REELECTED RAYTHEON PREXY**

Charles F. Adams, Jr., has been re-elected president of the Raytheon Manufacturing Co., Waltham 54, Mass.

Other officers reelected were: Ernest F. Leathem, assistant to the president; David T. Schultz, vice president and treasurer, and Wallace L. Gifford, Ray C. Ellis, Percy L. Spencer, Norman B. Krim, David R. Hull and Ivan A. Getting, vice presidents.

\* \* \*

**DR. CARL F. MOEN JOINS E-V**

Dr. Carl F. Moen, formerly professor of physics at Pennsylvania State College, has joined Electro-Voice, Inc., Buchanan, Mich., as a senior engineer.

Also appointed to the research staff were: Norman Friedman, Lynn Talbott, James Wendt and Frank James, junior engineers; and John English, mechanical designer.

A new balcony with over 4,000 square feet of floor space has been erected at E-V to accommodate expanded laboratory activities.

\* \* \*

**RMS HOLDS TECHNICAL MEETING IN MEXICO**

A technical meeting, conducted by Martin Bettan, was recently held in Mexico by Radio Merchandise Sales, 2016 Bronxdale Ave., New York 60, N. Y.

Bettan addressed a group of over 196 dealers and Service Men, discussing the installation of TV antennas, uhf reception problems and related topics.

Among those present were Miguel Pereyra, director general of Mexican communications, and Joe Kaufer, service manager and engineer for the Phillips Company in Mexico, who served as translator.

Martin Bettan (left), director of sales at RMS, addressing American-Mexican TV technical meeting. Interpreter Joe Kaufer, of Phillips Co., at right.



**Superlative "Direct Drive" and "Vertical Drive" cartridges reproduce all the recorded music on these modern wide-range high-fidelity records.**



These Shure "Direct Drive" and "Vertical Drive" Cartridges have been perfected to meet the greater requirements of high needle point compliance and fidelity demanded by the fine-groove recordings. The cartridges provide extended frequency response, high output, and high needle point compliance. They also feature the famous "Muted Stylus" and "Simple Mount" needles designed for longer record and needle life, faithful tracking and clear full tone qualities. These individually replaceable needles are easy to remove and insert.

Patented by Shure Brothers, Inc., and Licensed under Patents of the Brush Development Co.



**SHURE BROTHERS, Inc.**

Microphones and Acoustic Devices

225 W. Huron St., Chicago 10, Ill.

Cable Address: SHUREMICRO



**"DIRECT DRIVE" CRYSTAL (W31AR)** High output (2.1 volts!) "Direct Drive" cartridge specifically designed for use with all fine-groove records. Universal mounting bracket provides quick, easy installation in RCA-type 45 r.p.m. changers. (Fits 1/2" and 3/8" mounting centers.) Has easy-to-replace needle. For maximum quality, highest output, and low cost, specify Model W31AR at the low list price of only \$6.50.



**"DIRECT DRIVE" CERAMIC (W31AR)** Same as Model W31AR, except for ceramic element and .65 volts output. Highly recommended in areas where heat and humidity make use of conventional crystal cartridges impractical. List price, \$6.50.



**"VERTICAL DRIVE" (W21F)\*** High-fidelity cartridge. Provides superlative reproduction for 33 1/2 and 45 r.p.m. records. Extended frequency response (50 to 10,000 c.p.s.). Low tracking pressure (only 6 grams) and high needle compliance guarantee faithful tracking and longer record life. Uses quiet tracking Shure "Muted Stylus" needle, scientifically designed for maximum performance and long life. List price, \$7.75.

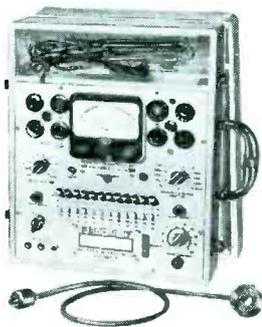
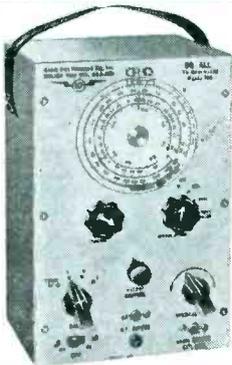
\*Cartridge with .453 Mount for Oak Changer

The Sensational New

# RCP

## 'DO-ALL' 3

COMPLETELY SERVICES TELEVISION



### TV "Do-All" GENERATOR MODEL 740

IT'S A

- SIGNAL GENERATOR
- AUDIO GENERATOR
- PATTERN GENERATOR
- MARKER GENERATOR

MODEL 740-Complete, **\$6950**  
Ready to operate . . . NET

### TV Set & Tube Tester MODEL 808

- ★ A TUBE TESTER
- ★ A CATHODE RAY TUBE TESTER
- ★ A CATHODE RAY TUBE REACTIVATOR
- ★ A VACUUM TUBE VOLTMETER (AC-DC)
- ★ AN OHMMETER

MODEL 808-Complete, **\$9995**  
Ready to operate . . . NET

### MIDGETSCOPE MODEL 533M

weights only 9 lbs.

Size: 11<sup>3</sup>/<sub>4</sub>" x 7<sup>3</sup>/<sub>4</sub>" x 5<sup>1</sup>/<sub>2</sub>"

SENSITIVITY:—Vertical—20 millivolts (.020 volts for 1" rms deflection on CRT face.)  
Horizontal—.6 volts.

MODEL 533M-Complete, **\$9950**  
Ready to operate . . . NET

Write for the latest RCP Catalog to Dept. SM-10

**RADIO CITY PRODUCTS CO., INC.**

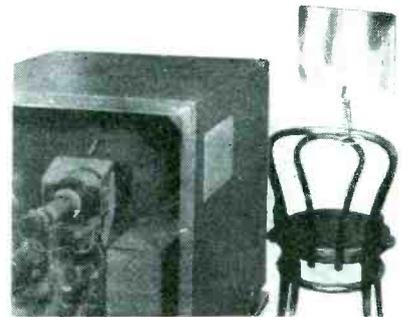
152 WEST 25th ST • NEW YORK 1, N. Y.



### G-C ADJUSTABLE METAL MIRROR

An adjustable metal mirror, 8198, for TV set servicing, has been announced by the General Cement Manufacturing Co. 919 Taylor Ave., Rockford, Ill.

Mirror, which measures 12" x 10" and is made of heavy chrome plated metal, is supplied with a rubber-lined spring clamp that can be clamped to a chair or other piece of furniture.



\*\*\*

### RMS OPEN-LINE WIRE SPLICER

A connector for splicing open transmission leadin, CON-450, featuring a clear lucite block into which the two wires from the lines to be connected are placed and held securely under screw pressure has been developed by Radio Merchandise Sales, 2016 Bronxdale Ave., New York 60

A lightning arrester and a spring-standoff, for supporting long horizontal spans of wire, have also been announced

\*\*\*

### HUNTER TV TUNING SLUG RETRIEVER

A tool, designed to retrieve the tuning slug in standard coil tuning units used in Packard-Bell, Olympic, Admiral, Hoffman, RCA and many other TV sets, has been developed by the R. N. Hunter Sales Co., 3499 East 14 St., Los Angeles 25 Calif.

Slug retrieving screwdriver incorporates a non-magnetized holding mechanism, which is said to enable Service Men to retrieve the slug without removing the chassis. Blade of the retriever is slipped into the tuning unit opening until it engages the slot on the head of the slug. When contact is made with the screw slot, a forward pressure on the handle of the tool seats the patented locking pin and the slug is then withdrawn and placed in its proper tuning position.



## TV Parts . . . Accessories

### DANBURY POWER LINE BOOSTER

A transformer, Danbury, designed to boost low line voltage, has been announced by the Danbury Transformer Corp., 27 River St., Danbury, Conn.

Booster, which approximates a 3" cube, can be hung behind the TV set, or placed between receiver and outlet.

### THORDARSON-MEISSNER POWER TRANSFORMER REPLACEMENT

A universal replacement power transformer, T26ROO, designed principally for the TV replacement field, has been announced by Thordarson-Meissner, Mt. Carmel, Ill.

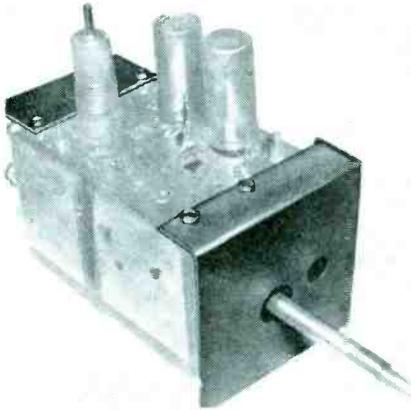
Through use of tapped secondary windings, two rectifier and four heater windings, model is said to replace power transformers in over 1,200 existing TV models. Other features include steel end shields, dual internal electrostatic shielding, plus heavy copper flux-shorting band.

Output voltages include: 300-360-420 v at 295 ma; one 5 v 6a and one 5v 3a rectifier, and four 6.3-7 3a heater windings.

**VIDAIRE TV TUNER BRACKETS**

Bracket sets for standard TV tuners have been announced by Vidair Electronics Manufacturing Co., Lynbrook, N. Y.

Sets, made to fit Philco and RCA tuners, are cadmium plated with bright finish.

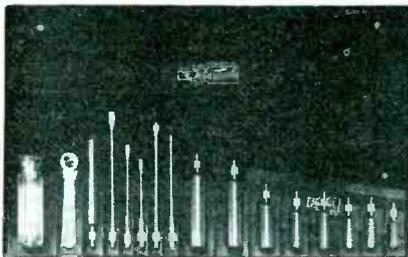


\* \* \*

**TELE-SCOPIC TV TOOL KIT**

A 17-unit tool kit, *Tele-Tool*, that features slip-on deep-wall socket wrenches in eight sizes from 1/4" to 3/8", has been announced by Tele-Scopic Products, Inc., 111 W. 42 St., New York 36, N. Y.

Kit features a ratchet wrench and an extension shaft, screw-driver blades (large, medium and small) and two recessed head sizes, etc. An amber handle is provided, as well as a plastic roll-up container with plastic pockets.

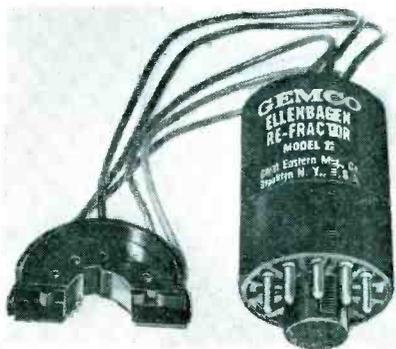


\* \* \*

**GEMCO RE-FRACTOR**

A self-levelling transformer, *Ellenbogen Re-Fractor*, that is wired in adaptor form so that the bias, grid, cathode and anode voltages applied to the picture tube remain unchanged, has been introduced by the Great Eastern Manufacturing Co., Brooklyn, N. Y.

Unit is said to increase the emission of a weak or dark picture tube. Can be installed by plug connection.



**three TIME-SAVING**  
**OHMITE Little Devil®**

**RESISTOR ASSORTMENTS**

**FOR RADIO-TV SERVICEMEN**



**WITH HANDY**

**PLASTIC CABINET**

**ALL FOR THE PRICE OF RESISTORS ALONE!**

Here's a handy all-plastic resistor cabinet that's a real time-saver. Five drawers, each with eight individually-labeled compartments, make it easy to locate the right resistor and to maintain visual stock control.

The 1/2-watt assortment contains 150 carefully selected Ohmite "Little Devil," individually marked, insulated composition resistors. The 1 and 2-watt assortments each contain 125 resistors. The assortments include the 40 values (10 ohms to 10 megohms) most frequently used by servicemen.

This cabinet is offered at the price of the resistors alone. See your jobber.



**CABINETS CAN BE STACKED ON EACH OTHER**

A dovetail joint is provided on top and bottom of each cabinet so they can be stacked one on top of another.

**OHMITE MANUFACTURING CO., 4878 W. Flournoy Street, Chicago 44, Illinois**

*Be Right with* **OHMITE®**

**RHEOSTATS • RESISTORS • TAP SWITCHES**

# AIM

MODEL No. RIM-70

**FOR THE FINEST TELEVISION PICTURES**

**AIM - AUTOMATICALLY MATCHES IMPEDANCE BETWEEN ANTENNA and RECEIVER**

There is always sure to be a difference (great or small) in impedance between the various types of antenna installations and the leadlines which carry picture impulses to the television receiver. To insure the closest possible reproduction as sent out from the studios, it is ABSOLUTELY NECESSARY that there be an EXACT impedance match between antenna, leadline and set.

**AIM** is the only known answer. **AIM DOES ITS JOB AUTOMATICALLY.** It's the "brain"—it does its own thinking. There is nothing to set at any time—no dials to turn—it's ready—just as you get it . . . "JUST INSTALL—THAT'S ALL."

**AIM WORKS ON ALL CHANNELS:** for V.H.F.—2 through 13, and U.H.F.—14 through 83.

**AIM HAS ALL THESE ADVANTAGES And FEATURES:**

**AIM:** Added signal strength helps to eliminate "snow." Provides clear, sharp pictures.

**AIM:** To get 3 to 7 additional decibels gain—on all channels.

**AIM:** To prevent standing waves on the leadline.

**AIM:** At the antenna—easily installed.

**AIM:** Compact—with Junction Box measuring only  $2\frac{5}{8}'' \times 1\frac{3}{8}'' \times 1''$  depth. Weighs only 8 ounces complete with U-Clamp and approximately 30' of AIM Wire.

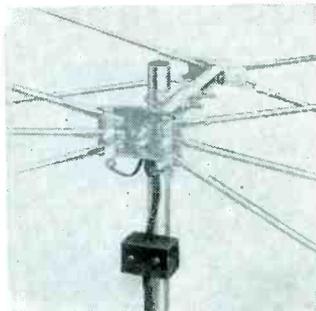
**AIM:** Individually packed in attractive plastic box. 12 boxes to Counter Display Carton.

**AIM:** FOR EVERY INSTALLATION—PAST & FUTURE. **AIM:** To make more TV friends and a steady profitable sale—ON EVERY INSTALLATION. You're RIGHT—when you AIM RIGHT.

**AIM** was developed by one of the country's largest aircraft manufacturers and is FULLY COVERED BY PATENTS.

**SOLD ONLY THROUGH DISTRIBUTORS**

**LIST PRICE: \$4.95**

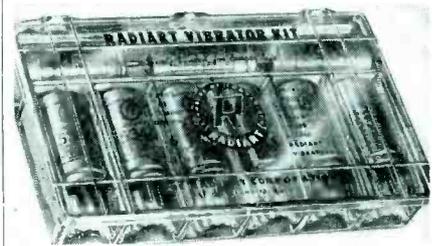


## Tools . . . Instruments Parts . . .

### RADIART VIBRATOR KIT

A vibrator kit, containing nine vibrators in a plastic box has been introduced by the Radiart Corp., Cleveland, O. In each kit there is a printed card containing the listings of car radios that can be serviced by the kit.

Each kit contains the following vibrators: two 5300; two 5301; two 5326; two 5342; and one 5335.

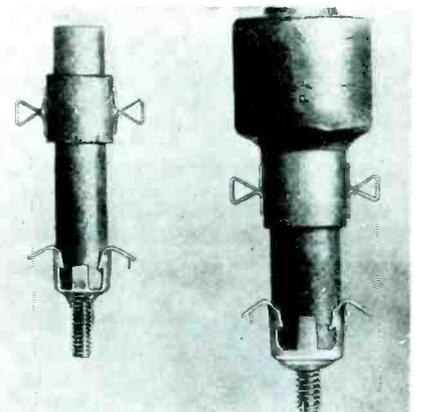


\* \* \*

### GRAYBURNE VARI-CHOKE AND COIL FORMS

A vari-choke, V-60, with an inductance range that is said to be variable from 30 to 130 mh, has been added to the line by Grayburne Corp., 103 Lafayette St., New York 13, N. Y. Coil section is  $\frac{3}{4}''$  diameter by  $\frac{5}{8}''$  long, and total overall length including snap-in mount is 2".

A series of ferrite-cored coil forms, with snap-in mounts, have also been announced. Sizes are: C1,  $\frac{1}{4}'' \times 1\frac{1}{8}''$ ; C2,  $\frac{1}{4}'' \times 2''$ ; C3,  $\frac{3}{8}'' \times 1\frac{1}{8}''$ ; and C4,  $\frac{3}{8}'' \times 2''$ .



\* \* \*

### IRC MOLDED CAPACITORS

A low-value molded capacitor, CAS,  $13/32''$  long x  $\frac{1}{8}''$  diameter, has been developed by the International Resistance Co., 401 North Broad St., Philadelphia 8, Pa.

Available in values from .22 to 2.2 mfd,  $\pm 20\%$  standard tolerance.

**ELECTRONICS MFG. CO.**  
9820 IRWIN AVENUE  
INGLEWOOD 1, CALIFORNIA

ALSO MANUFACTURERS: V.H.F. And U.H.F. ANTENNAS—HANDY PAD TUBES COVERS—ANTENNA CONNECTORS—TUBE REACTIVATORS—AUTO SPEAKER GRILLE KITS—VENT PIPE CLAMPS

### INDUSTRIAL OIL-FILLED CAPACITORS

A line of single-stud tubular oil-filled capacitors, G and H types, is now available from the Industrial Condenser Corp., 3243 N. California Ave., Chicago 18, Ill. In production are an 8 mfd (600 vdc), dual 4 mfd (600 vdc), 4 mfd (1000 vdc), and similar units of the same case size.

Capacitors are oil-impregnated and filled with Indco Oil A. Pyroteen filled capacitors are also available. Standard capacity tolerance . . .  $+20\%$   $-10\%$ ; temperature range . . . (Indco Oil)  $-40^\circ$  to  $+70^\circ C$  and (Pyroteen)  $-70^\circ$  to  $+90^\circ C$ ; power factor . . . (Indco Oil), 0.4% and (Pyroteen) .2%.

### CANNON MINIATURE CONNECTOR SERIES

A series of four miniature connectors, D series, has been released by Cannon Electric, Dept. 420, P.O. 75, Lincoln Heights Station, Los Angeles 31, Calif. Contact complement ranges from 15 contacts to 50, with the smallest having an overall length of  $1\frac{17}{32}''$ , depth  $31/64''$  and width  $27/64''$ , plus a solder pot extension of  $9/64''$ .

A nylon insulator is said to provide high dielectric qualities for gold-plated 5-amp contacts (No. 20 wire) which have a minimum flashover of 1500 vac rms. Series may be used as plugs on either side of the assembly by the addition of a junction shell, having an integral clamp.

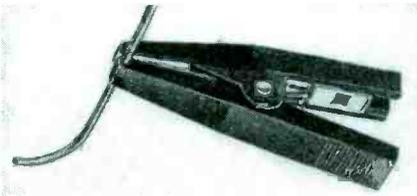
**GRAYHILL MINIATURE PUSH-BUTTON SWITCH AND TEST CLIP**

A miniature push button switch, 23-1, measuring 1.047" from end of plunger to end of terminal tips has been introduced by Grayhill, 4524 West Madison St., Chicago 24, Ill. Diameter is 1/2" at the widest point.

Contact resistance is reported to be .007 ohm maximum before use and .015 ohm maximum after approximately 200,000 operations. Switch has a spst momentary contact arrangement and is rated at 1/4 a, 115 v, non-conductive. Bushing, providing single hole panel mounting, is 5/16-32 thread.

An insulated, alligator-type test clip, 16, has also been introduced.

Clip is said to feature silver contacts and brass current carrying members silver soldered. Finger grips are of general purpose thermosetting phenolic.



Above: Alligator-type test clip.

Below: Miniature push-button switch.



**LEE CIRCUIT ANALYZER**

A circuit analyzer, E-C Dynamic T-V Serviset, that is said to require no external power, has been introduced by Lee Electronic Labs., Inc., 233 Dudley St., Roxbury 19, Mass.

Test set may be used as a rf-af signal tracer; rf-af signal injector; ac-de voltage indicator (0-60-550-20,000 v); dc polarity indicator (60-550-20,000 v); low-ohms continuity and short indicator (0-5 ohms); hi-ohms continuity and leakage checker (0-500,000 ohms); and for substitution and test for low capacity coupling, blocking and bypass capacitors, high-capacity electrolytic filters, high-value grid, plate load, agc and avc resistors, medium-value dropping and plate-load resistors, and for low-value cathode bias, current limiting resistors and filter chokes.

Features a high-impedance Alnico phone, extension cord, klipzon-type extension tip, TV high-voltage adapter, and a fabric pouch that provides compartments for all accessories including an instruction manual.

**S/C MINIATURE TUBE GUIDER**

A polyethylene guide wafer, Guide-A-Tube, which attaches to the base of a miniature tube, and is said to insure insertion of miniature tubes without damaging tube pins, has been developed by S/C Laboratories Inc., 37 George St., Newark, N. J.

*Servicemen — BOOST YOUR INCOME —*  
**SAVE HUNDREDS of DOLLARS**

—these **TRANSVISION** Instruments are *real necessities*—a "must" for your shop if you are not to throw good money away.

Here's why: —

1. **TESTING**—you can accurately test Cathode Ray Tubes.
2. **REACTIVATING**—you can save many dim or worn out tubes by reactivation.
3. **SPARKING OUT ELECTRICAL LEAKAGE** — many Cathode Ray Tubes develop electrical leakage. This can now be repaired.

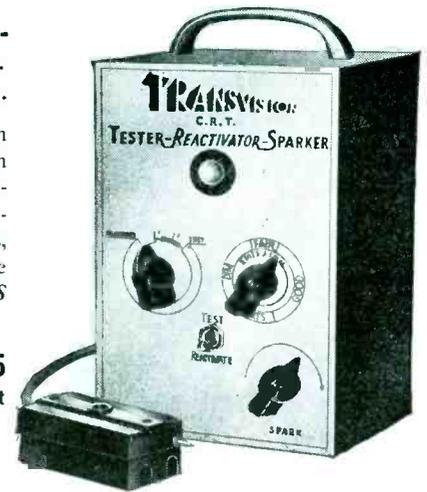
**CRT TESTER-REACTIVATOR-SPARKER**

3 Instruments in 1, making a complete CRT testing and repair unit. Compact, dependable, profitable.

It's a combination of the Transvision **TESTER-REACTIVATOR** and **TESTER SPARKER** in one handy instrument. It **TESTS PICTURE TUBES**—measures Cathode emission, locates shorts between elements, locates high resistance shorts or leakage as high as 3 megohms. **REACTIVATES DIM TUBES. SPARKS OUT ELECTRICAL LEAKAGE** in picture tubes.

Fully Guaranteed. ....

**\$34<sup>95</sup>** net



**CRT TESTER-REACTIVATOR**

2 Instruments in 1. As a **REACTIVATOR** it renews brightness, sharpness, and detail of old dim CR Tubes, without removal of tube. It's also an accurate **TESTER**: Measures Cathode emission, locates shorts between elements, locates high resistance shorts or leakage as high as 3 megohms. 110V-60 cycles; wt. 3 lbs. Fully Guaranteed. ....

**\$19<sup>95</sup>** net

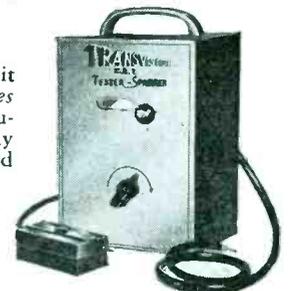


**CRT TESTER-SPARKER**

2 Instruments in 1. As a **PICTURE TUBE SPARKER**, it sparks out electrical leakage between elements. Saves many picture tubes and small tubes which would usually be discarded. Cathode-grid leakage is an especially common occurrence. The **Sparker** also gives a rapid check of gas condition of the tube.

As a **TESTER** it provides a variable 8,000-14,000 D.C. supply—useful for analyzing hard-to-solve deflection problems. Fully Guaranteed. ....

**\$19<sup>95</sup>** net



**FIELD STRENGTH METER** for better TV installations.

Make more efficient, more profitable TV installations, and save half the work, with the Transvision Field Strength Meter. Especially good for fringe areas—measures field strength as low as 10 microvolts. A great buy at this low price.

Model FSM-1, complete with tubes ..... **\$59** net



Order direct from **TRANSVISION, INC.**, New Rochelle, N. Y.

RUSH THIS COUPON

**TRANSVISION, INC.**, Dept. S-10S NEW ROCHELLE, N. Y.

Please send

\$ ..... deposit enclosed; send C.O.D. .... in full enclosed; send prepaid.

Name

Address

# Everybody Wins *with Miller* ... and it's **CASH!** Sell "Miller Needles" and Cash In!

• NO CONTESTS • NO PREMIUMS

## CASH FOR EVERYONE!

50,000 servicemen, dealers, etc. will win

Here's How:

Each Label  
Has a  
Cash Value!

Retain each label from every MILLER REPLACEMENT NEEDLE or CARILLON DYNAMIC CONVENTIONAL NEEDLE . . . Turn them in to M. A. MILLER MFG. CO. whenever you want — for CASH!

100 Labels from cards or packages you receive **\$500**  
(or more at same rate)

50 Labels from cards or packages you receive **\$225**

25 Labels from cards or packages you receive **\$100**

This offer is subject to all Federal, state and local regulations.

You are cordially invited to visit our new factory.



RELIABLE MANUFACTURER FOR OVER 35 YEARS

WITH MILLER NEEDLES YOU COLLECT REAL CASH!

M. A.  
*Miller*  
Manufacturing Co.  
New Address 4th & Church Streets  
Libertyville, Illinois

"Manufacturers of the world's largest line of long-life playback and recording needles"

### IDEAL ELECTRICAL TAPES

A line of electrical tapes, friction, rubber and plastic, has been introduced by Ideal Industries, Inc., 4025 Park Ave Sycamore, Ill.

Plastic tape, with a vinyl plastic body, is claimed to have a dielectric strength of over 8000 volts, resistance to acids, salts, water, oils, greases and alcohols, and retain its tackiness at low temperatures. Minimum thickness of plastic tape is .007", and two-way stretch is said to enable tape to fit snugly to irregular shapes and surfaces.

### RADIO-RECEPTOR TAPERED GERMANIUM DIODES

Tapered germanium diodes, featuring polarity at a glance, are now available from Radio Receptor Co., Inc., 251 West 19th St., New York 11, N. Y.

Each unit consists of a germanium wafer soldered to a nickel alloy cathode pin, and an electro-etched tungsten whisker welded to a nickel alloy anode pin, assembled into a glass-phenolic body. Entire assembly is impregnated with a special polyethylene compound using the vacuum-pressure method. Diode may be clip mounted by the terminal pins, or soldered in by rugged copper-tin clad iron pigtail leads which are welded into the pins.

Types available include the JAN 1N69, a general purpose and *whf* rectifier unit; 1N70, a high voltage diode, and 1N81, a medium voltage diode with very low back leakage near 10 volts; 1N4<sup>+</sup> and 1N51 general purpose diodes; 1N64 TV video second detector; and 1N65, *d* restorer.

### STAVE SUBMINIATURE SHIELDS

A combination shield, clip and mount *Sub-Mini-Shield*, that is said to dissipate heat through an aluminum wrap-around shield, has been announced by The Staver Co., Inc., Bay Shore, N. Y.

Available for tube diameters from a minimum .366" to a maximum .400", shield is of the overlap type. Shield mount is made of spring brass or phosphor bronze, and serves to clamp the shield for contact between tube and socket. Shield lengths are obtainable for tube types T3-1, T3-2, T3-3 and T3-4.

### DUMONT ILLUMINATED CALIBRATED 'SCOPE SCALE KIT

An illuminated calibrated scale kit 2562, for users of 'scopes who wish to bring their equipment up to date, has been announced by the Instrument Division Allen B. DuMont Laboratories, Inc., 1500 Main Ave., Clifton, N. J. Designed to fit any 5-inch 'scope with standard DuMont 2501 bezel.

Kit consists of four incandescent bayonet-type lamps with sockets, a bezel front and rear masks, a plastic rectangular-coordinate calibrated-scale, and a color filter. Lines on clear plastic scale are engraved 10 x 10 to the inch, with 1" vertical lines and 1/2" horizontal lines accentuated. Light from the lamps is diffused throughout the calibrated scale by means of four symmetrically arranged depressions on the scale.

Kit also includes a dimmer control consisting of a 6-ohm pot with a *spst* switch, black knob, and 30" of No. 18 stranded wire. Dimmer control, which may be mounted on the front panel of the 'scope, allows a continuous variation of illumination level of the calibrated scale.

### JCT VOLT-OHMMETER GUN

A volt-ohmmeter, *Meta-gun*, with a D'Arsonval meter set in the back of a case with a pistol grip, has been introduced by Jersey City Technical Laboratory, 880 Bergen Ave., Jersey City 6, N. J.

Plugin flexible probe projects from the front, as does a light bulb which is controlled by a switch on the grip. Ground lead plugs into base of handle. Range selection is made by the trigger.

Voltage ranges . . . 0-10, 100, 1000 ac/dc; and ohm ranges . . . R x 1, x 10, x 100 or R x 1, x 100 x 1000.

### SWITCHCRAFT ADAPTERS AND SHIELDED JACK

A line of adapters and a shielded jack have been introduced by Switchcraft, Inc., 1328 N. Halsted St., Chicago 22, Ill.

One adapter, 342, has a dual-purpose binding post banana jack input and a standard phone plug output. Binding post also accommodates the standard banana plug; standard pin plugs can be inserted through the binding post. Adapter 346 accommodates standard pin plugs only to the conventional phone plug.

Shielded jack, *CN-12A*, has a shield assembled and made a part of the jack. After the leads have been soldered to the jack terminals, the cover snaps into the mating housing. Jack is 1" diameter x 1 1/8" deep.

## High-Fidelity

(Continued from page 33)

morning glory horns and of early acoustical recording. Today, the high-fidelity audio assembly is expected to be capable of creating concert hall levels of sound intensity in the living room. This does not mean that the amplifier and loudspeaker must be able to furnish the same number of watts of acoustical power as a symphony orchestra, but that it must be able to produce an intensity level of sound in the living room which is equal to the intensity level of sound at a good seat in the concert hall. Since the living room is much smaller than the concert hall, acoustical power in the former is not spread as thin, and it takes far less power to accomplish the same result.

The amount of amplifier power required depends upon the size of the room, its reverberation time, the electroacoustical efficiency of the speaker system, and other factors. There is also the question of how much reserve power is to be included in the design for the purpose of handling occasional peaks, and to take advantage of the fact that the distortion rating of power handling components is improved when they are operated at less than their rated power levels. In the opinion of Dr. Olson, ten *clean* watts provide sufficient power and reserve for the average living room.

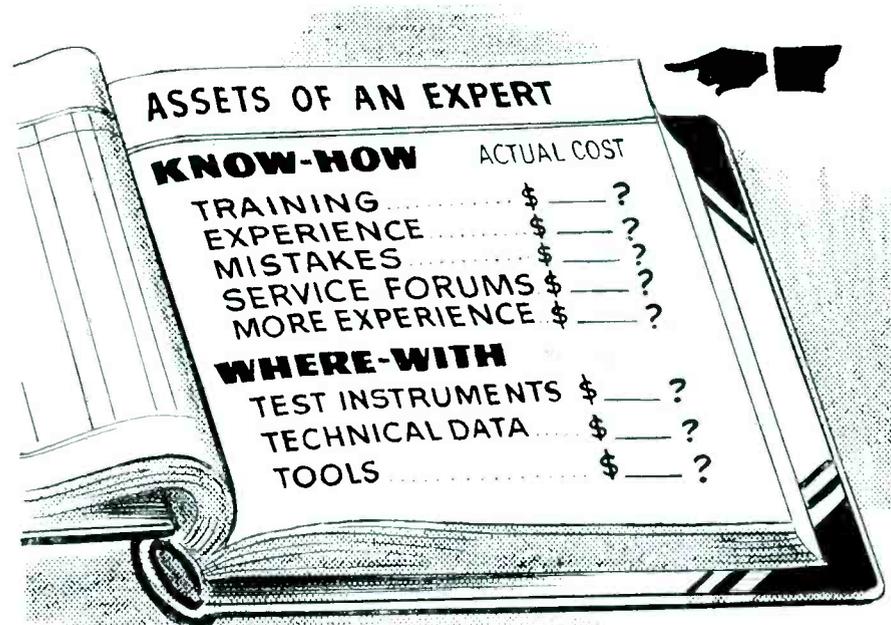
### Low Noise

The kinds of noise which are most frequently encountered in audio installations are hum, tube hiss, microphonics, and turntable rumble. The last of these can, in addition to its own contributing annoyance, create serious intermodulation products with the signal. In terms of technical ratings the total noise should be 60 db below the maximum signal level. A practical view will indicate that the noise level should be lower than the level of random noise in the room, and that it should be inaudible, or nearly so, at a normal listening position.

### Presence

All of the characteristics detailed cannot be achieved perfectly. They can be approached closely with good audio equipment, however, and when such is the case the overall result can be described by a very non-technical sounding term: The reproduced sound is said to have *presence*.

## "KNOW-HOW" and "WHERE-WITH"



A technician with thorough electronic training and adequate experience has the "know-how" that radio and television owners will pay for when their sets are in trouble. When the technician has invested in testing instruments and other technical aids for diagnosing trouble, he has the "where-with" to help convert this "know-how" to efficiency and profits.

Every technician realizes that all of the "know-how" that it is possible to acquire (through study, experience, and mistakes) is not worth much until he can make it pay off. If he were to stop and figure how much his "know-how" actually cost him over the years, in both time and money, he would be amazed at the amount. The average technician spends thousands of dollars before he is classed as an expert. The "where-with" investment is small by comparison.

Successful service technicians always consider the dollars and cents invested in training, experience, testing instruments and other technical aids when they establish their service charges. They know that the only reason any technician can consistently locate trouble in minutes instead of hours is because he has *both* the "know-how" and the "where-with."

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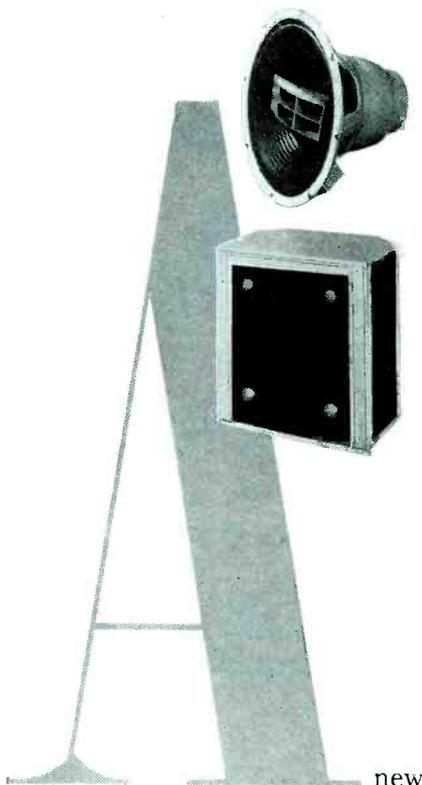
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PANEL METERS • SPECIAL PURPOSE INSTRUMENTS FOR GOVERNMENT AND INDUSTRY

Supreme, Incorporated

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## TV Antennas

(Continued from page 35)



new

12-inch coaxial, Jensen H-222 combines a special direct-radiator unit for frequencies below 2000 cycles, with a compression-driver high-frequency unit, loaded with a six-celled horn based on the famous Jensen Hypex\* formula.

Enclose the H-222 Coaxial in a Jensen Model BL-121 Back-Loading Folded-Horn Cabinet for superior acoustic performance. In this universal design, a long folded flare path expanding on the Hypex\* formula, gives better bass response—even when placed on a sidewall. In a corner, walls act as extensions of the horn.

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waves induce a current in the reflector element, radiating back to the dipole in phase with the incoming signal; Fig. 1, p. 35.

In applying the reflector theory to a vertical array, two dipoles were placed one above the other a half wavelength apart.

They were cut for full wavelengths on the high band and connected together by two transposed wires as shown in Fig. 2, p. 35. Since the dipoles were placed one above the other, it was found that the incoming wave striking the dipoles occurred at the same instant; therefore, the electrical charge on each element was in the same phase, voltage and current.

If the energy radiated from one dipole travelled through the air to the other, it would arrive out of phase and cancel out. It was noted that this is not the case in this instance, because the transposed wires carried *rf* voltage and current, and added in phase to the other dipole. To support this theory further another dipole was added to the array and wires transposed to add signal to the center dipole by way of the transposed wires.

### Low-High Band Results

The system was found to permit reception of the low band channels without interfering with the gain of the high band. This condition was found to obtain because the voltage curve on all elements was alike and crossing each dipole one-half way from the

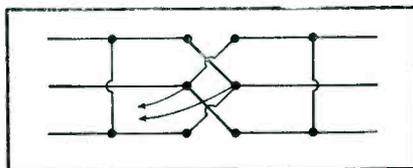


Fig. 4. Tying of elements together found to provide a better impedance match to transmission line.

Fig. 5. How regenerative antenna is connected for low-band operation. Heavy lines indicate that part of one side enters into opposite side; thus, one signal striking the center dipole is fed through the transposed wires to the outer elements on the opposite side and radiated to add to the signal on the other center dipole, providing a regenerative effect.

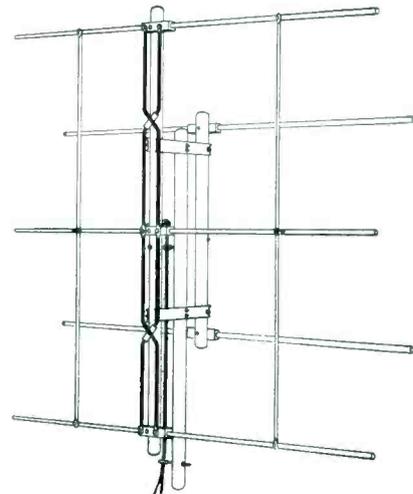
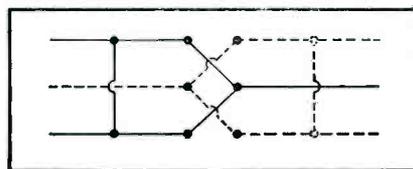


Fig. 6. Forward gain regenerative TV antenna. (Model 45-4F; Barb City Industries, Inc., 1150 S. Fourth St., DeKalb, Ill.)

center of each dipole. Since this point has zero voltage, all three points could be tied together without any harmful effects to the antenna. By tying these elements together a better impedance match to the transmission line was also available.

How the antenna looks when operating on the low band is illustrated in Fig. 5. The heavy lines indicate that

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6AK5	1.15	6CD6	1.79	12SA7	.57
6AL5	.45	6J5	.40	12SN7	.57
6AQ5	.51	6J6	.71	19BG6	1.44
6AT6	.41	6K6	.48	25BQ6	.90
6AU6	.45	6S4	.51	25L6	.50
6AV6	.41	6SN7	.57	35W4	.34
6BA6	.48	6T8	.83	35Z5	.40
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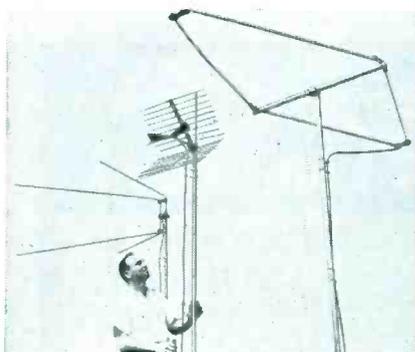


Automatic booster; 3-stage amplifier which it is said will deliver in excess of 18 db over all channels. Uses a cascaded circuit and three dual triodes. Additional features include automatic on-off operation with TV set, a switch for attenuating strong signals and *uhf* adaptability. (Model HA-3; Blonder-Tongue Laboratories, Inc., Westfield, N. J.)

part of one side enters into the opposite side. It was noted that one signal striking the center dipole, fed through the transposed wires to the outer elements on the opposite side, and radiated to add to the signal on the other center dipole, providing a regenerative effect.

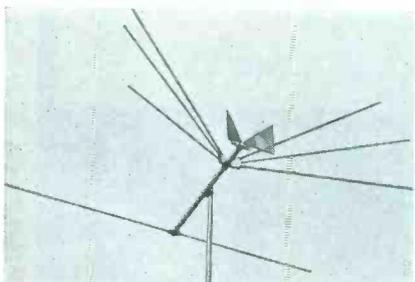
In one probe of the antenna's performance, it was decided to test it near

(Continued on page 78)

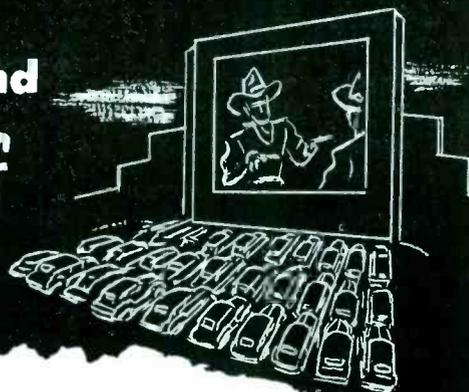


Above, line of *uhf* antennas: single and stacked Vs, corner reflectors, and rhombic. Stacked V antenna is a broad-band *uhf* type. Diameter of the rods is 4", while the dipole's lengths is 55". Stacking is approximately 1/2 wavelength apart at lowest operating frequency. Corner-reflector is claimed to offer up to 12 db gain. The reflector grids are of solid aluminum.

Below, *vhf/uhf* antenna which is said to combine the principles of the fan-front antenna with a broad band triangular dipole *uhf* antenna. The *vhf* section is claimed to deliver close to 9 db gain. (Models above are 100, 400 and 200. Below is a Jet 283; JFD Manufacturing Company, Inc., 6101 16th Ave., Brooklyn 4, N. Y.)



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## TV Antennas

(Continued from page 77)

Benton Harbor, Michigan. Here antennas require rejection of channel 7 from Grand Rapids, Michigan, and forward gain on 4, 5, 7, 9 from Chicago; channel 3 must also be admitted from the rear.

To accomplish this, elements cut to channel 7 were placed behind each of the front dipoles to reject channel 7 from the rear. Forward gain was required on 4 and 5, and thus two reflector elements were placed between the channel 7 rejector elements to permit forward gain on 4 and 5. These reflector elements were cut so that the frequency length was between 3 and 4. Since the element was too long for channel 4's resonant frequency and too short for channel 3's resonant frequency, the elements acted as reflectors on 4 and 5 and as directors on channel 3 from the so-called rear of the antenna.

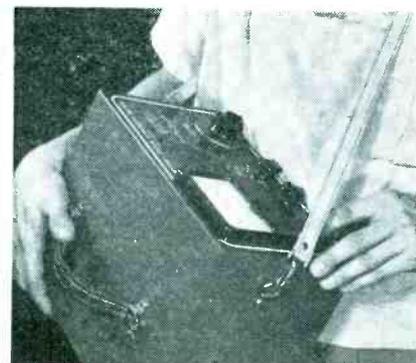


(Above)

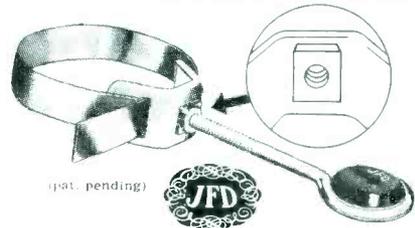
Automatic impedance matching unit, which it is said not only provides additional gain on all channels but eliminates interference. (AIM; Rysel Electronics Manufacturing Co., 9820 Irwin Ave., Inglewood, Calif.)

(Below)

Field strength meter designed for measurements of both uhf and vhf signals. A speaker is included to provide audible indication. Supplemental equipment in the form of a battery pack permits the use of the meter in locations where power is not available. Channels 2 through 82 are covered; 72 or 300-ohm input. Signal strength from 0 to 50,000 microvolts can be read on a 4½" rectangular meter. (Model IT-105R; Industrial Television, Inc., 369 Lexington Ave., Clifton, N. J.)



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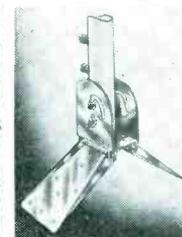
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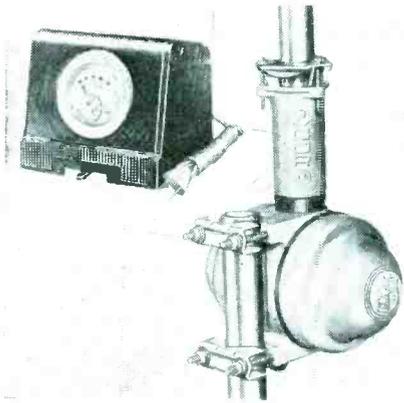
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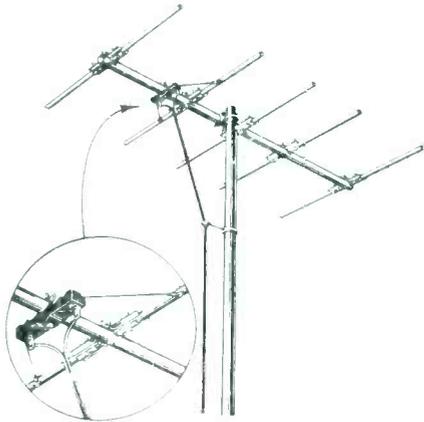
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(Above)

General-purpose rotor which has a meter-control dial, finger-tip control lever and 4-wire cable. Features of the rotor operation are said to include quick mounting antenna mast collet, high torque and instant locking, eliminating drift. Will fit all standard towers and take antenna masts up to 1 1/2" od. (TR-11; Radiart Corp.)

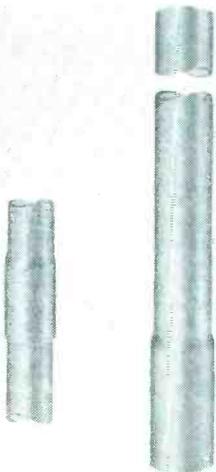


(Above)

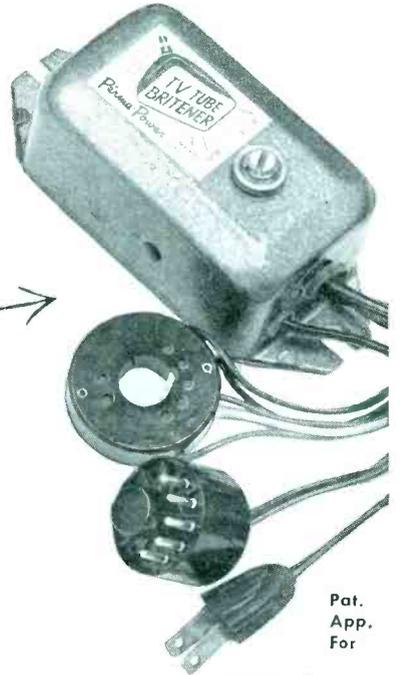
Yagi available in five, eight, and twelve-element models which incorporates a delta matching system said to provide exact 300-ohm termination. Delta line; Vee-D-X)

(Below)

TV antenna mast section available in 10' long sections, with reinforced end supports. Has three coat finish inside and outside; rustproof Bonderized with a coat of primer paint and a coat of baked heavy plastic enamel. (M10-X; Synder Manufacturing Co., Philadelphia.)

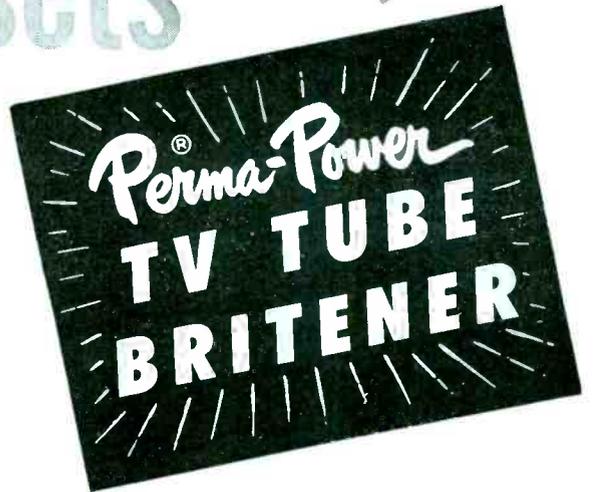


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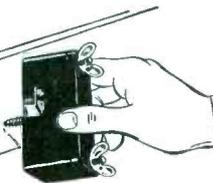
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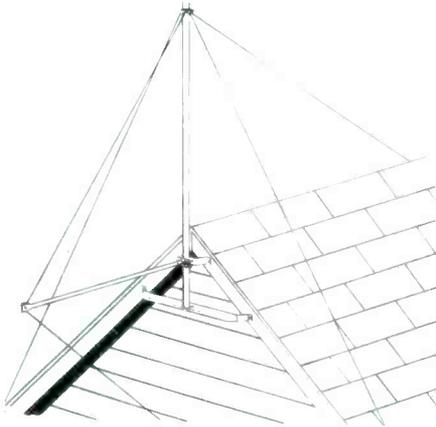
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## TV Antennas

(Continued from page 79)



(Above)

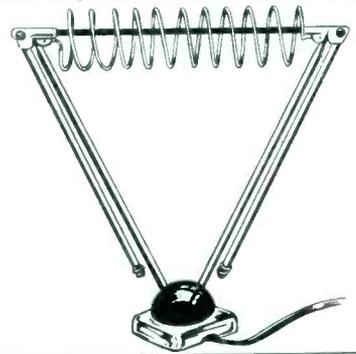
Strut for supporting guy wires. Masts requiring guy wire supports can be mounted on the side-wall or eave of a building and the guy wires supported on the open side by the new strut. Strut can be clamped to a mast, lagged to a wall or bolted directly to eave mounts and most popular types of wall brackets. An added feature is a built-in cable clamp on the outer end of the strut which locks guy wires in place preventing vertical movement. The strut is made of tubular steel with a welded base and has a weather resistant finish. (Model S40; Kenwood Engineering Co., Inc., Kenilworth, N. J.)

(Below)

UHF-VHF field strength meter designed to determine the strength of signals available at any given location. Also useful in determining the relative efficiency of different types of antennas as well as the optimum height. VHF range is continuous from 52 to 218 mc, with sensitivity at 60% meter deflection per 100 mv input. UHF range is continuous from 470 to 890 mc, with sensitivity at 50% meter deflection per 100 mv input. Number of tubes used, 11. (Erwood, Inc., 1770 Berneau St., Chicago 13, Ill.)



Helix-type indoor antenna featuring a dipole which can be folded or extended to accommodate receiving conditions. (Beta Beam; K-G Electronics Corp., 1766 Clybourn, Chicago 14, Ill.)



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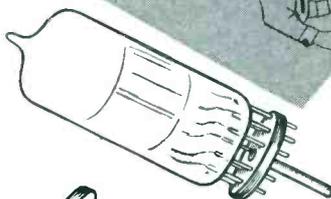
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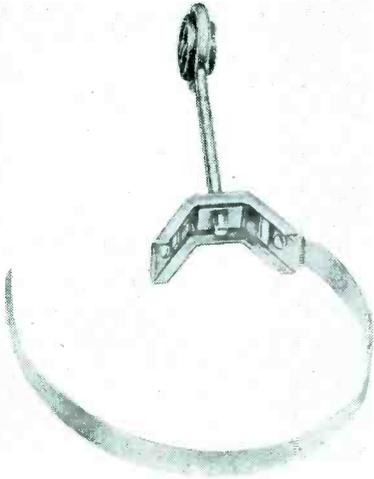
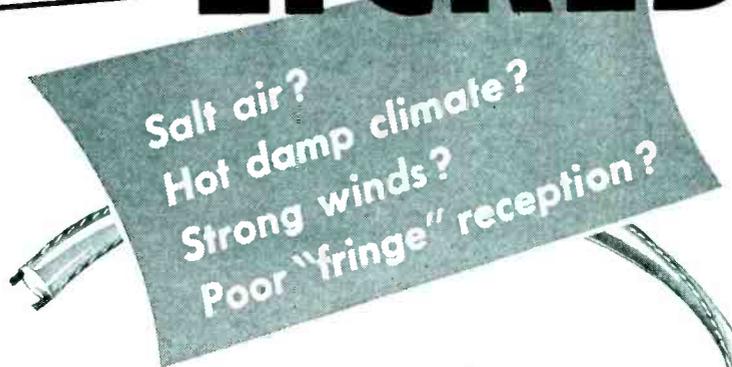
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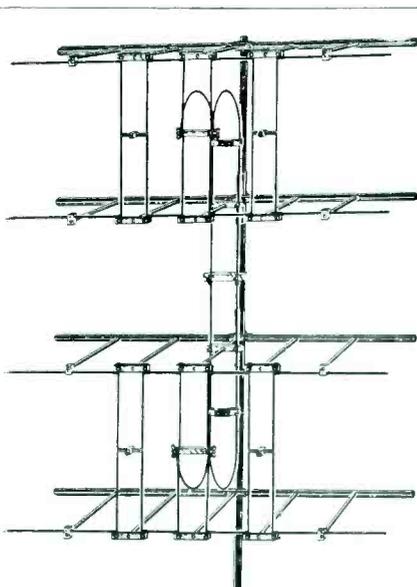
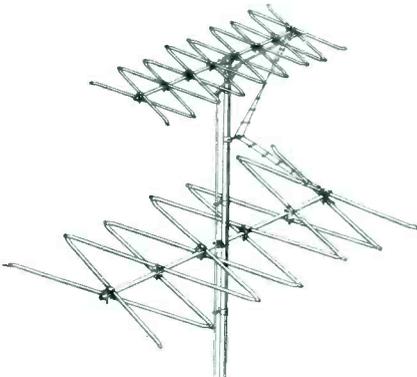


(Above)

Mast standoff insulator with stainless steel strapping. Strapping is joined to the buckle with a stainless steel rivet. Additional feature is the bent lip buckle which is provided with a pressed-in nut. The pressed-in nut has generous threading and claimed to provide better tightening. (Models MC-3S and MC-7S for 3½" and 7", respectively, and DMC-3S and DMC-7S dual type mast standoffs; RMS.)

(Below)

Zig-Zag TV antennas whose construction is said to be such that on any one channel there are resonant elements and the remaining elements act as efficient directors and reflectors. All elements are end-connected in one continuous series. Eight models are available for reception in ultra-fringe, near-fringe, suburban and metropolitan areas. (Trio Manufacturing Co., Griggsville, Ill.)



(Left)

Foldable, multiple bay, colinear antenna. Patented construction process is said to afford higher gain by eliminating at least 32 element connections from this type of design, reducing resistance, and interference from oxidization, corrosion, and wear. Antenna contains 12 high-band elements and 8 low-band elements. It is preassembled for quick rig. (Skyline Mfg. Co., 1458 E. 17th St., Cleveland 14, Ohio.)

(Right)

Bill Connors, Ward rep, checking shipment of Ward antennas to L. B. Walker Radio Co. in Denver.



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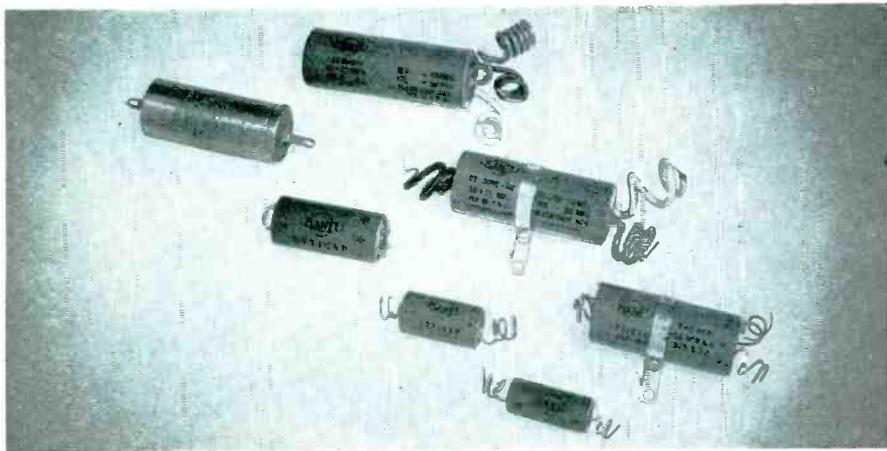
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Custom engineered to your specifications or supplied from stock, Planet capacitors meet the highest standards of the industry. Every capacitor is tested mechanically and electrically throughout its manufacture.

This rigid system of quality control makes our unconditional one-year guarantee possible. But making Planet capacitors right from the start means reasonable prices too!

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SEE YOUR *Jensen* NEEDLE DISTRIBUTOR  
TODAY FOR DETAILS AND ENTRY BLANKS.

## Audio

(Continued from page 40)

cycling cam; out-of-round knurled roller; bent turntable shaft, etc.

### Additional Phono Servicing Hints

**Motorboard Tilt Check for Pre-Trip or Failure to Trip:** When properly adjusted, the motorboard may be elevated by raising the front edge approximately  $\frac{3}{8}$ " ( $3^\circ$  from horizontal) without having pre-trip or continuous-trip occur. A similar check may be made by elevating the rear edge of the motorboard by approximately  $\frac{3}{8}$ " without having failure to trip occur.

**Cartridge or Stylus Replacement by Removing Pickup Arm:** When a crystal cartridge or stylus replacement is required, it may be more convenient to remove the entire pickup arm than to remove the cartridge with the pickup arm in position. This can be done without changing the under-motorboard landing and tripping adjustments, if the following method is employed: The pickup arm should be removed by loosening the arm mounting screw located under the housing at the rear of the pickup arm. The arm should be lifted from the shaft and turned over, and the cartridge or stylus replaced. The reject lever should then be pressed and the changer run part way through its cycle by rotating the turntable clockwise by hand with one record on the turntable. The pickup arm should be reinstalled on the shaft at approximately correct position and the mounting screw tightened just enough to give a slight amount of friction. The turntable should continue to rotate during the period the arm is moving down, stopping when the stylus is about  $\frac{1}{8}$ " above the recording in the landing position. The arm should be moved sideways then, as required.

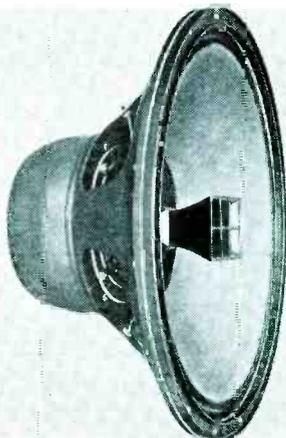
Three-speed record changer designed to play automatically all records on both sides in proper sequence without turning them over, which features use of a *Plan-Tone* hi-fi phono pickup (Playmaster; Markel Electric Products, Inc. Buffalo, N. Y. *Plan-Tone*; Planstiehl Chemical Co.)



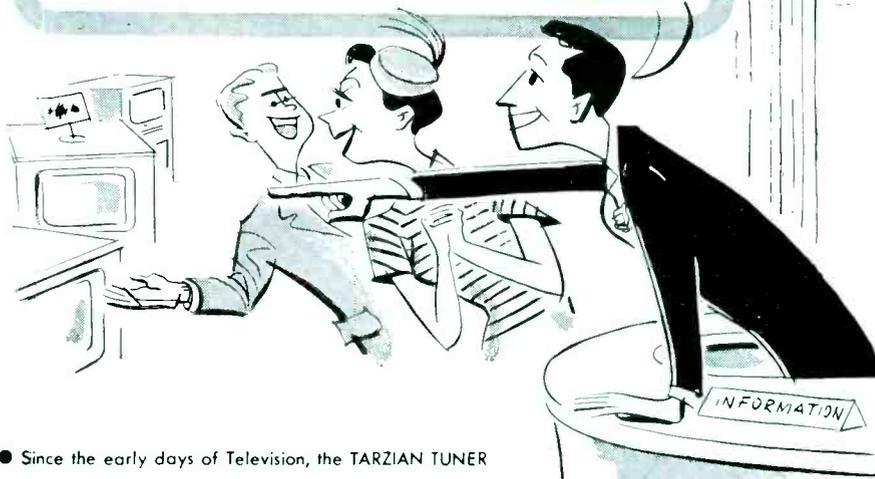
against the friction of the pickup arm mounting screw until the stylus is exactly half way between the edge of the record and the first music groove. This is the correct landing position. (If the stylus must go to the right, the arm should be moved to the right against the spring tension until a positive stop is reached, and the arm should be moved to the left the proper distance.) The arm mounting screw should be tightened sufficiently to assure that the arm is held firmly. The changer should then be run through its cycle again by hand to make certain that the stylus is landing correctly; then the pickup arm mounting screw should finally be tightened.



Tape walkie recorder which operates on dry batteries, and at standard voice speed of  $7\frac{1}{2}$ " per second. The unit erases, records, monitors, plays back to a headset. Incorporates a power-rewind, and has a built-in editing fixture. A tape-drive is said to eliminate clutches or belts, and drives tape and take-up reel simultaneously with a rubber idler wheel which is rotated by a 78 rpm capstan. Records continuously for 15 minutes on 5" reels of red oxide tape. Runs 5-6 minutes per winding and may be rewound while running. Indicators warn when winding is needed. Drive mechanism is shiftable to fast reverse without rethreading. Will operate with cover closed using external stop-start control. Mike, headset, spare reel and splicing tape fit inside case. Battery tester is built-in. (Travis Tapak; Broadcast Equipment Specialties Corp., 135-01 Liberty Ave., Richmond Hill 19, N. Y.)



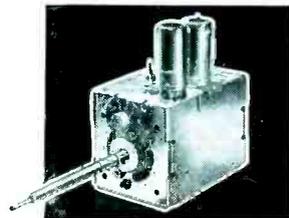
**THE LADY SAYS SHE WANTS A SET WITH  
A HOT FRONT END... SHOW HER THOSE NEW  
MODELS WITH THE TARZIAN TUNERS**



● Since the early days of Television, the TARZIAN TUNER has been used exclusively by—and is closely identified with—most of the nation's leading set manufacturers.

The TARZIAN TUNER is an outstanding engineering achievement. For selectivity... unexcelled stability... and trouble-free performance, the TARZIAN TUNER is recognized as a leader in the industry.

And, the full band—all channel—approach to UHF is a further example of Tarzian pioneering "in the right direction." Isn't it only natural that the world's largest producer\* of switch-type tuners should produce the best?



\*SARKES TARZIAN, Inc., Tuner Division, Bloomington, Indiana

**TARZIAN MADE PRODUCTS**



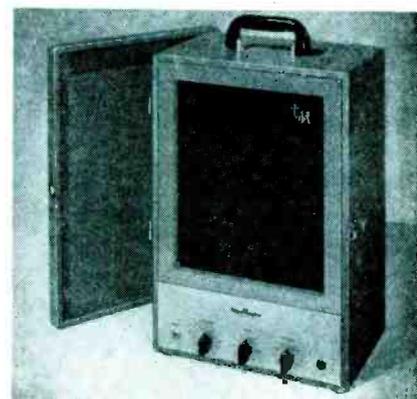
STATIONS WTTN (5000 WATTS) AND WTTV (CHANNEL 10)  
OWNED AND OPERATED BY SARKES TARZIAN IN BLOOMINGTON

(Left)

Duplex loudspeaker, available in 12 and 15-inch models, which employ a *dividing network* for a crossover frequency of 3,000 cycles. Frequencies from 30 to 3,000 cycles are reproduced by cone speaker using a 3" edge-wound aluminum voice coil, and frequencies from 3,000 to 22,000 cycles are reproduced by a high-frequency unit, mounted in the center of the cone, through an exponential horn. Has a 20 watt capacity. (Models 601A and 602A, illustrated; Altec Lansing Corp.)

(Right)

Portable power amplifier and speaker, engineered and designed as a companion unit to the model PT-125 *tapeMaster* tape recorder. Has a  $7\frac{1}{2}$ " accordion type floating cone speaker. Amplifier response is said to be within 1 db. 30-15,000 cps; total distortion at 5 watts output less than 1%; peak output 8 watts. Model SA-13; *tapeMaster, Inc.*, 13 West Hubbard St., Chicago 10, Ill.)

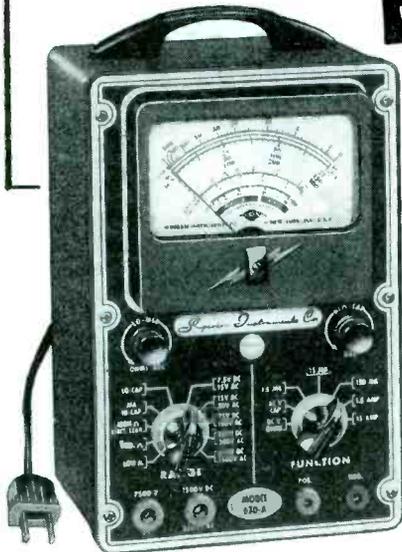


The New Model 670-A

# SUPER-METER

a combination

**VOLT-OHM MILLIAMMETER plus CAPACITY REACTANCE, INDUCTANCE and DECIBEL MEASUREMENTS**



**SPECIFICATIONS:**  
**D.C. VOLTS:** 0 to 7.5/15/75/150/750/1,500/7,500 Volts  
**A.C. VOLTS:** 0 to 15/30/150/300/1,500/3,000 Volts  
**OUTPUT VOLTS:** 0 to 15/30/150/300/1,500/3,000 Volts  
**D.C. CURRENT:** 0 to 1.5/15/150 Ma.  
 0 to 1.5/15 Amperes  
**RESISTANCE:** 0 to 1,000/100,000 Ohms 0 to 10 Megohms  
**CAPACITY:** .001 to 1 Mfd. 1 to 50 Mfd. (Quality test for electrolytics)  
**REACTANCE:** 50 to 2,500 Ohms 2,500 Ohms to 2.5 Megohms  
**INDUCTANCE:** .15 to 7 Henries 7 to 7,000 Henries  
**DECIBELS:** -6 to +18 +14 to +38 +34 to +58

The Model 670-A comes housed in a rugged crackle-finished steel cabinet complete with test leads and operating instructions. Size 6 1/4" x 9 1/2" x 4 1/2"

**\$28.40 NET**

**ADDED FEATURE**

The Model 670-A includes a special GOOD-BAD scale for checking the quality of electrolytic condensers at a test potential of 150 Volts.

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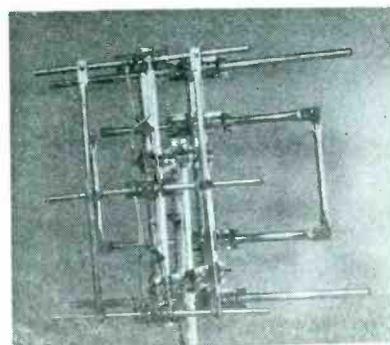


Photo of Model 45-R

**All CHANNEL TV ANTENNA WITH REGENERATIVE EFFECT**

**BARB CITY INDUSTRIES**  
 Inc.

1150 So. 4th St.  
 DeKalb, Illinois

## Auto Radio

(Continued from page 48)

way. In other respects, the circuit operation is the same as in the shunt-fed vibrator; *dc* from the battery flows through each half of the primary in turn, and is regularly interrupted and changed into *ac*, by the reeds back-and-forth movements.

### Sync Vibrators

The vibrators discussed are known as *non-synchronous*. A *synchronous* type vibrator is shown in Fig. 3. It differs in that it requires no rectifier; the vibrator itself acts as the rectifier.

An extra set of contacts, connected to the secondary of the power transformer, is present in the synchronous vibrator. The connection of primary and secondary windings is such that when the upper end of the primary is grounded through the reed, the top of the secondary goes negative causing an electron flow from point *A*, up through *R*<sub>1</sub>, through *L*<sub>1</sub>, back to point *A*.

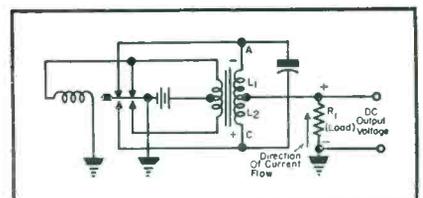
When the lower end of the primary is grounded through the reed, the bottom end of the secondary goes negative and current flows from point *C* up through *R*<sub>1</sub>, through *L*<sub>2</sub>, back to point *C*.

In either case, current flows up through *R*<sub>1</sub>, making the top of the resistor positive with respect to the bottom.

If the battery connections to the primary were reversed (due to improper servicing) the polarity of the voltages present across each half of the secondary would be such that current would always flow down through *R*<sub>1</sub>, instead of up, causing the rectified output voltage to be negative. The radio would not work in such a case, and the filters might be damaged.

The sudden breaks at the vibrator contacts cause a high back *emf* to be developed across the primary and secondary windings of the transformer. These very large surge voltages can damage the vibrator, as well as the rectifier and its filter system. To dampen or reduce them, one or perhaps two buffer capacitors are placed

Fig. 3. Schematic of synchronous vibrator.



# STANCOR NEWS BULLETIN

## NEW STANCOR TRANSFORMERS



**A-4747**—Input transformer for single button mic. or low imp. line to single grid. Pri.: 70 ohms sec. 1,300,000 ohms. Turns ratio, 1:137. Ideal for mobile transmitter use.



**A-3335**—Output transformer for P-P plates to V.C. An economical unit used with 6V6's and inverse feedback. 10,000 to 6-8/3.2-4 ohms. Max. pri. DC, 40 ma., 10 watts.



**P-6468**—Filament transformer for a pair of Eimac 4-250A's where CT is operated near ground potential. Sec. 5.0V. CT 3.9 amps., RMS insul. 2500V.



**P-6410**—Electrostatically shielded isolation transformer designed for servicing small receivers, amplifiers and test equipment. 50-60 cycle. Conservatively rated at 50 watts.

Ask your Stancor distributor for Bulletin 450R for additional information on these and other new Stancor transformers.

## NEW TELEVISION REPLACEMENT TRANSFORMERS



**A-8125**—Vertical blocking oscillator. Used in over 600 models by 21 manufacturers. Turns ratio, 1:4.2; height 1 3/4", mounting centers 1 3/4".

**P-8170**—Power transformer, used in 48 models by Andrea, Bendix, Kaye, Halbert, and Magnavox. Plate supply 380-0-380 AC volts, 220 DCMA. Rect. fl. 5V. at 3 amps., other filaments, 6.3 at 1.2, 6.3 at 5.0 and 6.3 at 7.0.



**P-8171**—Power transformer replacement for Air King part A10109. Plate supply 375-0-375 AC volts, 225 DCMA, rect. fl. 5V. at 3 amps. Other filaments 6.3 at 2.0 and 6.3 at 9.0.

See Bulletin 451 on these new Stancor TV replacements.

## STANCOR CR TUBE BOOSTER



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Stancor transformers are listed in Howard W. Sams Photofact Folders and in John Rider's Tek-Files

## STANDARD TRANSFORMER CORPORATION

3588 ELSTON AVENUE, CHICAGO 18, ILLINOIS

across the power transformer secondary.

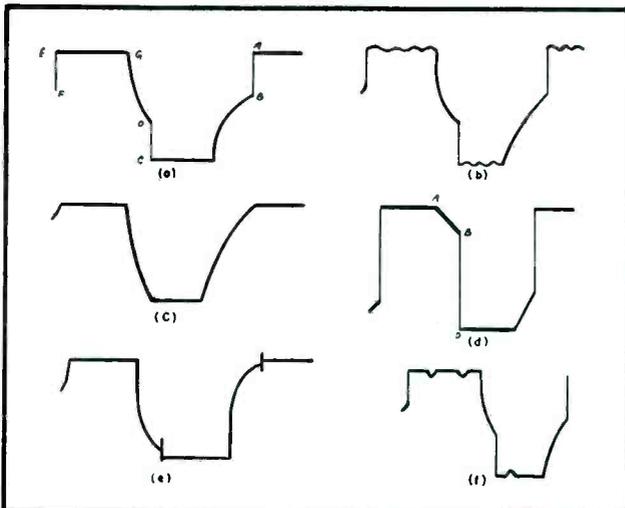
The buffer has a value such that it will resonate with the inductance with which it is placed in parallel, at or near the frequency of the surge voltage. The large circulating current set up in this series-resonant circuit dur-

ing contact-break time loads down the primary, reducing the surge voltage present across it, and also minimizing the voltage surge across the secondary.

Service Men should replace the buffer, when it becomes necessary, with another capacitor of an identical value

(Continued on page 86)

Fig. 4. Vibrator waveforms. Plots a, b, c and d represent normal waveforms. The lightly-drawn lines may be invisible on a scope. G-D in sketch a should not be more than about 65% of total distance G-C. Distance between A-E to D covers a cycle. The irregularities in b will generally disappear after a short period of operation, and are not cause to reject the vibrator. Distance A-B in d should not be less than 25% of total distance A-D. The waveform in e indicates a defective vibrator. The plot in f also indicates a defective unit, if defect persists. (Waveform sketches based on drawings in Philco handbook.)



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**TYPICAL ASSEMBLY**

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View of typical 8" deep shelf showing flange down.

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View of typical 8" deep shelf inverted showing flange up.

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Write for FREE Catalog



## Auto Radio

(Continued from page 85)

and voltage rating. If the capacitor is too large in capacitance, the primary will be too greatly loaded, and the battery current drain will be excessive, reducing the life of the vibrator contacts.

If the buffer is too small, it will not be capable of damping the surge voltages sufficiently, and damage to the vibrator, rectifier or filter units may result.

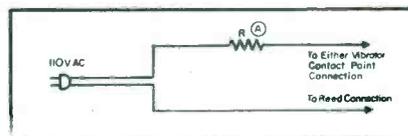
### Use of 'Scope to Determine Capacity

In some instances, the value of a defective buffer that needs replacement may be unknown. If there is no other way of determining what its value should be, capacitors with a 1,600 v or better breakdown rating, varying in capacitance between .0005 to .05 mfd may be successively tried, with a 'scope connected across the primary of the power transformer. The capacitance that produces a waveform most closely resembling the one shown in *a* of Fig. 4 (p. 85) should be employed. It will be noted that both the positive and negative half-cycles of the waveform are very similar.

When the buffer loses considerable capacitance or open-circuits, the very rapid voltage reversals across the primary are no longer effectively damped, and the large back *emf* voltages tend to produce severe arcing across the vibrator contacts, with resultant damage to these units. The inverse voltage on the rectifier may exceed the safe peak value, causing an arc-over in the rectifier tube as well. The filters will be endangered, and the power transformer may have to sweat out an excessive current.

If the vibrator acts defective, or the set fuse blows repeatedly, or the rectifier arcs internally or seems to be drawing excessive current, or the *B* voltage is too low, and the source of the trouble cannot be discovered by tube, voltage or resistance checks, the buffer should be replaced, and results noted. In the case of a defective vibrator, it is a good policy to replace the buffer (as well as the vibrator) even

Fig. 5. Hookup which can be used to remove vibrator oxide. At *A*, *R* = a 200-ohm 25 or 50-watt resistor or a 60-watt lamp.



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NEW YORK CITY (14)

if the buffer tests okeh (on resistance or capacitance checks).

A shorted buffer is a threat to the power transformer, as well as the vibrator. It can readily be located by conventional voltage and resistance tests.

#### Vibrator Tests

A good way to check a vibrator is to determine the voltage at which it will start. A means of varying the battery eliminator voltage is needed for such a test. A suitable circuit arrangement that can be used for the purpose appears in Fig. 6; a 1-ohm, 100 watt potentiometer is placed in shunt with the battery eliminator, as a voltage divider.

In testing, 4.2 v should first be applied to the vibrator. If the set fuse blows at this voltage or if it blows at a higher voltage, the vibrator can be considered defective, and should be replaced. There may be cases when tapping the vibrator eliminates the short present, and stops the excessive current. The vibrator should be rejected in such a case anyway, because the clearing of the short is generally temporary, not permanent.

If the vibrator refuses to start at 4.2 v, the voltage may be raised slightly. As soon as the vibrator starts, it should be tried again at 4.2 v, to see if it continues working at this voltage. A good vibrator should be capable of working at 4.2 v.

New vibrators, while idle on the shelf, may find its contacts coated with oxide. This coating can prevent the vibrator from starting. Operating the vibrator at a higher voltage—say, 6.3 v—for a short period of time, will often remove the oxide.

In stubborn cases, the application of 110 v ac between the reed and one of the contact points (Fig. 5) through a 200-ohm, 25 or 50-w resistor will often bring the reed loose. A 60-watt lamp can be used in place of the resistor. One to ten seconds will be required to start the vibrator and remove the oxide. The method is primarily intended for shunt-fed vibrators.

When it has been found that the vibrator starts as it should, 8.4 v dc should be applied, and vibrator operation noted. No *sticking* should occur at this voltage; neither should the fuse blow. If these faults are present, the vibrator should be replaced.

Waveform checks may be made to determine if the vibrator is operating correctly. The scope should be connected across the primary of the power transformer for these checks. Waveforms *a* to *d* in Fig. 4 are those pro-

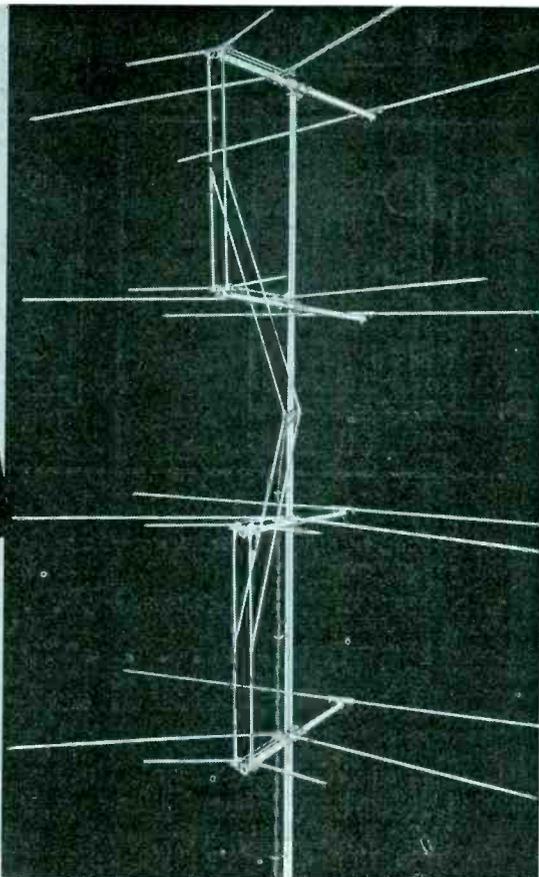
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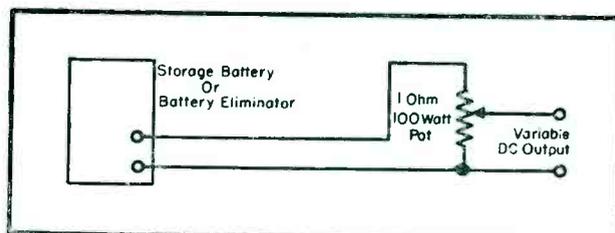
duced by acceptable vibrators; if waveforms are like those in *e* or *f*, or other kinds are seen, the vibrator producing them should be replaced.

Most auto radio Service Men are reluctant to make *major* repairs to

vibrators. This is a wise philosophy. However, there are certain instances when repairs can be quickly and effectively made.

[To Be Continued]

Fig. 6. Circuit arrangement used to vary dc output of battery or battery eliminator.



Columbia

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## Ser-Cuits

(Continued from page 44)

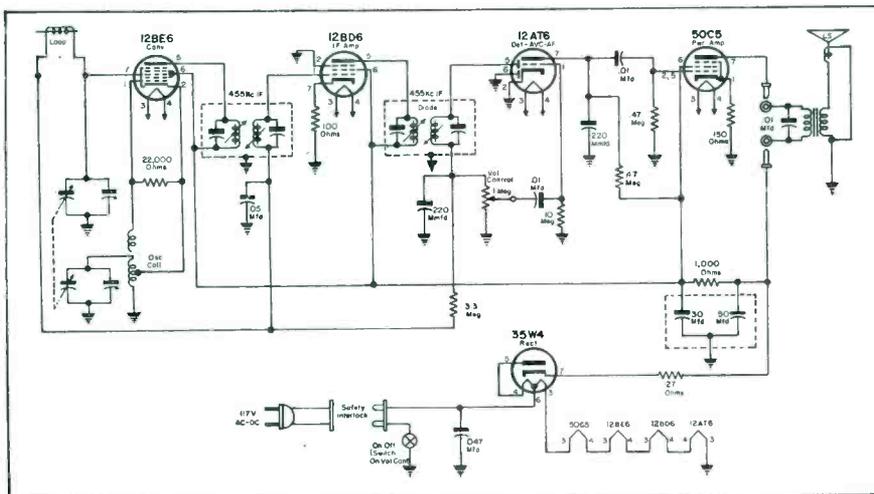


Fig. 2. Schematic of the Motorola HS-289 plated-circuit chassis.

trolytics, their lugs will have to be immersed into a small soldering pot. The part can then be lifted off the chassis. If a soldering pot is not

available, it will be necessary to heat each lug individually with a small soldering iron, shaking off as much  
(Continued on page 90)

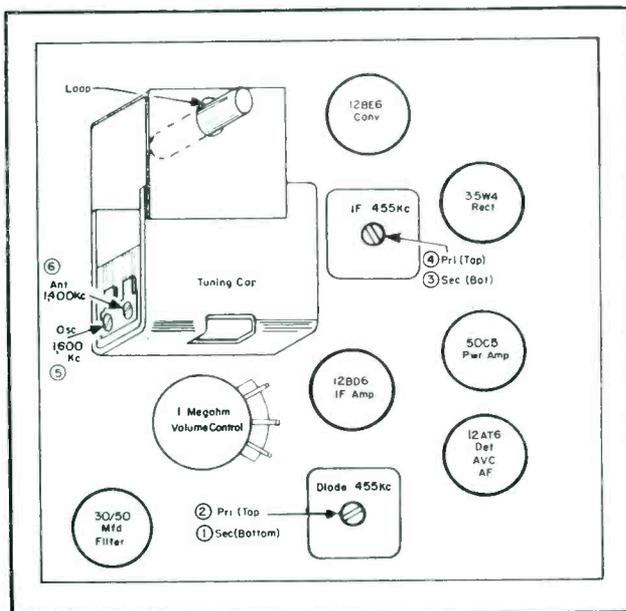


Fig. 3. Motorola pc chassis tube and trimmer locations.

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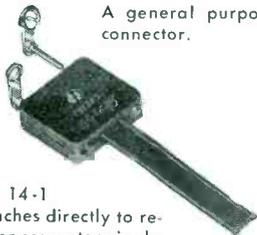
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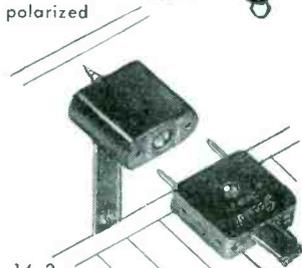
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connector.



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Attaches directly to re-  
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Eliminates cutting line  
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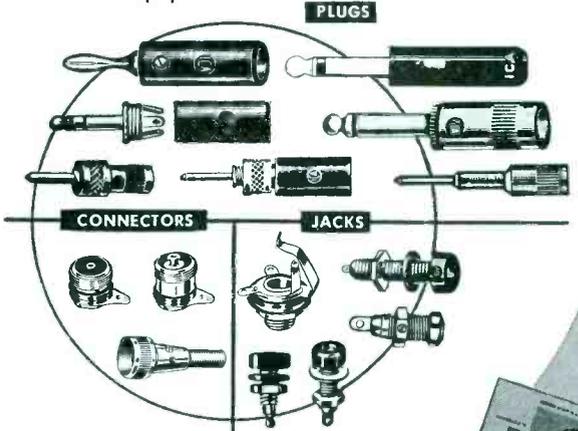
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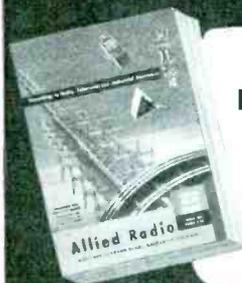
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## Ser-Cuits

(Continued from page 88)

molten solder as possible. Then, by alternately heating and loosening each lug, the entire component will be freed. There is a disadvantage in using an iron instead of a pot; the printed connections may be pulled loose from the chassis. Resistors or capacitors can be removed by unsoldering one end at a time.

Before a new component can be installed, all solder must be cleaned from holes. And when the component is resoldered, it is important to see to it that no solder runs onto an adjacent lead, as a short circuit will be created.

### Handling Precautions

The printed circuit chassis must be carefully handled when it is being removed or replaced in its housing. Insulating washers must be placed on the mounting screws; otherwise the heads of the screws may damage the printing.

When servicing these chassis, they should be placed on an insulated mount; if they are placed on a metal plate, the possibility of a short will prevail.

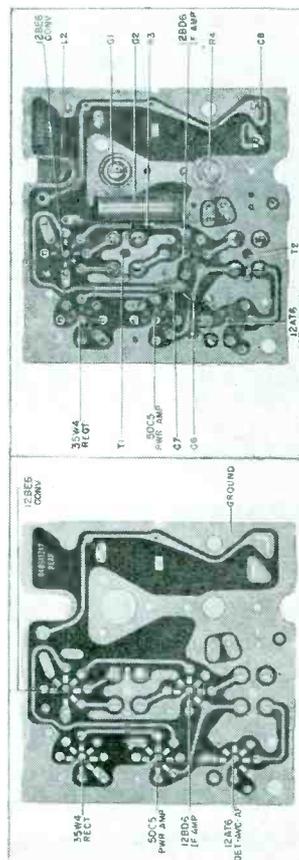
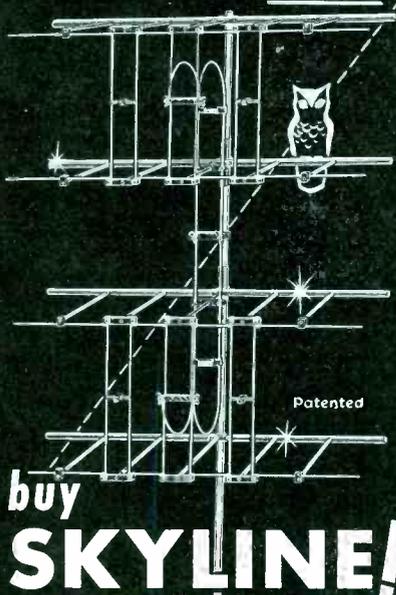


Fig. 4. Views of wired and blank Motorola pc chassis.  $T_1$  = if transformer;  $T_2$  = diode transformer;  $L_1$  = oscillator coil;  $C_1$  = 2-kang capacitor;  $C_2$  = 220 mmfd capacitor;  $C_3$  = 10,000-mmfd capacitor;  $C_4$  = filter;  $R_1$  = 3.3-megohm resistor and  $R_2$  = 1-megohm resistor.

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## VR TV Troubleshooting

(Continued from page 47)

trouble may be evident: (a) distorted sound, good video information, loss of sync, loss of control over brightness; and (b) no sound, no picture, raster dim.

Any combination of several more or less unrelated ailments usually indicates that the trouble is in the low-voltage supply. This does not necessarily mean that the defect is in the low-voltage supply as such. The defect may merely affect the voltages in the low-voltage supply and so cause a redistribution of voltages so that more than one stage is affected. For example, an audio output tube with an open filament in Fig. 2 (p. 47) may cause loss of both sound and picture. Obviously, knowing the *dc* voltage distribution in a given receiver will expedite servicing. In sets having a complex voltage distribution, it is generally a wise precaution to change tubes first in all the circuits associated with the defective indications. For example, where there are indications such as distorted sound, good video information, loss of sync, and loss of control over brightness, it would be advisable to change tubes in the audio strip and sync circuits before pulling the chassis and looking further for trouble. When it is necessary to pull the chassis, the first step in servicing multiple-symptom sets is to measure voltages at various points along the divider. The point on the divider where the voltage reading is most widely different from the specified voltage is usually the point where further checks should be made to track down the trouble.

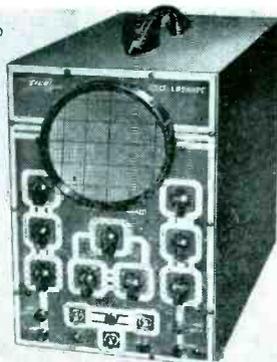
A schematic usually saves time when making voltage checks along the low-voltage supply lines. Because of the manner some schematics are drawn,

(Continued on page 92)

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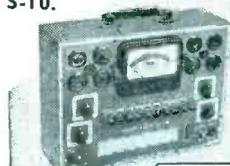
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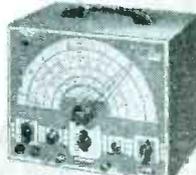
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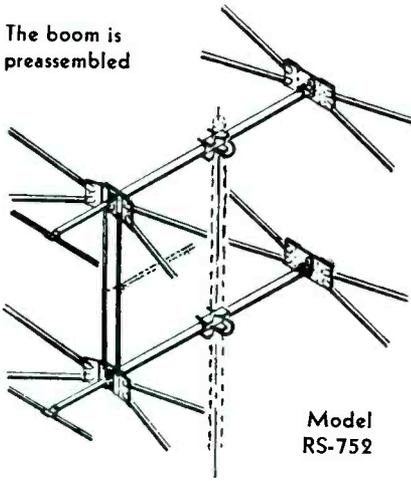


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## VR TV Troubleshooting

(Continued from page 91)

however, it may be difficult to follow the voltage distribution. It is helpful to draw arrowheads, showing the current path through the points of increasing voltage up to the highest  $B+$  point.

Receivers which use a simple series-parallel arrangement, as mentioned, with the  $pa$  stage in series with the video  $if$  and sync stages, sometimes develop characteristic troubles. As noted in Fig. 2, the cathode of the  $pa$  stage is normally approximately  $+150$  v and the control grid  $+130$  v. A positive voltage on the control grid, with respect to ground, is normal and not necessarily a sign of trouble. However, a shorted or leaky capacitor in the video  $if$  stage may upset voltages so that both picture and sound are affected. For example, a leaky decoupling capacitor will reduce the voltage readings on all the parallel video  $if$  stages. Another possible result is that the cathode voltage of the audio output stage becomes less positive (reduction or loss of bias), and the control grid of the audio output stage may draw current. In addition, current through the audio output stage increases and the tube may burn out. If the redistribution of voltage is not great enough to cause a failure of the  $pa$  tube, the resulting symptoms may include both a weak picture and distorted sound.

A trouble which occasionally occurs in this type of circuit is sound bars in the picture. In conventional split-sound circuits, this usually indicates that the fine tuning control has been incorrectly set, misalignment of the video  $if$  stages, or mistuning of the sound traps in the video  $if$  stages. In this type of circuit, which is usually part of an intercarrier system, sound bars can be caused by open filters at the cathode of the  $pa$ ,  $C_{102}$ , or screen ( $+350$  v point) to cathode bypass,  $C_{157}$ . The function of these capacitors especially  $C_{102}$ , is to prevent the audio variations of current from appearing in the video  $if$  stages (in series with the  $pa$  stage) by smoothing out the  $dc$  supply from the  $+150$  v point to ground.

The sets with complex series-parallel tube arrangements, acting as voltage dividers across the power supply, act very much like those with resistive voltage dividers. A defect at one point may change the voltage distribution to several stages.

In  $A$  of Fig. 3 (p. 47) appears a simplified schematic of an Emerson model 662B showing the  $dc$  voltage

distribution across each stage. An even more simplified schematic is shown in  $B$ . This shows each group of stages across the same potential as one resistor. For example, in  $A$ , the tuner, three video  $if$  stages, sync amplifier and sync separator are shown as connected from ground to  $+130$  v. In  $B$ , all of these stages are shown as one resistor.  $R_b$ , from group to  $+130$  v. From  $B$ , it is simpler to see what effect a defect at one point has on the voltage distribution to other stages.

A defect causing excessive current through one tube in the  $b$  group, would cause an excessive voltage drop in  $R_b$ . All of the tubes in parallel in the  $b$  group would have lower than normal plate and screen voltages. In the same way, any defect causing a substantial increase of current through one tube in the  $a$  group would cause the effective resistance of  $R_a$  to go down, thereby decreasing the voltage drop across  $R_a$ , thus reducing the negative voltage across this group. There would also be some increase in the other voltages around the circuit.

### Radio/TV Power Supplies

Experience gained in tracking down defects in the power supplies of radio receivers can be readily applied to TV servicing. In radio receivers, a trouble either in the power supply or in one of the other stages can result in lower  $B+$  and so affect the voltage readings of all stages. By checking  $B+$ , then following the  $B+$  supply line and checking voltages at each take-off point, it is usually possible to track down the trouble in short order. This method can be supplemented by resistance checks and, if necessary, by disconnecting the load from  $B+$ , as described. The power supply can then

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be checked by itself to determine whether the trouble is in the supply or the load.

The same general principles can be used for some of the more complex voltage distribution circuits in TV. Symptoms in the defective receiver should be studied to help localize the trouble to one or to several stages. Tube substitutions, as usual, should be tried first. If voltages at a given stage are found incorrect, it would be customary to check the supply voltage to see whether that is normal. If not, key voltage points on the *dc* supply will have to be checked to determine at which point the readings are off most. The feed-line from this point must then be followed and voltages checked at each take-off point. If necessary, it will be best to use resistance checks and the load disconnected at suspected points to localize the defect. In disconnecting suspected stages, however, care must be exercised especially in vacuum-tube voltage divider networks. It may not only be advisable but essential to wire in equivalent dummy-load resistors or the entire voltage distribution may be thrown off.

### Tube News

(Continued from page 59)

dampener tube in horizontal deflection circuits, has been designed.

The tube is said to withstand negative peak pulses between heater and cathode of as much as 4,000 volts with a *dc* component up to 900 volts.

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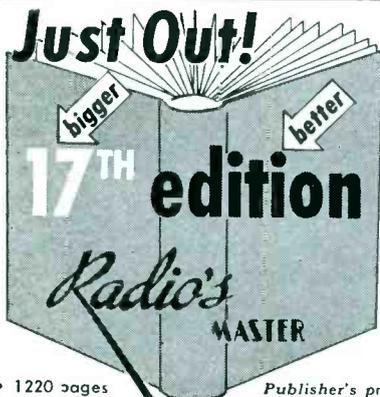
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## Servicing Helps

(Continued from page 55)

can be overcome in Admiral TV sets by making the following changes:

In chassis with glass picture tubes<sup>2</sup>, a .01 or .015-mfd 600-volt capacitor should be connected from each side of the 110 volt ac line to chassis ground. A 500-mmfd 20-kv capacitor should then be connected between the second anode lead of the picture tube and chassis. This capacitor should be mounted to the inside of the high voltage shield, adjacent to the hole for the second anode lead. The capacitor should be located equidistant from the *hv* rectifier tube, the top and the side of the hi-voltage can, to avoid flash-over to the can or *hv* rectifier tube. The second anode lead should not be cut; enough of the insulation should be removed to allow the lead to be soldered to the capacitor, making sure that there are no sharp points on the soldered connection to cause corona. The bell of the tube should be completely covered with paper-backed aluminum foil with the aluminum side touching the glass. The foil may be held in position with scotch tape. A hole should be cut in the foil for the second anode connector and the foil near the neck of the picture tube should be folded back on itself so that it makes good connection with the ground spring. The focus coil and deflection yoke should then be removed from the picture tube. Two turns of electrical scotch tape should be wound around the exposed portions of the yoke windings, and then a 2¾" strip of aluminum foil tape should be wound around the yoke with the aluminum side out. The yoke should then be placed back on the picture tube. The yoke leads should be wrapped with

(Continued on page 96)

<sup>2</sup>Admiral kit 98A71-1 can be used.

## Associations

(Continued from page 64)

cut; time constant of r-l circuits; effect of square wave voltage on an r-l circuit; diode limiter circuits; diodes in dc restorer circuits; triodes used as limiters, clippers and dc restorers; scope operation; scope limitations; blocking tube oscillators; multivibrators; pulse mixing; sync generator timing unit, stabilized and counter types; and shaper unit.

#### TEN YEARS AGO

SOUND SYSTEMS, especially those employed in plants and USO organizations, were the basis of a feature analysis in the October '42 issue of SERVICE. Covered were central control racks, remotes, hi-gain amplifiers, trumpet speaker applications, radial reproducers, and typical layouts. . . . A two-band portable, utilizing a hot-cathode type oscillator circuit with filament running at rf potential above ground, served as the front-cover story. . . . The circuit of Crosley's receiver-phonograph 72CP (chassis 85) was reviewed. Set used a single switch for radio-band switching and phonograph operation; front section was an audio switch, while the rear section consisted of four separate switches. . . . In the initial installment of a series on instantaneous sound-recorder servicing, A. Ghirardi described the electrical systems employed in home radio-phonograph-recorders, simple recording and record player attachments to be added to home radio receivers, and portable recorders and playback units. Disc speeds and playing times were also analyzed. . . . The issue also featured a comprehensive study of wave traps. . . . The news columns noted that Orrin E. Dunlap, Jr. had written a book on *Future of Television*. . . . Army-Navy E awards were presented to Ward Leonard Electric Co., five Pittsburgh-area plants of Westinghouse, and to Eitel-McCullough. . . . J. M. Tuttle was named manager of sales for RCA Victor in Chicago. . . . It was reported that Universal Microphone Co., Inglewood, Calif., and Solar Manufacturing Corp., Bayonne, N. J., were employing blind men and women in certain types of precision assembly. . . . Ed Rehfeldt of Thordarson had visited New York City. . . . Henry Hutchins, on leave from National Union as sales manager, was in the Navy serving as a Lieutenant Commander. . . . Perry Saffler, rep, had moved to larger quarters at 53 Park Place, New York City.

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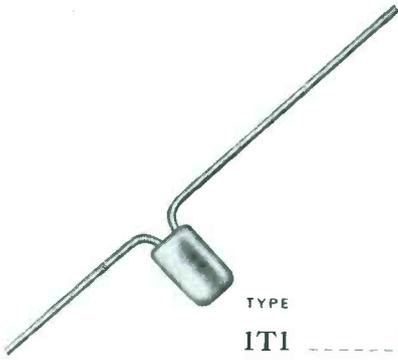
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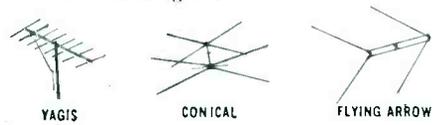
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**Miller TELEVISION CO.**  
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## Servicing Helps

(Continued from page 94)

aluminum foil tape, overlapping each turn so as to completely shield the leads. The focus coil should be replaced and one end of the yoke lead shield should be clamped between the focus coil and the yoke bracket to ground the shield. If the horizontal output tube is not enclosed in the high-voltage shield, the plate lead of the horizontal output tube should be pushed into the high-voltage shield until the exposed portion of the lead is as short as possible. The exposed portion should then be covered with metal braid soldered to the high voltage shield. The picture tube cathode lead should be replaced with a piece of RG59U coax and the shield should be grounded to the chassis. The cathode lead goes to pin 11 on the picture tube socket and is generally the yellow wire.

In chassis with metal picture tubes<sup>3</sup>, the first step, and the last three steps described for the glass tubes, should be followed. In addition, if the metal picture tube is a 17CP4, it should be replaced with a 17BP4 glass picture tube, and a 500-mmfid capacitor should be added and the tube shielded.

<sup>3</sup>Admiral kit 98A71-2 can be used.

## Catalogs... Bulletins

(Continued from page 63)

**YMCA Trade and Technical School**, 15 W. 63rd St., New York, N. Y., has issued a brochure describing their full time day courses and evening classes in radio communications and radio-TV servicing. Nine hundred hours of training in radio and FM-TV servicing, leading to a graduation certificate, may be undertaken by a student.

\* \* \*

**Aerovox Corp.**, New Bedford, Mass., has issued a bulletin, *High Temperature Metallized-Paper Capacitors*, which describes capacitors for temperature applications of from -55° to +125°C. Basic information on performance characteristics such as temperature range, insulation resistance, power factor, humidity resistance, etc., are provided.

\* \* \*

**Hickok Electrical Instrument Co.**, 10514 DuPont Ave., Cleveland 8, Ohio, has released a brochure describing a complete tube tester and set analyzer, model 605. Instrument, which includes a 20,000-ohm-per-volt *dc* multimeter, is said to test tubes under actual operating conditions.

\* \* \*

**Califone Corp.**, 1041 N. Sycamore Ave., Hollywood 38, Calif., has prepared an 8-page catalog describing fifteen models of phonographs, transcription players and sound systems.

## VHF/UHF Channels and Their Frequencies

Channel	Mc	Video Carrier	Audio Carrier	Channel	Mc	Video Carrier	Audio Carrier
2	54-60	55.25	59.75	43	644-650	645.25	649.75
3	60-66	61.25	65.75	44	650-656	651.25	655.75
4	66-72	67.25	71.75	45	656-662	657.25	661.75
5	76-82	77.25	81.75	46	662-668	663.25	667.75
6	82-88	83.25	87.75	47	668-674	669.25	673.75
7	174-180	175.25	179.75	48	674-680	675.25	679.75
8	180-186	181.25	185.75	49	680-686	681.25	685.75
9	186-192	187.25	191.75	50	686-692	687.25	691.75
10	192-198	193.25	197.75	51	692-698	693.25	697.75
11	198-204	199.25	203.75	52	698-704	699.25	703.75
12	204-210	205.25	209.75	53	704-710	705.25	709.75
13	210-216	211.25	215.75	54	710-716	711.25	715.75
14	470-476	471.25	475.75	55	716-722	717.25	721.75
15	476-482	477.25	481.75	56	722-728	723.25	727.75
16	482-488	483.25	487.75	57	728-734	729.25	733.25
17	488-494	489.25	493.75	58	734-740	735.25	739.75
18	494-500	495.25	499.75	59	740-746	741.25	745.75
19	500-506	501.25	505.75	60	746-752	747.25	751.75
20	506-512	507.25	511.75	61	752-758	753.25	757.75
21	512-518	513.25	517.75	62	758-764	759.25	763.75
22	518-524	519.25	523.75	63	764-770	765.25	769.75
23	524-530	525.25	529.75	64	770-776	771.25	775.75
24	530-536	531.25	535.75	65	776-782	777.25	781.75
25	536-542	537.25	541.75	66	782-788	783.25	787.75
26	542-548	543.25	547.75	67	788-794	789.25	793.75
27	548-554	549.25	553.75	68	794-800	795.25	799.75
28	554-560	555.25	559.75	69	800-806	801.25	805.75
29	560-566	561.25	565.75	70	806-812	807.25	811.75
30	566-572	567.25	571.75	71	812-818	813.25	817.75
31	572-578	573.25	577.75	72	818-824	819.25	823.75
32	578-584	579.25	583.75	73	824-830	825.25	829.75
33	584-590	585.25	589.75	74	830-836	831.25	835.75
34	590-596	591.25	595.75	75	836-842	837.25	841.75
35	596-602	597.25	601.75	76	842-848	843.25	847.75
36	602-608	603.25	607.75	77	848-854	849.25	853.75
37	608-614	609.25	613.75	78	854-860	855.25	859.75
38	614-620	615.25	619.75	79	860-866	861.25	865.75
39	620-626	621.25	625.75	80	866-872	867.25	871.75
40	626-632	627.25	631.75	81	872-878	873.25	877.75
41	632-638	633.25	637.75	82	878-884	879.25	883.75
42	638-644	639.25	643.75	83	884-890	885.25	889.75

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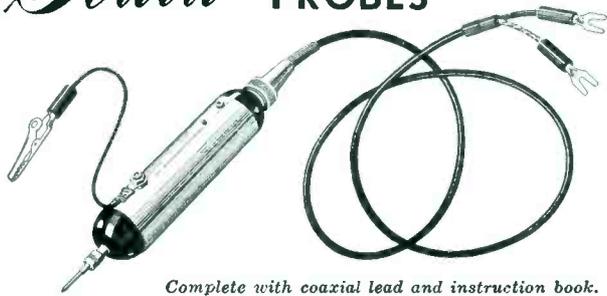
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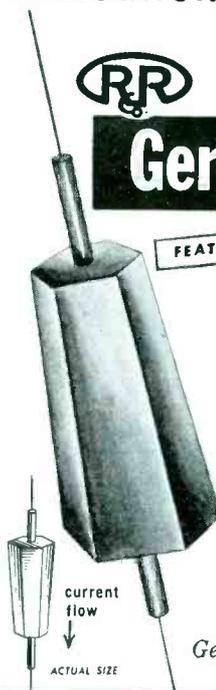
**BZ-3 100:1 VOLTAGE DIVIDER PROBE** . . . is very useful in trouble-shooting horizontal sweep circuits. It may be applied directly to plate of horizontal output tube or at the plate of the damper tube to check the operation waveforms and to measure their peak to peak voltages without impairing the wave shape or incurring danger to the oscillograph.

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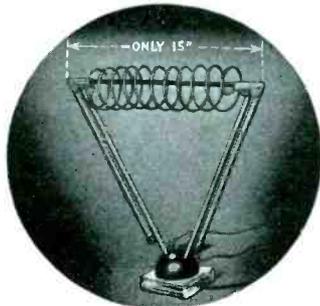


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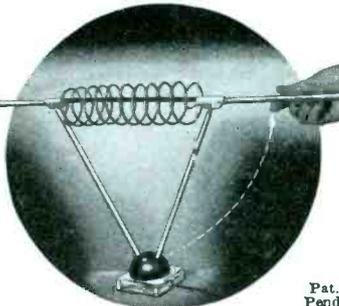
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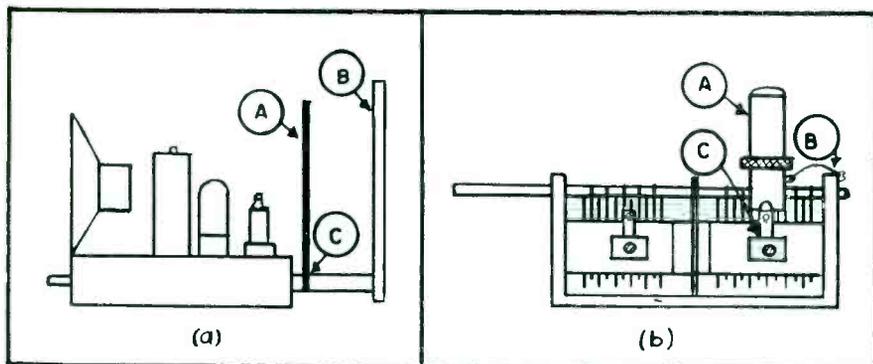


Fig. 1. At left is illustrated position of metal shielding added to *ac/dc* chassis to prevent oscillation at low-frequency end of the dial: *A* represents the added metal shield; *B* is the loopstick and *C* is the ground to chassis at two or more points. At right, the ferris-loopstick mounting is illustrated; *A* is the loopstick; *B*, connection from stick to frame of capacitor or *avc*; and *C* is the hot wire to lug on the antenna trimmer

## Part II . . . Pinpointing Oscillation Sources and Eliminating Them . . . Checking Components for Low-Signal Troubles . . . Aligning for Top Performance in Fringe Areas

OSCILLATION TROUBLES are particularly annoying in servicing, and especially so when the receiver being checked is in a weak-signal area. Some of the causes of oscillation were reviewed in the initial installment of this series.

Continuing this analysis, let us now turn to *avc* bypasses, which if open or leaky also cause trouble. This type of oscillation is usually noted when tuning across stations. On *ac/dc* models the common return bypass from *B-* to chassis can give trouble. In this instance, you might install a resonant type bypass .1 or .2 mfd. These are paper bypasses, inductively wound so that each capacitor forms a series resonant circuit, at approximately 455 kc. They will help take the squeals out of many a small set.

Sometimes puzzling oscillations appear at the low end of the dial, usually on chassis with the loop mounted close to the chassis. Moving the loop away from the chassis may cure the trouble. However, installation of a sheet-metal shield, all the way across the back, up to the height of the tops of the tubes, and grounded to the chassis, will make a permanent cure. Realignment of the antenna stage will be necessary after this has been done.

There is still a considerably better and easier cure for this trouble and others due to the loop; replacement of the loop with the small ferrous-cored loopsticks recently developed. These may be tuned with their adjustable core at the low end of the band, and then with the trimmers at the high end, and an amazing improvement in perform-

ance will generally be found. Due to their small size, they may be attached almost anywhere in the cabinet. A handy place is on the tuning capacitor itself, if used. In slug-tuned sets, these units may be mounted above the chassis. On the very small *sub-midgets*, the end of the short pickup wire connected to the loopstick may be connected to the inadequate loop antenna previously used, and wound around the cabinet, under the covering. When these little gadgets are tuned accurately, the results are astonishing.

Bypass and filter capacitors contribute their share of troubles to the weak set, too. A filter section that does not come up to rated capacity, especially if it is used as the input filter, will cause low plate voltage and weakness. This, together with a low rectifier, will cause a severe drop in volume. At least 125 volts *dc* should be read at the filter input, with a line voltage of 117. Readings from 100-110 volts usually indicate a weak rectifier tube; it should be replaced temporarily. If this doesn't restore the plate voltage to normal, a good filter should be bridged across the input. If even this does not help, it is then necessary to check the small surge resistor connected between the cathode and first filter section. During calls, it has been found that some resistors check normal when cold, but increase in resistance when hot, causing voltage drop. Filter resistors, used in small sets to replace filter chokes, can increase in value. Selenium rectifiers

used in many of the later model sets can also drop off in output. For a quick test, one end of the rectifier should be disconnected and a new rectifier installed with a pair of test leads.

The possibility that the low-voltage condition may be caused by an overload should not be overlooked. Excessive power factor in electrolytics and high leakage, may load the small power supply until it is incapable of delivering its rated voltage. Leaky coupling capacitors can cause power tubes to draw so much current that the power supply is overloaded, too. Internal leakage in the 50B5, 50L6 type tubes can also give rise to this condition. This will appear as a high positive voltage on the control grid, after the tube heats up. This condition can be checked positively by disconnecting the coupling capacitor. If the high positive voltage still remains on the grid, the tube is probably at fault. A new tube should be substituted and a new check made. This condition may even prevail in new replacements; on occasion new tubes right off the shelf will display the same symptoms.

Intermediate-frequency transformers, *rf* interstage coils, output transformers, oscillator coils and chokes are all subject to damage from electrolytic action in the windings. This is especially true on the older sets. This trouble can be spotted as a general weakness, accompanied by frying and popping noises, and they can create wonderful intermittents, too. Most of these troubles occur in primary windings, which carry plate currents; secondaries should not be eliminated from consideration for they can and will go out on occasion. If a transformer primary is suspected of being defective, it is wise to try shorting it to ground momentarily with a screwdriver; the resultant surge of current will cause a bad one to open completely, but will not harm a good one. The short should be left on only for a few seconds.

\*Based on notes prepared by Jack Darr.

[To Be Continued]



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## JOTS AND FLASHES

STANDARD BROADCAST CHASSIS will continue to be a substantial factor in industry, with sales totaling around a quarter of a billion dollars annually, according to Arthur A. Brandt, general sales manager for the receiver department of G.E. Clock-radios and a large replacement market, plus the continued trend toward multiple ownership, were cited as the basic reasons for the substantial annual volume. . . . Over 2.4-million TV sets were shipped in the first seven months of this year, according to RTMA. This compares with 2,588,816 receivers shipped to dealers during the same period in '51. . . . The '52 Audio Fair will be a 4-day affair, opening October 29 and continuing through November 1, with exhibits on the fifth and sixth floors of the Hotel New Yorker, New York City. Admis-

sion is free. . . . R. J. Yeranko, The Magnavox Co., has been reappointed chairman of the RTMA Service committee. F. B. Ostman, Capehart-Farnsworth, has been appointed vice chairman. . . . Mail address of Hytron Radio and Electronics Co. is now 100 Endicott St., Danvers, Mass. . . . Land-C-Air Sales Co. has moved to 42 Oak Ave., Tuckahoe, N. Y. . . . A. D. Plamondon, Jr., who has been chairman of the RTMA board of directors since his election in June, has assumed the additional duties of president of the association. General manager James D. Secrest has been promoted to the position of executive vice president. . . . Javex has opened a midwestern office at 6349 N. Clark St., Chicago, Ill. . . . Dr. Allen B. DuMont was chief speaker at the kickoff dinner of the Pittsburgh Radio-TV Exposition, held recently at the Webster Hall Hotel in Pittsburgh.

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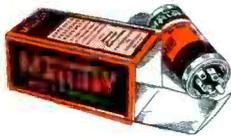
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Some people make their living by taking chances. But you must make your living by earning customer satisfaction—so why take chances by ordering capacitors by rating only? Order by rating *and* brand!



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Customer satisfaction with your service pays off in repeat business . . . word-of-mouth advertising . . . cash in the bank. You can build it by using Mallory capacitors on all your service work.



Top-notch TV and radio set makers accept Mallory FP's as *the* standard of capacitor quality. You get longer life even with higher temperatures and greater ripple current . . . dependable operation even at 185° F. (85° C.).



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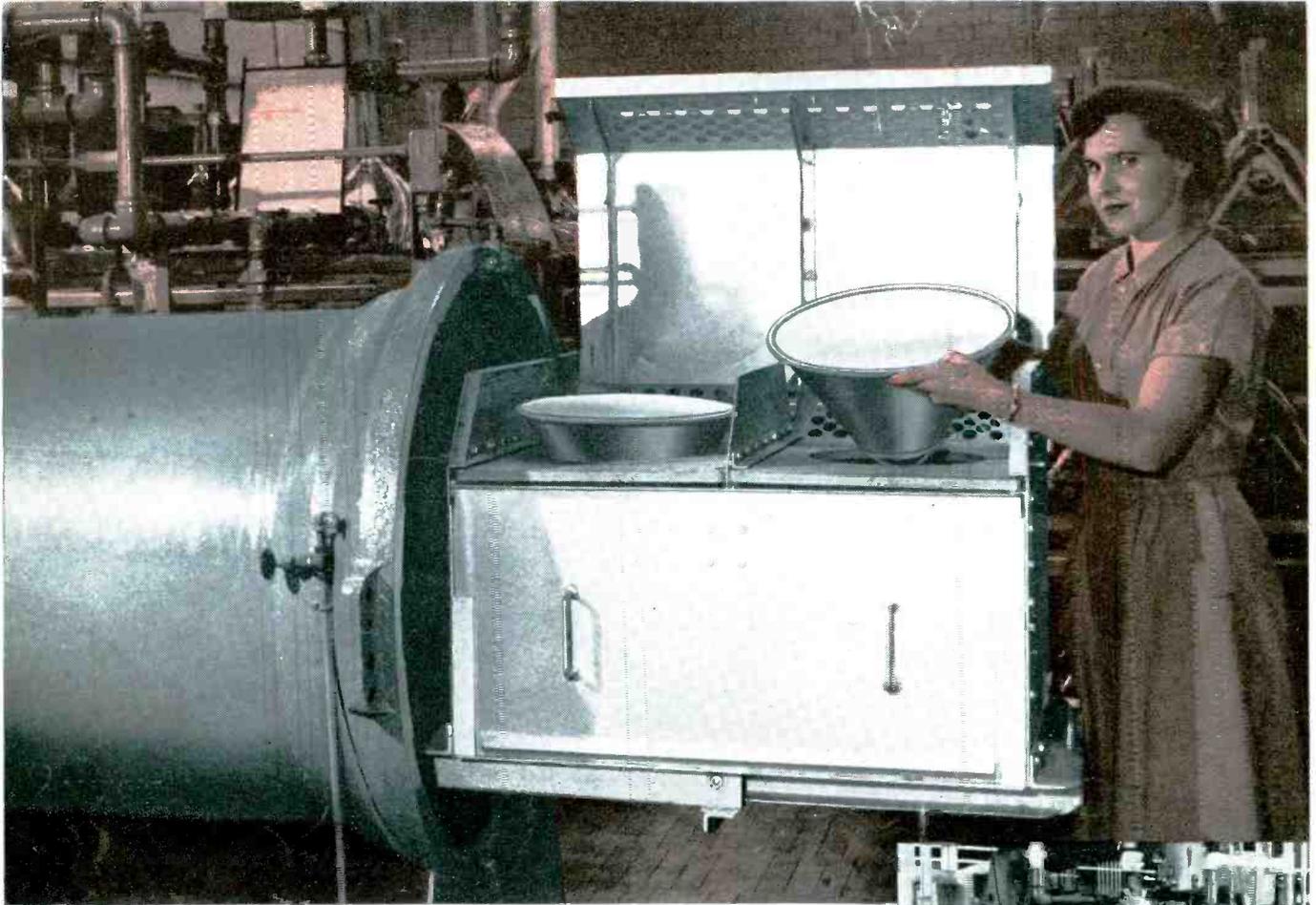
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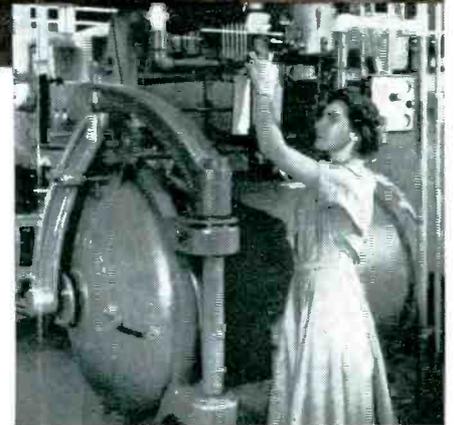
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**APPROVED PRECISION PRODUCTS**

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



Top: Picture tubes being placed into carriage before being rolled into chamber. Right: Operator admitting compressed air into chamber.



## The Torture Chamber that tests the strength of RCA Picture Tubes

How *strong* is a picture tube? Well, certainly no stronger than its envelope. And that means that poor sealing of glass-to-glass or glass-to-metal, improper annealing of the glass—and even thermal or physical shock during manufacture—can contribute to structural weakness.

How *strong* should a picture tube be? Obviously, it must at least have adequate strength to be handled, transported, and installed safely. To insure safety, RCA has established a rigid standard of strength based on

air-pressure tests evolved through unequaled years of experience.

Throughout the day, glass and metal picture tubes of each size are picked at random from the production lines, and placed in an air-compression chamber where they are subjected to "torturing" pressure for several minutes. Any tubes failing this test are examined by RCA production inspectors who can trace the fault and correct it on the production line almost as soon as it appears. Result . . . *structurally weak tubes never reach your shop.*

RCA's constant vigilance at *all* stages of manufacture is your assurance that only top-quality RCA picture tubes leave the factory. In this way, RCA closely guards its own reputation . . . *and yours as well.*

With RCA Receiving Tubes, as well as RCA Kinescopes, **TOP-QUALITY CONTROL** makes the difference.



**RADIO CORPORATION of AMERICA**  
ELECTRON TUBES  
HARRISON, N. J.

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