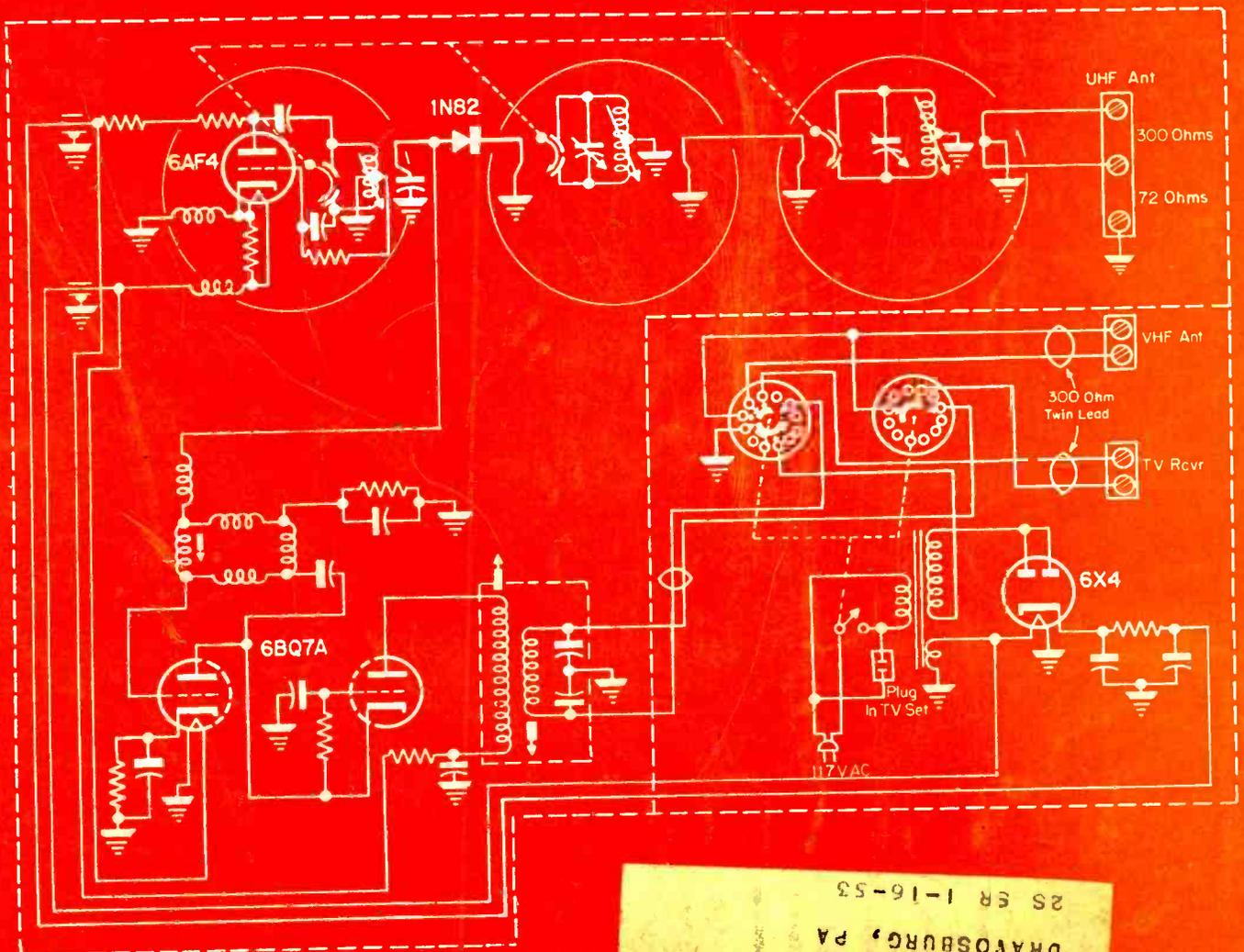


# SERVICE

VOL. 22

THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE

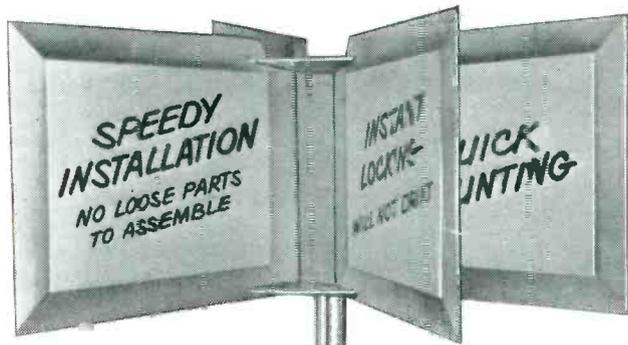
MAY  
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UHF coax-cavity converter.  
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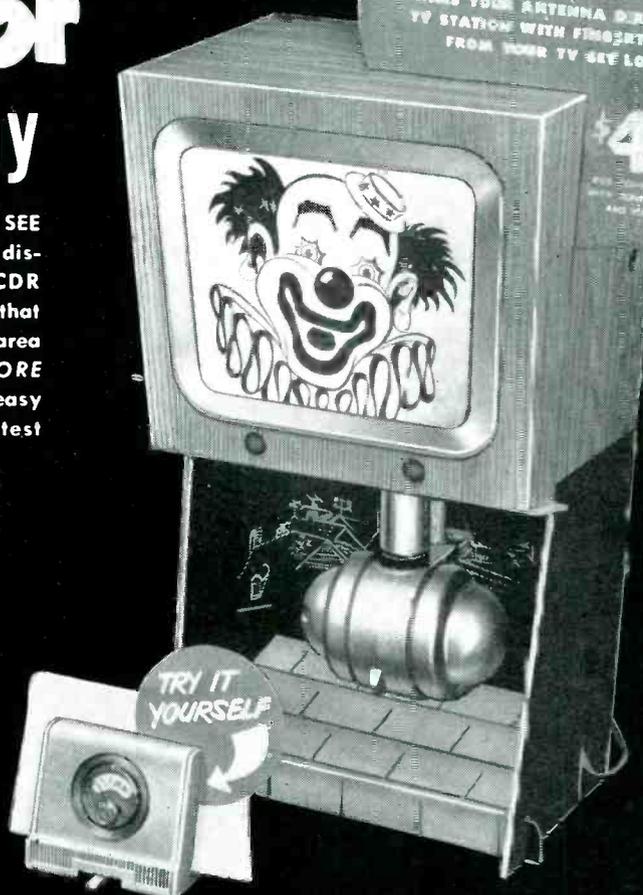
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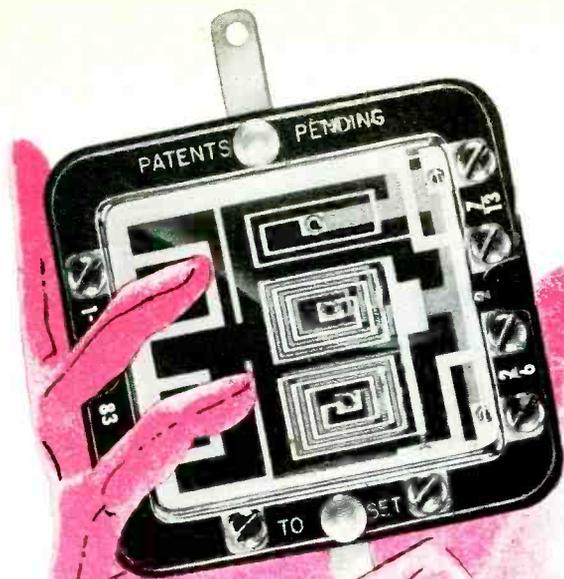


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- joins one UHF and one VHF antenna
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**12v. AUTO RADIOS**



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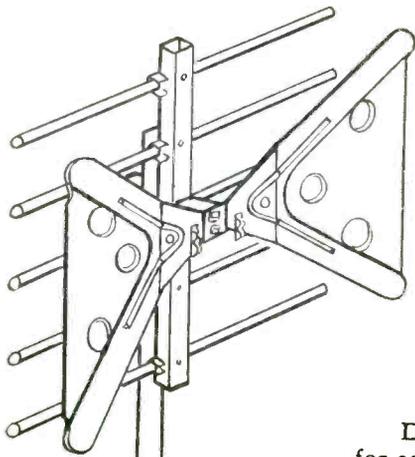
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**OUTSTANDING BROADBAND LOW ANGLE**, constant impedance array.

A stacked "Conical-V-Beam" array offers the perfect pattern with constant center impedance, one major in-line lobe with compacted, low angle vertical lobe and elimination of all spurious lobes, for outstanding long distance or local reception without snow, ghosts or reflections, with full video and audio fidelity on any UHF channel.

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## Independent laboratory tests show these 12 outstanding qualities of Sylvania Picture Tubes

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for this  
report



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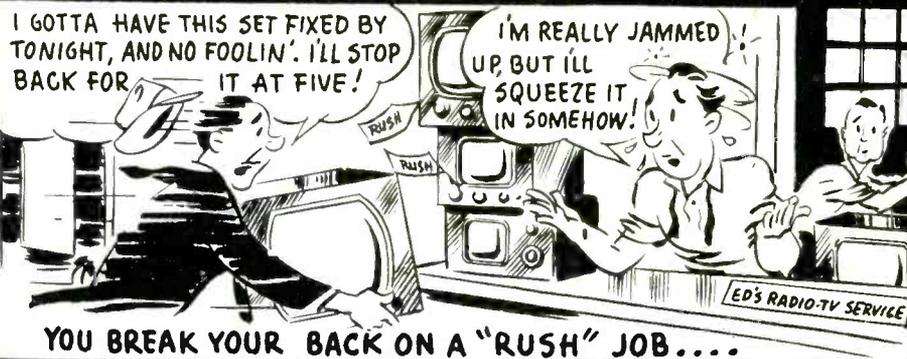
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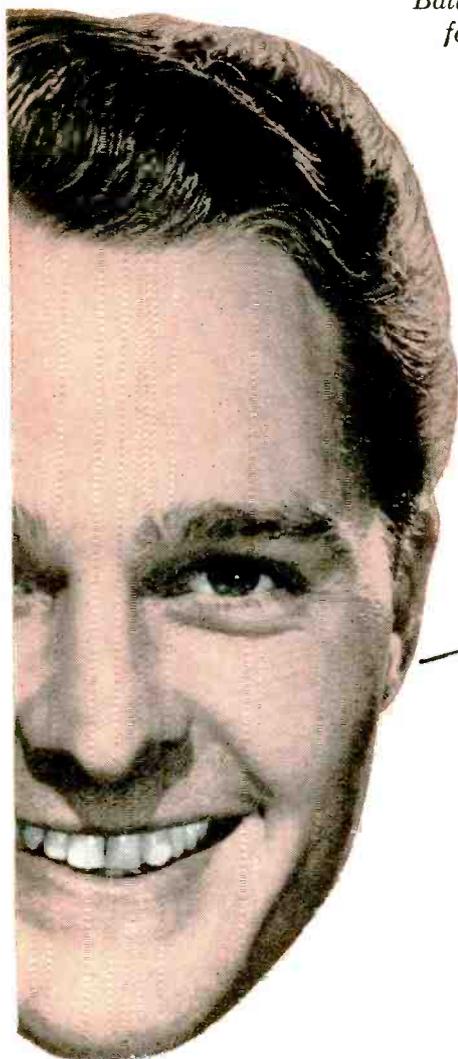
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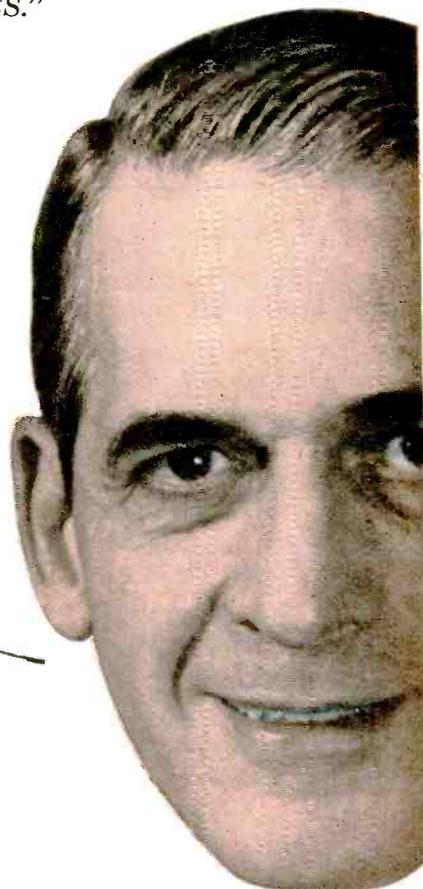
**"Naturally I like to sell RCA Radio Batteries—**  
*they're my brand. When my customers think of  
 RCA—they remember the local radio dealers and  
 servicemen selling RCA tubes and batteries. That's  
 why my steady business grows when I sell RCA  
 Batteries—my customers look to a radio dealer  
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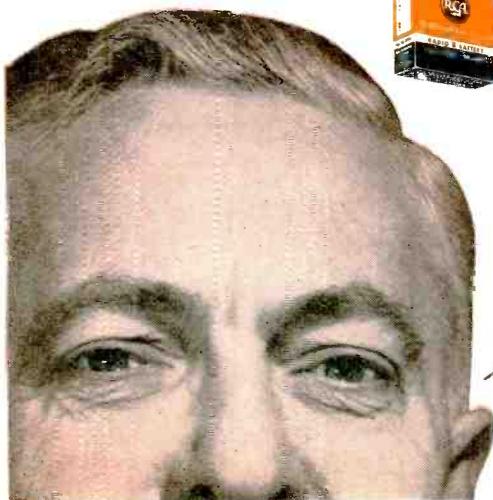
**"My battery inventory  
 problems were licked** when I started  
*to concentrate on RCA Radio Batteries.  
 I found that with ten RCA Battery types  
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 batteries. And what's more . . . with the  
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**"National television  
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 attracting many new customers for  
 my other radio products and services.  
 It sure pays to sell RCA Batteries."*



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 serviceman** should stock and  
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 battery for the radio trade. RCA  
 Batteries have brought me more  
 sales, more profits and more  
 satisfied customers."*



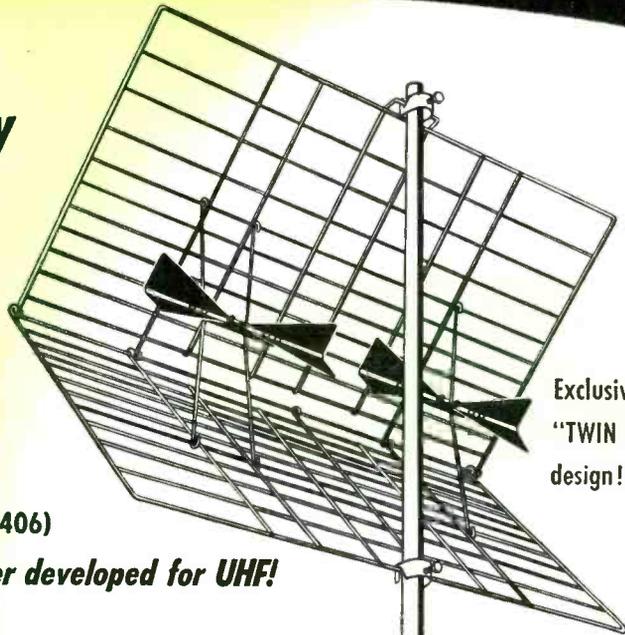
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# Two heads are better than one!

And that's exactly why  
**CHANNEL MASTER'S**  
 amazing new

## **TWIN CORNER REFLECTOR** (Model No. 406)

*is the most sensitive fringe-area antenna ever developed for UHF!*



Exclusive  
 "TWIN DIPOLE"  
 design!

### **TWO DIPOLES—HIGHER GAIN**

The two dipoles of the Twin Corner Reflector provide TWICE as much gain as standard-type Corner Reflectors!

This two-dipole construction is an original Channel Master idea which successfully combines two separate Corner Reflectors into ONE ANTENNA STRUCTURE — requiring ONE simple installation.

This 2-in-1 combination gives you:

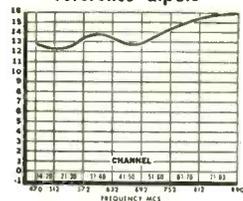
- ... the economy of one antenna.
- ... the convenience of one antenna.
- ... BUT the combined performance of TWO separate high gain antennas.

Model No. 406 furnishes far better picture quality — at far greater distances — on every UHF channel.

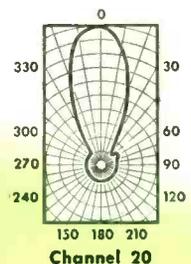
**Eliminates UHF's "Twin Terrors."** 100% vibration-proof construction prevents picture flicker. "Free space" terminals prevent dirt and rain water from shorting out the picture.

up to  
**16 DB gain**

gain above tuned  
 reference dipole



horizontal  
 polar pattern  
 (relative voltage)



Extremely narrow  
 "Yagi-type" forward  
 lobe; no side lobes;  
 very high front-to-  
 back ratio

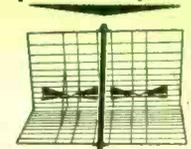
## **2 antennas in 1**

The Twin Corner Reflector furnishes the performance of 2 antennas because it really is 2 separate antennas . . .

stacked side  
 by side . . .



into 1 simple  
 structure . . .



with just a  
 single down-  
 lead to the  
 set.

**CHANNEL MASTER**  
 engineering  
 pays off on UHF!



**CHANNEL MASTER CORP.**  
 ELLENVILLE, N. Y.

# At Last! a YAGI for the ENTIRE LOW BAND!

## CHANNEL MASTER'S Newest futuramic

Completely covers every low band channel- 2 through 6

**Now** the extraordinary high gain of a Yagi . . . the razor-sharp directivity of a Yagi . . . Not on just one channel — but clear across the entire Low Band!

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

**Areas in which present VHF stations are changing channels (on the Low Band).**

The Futuramic Yagi provides 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. And you can make your change-over installations NOW.

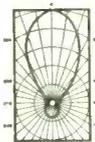
**Areas in which a new VHF station is being added to the present one (on the Low Band).**

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.

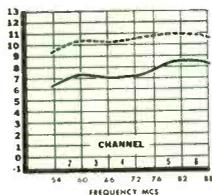
**Areas served at present by two or more VHF stations on the Low Band.**

You no longer have to compromise between conventional broad band antennas, and separate Yagis for each channel. The Futuramic gives you the full advantages of both. It combines highest gain and sharpest directivity with simple, economical installation.

horizontal polar pattern (relative voltage)



gain above tuned reference dipole



A high-low Futuramic combination is the most sensitive array ever designed for all-channel VHF reception. Just combine models 1173 and 1126.

Now — 6 great Futuramic models, designed for every reception area:

| model no. | channels covered  | list price         |
|-----------|-------------------|--------------------|
| 1173      | 7 — 13            | \$20 <sup>83</sup> |
| 1124      | 2, 3, and 4       | \$40 <sup>97</sup> |
| 1125      | 2, 3, 4, and 5    |                    |
| 1136      | 3, 4, 5, and 6    |                    |
| 1146      | 4, 5, and 6       |                    |
| 1126      | 2, 3, 4, 5, and 6 |                    |



CHANNEL MASTER CORP. ELLENVILLE, N. Y.



CHANNEL MASTER engineering pays off on VHF!

GET THIS \$12.95

# SOLDERING GUN FREE!

With a supply of Admiral TV Masts  
ASK YOUR ADMIRAL DISTRIBUTOR



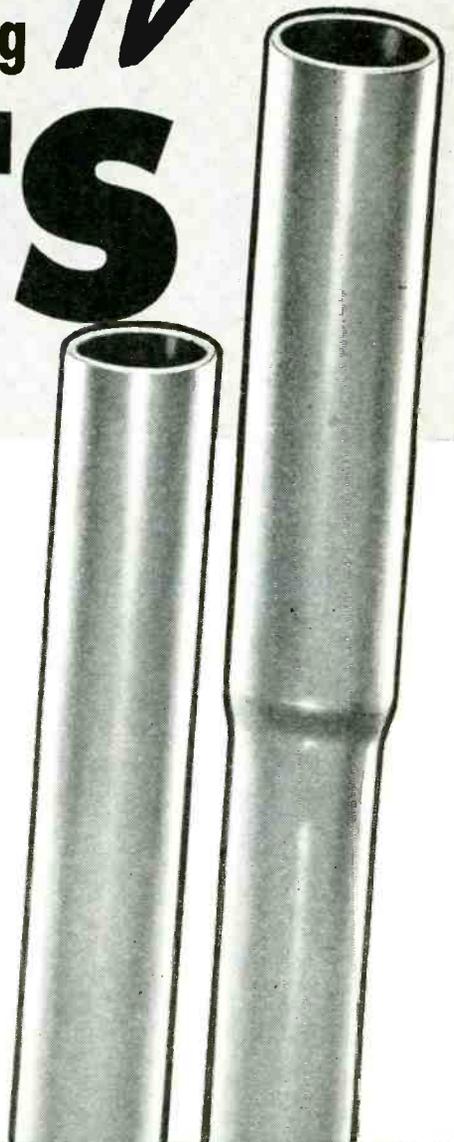
# 5 ft. and 10 ft. Self-Coupling TV MASTS

You may have found that masts are hard to get . . . due to the increased need for outside antennas in new station areas. Now your Admiral Distributor can give you *quick delivery*. What's more, you can get a genuine Wen Electronic Soldering Gun *free of extra charge* with quantity orders. This offer is good for a limited time only.

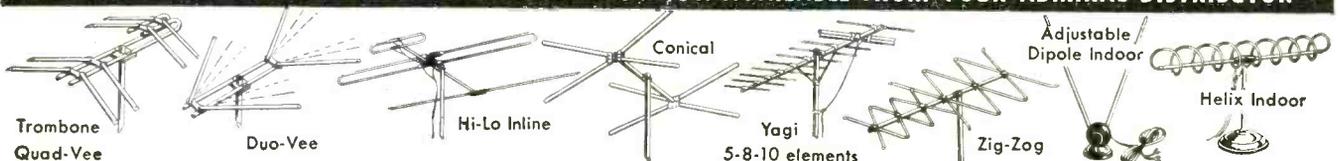
Admiral's huge production brings you these masts at the industry's lowest prices. Finest quality, too . . . made of cold-rolled seamless steel tubing, heavily electrogalvanized for utmost rust resistance. Both 5 and 10 foot masts are available with one end flared to take extensions . . . eliminates the need for separate mast couplers. Order from your Admiral Distributor by part number:

|                   | 20 gauge | 18 gauge | 16 gauge |
|-------------------|----------|----------|----------|
| 5 ft. plain end   | M 40     |          |          |
| 5 ft. flared end  | M 40A    |          |          |
| 10 ft. plain end  | M 41     | M 42     | M 43     |
| 10 ft. flared end | M 41A    | M 42A    | M 43A    |

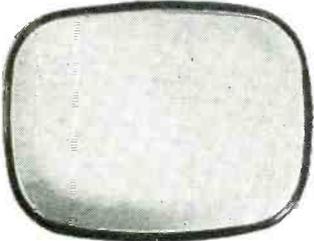
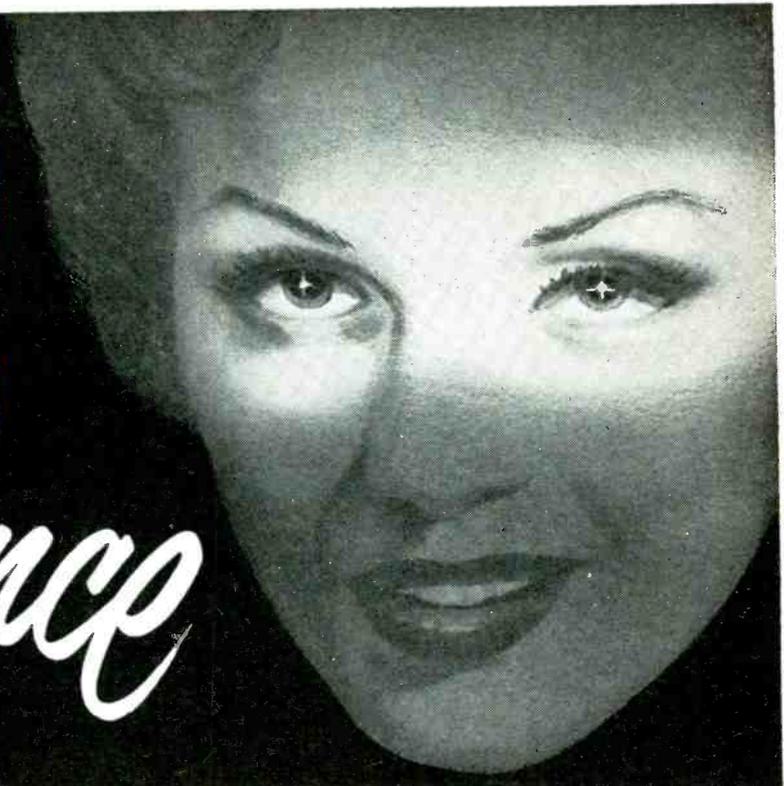
**Admiral Corporation**, Accessories and Equipment Division, Chicago 47, Ill.



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you can  
**SEE** the  
*difference*



**SCREEN-WISE THERE'S THE DIFFERENCE**

There's a visible difference in the screen itself which is acquired through Thomas' attention to every detail in the process of screen production of Phototron.



**45 TESTS MAKE THE DIFFERENCE!**

Thomas Phototrons are given 45 individual tests to maintain their high standards.



**Quality control Assures the *Difference* in Television Picture Tube Manufacture . . .**

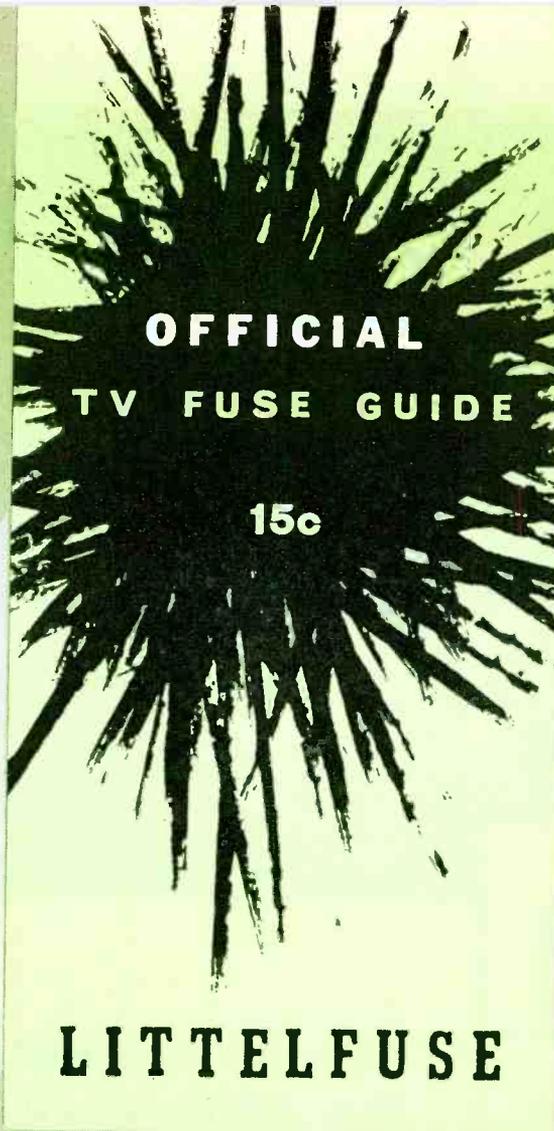
A **Difference** which is **seen** in the **screen** — influencing long-lasting, true-to-life picture reproduction! Naturally, Thomas continues to maintain this rigid supervision in all other phases of tube construction which has made Thomas the leading name in picture tubes. That's why top TV set makers insist on Thomas Phototron tubes!

Write or phone now for complete information and **see the difference.**

See us at Booth #117 at the May Parts Show.

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**ELECTRONICS**  
PASSAIC, NEW JERSEY

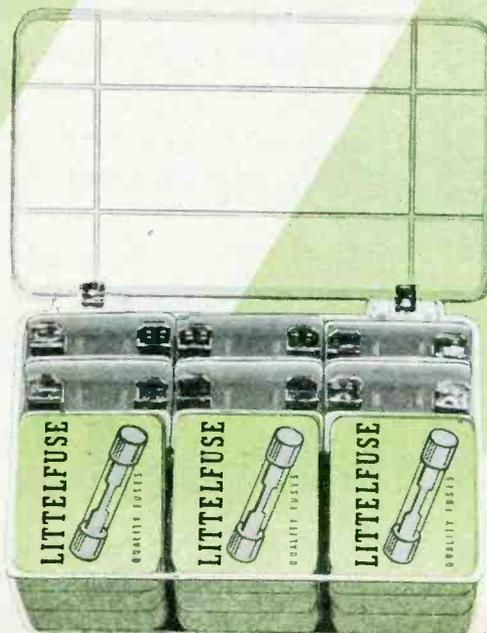




Littelfuse 1953 TV Fuse Guide enlarged to include latest models

# Both New - Both Needed

Littelfuse new One Call Kit adapted to include fuses being used in latest models—94 out of 100 times one call is all. Littelfuse Inc., Des Plaines, Ill.





did you know . . .

that Rauland made the first rectangular tube in 1943  
everybody knows . . . that engineering leadership means  
sales leadership . . . and that means RAULAND

THE RAULAND CORPORATION, 4245 N. KNOX AVENUE, CHICAGO 41, ILLINOIS • MULBERRY 5-5000

**RAULAND**

did you know . . .



that Rauland was the first company to produce the  
electrosatic low focus voltage tube?  
everybody knows . . . that engineering leadership means  
sales leadership . . . and that means RAULAND

THE RAULAND CORPORATION, 4245 N. KNOX AVENUE, CHICAGO 41, ILLINOIS • MULBERRY 5-5000



**DID YOU KNOW**

that Rauland was the first company to manufacture  
aluminized tubes on a production basis?  
everybody knows . . . that engineering leadership  
means sales leadership . . . and that means RAULAND

THE RAULAND CORPORATION, 4245 N. KNOX AVENUE, CHICAGO 41, ILLINOIS • MULBERRY 5-5000

Burton-Brown Advertising

Linearity adjustments in the  
palm of your hand...

## with the CREST TV BAR GENERATOR

Provides actual bar pattern on TV receiver screen

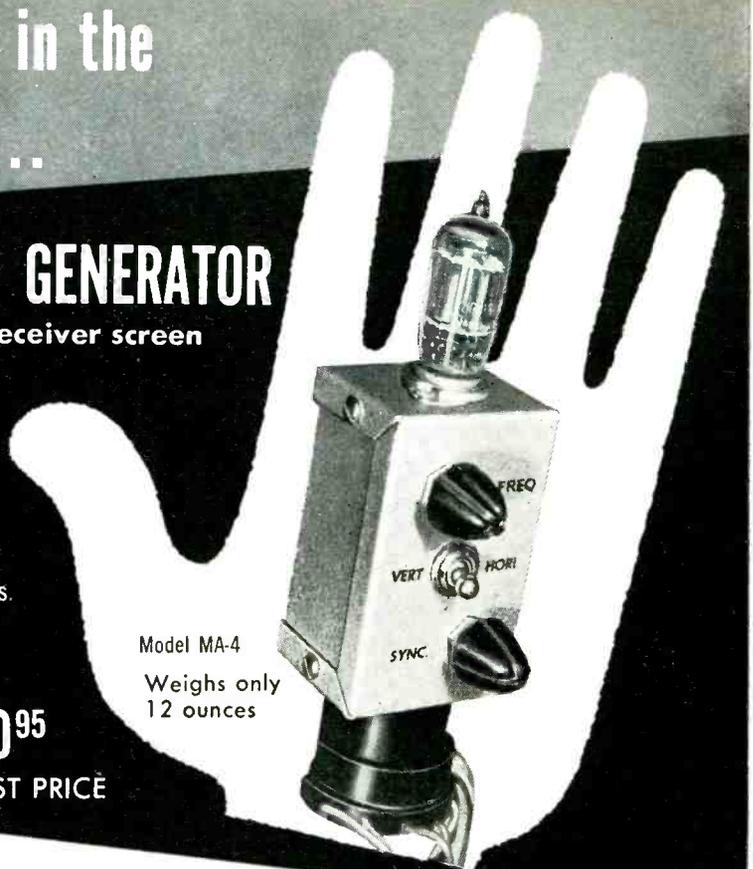
A highly efficient, portable, lightweight unit provides servicemen with the sensibly engineered Television Bar Generator.

On the spot accurate linearity adjustments

- Can be used when no stations are on the air.
- Produces horizontal or vertical bars.
- Adjustable number of vertical and horizontal bars.
- Simple self-powered plug-in unit... fits picture tube... no tools required for this 10-second installation.
- Vest pocket size... stow conveniently in tool box.

**\$10<sup>95</sup>**

LIST PRICE



Model MA-4

Weighs only  
12 ounces



## When ACCURATE voltage boost is required CREST LVB-117

The LVB 117 is engineered to safely and accurately restore required voltage to any TV set or electrical appliance.

Insures full strength and proper width and height of TV picture when low line voltage weakens and shrinks picture. Corrects low line voltage sync and oscillator drift troubles.

### 6 unique features for the ultimate in accurate voltage boost!

- ✓ 350-Watt Rating... ample for most requirements on line voltages from 90 to 135 volts.
- ✓ Simple External Plug-in... 10-second installation.
- ✓ Automatically Operated... turns on and off with set or appliance.
- ✓ Multi-Tap Selector Switch... permits exact voltage boost.
- ✓ Overload Fuse Protection... protects against unsafe line voltage increase.

Standard RTMA Guarantee

**\$17<sup>95</sup>**

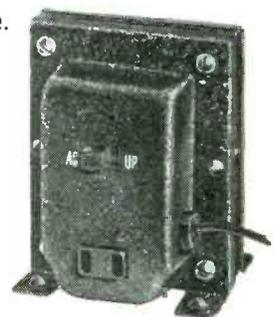
LIST PRICE

### Now available in the CREST LVB "Jr."

- Single Switch Control... for 10 volt boost or straight-thru line.
- 350 watts rating.

#### Corrects...

Inadequate picture width  
Insufficient height  
Weak picture brightness  
Poor sync and oscillator drift  
Tube failures  
Low sensitivity in fringe areas  
When caused by low line voltage.



Catalog No. 3021 **\$9<sup>75</sup>** LIST PRICE

# CREST

LABORATORIES INC.

See us at the Electronics Parts Show, Chicago, Booth 120

84-11 Rockaway Beach Blvd., Rockaway Beach, N. Y. NEptune 4-3328

# 10 TIMES MORE POWERFUL THAN STACKED 10 ELEMENT YAGIS

## PHILCO *All-Purpose TV Antenna*

### NEW Design and Principle

By far the most powerful TV antenna on the market today . . . a sales value unsurpassed at its popular price. With the mere flip of a switch this exclusive all-purpose Philco antenna without rotor or moving parts of any kind instantly and automatically beams the set to the best possible signal for both UHF and VHF reception. No attenuators are necessary in strong signal areas since an off position of the switch will automatically attenuate the signal. Available in preassembled aluminum dowel reinforced elements of single bank and stacked arrays for metropolitan and fringe areas at your Philco distributor now.

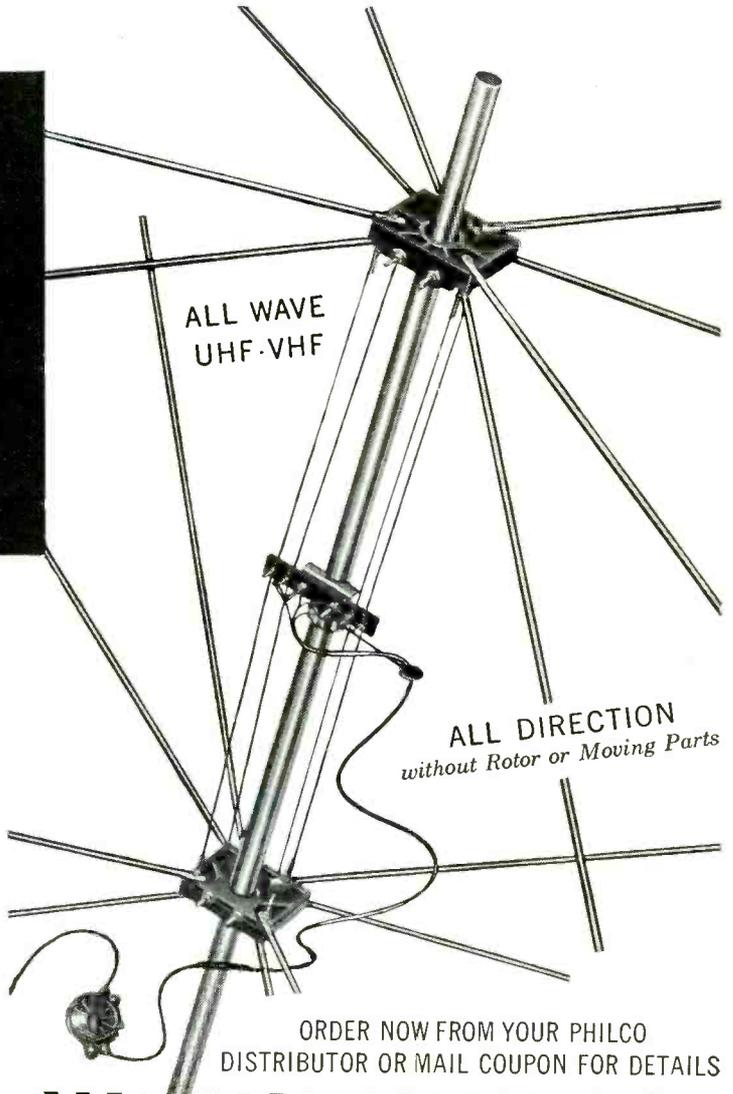
### *Up to 22.3 DB Gain over Tuned Dipole*

DB GAIN OVER A TUNED DIPOLE CUT FOR EACH CHANNEL FREQUENCY

|              | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11   | 12   | 13   |
|--------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Single Array | 7.8  | 14.0 | 6.7  | -1.7 | 16.3 | 2.5  | 6.0  | 9.6  | 12.1 | 10.8 | 15.0 | 12.8 |
| Gain Chart   | 36"  | 18.8 | 3.5  | 7.4  | 17.3 | 0.0  | -1.3 | 6.0  | 8.4  | 11.5 | 13.0 | 12.5 |
| using        | 45"  | 6.5  | 14.3 | 6.0  | -6.0 | 18.6 | 6.7  | 8.5  | 18.2 | 18.1 | 13.2 | 14.3 |
| different    | 60"  | 5.8  | 2.2  | 9.6  | -1.0 | -2.0 | 1.5  | -4.0 | 10.3 | 4.0  | 15.4 | 7.0  |
| spacing      | 82"  | 8.4  | 15.5 | 13.0 | 10.5 | 21.3 | 3.0  | 14.0 | -2.0 | 1.6  | 10.0 | 6.0  |
| between      | 98"  | 2.5  | 8.0  | 9.5  | -4.5 | 17.0 | 6.0  | 2.0  | 4.0  | 1.0  | 10.0 | 7.0  |
| two single   | 114" | 21.0 | 19.0 | 7.4  | 22.3 | 0.0  | 6.0  | 8.2  | 10.4 | 11.5 | 14.0 | 14.1 |
| arrays       | 122" | 7.4  | 17.0 | 13.4 | 2.5  | 21.5 | 8.5  | 17.3 | 16.2 | 12.1 | 14.8 | 15.6 |

The above tests were made using a 40-foot lead-in. However amazing results have been obtained on installations using a lead-in up to 150 feet without any appreciable difference in gain. These tests were made in real fringe areas.

For maximum gain in outer fringe areas, orient the antenna for the weakest channel desired. Location will determine the number of elements to be used.



ORDER NOW FROM YOUR PHILCO DISTRIBUTOR OR MAIL COUPON FOR DETAILS

PHILCO CORPORATION, Accessory Division  
Allegheny and A Streets  
Philadelphia 34, Pa.

Please send me information about the Philco All Purpose Antenna, with current trade price list.

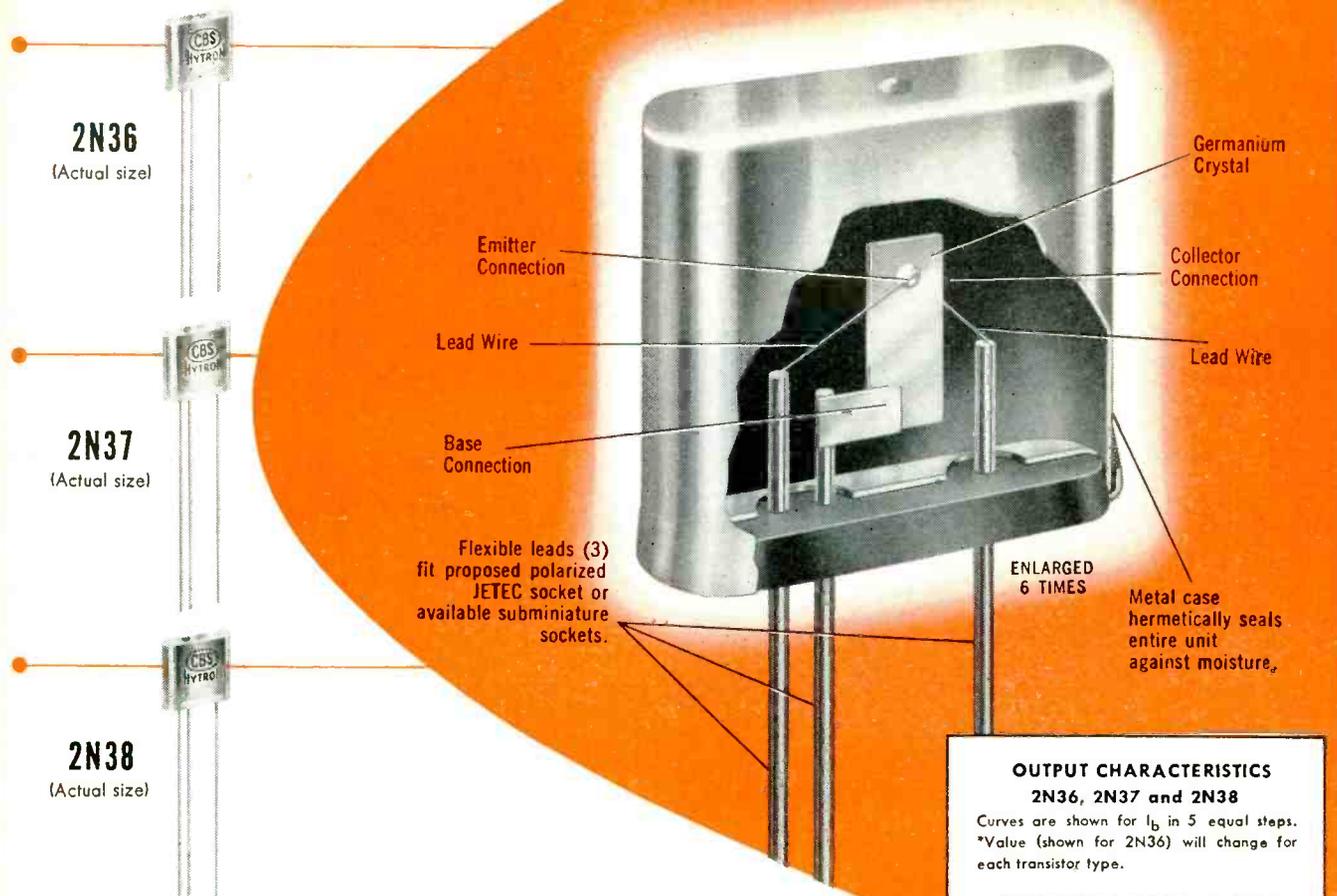
NAME .....

STORE NAME .....

CITY ..... ZONE ..... STATE .....

Please check in space below

I am a Retail Dealer  I am a TV Serviceman



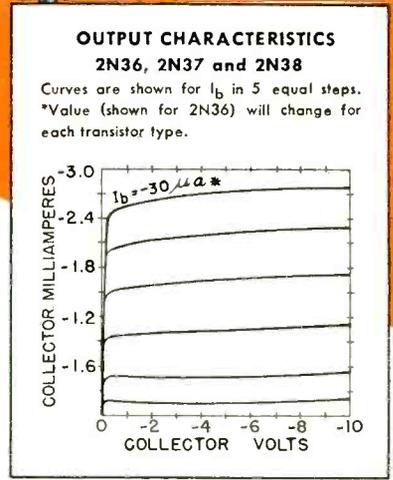
# NOW...HERMETICALLY SEALED CBS-HYTRON JUNCTION TRANSISTORS

In junction transistors, the surfaces are extremely sensitive to moisture. For dependability, they must be completely moisture-proofed. CBS-Hytron, recognizing this, is the first to offer you the new *hermetically sealed* 2N36, 2N37, and 2N38 junction transistors. Each is uniquely sealed in a metal case . . . moisture-proof, contamination-proof, light-proof. (See drawing.)

You can buy these new hermetically sealed P-N-P junction types immediately. All are amplifier types. Have similar characteristics, except for current amplification and power gain. You may operate the 2N36, 2N37, 2N38 up to 55°C. Their in-line design gives you: Compact, flat mounting . . . easily identified polarity . . . solder-in or plug-in (with clipped leads) convenience.

In addition to their unique moisture-proof feature, these CBS-Hytron junction types offer: (1) High gain. (2) Low noise figure. (3) Operation at low voltages. As well as other advantages characteristic of transistors: Compactness . . . light weight . . . ruggedness . . . instantaneous operation . . . and long life.

Remember, CBS-Hytron hermetically sealed 2N36, 2N37, 2N38 transistors are available at once. Write for complete data. Or order now for prompt delivery.



**ELECTRICAL CHARACTERISTICS †**  
CBS-Hytron P-N-P Junction Transistors

| Characteristic                 | 2N36 | 2N37 | 2N38 |
|--------------------------------|------|------|------|
| Collector voltage              | -6   | -6   | -6   |
| Collector current              | -1   | -1   | -1   |
| Current amplification factor # | 45   | 30   | 15   |
| Power gain #                   | 40   | 36   | 32   |

†Typical values at 25°C. #Grounded emitter connection.



**NOW 3 CBS-HYTRON TEST ADAPTERS.** By popular demand. Three sizes now available at these net prices: 7-Pin Miniature, \$1.45; 8-Pin Octal, \$2.25; 9-Pin Miniature, \$1.75. Take advantage of e-a-s-y "topside" testing. Order your Test Adapters today from your CBS-Hytron jobber.

**CBS-HYTRON** Main Office: Danvers, Massachusetts

A Division of Columbia Broadcasting System, Inc.

RECEIVING . . . TRANSMITTING . . . SPECIAL-PURPOSE AND TV PICTURE TUBES • GERMANIUM DIODES AND TRANSISTORS



# The Picture Tells the Story

TV Antennas exist for one reason — to provide a clear, strong, sharp picture!

TRIO ZIG-ZAG\* TV Antennas perform so well in this all important respect that they are America's most wanted.

Yes, a picture — the TV picture — tells the TRIO story more eloquently than anything else! Where all other antenna designs fail, high gain TRIO ZIG-ZAG TV Antennas consistently lock in sharp, clear pictures — from Maine to Texas, in city or country!

TRIO TV antennas look different, work different — provide a magnificent DIFFERENCE in picture quality!

\*Patent Pending



## Also in the Picture

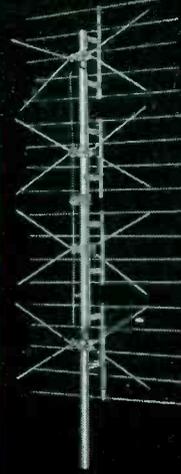
The TRIO Rotator and Direction Indicator are the most dependable ever built. Developed after \$50,000 research. Fully guaranteed for a FULL two years!

\*New insulating sleeve, with longer leakage path and elimination of slit, does away with assembly errors — elements cannot short out. For maximum strength, new steel, electro-plated element clamps have been introduced.

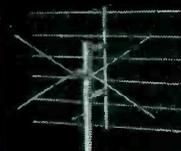
## Best Buy in UHF Antennas LOW IN COST — HIGH IN PERFORMANCE

### NEW TRIO UHF BOW-TIE with reflector

Sturdy, broadband antennas of uniformly high gain that have been thoroughly field tested. Phasing strips installed, pre-assembled — a jiffy to attach reflector screen. Available in one, two and four bay models. Usual high-quality TRIO construction.



Model UBT-4  
Supplied With  
4 Foot Mast

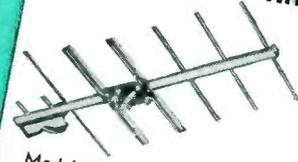


Model UBT-1  
Supplied With  
2 Foot Mast



Model UBT-2  
Supplied With  
3 Foot Mast

## NEW TRIO UHF MULTI-CHANNEL YAGI ANTENNAS



Broadband yagis developed by TRIO now successfully applied to UHF. Four models cover all UHF channels, rarely any one area.

- Model 6-UBY 14-26 for Channels 14-26
- Model 6-UBY 27-42 for Channels 27-42
- Model 6-UBY 43-60 for Channels 43-60
- Model 6-UBY 61-83 for Channels 61-83

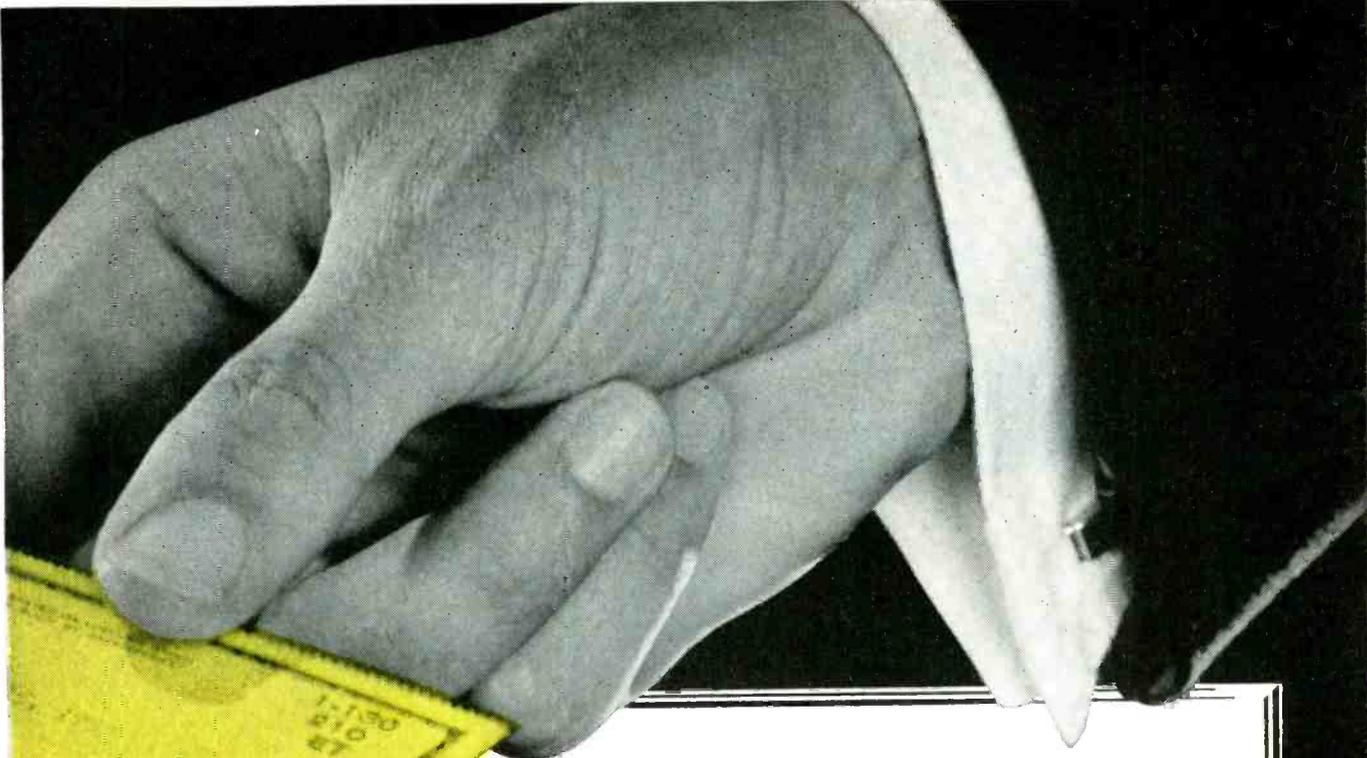
These high gain six element yagis have sharper directivity, thereby eliminating ghosts. Thoroughly field tested. Entire antenna mounted in front field of reflectors or antenna elements. Mast clamp supplied. Completely assembled.



# TRIO MANUFACTURING CO.

GRIGGSVILLE, ILLINOIS





# FOR YOU... \$2500!

Win it in cash! Tell in 50 words or less how you would spend \$2,500 to increase your service business! 139 other cash prizes. Total \$7,125.

**T**HIS is a real big-money contest—and ABC—easy to enter! No figures to put down, no reports, no documents to attach. You win dollars simply by telling how to spend them wisely and profitably. You "Write your own ticket"!

Contest is open to all TV-radio service dealers and their employees. Rules are easy:

- Between June 15 and August 31, secure an entry blank from your G-E tube distributor. One blank with every purchase of 25 G-E receiving tubes or 1 G-E picture tube.
- Tell in the space provided on the blank how you would spend \$2,500 to increase service business. Would you buy new equipment... remodel your store... run a hard-hitting advertising campaign... or invest the money in some other way?
- Fill out and mail as many entries as you choose. They must be postmarked not later than midnight, August 31, 1953.
- Winners will be selected on the basis of originality, business judgment, and clear thinking. An impartial board of judges will make the selections.

First prize, \$2,500  
4 prizes, each \$500  
10 prizes, each \$50  
25 prizes, each \$25  
100 prizes, each \$15

All prizes are cash!

### Use the helps G.E. makes available!

If you're looking for ideas, they're waiting for you in G.E.'s new 12-page promotion catalog, ETR-589-A. Learn what you can obtain in identification and advertising aids of all types... business helps... service aids... technical manuals and publications.

Get your copy from your G-E tube distributor when you obtain your contest entry blank. Tube Department, General Electric Company, Schenectady 5, N. Y.

161-4A5



*Diamond Anniversary*

# GENERAL ELECTRIC

World's most powerful TV ANTENNA!

**22 Db gain**

over tuned dipole!

motorless all-direction  
UHF-VHF-FM  
reception

**MONEY BACK GUARANTEE**

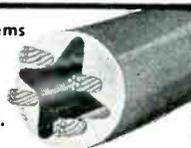
to outperform all other  
antennas using rotor motors on  
UHF-VHF & FM

- Guaranteed 10 times more powerful than stacked 10 element Yagis.
- Receives channel 2-83 from all directions without a rotor.
- Broadband UHF-VHF and FM, motorless all direction reception.
- All aluminum flip-out assembly.

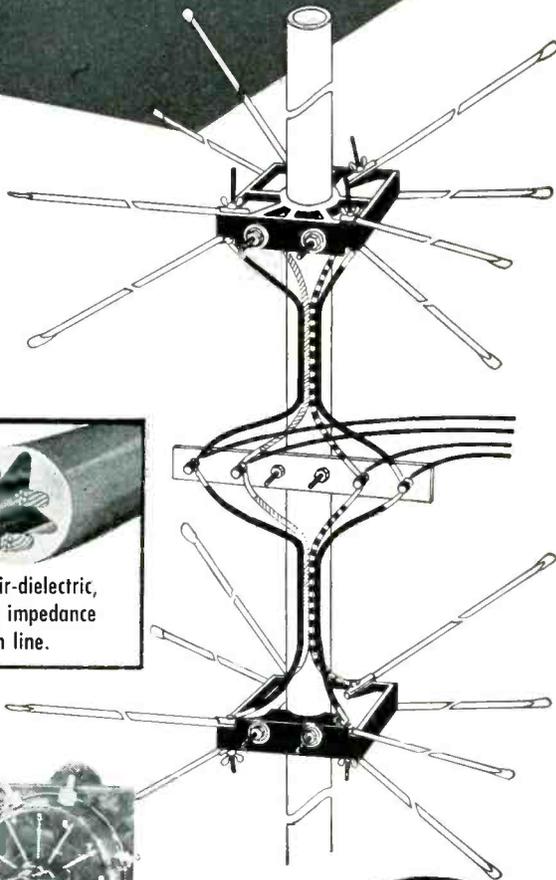
The only TV antenna that instantly beams the television set directly to the signal without a rotor. This antenna brings strong UHF & VHF signals from all directions to weak signal areas instantly . . . with a flick of the nine position switch located near the television set.

**MONEY BACK GUARANTEE** To out-perform all other antennas (using rotor motors) on both UHF and VHF, including stacked ten element Yagis, stacked corner and bow-tie reflectors, four bay conicals, etc.

Approx. 300 Ohms  
between every  
two of the  
four conductors.



Four conductor air-dielectric,  
tubular, matched impedance  
transmission line.



**Model A D 2-8**

Includes Stacked Antenna Array,  
9 Position Switch, Completely  
Wired Stacking Harness, A.I.M.—  
Automatic Impedance Matching  
Coupler.

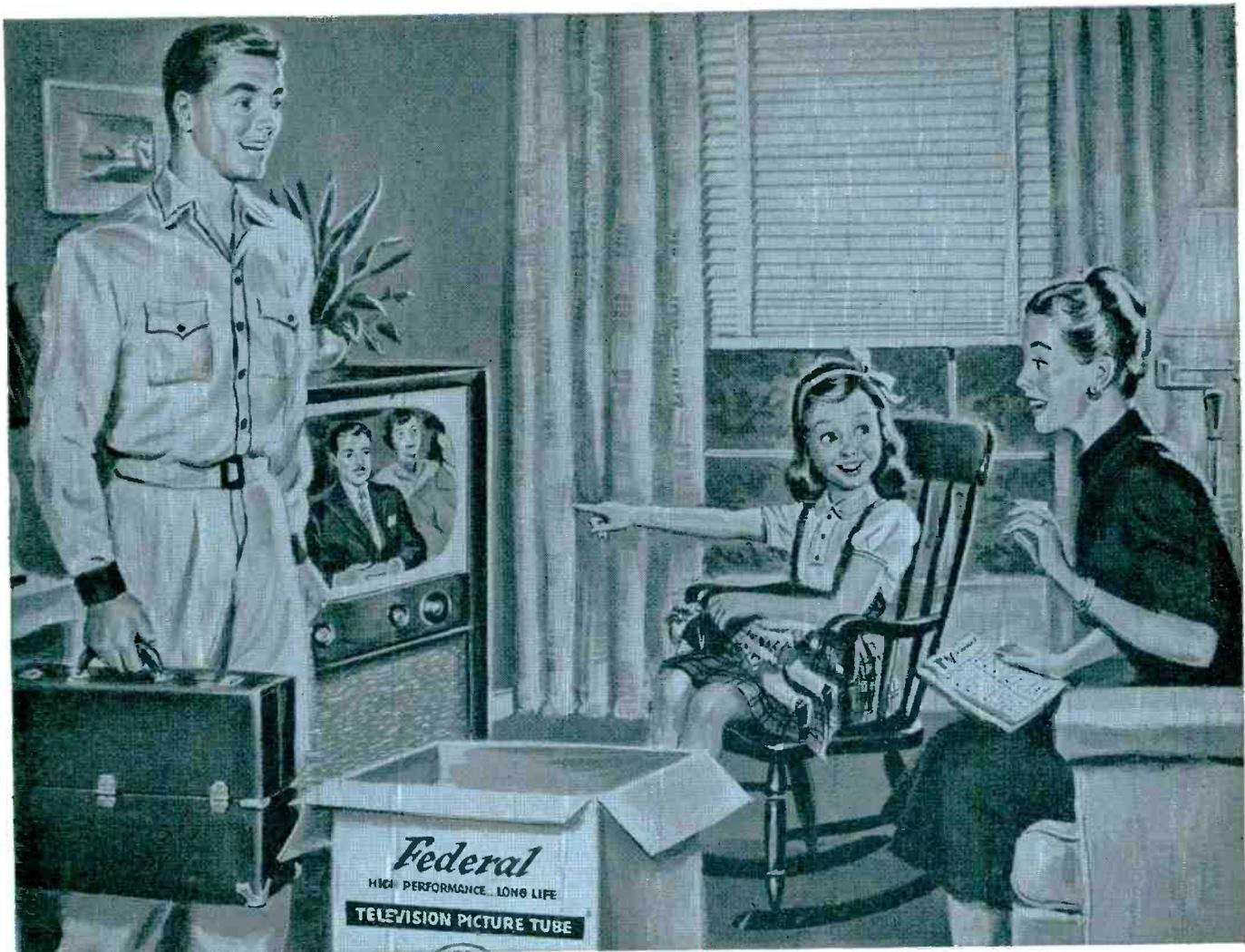
List Price  
**\$36<sup>50</sup>**

see us at . . .

THE ELECTRONIC PARTS SHOW, CHICAGO ROOMS 647A & 648A

**ALL CHANNEL ANTENNA CORP.**

70-07 Queens Blvd.,  
Woodside 77, N.Y. Hickory 6-2304



## The man who brought back a smile

**E**XCITED? Cynthia was practically bursting! Last thing Dad said was "Now you look close, Cindy. You'll see me right there in the audience tonight, and I'll wave to you." (They always do!) Long about three o'clock Cynthia's mother turned on the set . . . "just to make sure." Well, there was a picture, if you could call it that . . . but so dim and fuzzy they'd never even recognize Dad that evening. And Cindy . . . disappointed? She was brokenhearted! But, you know the happy ending . . . the serviceman's competent analysis . . . replacement of a worn-out tube with a Federal "Best-in-Sight" Picture Tube . . . and there are smiles again.



*Federal's*

Line of Popular-Size Picture Tubes will take care of over 90% of all TV replacements. Write for free copy of Federal's TV Picture Tube Data Book, Dept. N-256.

**THE SERVICEMAN** gives his customers years of experience and expert technical ability. His business is knowing what's best . . . and giving the best. Customers rely on his judgment just as thoroughly as he relies on Federal "Best-in-Sight" Picture Tubes for the sharpest, brightest, clean-cut pictures possible. He *knows* that when he picks up the carton with the blue and white Federal label, he's going to make some customer a lot happier for a long, long time.



Consult your local Federal Distributor or write to  
**Federal Telephone and Radio Corporation**

VACUUM TUBE DIVISION

100 KINGSLAND ROAD, CLIFTON, N. J.

In Canada: Federal Electric Manufacturing Company, Ltd., Montreal, P. Q.  
Export Distributors: International Standard Electric Corp., 67 Broad St., N. Y.

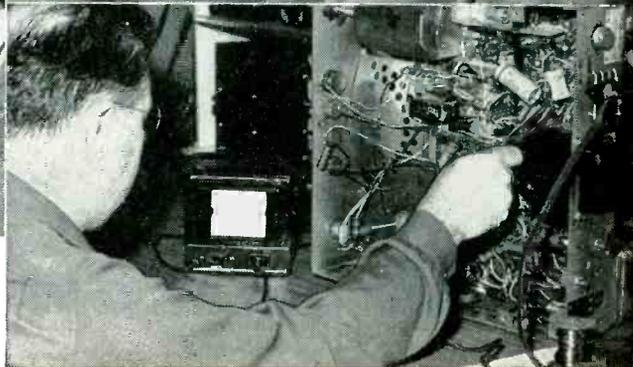
## Bill Clemens says—

Midget Radio Service (a 3-Man Shop)  
129 S. Elizabeth St., Lima, Ohio

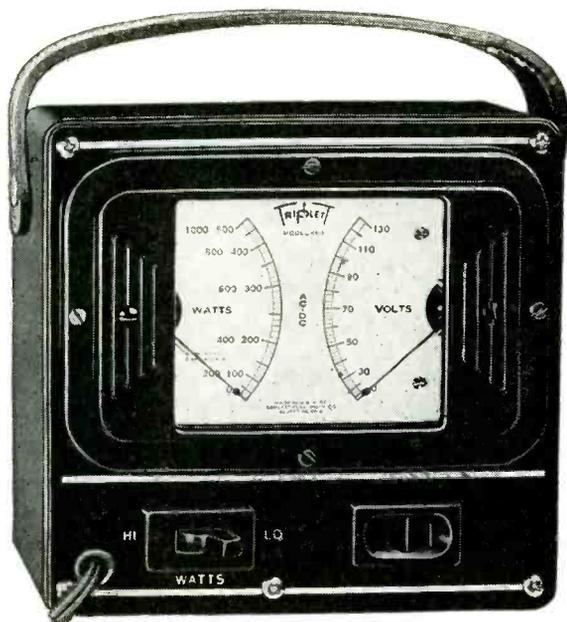
*"TRIPLITT 660 saves us  
50 to 100 man hours  
per month."*



1. **ISOLATING THE TROUBLE**—Plug the power cord of the chassis into LOADCHEK and note the reading. With your eye on the large meter remove the rectifier tube and you can tell immediately which side of the tube the trouble is on. You have already eliminated 50% of your probing time.



2. **LOCATING THE SHORT**—With Loadchek you can quickly check the shorted side, part by part, without laying down tools or picking up test leads. Here, the trouble was a short in the transformer, spotted without having to warm up set. Overloads are found the same way.



### Locates trouble in a hurry

The above pictures illustrate but one of the many time-saving uses of Triplitt 660 Loadchek. This versatile instrument accurately measures power consumption, enables you to see instantly any deviation from normal load, without disconnecting a single part... finds trouble in a hurry.

For Radio and TV servicing—for almost any kind of electrical trouble-shooting—LOADCHEK saves hours of painstaking work every day. At its moderate cost no service technician can afford to be without it. Try one today—and see! Write for free booklet.

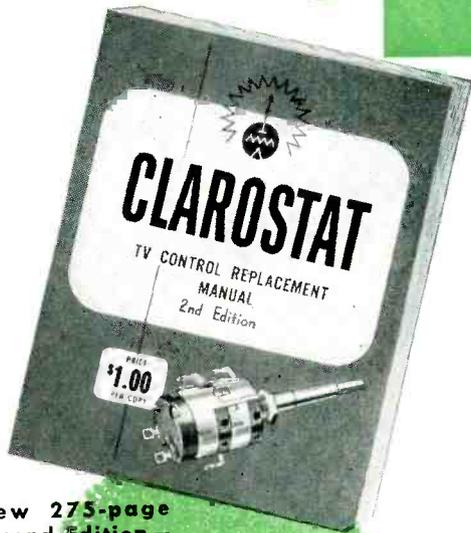
TRIPLITT ELECTRICAL INSTRUMENT CO., BLUFFTON, OHIO, U.S.A.

Suggested U. S. A. DEALER NET \$29<sup>50</sup>  
Price subject to change without notice.

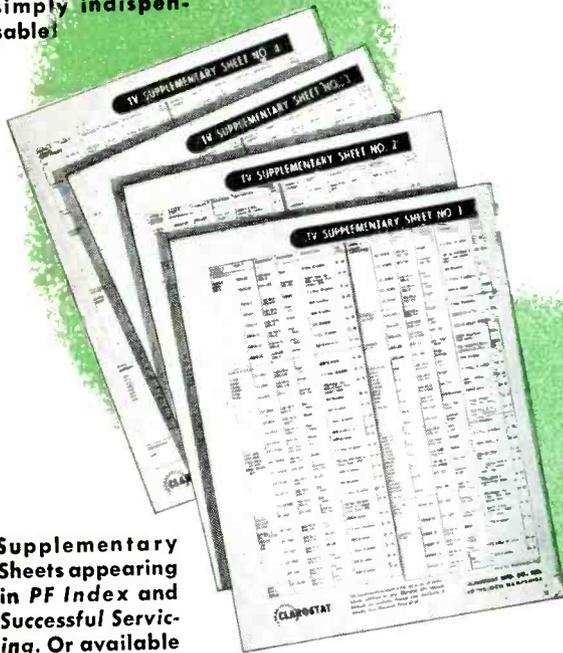


# Triplitt

don't improvise ...



New 275-page  
Second Edition —  
simply indispensable!



Supplementary  
Sheets appearing  
in *PF Index* and  
*Successful Servicing*. Or available  
from your jobber.

# RTV-ize!

## FOR FAST, SURE, ECONOMICAL CONTROL REPLACEMENTS

As easy as using the 'phone book. As sure as if you looked up the original specs of that chassis. Because Clarostat engineers, responsible for the majority of TV controls in use, have compiled the replacement data available to you in the *Clarostat TV Control Replacement Manual* and the *Supplementary Sheets*.

The listings are by set-manufacturer's model and chassis, part number, Clarostat catalog number, function and description. Cross references, too. Standard types where feasible; RTV or matched replacements, where essential.



RTV or matched replacements available when Standard types won't do.

Standard types when feasible — especially field-assembled "Pick-A-Shaft" and Ad-A-Switch combinations.

### ASK YOUR JOBBER . . .

He'll gladly show you the big Second Edition of the Clarostat TV Control Replacement Manual. Also the Supplementary Sheets. And remember, he carries Clarostat Standard and RTV controls for your convenience.

STAND PAT WITH

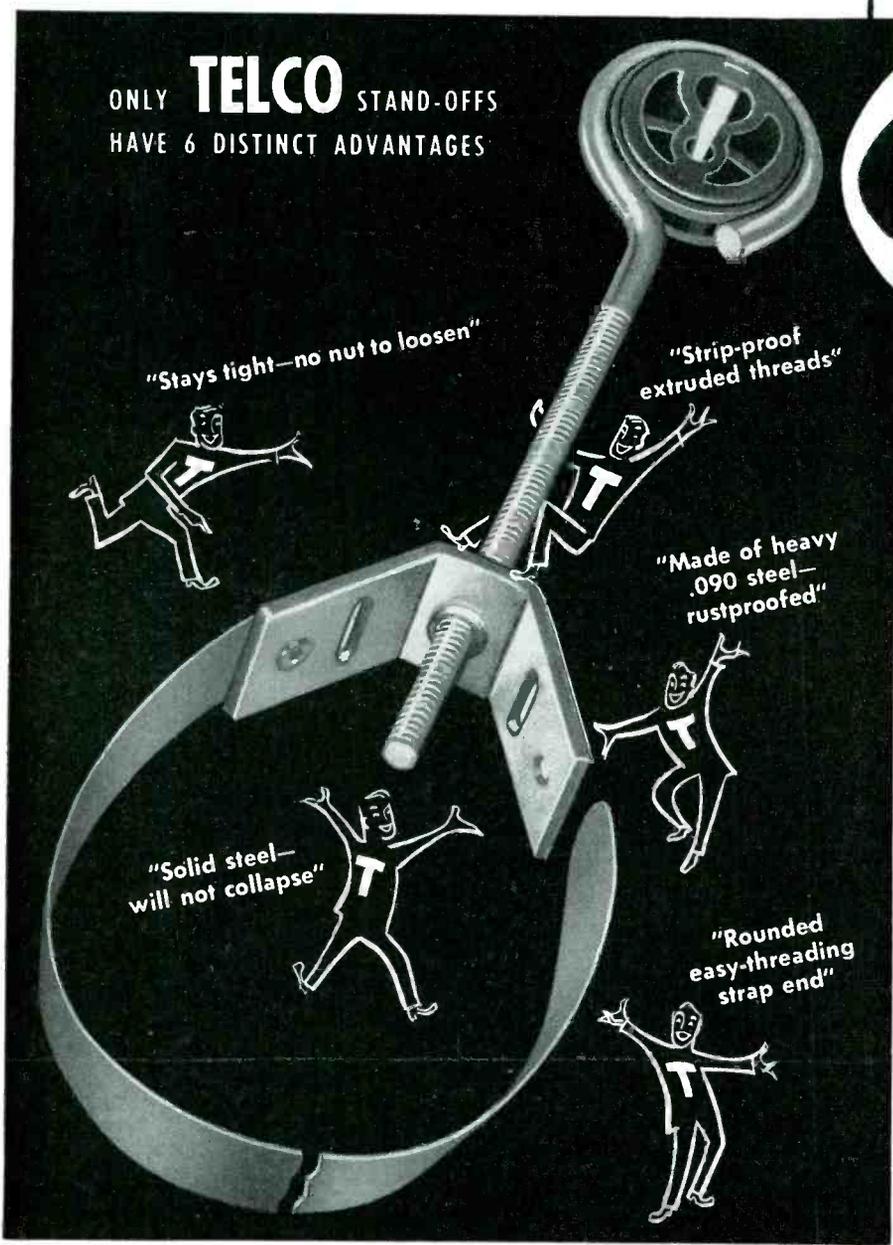
# CLAROSTAT Controls & Resistors

CLAROSTAT MFG. CO., INC., DOVER, NEW HAMPSHIRE  
In Canada: Canadian Marconi Co., Ltd., Toronto, Ontario

\*Trade-mark

# Now... One Name... One Source... for Top Quality TV Hardware!

ONLY **TELCO** STAND-OFFS  
HAVE 6 DISTINCT ADVANTAGES:



"Stays tight—no nut to loosen"

"Strip-proof  
extruded threads"

"Made of heavy  
.090 steel—  
rustproofed"

"Solid steel—  
will not collapse"

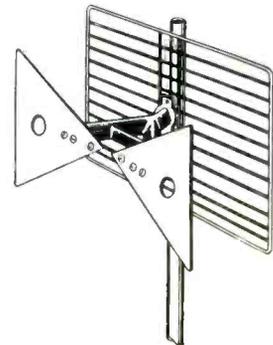
"Rounded  
easy-threading  
strap end"



TELCO means Television Hardware . . . hundreds of finest quality items needed for TV installation. Here's everything you need in antenna mounts; also every type of antenna, both UHF and VHF and more real value for your money than ever before. Ask your parts distributor about TELCO . . . he's got these money-saving products.



TELCO No. 8642  
**UNIVERSAL UHF LIGHTNING ARRESTOR**  
This one arrestor fits all twin leads, mounts anywhere. UL approved. Hi-dielectric bakelite. All hardware included. List \$1.25



**TELCO UHF WISHBONE BUTTERFLY ANTENNA**  
Newest design for all-channel reception. Tested and proved best in actual UHF areas. Highly directional. Rugged aluminum construction, low wind resistance. No. 8965 Telco Wishbone Butterfly Antenna. Single Bay with Tie Bar. List \$7.75

## OVER 135 MILLION TELCO STAND-OFFS NOW IN USE

- Finest Polyethylene Insert
- Smooth, Rounded Bracket Slots . . . Never Cut Strap
- 29 Telco Stand-Off Styles Available
- The Strongest Stand-Offs Ever Made



WRITE TODAY for your free copy, new TELCO Catalog  
**TELEVISION HARDWARE MFG. CO.**  
901 TAYLOR AVENUE ROCKFORD, ILLINOIS  
DIVISION OF GENERAL CEMENT MANUFACTURING CO.

SEE US AT THE PARTS SHOW!

# 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.

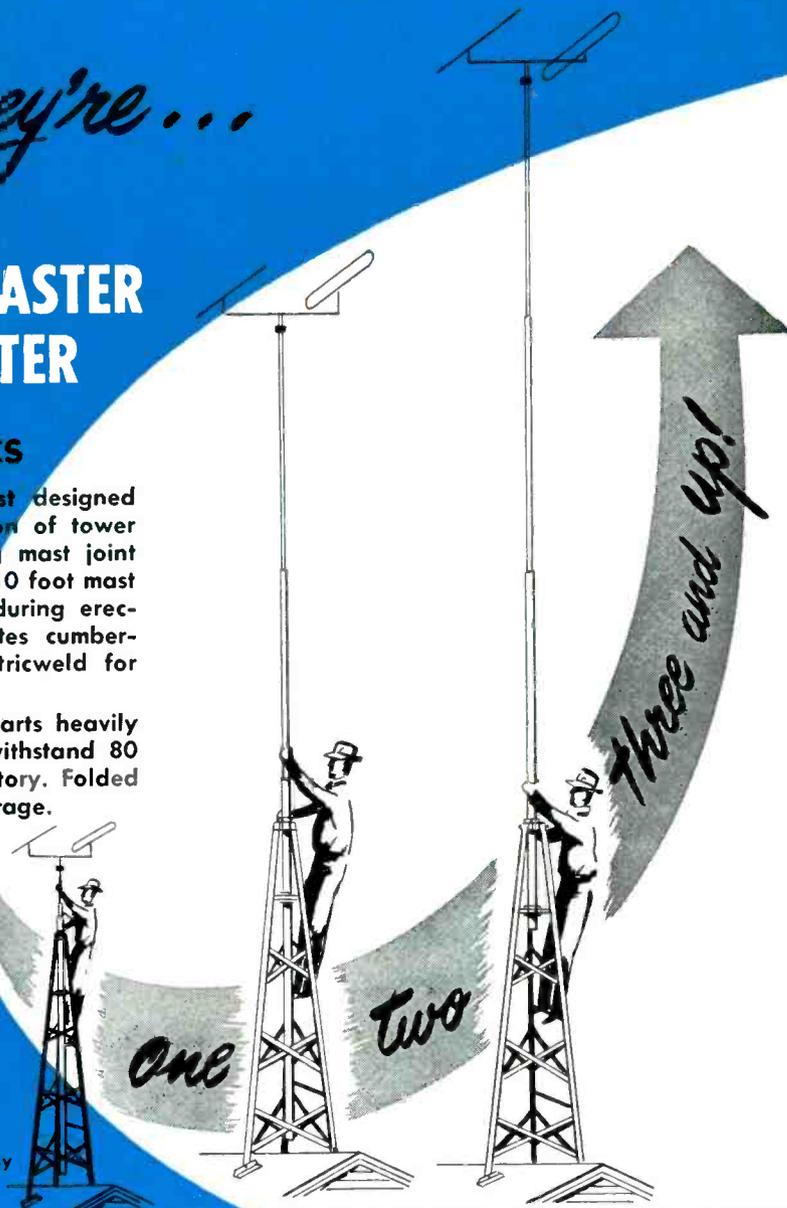
Tower fits any pitch roof. All steel parts heavily galvanized for long life. Designed to withstand 80 mile wind. Major assembly done at factory. Folded compact flat for easy shipment and storage.

## EASY TO INSTALL

*As easy as one, two, three*

- 1) Simply bolt the base level on roof and clamp reared 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

Model 40 TK  
Complete 40 ft.  
Installation \$54.60  
Shipping weight 80 lbs.

### • BAKER OFFERS THE DEALER

- 10' fitted end masts.
- 20' telescoping masts.
- 30' telescoping masts.
- Roof mounts 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 . . . . .

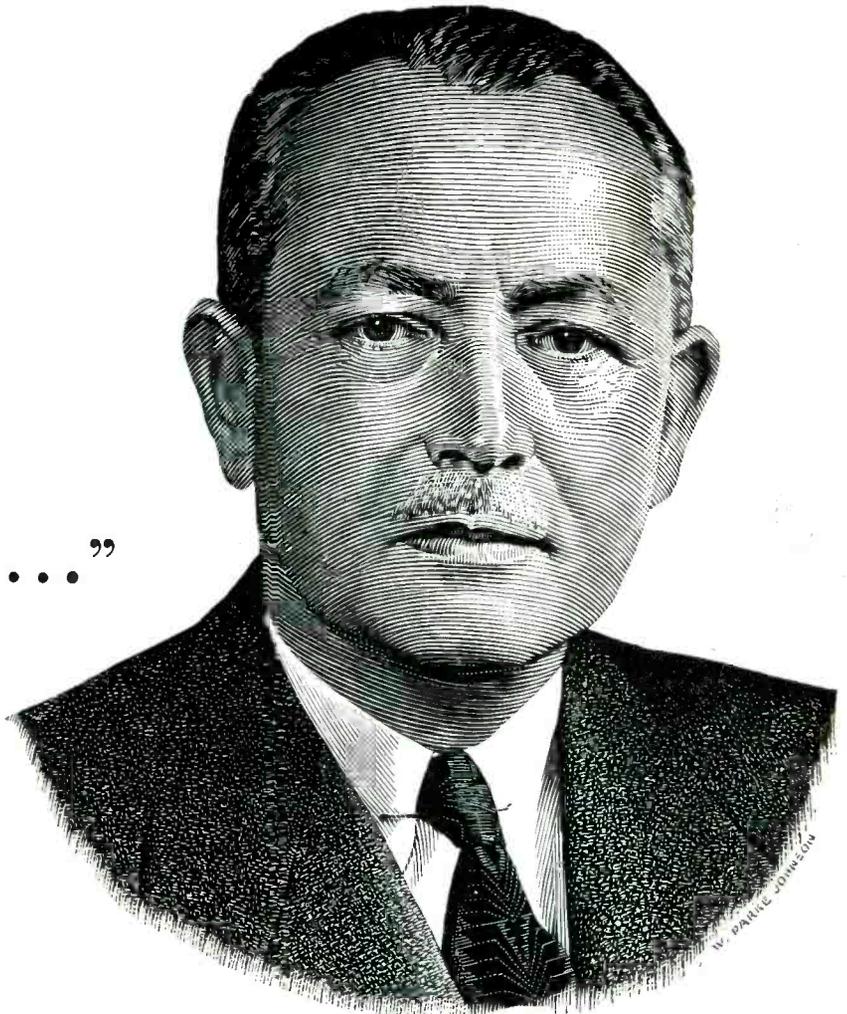
Name \_\_\_\_\_ Company \_\_\_\_\_

Address \_\_\_\_\_

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

*“... 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.
- their investment in Defense Bonds—and America—add up to \$140 million per month.
- they constitute a large block of the men and women who on December 31, 1951, held Series E Bonds

amounting to \$34,727,000,000—\$4.8 billions more than the cash value of Series E’s outstanding in August, 1945.

Not far from you is a State Director of the Savings Bond Division. He will be glad to tell you how easy it is to give your employees a Payroll Savings Plan. Or, if you already offer the Plan to your people, he will show you how to conduct a simple person-to-person canvass of your plant—a canvass intended to do only one thing—to put a Payroll Savings Application Blank in the hands of every man and woman on your payroll. Your employees will do the rest.

Phone or write to Savings Bond Division, U.S. Treasury Department, Suite 700, Washington Building, Washington, D. C.

*The U. S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and*

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PHILADELPHIA

**UHF-3**  
**BROAD-BAND**  
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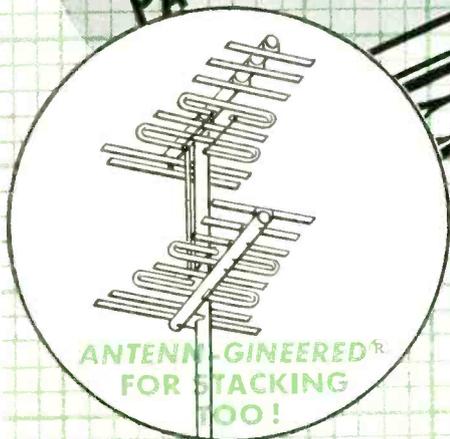
"A"—14 TO 48

"B"—27 TO 62

"C"—47 TO 83

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EXPORT DIVISION: ROBURN AGENCIES INC., NEW YORK 7, N.Y.  
CANADIAN DISTRIBUTOR: VAN DER HOUT ASSOCIATES, LTD., TORONTO

Presenting *Federal's* TV-1185

...**"PIPELINE"** of the air!



**300-OHM  
ALL-CHANNEL  
FOR THE FINEST  
VHF-UHF  
TV**

with the all-weather "silver" pigmentation that lets you  
**INSTALL IT and FORGET IT!**

FEDERAL'S TV-1185—newest sensation of the top-quality twin-leads—is virtually a "pipeline" for better-than-ever TV reception... VHF or UHF!

Insulated with the revolutionary Federal-developed "silver" polyethylene, TV-1185 is amazingly tough and efficient. It repels sunlight... fights heat... resists moisture and salt spray and other destructive deposits. Dirt and dust tumble off its fine, smooth, tubular surface!

TV-1185 keeps the energy field inside the weather-proof "silver" polyethylene sheath... providing low loss... more constant impedance... a better TV picture regardless of area or length of lead!

There's nothing finer for VHF or UHF than Federal's "pipeline" twin-lead... because nothing but the finest has gone into its design and production!

For complete details see your Federal distributor or write to Dept. D-556

**OUTSTANDING FEATURES  
OF FEDERAL'S  
TV-1185**

- Exceptionally low loss
- Holds impedance values
- Copperweld conductors—7/#28
- Leads in Weatherometer tests
- Flexible in low temperatures
- Rejects ultra-violet rays at higher temperature levels
- Top performer in any area
- Attenuation- db/100 ft.
 

|              |              |
|--------------|--------------|
| 10 mc— 0.50  | 400 mc— 2.6  |
| 50 " — 0.95  | 500 " — 3.0  |
| 100 " — 1.11 | 1000 " — 4.6 |
| 200 " — 1.7  |              |

• **SO EASY TO INSTALL:**

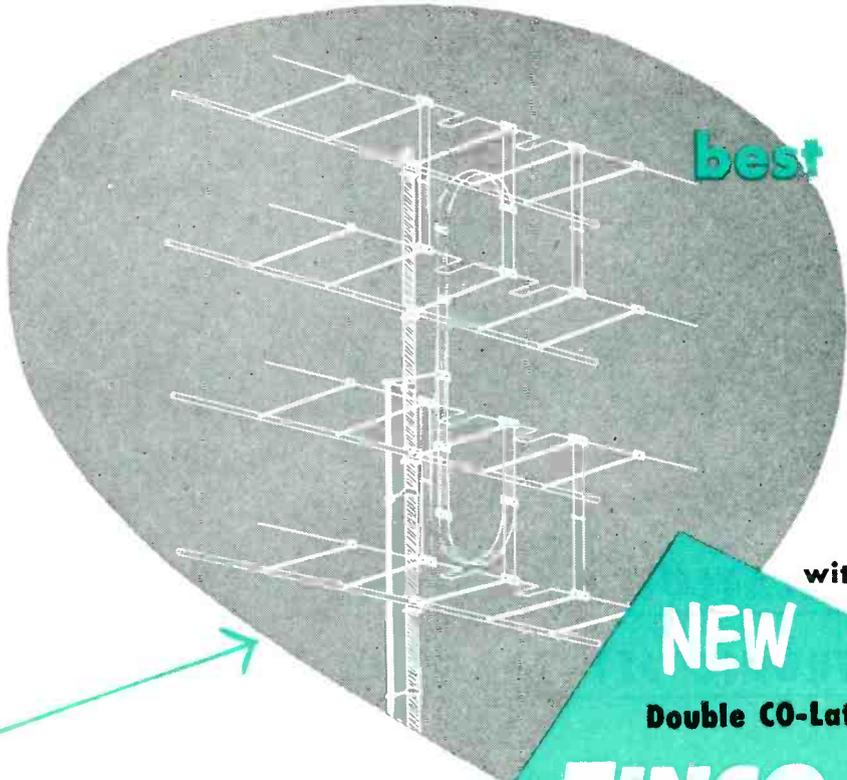
Expose required length of wire by stripping off polyethylene. To tight-seal, heat end of tube with match or other flame and crimp together with pliers. Sealing assures quality performance under all atmospheric conditions.

*Federal*   
*Telephone and Radio Corporation*

SELENIUM-INTELIN DIVISION, 100 KINGSLAND ROAD, CLIFTON, NEW JERSEY

In Canada: Federal Electric Manufacturing Company, Ltd., Montreal, P.Q.

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**Fringe area installation**

with the remarkable

**NEW**  
**Double CO-Lateral**  
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**ALL Channel UHF and VHF Antenna**  
**for excellent reception 120 to 150 Miles from stations**

**32 Driven Elements**

Here is one truly great antenna for the fringe area market — an antenna that can give YOUR installations recognition in the community. The new 400-A was tested all over the country under all types of conditions. Reception was the finest — we can prove this! The traditionally superb Finco engineering is evident in the performance and symmetrical design. One antenna — one transmission line. All-aluminum construction — rugged, lightweight, completely pre-assembled. Total weight only 8 lbs.

*Fringe area TV buyers demand Quality installations... FINCO is Quality!*

Fringe area buyers more and more ask for the FINCO by name. Let them know you handle the best—advertise the low cost way with Finco co-op ad mats—tie-in with LIFE—watch your sales soar! Get the complete story from your jobber or write direct.

TO PUT THE **FINCO** NAME BEFORE YOUR CUSTOMERS WE ARE ADVERTISING IN . . .

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- RADIO**
- TELEVISION**
- LOCAL NEWSPAPERS**
- FARM MAGAZINES**

**Tie-In With This Program**

The Finney Co. **RUSH**  
 Dept. S-15  
 4612 St. Clair Ave.  information on the new 400-A and UHF Conversion Kit No. 12  
 Cleveland 3, Ohio  FREE LIFE merchandising display material.  
 Co-op newspaper ad mat brochure.

NAME .....

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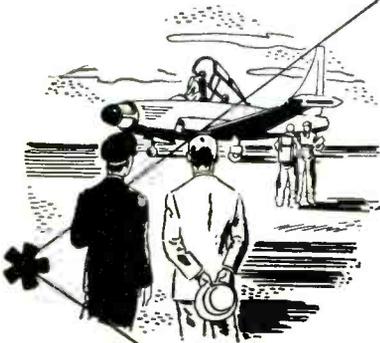
CITY ..... ZONE ..... STATE .....

**the**  
**FINNEY**  
**COMPANY**

Dept. S-15 • 4612 St. Clair Ave. • Cleveland 3, Ohio

# Field Engineers

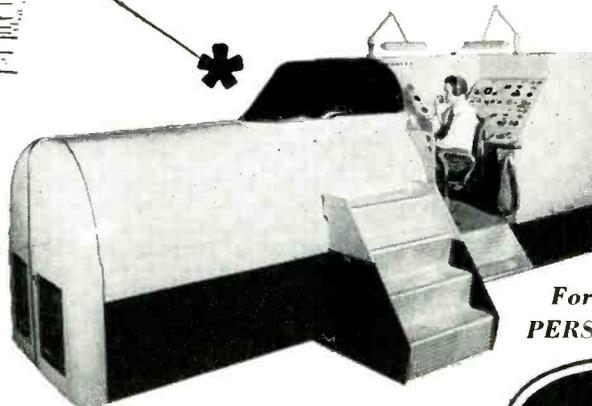
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You will work in close contact with key personnel of the U.S. Air Force and Naval Aviation. Your responsibilities will include supervising the installation and long range maintenance of highly specialized Link Electronic Jet Training Equipment. After three months' special training at the Binghamton, N. Y. plant of Link Aviation, you will be assigned to a U.S. Air Force or Navy jet training base in the U.S., Europe or the Far East!

In addition to excellent base pay and unusual company benefits, you will be placed on a liberal expense account and receive a 20% bonus if you receive an overseas assignment.



Immediate Openings  
are available  
**ACT NOW—**  
for a career  
with a future!

For Interview write to  
**PERSONNEL MANAGER**

*—the connecting link between ground and sky*

Manufacturers of the famous World War II LINK TRAINER,  
now producing Electronic Jet Training Equipment  
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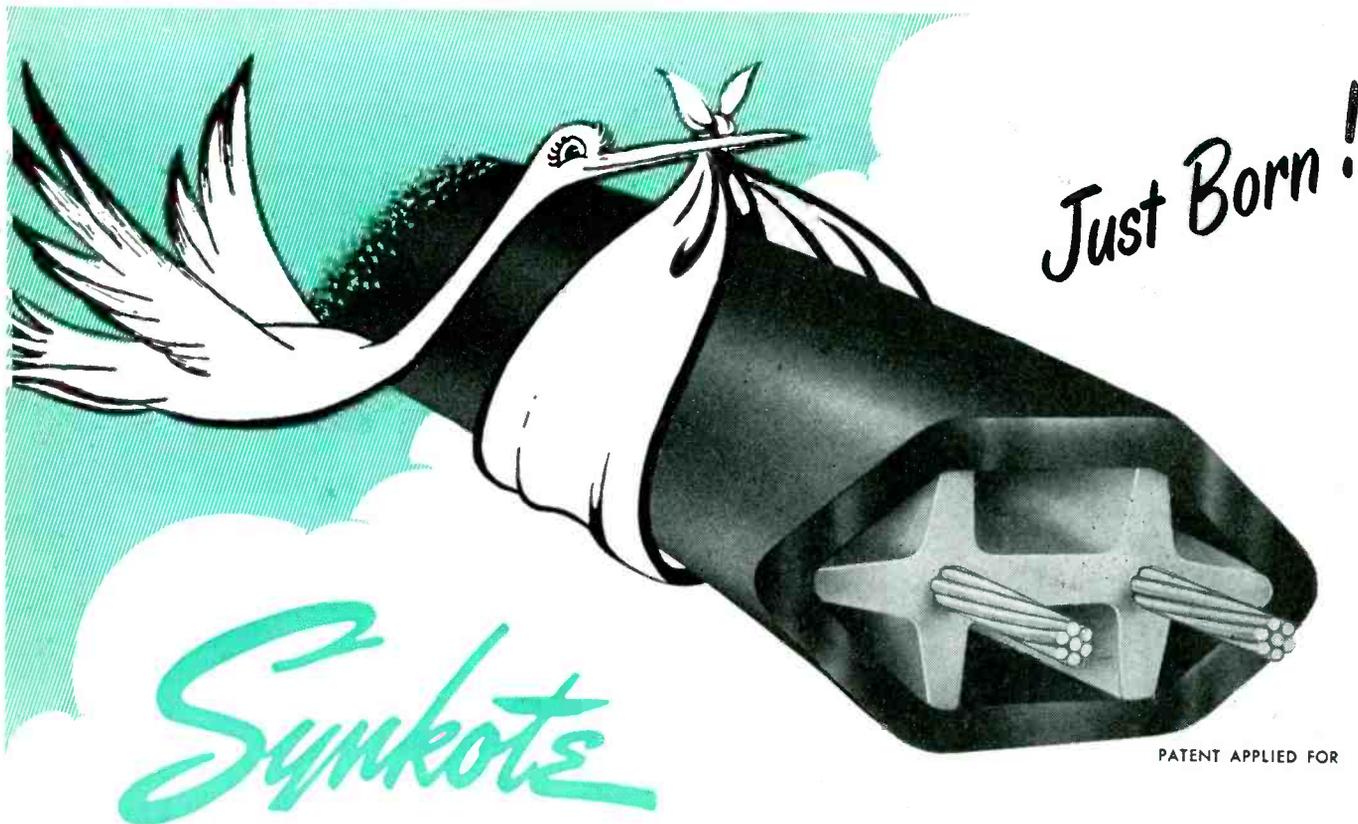




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Vice President in Charge of Sales, Magnecord, Inc., says: "Regency proves you can always tell a champion."

*Regency* · LARGEST SELLING BOOSTER AT ANY PRICE



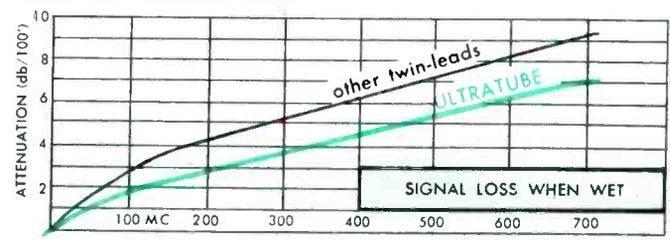
Just Born!

Synkote

PATENT APPLIED FOR

# "ULTRATUBE"

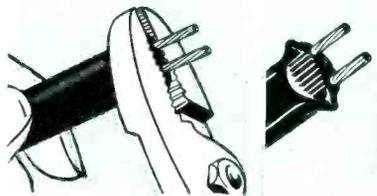
**PROOF OF PERFORMANCE:**



ULTRATUBE and other twin-lead constructions were tested under both wet and dry conditions. The data clearly show that for clear, strong signals under adverse weather conditions, no transmission line gives better reception than Synkote ULTRATUBE.

**SEALING THE ENDS:**

To seal the inside of "ULTRATUBE" against moisture, simply heat the ends with match or cigarette lighter, then clamp shut with pliers. This must be done or reception will deteriorate.



**For Unexcelled UHF Transmission Under All Weather Conditions**

Look at this cross-section of Synkote "ULTRATUBE". Note how the conductors are spaced equidistant from the outer insulation by several millimeters. This means that no matter how encrusted with salt or moisture the insulation becomes, the magnetic field between the two leads is practically unaffected — and signal strength is undiminished all the way down the line. For UHF — for better VHF — for fringe area reception, — there's nothing finer than Synkote "ULTRATUBE"!

Ask your Plastoid representative for samples of Synkote "ULTRATUBE" — for ultra-high frequency but *not* at ultra-high prices. Catalog No. PP 4911.



"Manufactured by the mile - tested by the inch"

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BUSSMANN Mfg. Co. (Division of McGraw Electric Co.)  
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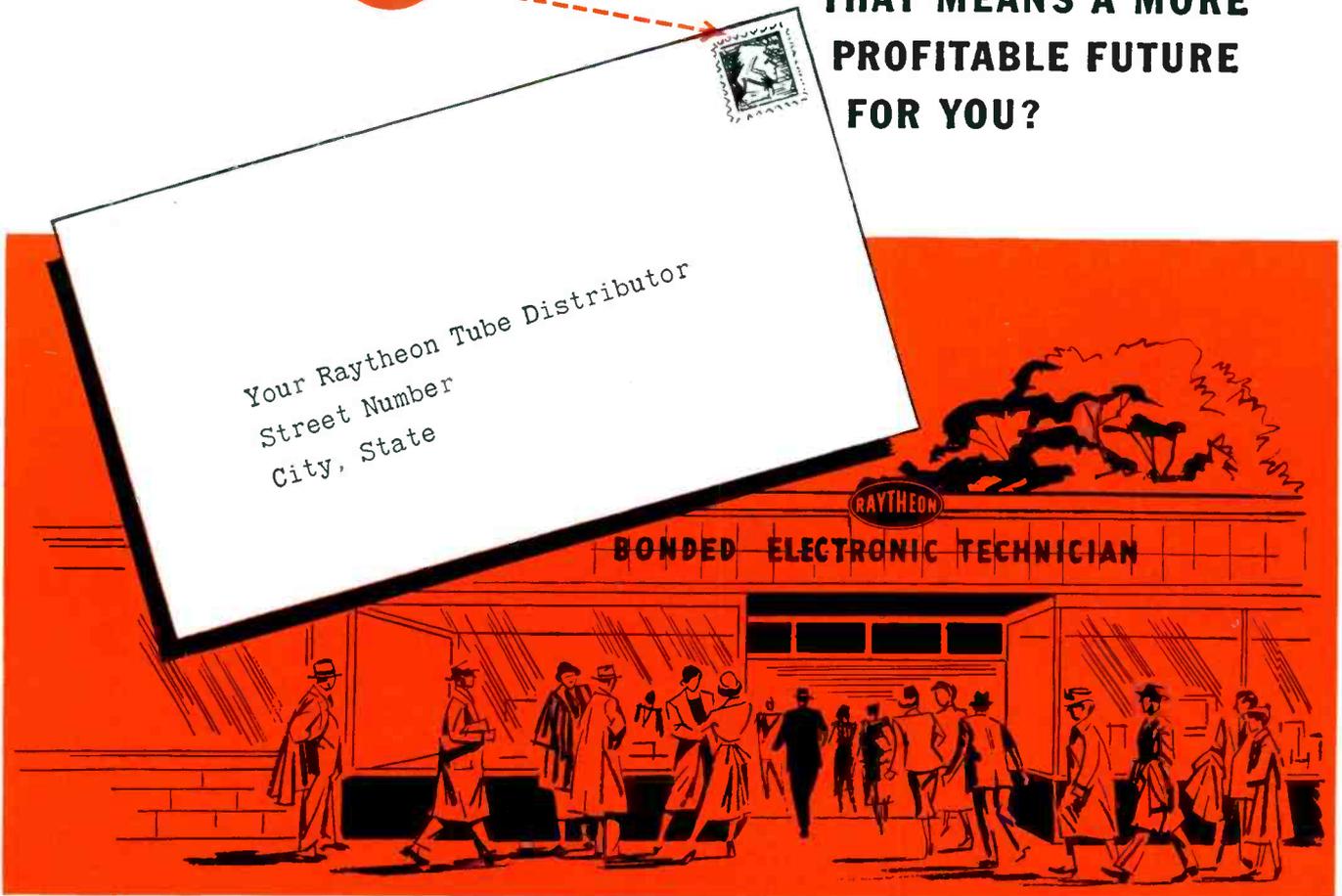
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SERVICE, MAY, 1953 • 33

WOULD YOU RISK **3¢** TO CREATE THE CUSTOMER CONFIDENCE THAT MEANS A MORE PROFITABLE FUTURE FOR YOU?



If the answer is yes, write your Raytheon Tube Distributor right now. Ask him if you can qualify as a *Raytheon Bonded Electronic Technician*.

Here's why:

As a *Raytheon Bonded Electronic Technician* your repair work is guaranteed for 90 days — a guarantee cash-protected by a bond backed by Continental Casualty Company. You receive a registered Bond Certificate, Identification Cards, Decals, Creed Displays and other sales and shop helps, designed to build your business by creating customer confidence in you and your shop.

If you can qualify for this complete Raytheon Bonded program that is increasing volume and profit for thousands of service dealers from coast to coast *it costs you nothing*. It is Raytheon's investment in *your* future.



**RIGHT... FOR SOUND AND SIGHT**



**RAYTHEON MANUFACTURING COMPANY**

Receiving Tube Division  
Newton, Mass., Chicago, Ill., Atlanta, Ga., Los Angeles, Calif.

*Excellence in Electronics*

RAYTHEON MAKES ALL THESE:  
RECEIVING AND PICTURE TUBES • RELIABLE SUBMINIATURE AND MINIATURE TUBES • GERMANIUM DIODES AND TRANSISTORS • NUCLEONIC TUBES • MICROWAVE TUBES

### Doing It the Right Way

SERVICE ASSOCIATIONS have often been praised for their spirit, resourcefulness and diligence. They have been unceasing in their driving efforts to mold an enlightened membership, respected by all in the community. During the past few years, their work has been particularly trying, for it has been necessary to cope with unprecedented, vexing problems occasioned by the arrival of TV. Nevertheless, they have striven hard, exhibited sparkling enterprise, and with noble results. An inspiring example of such achievements was recorded recently in Buffalo.

About two years ago, a group of independent TV Service Men in that city met to lay the framework for a new association. They mapped out an ambitious program focused on, particularly, self-improvement. They adopted an exhaustive training program, attended numerous clinics, and forged a streamlined, yet bold, code of ethics. The plan won immediate acceptance. Improved know-how and increased efficiency resulted in better customer relations, brought more business to member shops, and even resulted in dollar savings for set owners because of less callbacks, due to better servicing. Even the dailies applauded the group's work. In one report, it was noted that even though new set sales increased over 10%, and over 300,000 had become viewers, customer complaints had decreased more than 10%; a creditable record, indeed.

A few months ago, the group found itself faced with another problem; ultrahighs were coming to town, and Buffalo was to have two new *uhf* stations . . . WBUF-TV (17) and WBES-TV (59). Recognizing that practically all of the 300,000 sets in the city would have to be equipped with additional gear to receive these new stations, the group once again displayed leadership, and began planning for this invasion. The boys began learning how to install converters, tuners and strips, and new antennas that would be needed to receive the new bands. And, to insure further that ultrahigh reception would be satisfactory everywhere, the group has proposed a unique *operation changeover* program, which features an operations manual listing all makes of sets, plus model numbers

of all units distributed in western New York. This will include manufacturer's suggestions for *uhf* auxiliary equipment, and unit cost. In addition, the plan suggests the sponsoring of a series of *uhf* service clinics, reviewing ultrahigh problems and cures. Set owners would also be told how best to protect their individual interests through bulletins and cooperative advertising. A highlight of the plan is a *conversion club* which would make it possible for set owners to purchase conversion equipment, antennas and any accessories on a convenient payment plan at low interest rates.

The plan was introduced during a homes and garden exhibit, with the distribution of explanatory brochures, prepared in cooperation with one of the new *uhf* stations and a set manufacturer, at two booths manned by members of the association. Additional support for the idea appeared in a display of the *uhf* material consumers will probably need. On view were a variety of *uhf* antennas, strips, tuners, internal and external converters and test equipment.

Everyone has cheered this campaign evolved to bring the best in *uhf* to Buffalo.

In Dayton, with *uhf* on the horizon, another group has shown foresight, too, with a constructive plan. To avoid the pitiful events which followed the advent of ultrahighs elsewhere, members of this group have proposed a public relations program which would explain honestly what will be needed when *uhf* comes. In their opinion, *facts*, not frothy promises, should be published. TV owners should be told that the arrival of *uhf* will mean the installation of new antennas and attachments. Set owners, they said, should be reminded that only well-schooled Service Men can install, maintain and service accessories and antennas when *uhf* does arrive. Such Service Men, it was pointed out, are usually members of local service associations, and best qualified to serve the consumer.

If advertising is based on facts instead of wishes, everyone, including stations, distributors, dealers, Service Men and the consumer, will profit, they said.

St. Louis has also become a beehive

of association activity recently, for this area will soon have six *uhf* channels, with the first scheduled to go on the air within a matter of weeks. To familiarize the consumer with what will have to be done to receive the high-band signals, an extensive advertising-public relations program has been initiated. Consumers are being told that conversion will be necessary, and that this will mean in most cases a new antenna, as well as a converter or tuner. Stressed, too, is the fact that all conversion work should be done by reputable, recognized Service Men.

Here are stirring illustrations of association insight on problems of the day, to help everyone. Their studied, painstaking planning insures a hearty welcome for the new bands, with good viewing on deck for all.

### An Invitation to Trouble

NEW DEVELOPMENTS always prompt enthusiastic reports, and often excite some to issue prophecies or promises that have little immediate substance. In radio, TV and electronics, such forecasts have been common. Even though pleas, asking for tempered headlines, have poured forth, many have been prone to yield to temptation and roar away with blatant predictions that hold little weight.

One classic example appeared a few weeks ago. It was noted, in a release, that tubeless radio and TV receivers were a step closer because of a new and revolutionary means of producing germanium for transistors. However, it was emphasized that the new method was still in the laboratory stage. Most newsmen blandly dismissed the latter statement, and struck out with a headline declaring that home tubeless sets for TV and radio *were here*. What a fantasy!

The day of tubeless receivers is still distant—very much so. There are still streams of problems to be solved, as these columns have disclosed on numerous occasions. A careful reading of that release would have revealed such information, too.

It is hoped that the gentlemen of the press will strive to repress that urge to write those blazing heads, which can only serve as an invitation to trouble and lead to general confusion.

—L. W.

# COAX

[See Front Cover]

(Below)

Fig. 1. Block diagram of *uhf* converter.

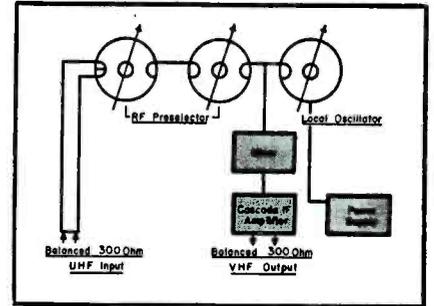
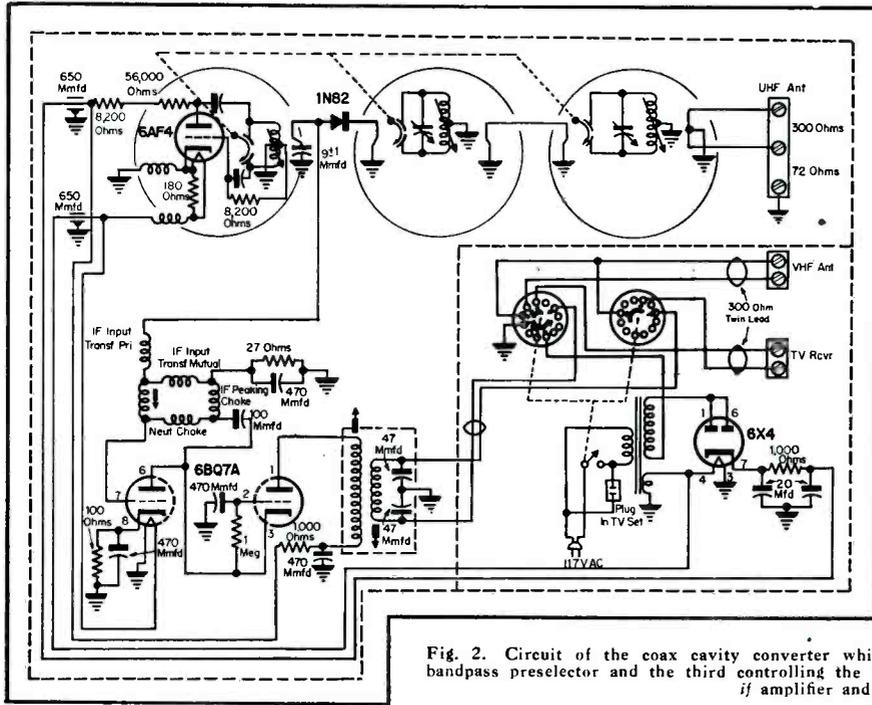


Fig. 2. Circuit of the coax cavity converter which employs three cavities: two functioning as a bandpass preselector and the third controlling the local-oscillator frequency. Also features a cascode *if* amplifier and power supply.



RESONANT CAVITIES have long been recognized for their efficiency as tuned circuits at microwave frequencies. Unloaded  $Q$ 's of 10,000 or 20,000 have not been unusual. In view of this effectiveness in the microwaves, it was felt that the cavities should be also particularly effective in the neighboring ultrahighs for TV applications. Tests confirmed this belief, and it was decided to incorporate the cavity system in a converter† of the type shown on the cover, and in Fig. 2. In adapting this tuning element to *uhf* additional losses due to loading capacitor dielectrics are inevitable; however, it was possible to obtain  $Q$ 's of 1,000 or more. Since the unloaded  $Q$  determines the insertion loss of the preselector, it may be considered a basic figure of merit of the tuner; thus it can be said, that the higher the tuning element  $Q$ , the

better the noise figure and gain will be, all other things being equal.

In studying the circuit of the converter (Fig. 1), with resonant cavity tuning elements represented schematically by their lumped constant equivalents to facilitate analysis, it will be noted that balanced 300-ohm antenna coupling is achieved by a properly proportioned loop located in the cavity field. Since coupling is almost constant over the entire tuning range, losses due to antenna mismatch are said to be minimized.

### Preselector

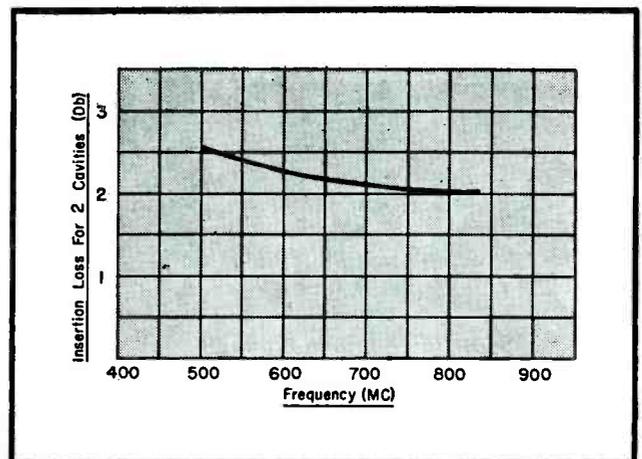
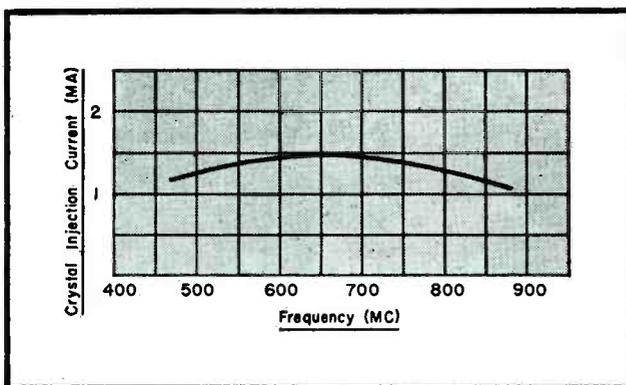
The skirt selectivity requirements at *uhf* are more severe than those at *vhf*, because of the relatively close spacing of signal and image frequency, and the multiple spurious responses which result from double conversion. Considerable selectivity may be ob-

tained by using three or four tuned circuits; however, because of increased insertion loss and tracking errors, improvement in selectivity is accompanied by rapid degradation of noise figure. Fortunately, because of the high operating  $Q$ 's possible at *uhf*, two tuned circuits can provide adequate image and *if* rejection. The double-tuned preselector shown was found to have an image ratio better than 50 db, an *if* (80 mc) rejection greater than 80 db, with an insertion loss of approximately 2 db at 890 mc.

Another measure of the effectiveness of a preselector, is the value of end-to-end feed-thru capacitance which generally determines the amount of oscillator voltage appearing across the antenna terminals. Since cavity-preselector coupling throughout is primarily magnetic, capacitance feed-thru was said to be reduced to negligible proportions. The attenuation at oscil-

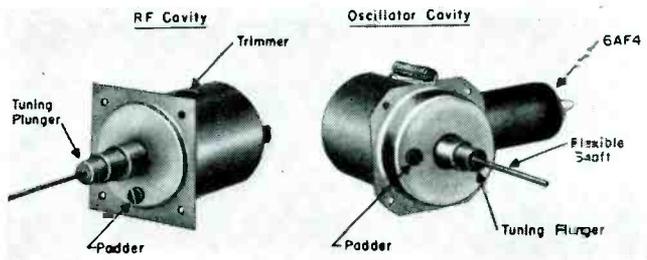
Fig. 3 (below). Plot of injection current versus frequency.

Fig. 4 (right). Insertion loss versus frequency of converter.



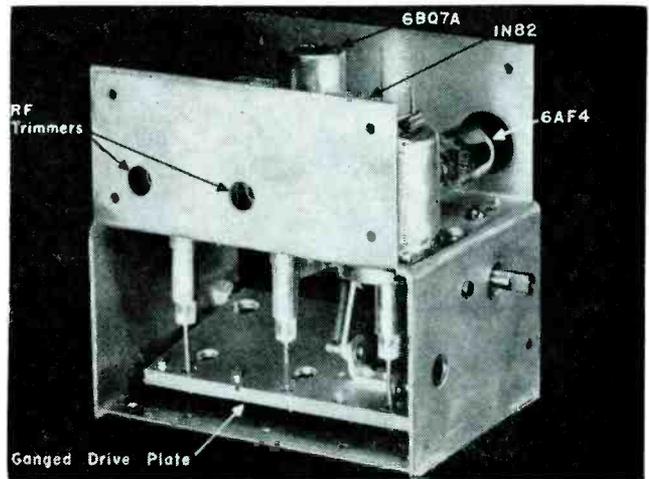
# CAVITY UHF Converter

by WYN MARTIN



(Above)

Fig. 5. View of tuning elements used in coax unit.



(Right)

Fig. 6. The complete tuner.

lator frequency was found to be about 45 db, which means that antenna radiation due to back-to-front coupling is less than 100 mv.

Another source of oscillator radiation, due to coupling around the pre-selector by stray magnetic and electrostatic fields, was minimized by a careful layout and fully shielded construction, which was found to confine effectively the *rf* and oscillator fields within the metallic cavity walls.

## Mixer

A 1N82 low noise silicon diode is used as a mixer. Diode conversion was selected because better noise figures were found to be possible, and as a result of the small injection voltages required, oscillator radiation was considerably reduced. In addition, the loose coupling between oscillator and mixer permitted more stable oscillator performance. The preselector and oscillator outputs are linked by a common coupling loop which combines the fields of both cavities at the mixer input.

A 6AF4 local oscillator completes the circuit complement. The oscillator tunes below the carrier, to prevent reversal of the sound and picture position on the *if* response curve of the TV receiver, during double conversion. To assure stable oscillator performance and reliable dial tracking all circuit elements were designed as an integral part of the resonant cavity, which was found to result in almost constant injection current. This has an important advantage of confining

the oscillator field and substantially reducing radiated interference.

## Stability

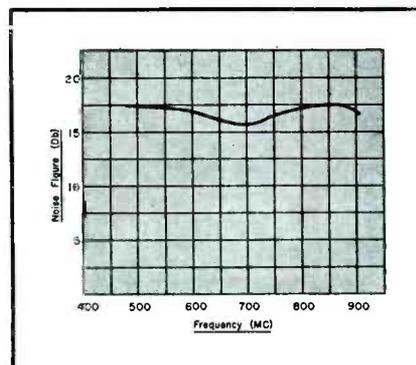
Particularly important in *uhf* oscillator performance is stability. Although the *uhf* oscillator operates at a much higher frequency than a *vhf* oscillator, the permissible frequency drift on an absolute basis must be much smaller. This is the direct result of double superhet operation, in which the additive drift of two local oscillators determines the overall frequency stability of the *uhf* receiver. Theoretically, assuming that the *vhf* tuner designer has taken full advantage of the permissible drift tolerance, the *uhf* oscillator must either be absolutely stable, or have a drift characteristic opposing that at *vhf*. While it may be interesting to speculate on a lab means of accommodating these requirements, it has not been found possible to meet these specs in production design.

Fortunately, modern *vhf* tuners operate well within the allowable drift

tolerance, and as an added precaution, in anticipation of the severe *uhf* requirements, sets now using intercarrier sound circuits. While this eliminates the possibility of complete loss of sound due to drift, picture quality degradation and loss of sensitivity still remain.

Two factors generally influence oscillator frequency stability; temperature changes and power supply fluctuations. The former can be controlled by including a temperature compensating circuit element which nullifies the temperature characteristics of all other oscillator components. The latter can be minimized by proper design, and completely eliminated by the use of regulated power supply. The local oscillator cavity contains a temperature sensitive element which varies its electrical length and holds the frequency substantially constant over a wide temperature range. Voltage control has been affected by careful circuit design; a regulated supply was not found to be necessary for normal applications.

Fig. 7. Noise figure versus frequency.



The choice of a first *if* for a *uhf* tuner is essentially a design compromise. If a high *vhf* channel is selected, improved *uhf* image ratios and reduced oscillator radiation are possible; however, lower gain, poorer noise figure and decreased *if* rejection result. Also, numerous additional spurious responses due to low order harmonics of both the *uhf* and *vhf* oscillators arise. In view of these factors, *vhf* channels 5 and 6 were chosen as the intermediate frequency. Despite the fact that it

(Continued on page 97)

# Picture Tube Faults,

First of a Series of Streamlined Tables Detailing Symptoms and

THERE ARE SO many different faults which can occur in TV chassis, that considerable time must pass before encountering them all. Some fault symptoms are encountered so seldom that it is difficult to keep in mind their exact meaning. It is therefore conven-

ent to have a fault index, for ready reference to provide suggestions of possible trouble. The summary tables which follow have been prepared to serve such a purpose. Space prohibits the listing of *all* possible faults, but there do appear many of the more

common problems, and many of those which may be caused by rather subtle troubles, as well as a number of those which are relatively rare. Those simple troubles, which are obvious from quick basic service checks, have been omitted.

| Possible Fault   | Verification and Correction   | Faults-Corrections  |
|--|---|---|
| <p><b>1—No raster:</b></p> <p>(A) In electrostatic deflection chassis—Leaky deflection plate blocking capacitors throwing the electron beam off the face of the tube.</p> <p>(B) No high voltage.</p> <p>(C) Ion trap misadjusted or faulty.</p> <p>(D) Improper voltages on picture tube.</p> <p>(E) Dead picture tube.</p> | <p>(A) Remove one blocking capacitor at a time from circuit until beam returns to face of tube.</p> <p>(B) Measure high voltage, check spark from plate of high-voltage rectifier and horizontal output tube to <i>insulated screw driver</i>. Note: Use caution . . . Replace high-voltage rectifier, horizontal output, and horizontal oscillator tubes . . . Check <i>dc</i> voltages and waveforms in horizontal deflection circuits.</p> <p>(C) Measure high voltage as brightness control is varied over its range; should show a decrease of 5 to 10% as brightness is advanced indicating that the picture tube is drawing current from the <i>hw</i> supply. If <i>hw</i> current is flowing, proper adjustment of a good ion trap should provide a raster. If no <i>hw</i> probe is available picture tube anode current can be checked by <i>carefully</i> holding the <i>hw</i> lead near the second-anode terminal with an insulated tool. A sustained arc indicates current is being drawn. A single spark not sustained shows no current is being drawn.</p> <p>(D) If <i>hw</i> current is not flowing in (C) test, tube voltages on picture tube elements should be checked as brightness control is varied.</p> <p>(E) If <i>hw</i> and other picture tube voltages are correct and no high-voltage current is flowing the picture tube will probably be found defective.</p> | <p><b>3—Brightness control will not decrease brightness:</b></p> <p>(A) Fault in brightness control circuits.</p> <p>(B) Leaky picture-tube grid-coupling capacitor.</p> <p>(C) Picture tube leakage between elements.</p> <p>(A) Measure voltages on brightness control as it is varied over its range.</p> <p>(B) Measure voltage on picture-tube grid.</p> <p>(C) Leakage between elements may show as a high resistance in a continuity check or may only be evident when the tube is heated. The fault may sometimes be corrected by jarring the neck of the tube. In stubborn cases the fault may sometimes be cleared by burning the short free with the high voltage lead. For this purpose all but one pin should be connected to ground and the high-voltage lead carefully arced to the remaining pin. In the case of a heater cathode leakage, rather than replace the tube, it may be cheaper to isolate the heater from ground by the use of a separate filament transformer.</p> |
| <p><b>2—Low brightness:</b></p> <p>(A)—Ion trap misadjusted or faulty.</p> <p>(B) Low high-voltage.</p> <p>(C) Low <i>B</i> voltage.</p> <p>(D) Incorrect picture-tube voltages.</p> <p>(E) Weak picture tube.</p>   | <p>(A) Adjust position of ion trap for maximum brilliance. Also be sure yoke is against tube flare, and adjust focus coil. Position so that no shadows are visible on tube face when ion trap is adjusted for maximum brightness . . . Replace ion trap.</p> <p>(B) Measure high voltage . . . Replace <i>hw</i> rectifier, horizontal output and horizontal-oscillator tubes . . . Check <i>hw</i> series filter resistor . . . Measure <i>dc</i> voltages and waveforms in horizontal deflection circuits.</p> <p>(C) Replace rectifier tube . . . Measure <i>B</i> voltages.</p> <p>(D) Measure voltages on all picture tube terminals.</p> <p>(E) Measure <i>hw</i> as brightness control is varied throughout its range. If second anode current is normal the high voltage will drop 5 to 10% to the range of the control. If all picture tube voltages are correct and the second anode current appears lower than normal, the picture tube probably has low emission.</p>   | <p><b>4—Decreasing brightness as brightness control is advanced:</b></p> <p>(A) Weak <i>hw</i> rectifier tube.</p> <p>(B) Faulty <i>hw</i> series filter resistor.</p> <p>(A) Replace tube.</p> <p>(B) Measure value of resistor.</p> <p><b>5—Sporadic changes of brightness, size or focus:</b></p> <p>(A) Faulty series filter resistor in <i>hw</i> power supply.</p> <p>(A) Replace the series filter resistor with three 330,000-ohm, 1-watt resistors (or resistors of the value to provide the required total).</p>  |

[Additional tables on pages 40 and 41]

# Checks and Cures by J. C. GEIST

*Troubleshooting Procedures Which Will Eliminate Problems*

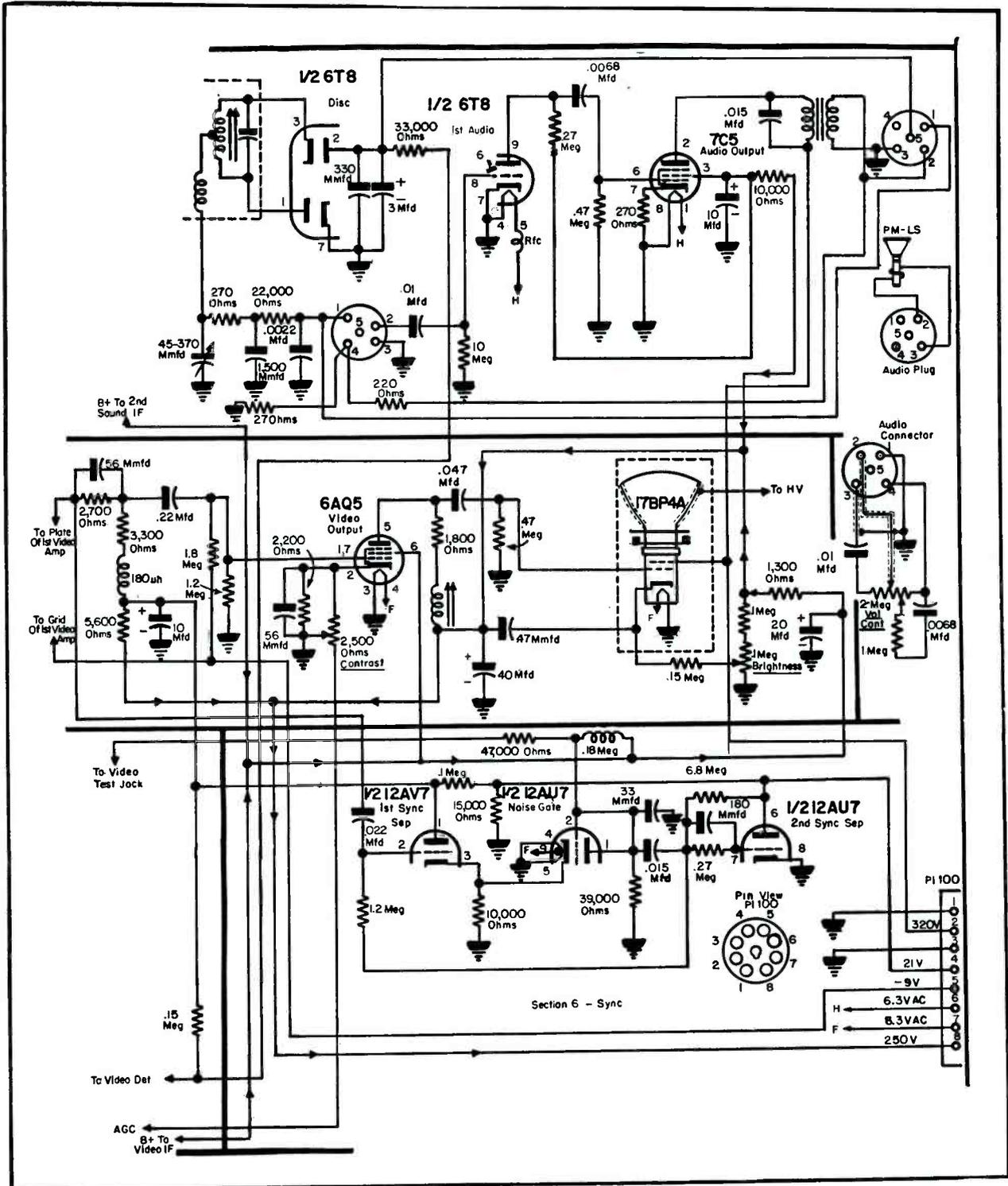


Fig. 1

Partial schematic of Philco 52-T1610, illustrating picture-tube circuitry, where fault-summary plan detailed at left and on following pages, may be applied; arrowheads added to clarify direction of current flow in +250  $\mu$  bus.

**6—Keystone raster:**

(A) Short in deflection coil.

(A) Check deflection coil shunt capacitor for short . . . Replace yoke.

**7—Shadow in raster corners:**

(A) Improper adjustment of focus coil or ion trap.

(A) Adjust focus coil or centering magnet so that no shadows are visible when iron trap is adjusted for maximum brightness. Also, be sure deflection yoke is tight against flare of tube.

**8—Focus not sharp over entire raster:**

(A) Defect inherent in design of deflection yoke.

(A) Check operation of focus adjustment. If normal, replace yoke with a *cosine* wound yoke.**9—Black vertical line on raster:**

(A) Barkhausen oscillations in horizontal output tube. (Barkhausen oscillations appear when a sharp sawtooth drives the plate voltage negative with respect to the screen grid.)

(A) Reduce horizontal drive . . . Change output tube† . . . Install an *anti-Barkhausen* magnet assembly on the horizontal output tube . . . Adjust width and linearity coils . . . Feed back an out-of-phase voltage from the secondary of the horizontal output transformer to the screen of the output tube. (Can be taken from the hot side of the width coil through a 100-mfd capacitor. May require a 250-mh isolation choke in the screen voltage lead.)**10—White vertical bands on left of raster:**

(A) Ringing in horizontal output circuit.

(A) Replace damper tube . . . Insert a parallel resonant trap tuned to approximately 250 kc in series with the horizontal deflection coil; approximately 3,300 mmfd, 100 mh and 470 ohms in parallel.

**11—White horizontal line in picture:**

(A) Spurious pip on sawtooth wave generated by vertical amplifier tube, causing one or more scanning lines to overlap and leaving a white line with no picture content.

(A) Replace vertical amplifier tube.

**12—Blanking of part of picture with advanced contrast control:**

(A) Deflection voltage on B+ bus modulating rf or if amplifiers.

(A) Check bypass capacitors on B+ bus common to the deflection circuits and rf or if amplifiers.

**13—Straight horizontal line in center of tube face:**

(A) Indicates no vertical deflection.

(A) Follow normal procedures for servicing the vertical deflection system, as outlined in step 15.

**14—Wavy horizontal line in center of tube face:**

(A) No vertical deflection due to a broken wire in the vertical deflection coil.

(A) Check resistance of vertical deflection coil. If coil is open or has incorrect value of resistance, replace it.

**15—Height insufficient:**

(A) Weak vertical oscillator or vertical output tubes.

(A) Replace tubes.

(B) Voltages low in vertical deflection circuits.

(B) Measure voltages in vertical deflection circuits.

(C) Faulty resistors or capacitors in vertical circuits.

(C) Measure resistor values and check capacitors for shorts and by substitution throughout.

(D) Picture tube *hw* too high.

(D) Measure high voltage.

**16—Curved edge raster (Horizontal raster pulling or edge of raster bent with no picture present):**

(A) 60 or 120-cps voltage in horizontal deflection circuits due to heater-cathode leakage or faulty bypassing.

(B) Magnetic fields near picture tube; a rare trouble.

(C) Magnetized metal-shell picture tube.

(D) *Pincushion* raster, which can result from faulty yoke.**17—Width insufficient:**

(A) Weak horizontal oscillator and output tubes.

(B) Improper adjustment or horizontal drive.

(C) Incorrect voltages on horizontal oscillator or output tubes.

(D) Improper connection to horizontal output transformer.

(E) Faulty resistors or capacitors in horizontal deflection circuits.

**18—Noisy picture:**

(A) Weak or noisy tubes in tuner, video if or video amplifiers.

(B) Overall gain too low requiring contrast to be advanced beyond the point where noise in rf tubes begins to show in picture.

(C) Video carrier too low on response curve.

**19—Weak or flat picture:**

(A) Open peaking coil causing video amplifier gain to be reduced.

(B) Wrong value or partially shorted peaking coil.

**20—Blurred picture . . . poor definition and poor hf response:**

(A) Blurred pictures on strong signals; may be caused by limiting in video stages.

(B) Video carrier too high on response curve.

**21—White or black following:**

(A) Faulty video amplifier. (Overshoot in step function or square wave response. Can be most easily verified by square-wave test of video amplifier.) Check other stations or other programs on same station since this fault may easily originate in the television station equipment.

†Special tubes have been developed for this application; one such type is the NU6BG6 anti-Barkhausen tube.

(A) Replace tubes in horizontal deflection circuits . . . Check for excessive ripple on voltage buses and substitute filter and bypass capacitors.

(B) Rotate yoke. If the shape of the raster does not change as it rotates, the trouble is not due to extraneous magnetic fields.

(C) Rotate the tube without rotating the yoke. If the direction of pulling changes, a magnetized shell may be expected.

(D) Check yoke resistance and shunt capacitors . . . Substitute new yoke.

(A) Replace tubes.

(B) Check adjustment

(C) Measure voltages throughout horizontal deflection circuits.

(D) If universal or tapped output transformer is used check connections and try different taps.

(E) Measure resistor values and check capacitors for shorts and by substitution throughout horizontal deflection circuits.

(A) Replace tubes.

(B) Check gain of video amplifiers, video *if* and tuner. Check voltages, resistors and capacitors in suspected areas.

(C) Adjust local oscillator frequency . . . Realign *if* and *rf* circuits to provide proper overall frequency response characteristic; video carrier should be 50% below top of response curve.

(A) Check continuity of peaking coils.

(B) Substitute peaking coils.

(A) Reduce contrast control setting to obtain less input to video amplifiers . . . Check *agc* circuits for proper operation . . . Check coupling capacitors in video *if* and video amplifiers for *dc* leakage.

(B) Adjust local oscillator frequency . . . Realign *if* or *rf* circuits to provide proper overall frequency response characteristics; video carrier 50% below top of response curve.

(A) Check all voltages in video amplifier . . . Check for open damping resistors and other faulty parts throughout video amplifier.

#### 22—Smear or fuzzy picture:

(A) Poor low-frequency compensation.

(B) Overpeaking at high frequencies.

(C) Regeneration.

#### 23—Picture interference:

(A) Deflection circuit radiation causing interference in tuner.

(B) Second detector radiation causing interference in tuner.

#### 24—Multiple images . . . Ghosts originating within the receiver:

(A) *If* regeneration.

(B) Faulty video amplifier.

#### 25—Multiple picture:

(A) Deflection oscillator operating at a sub-multiple of correct frequency. If multiple pictures appear side by side horizontal oscillator is at fault. If one appears above the other the vertical oscillator is faulty.

#### 26—Retrace lines visible:

(A) Faulty *dc* restorer tube or circuits.

(B) Hum on vertical oscillator grid. (Will cause picture to lock-in out of phase with retrace lines showing if transmitter and receiver vertical sweep frequency are locked together through a common power source.)

#### 27—Interlace lost:

(A) Improper sync pulse limiting which does not maintain sync pulse level low enough for the equalizing pulses to be properly integrated.

(B) Video in sync circuits which appears as extra equalizing pulses, thus causing the output of the vertical pulse integrator to be incorrect.

(C) Improper equalizing pulse integration due to insufficient integration.

(A) Check parts values in low-frequency compensation network . . . Check video coupling capacitor for insufficient capacity.

(B) Check value of damping resistors in video stages.

(C) Regeneration in *rf* or *if* stages can be detected by observing the frequency response using a sweep generator and oscilloscope. Sharp high peaks in the response or general instability indicate the presence of regeneration. (Care must be exercised to insure that apparent regeneration is not due to the test equipment arrangement. Test equipment should be checked out on a receiver known to be operating properly.) . . . Regeneration in video stages can be detected by comparing output of video detector with output of each video stage on 'scope.

(A) Move antenna lead away from horizontal deflection circuits . . . Shield deflection circuits . . . Filter voltage supply leads from horizontal-deflection circuits.

(B) Move antenna lead away from vicinity of second detector or sound discriminator . . . Shield second detector . . . Depending on channels in use in a given area it may be possible to realign *if* amplifiers to a slightly different frequency to avoid interference.

(A) Check for proper bias and *agc* voltages in video *if* amplifiers . . . Check *if* alignment for proper frequency-response characteristics; note particularly any pronounced peaks . . . Check screen bypass capacitors and decoupling networks in *if* amplifiers.

(B) Check for open or high-value damping resistors and for open peaking coils.

(A) Check adjustment of malfunctioning oscillator . . . Check parts values in deflection oscillator.

(A) Replace *dc* restorer . . . Check *dc* restoration circuit elements . . . Stubborn cases may be corrected or general improvement obtained by installing vertical retrace blanking as used in more recent designs.

(B) Check sync amplifier and vertical oscillator tubes for heater cathode leakage. Check for presence of hum with 'scope.

(A) Check sync pulse wave shapes with 'scope and compare with service information.

(B) Check operation of sync separator with 'scope.

(C) Check values of parts in the vertical-pulse integrating circuits. (Sufficient integration will usually be obtained in a three-stage integrator in which each stage reduces the sync pulse level by about  $\frac{1}{3}$ .)

Lucid Analysis† of Calibrator Featuring DC Supply for Diode Bias, Voltage Regulator Which Serves to Maintain Level of Bias, AC Source Isolated from Line to Furnish Sine Waves for Clipping, Clipping Circuit to Convert Sine Waves to Semi-Square Waves, and Voltage Divider to Permit Adjustment of Semi-Square Wave Output to Match Waveforms on 'Scope

# 'Scope Voltage-Calibrator

by DONALD PHILLIPS

VOLTAGE CALIBRATORS\* used with 'scopes, which reveal peak-to-peak outputs on a calibrated dial, are becoming key items in the shop.

Their operation is extremely interesting. As shown in Fig. 3, illustrating one popular type using a voltage regulator, a *dc* supply is used to furnish diode bias and a voltage regulator serves to insure the maintenance of the diode bias at a constant level. In addition, there is an *ac* source, isolated from the line, to furnish sine waves for clipping; a clipping circuit (here a biased dual diode) to convert sine waves to semi-square waves, and a voltage divider, to permit adjustment of the semi-square wave output to match the waveforms on the 'scope.

The *dc* supply shown here is a conventional full-wave circuit, differing from that in the average good receiver only in that the negative is not grounded.

When the *ac* is turned on, power from the transformer secondary is ap-

plied to the plates of the 5Y3. Whenever a plate is positive with respect to the filament, conduction takes place, and the first filter acquires a charge. As the supply is sinusoidal *ac* (nominally), and the transformer secondary is center-tapped, the plates will conduct during parts of alternate half cycles, and the filter will receive positive increments at twice the line frequency; 120 times per second if line frequency is 60 cycles.

As the first filter receives charge increments, it also tends to discharge through the load, here consisting of a 10,000-ohm resistor, a second filter, and added loads. Because of the relatively high resistance of the load, the first filter cannot discharge completely each half cycle, and the ripple voltage across it is greatly reduced. Also, there will be no current flow through the 10,000-ohm resistor, unless there is a difference in potential between the two capacitors.

Because of tube rectification and filtering in the *rc* circuit, the output is almost pure *dc*, polarized as shown, and having a voltage *E* across the output leads; Fig. 1.

## Voltage Regulator

The voltage regulator insures stabilization of the diode bias voltage regardless of ordinary variations in line voltage. (A voltage regulator tube is a gas-filled diode so constructed that

the voltage drop across it remains constant through a wide range of applied voltages.) The series resistor is installed to keep the current through the regulator circuit within safe limits.

## Constant Voltage Maintained

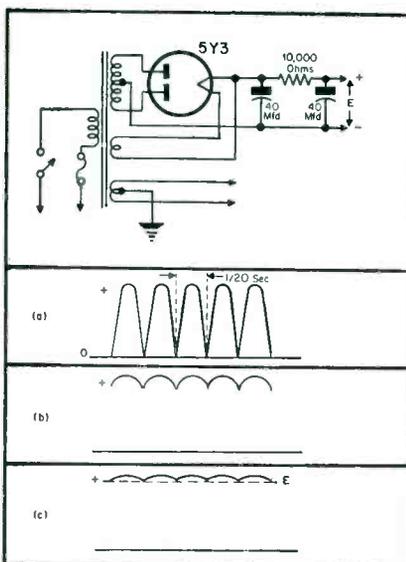
With this circuit (Fig. 2), the voltage  $E_{out}$  remains constant within about 1%, even though the supply voltage may vary 10% or more. The output voltage is a primary function of the tube used, and cannot be changed except by changing the tube.

## Diode Clipper Circuit

The diode-clipper circuit used converts the sine waves obtained from the power transformer secondary into semi-square waves by clipping both positive and negative peaks. One side of a dual diode (6H6) clips the positive waves; the other, the negative waves.

A diode can be used as a clipper because of its inherent unilateral (one-way) conductivity. In general terms, a diode only conducts when the plate is positive with respect to the cathode. Consequently, any diode may be used as a half-wave rectifier, as in Fig. 4a.

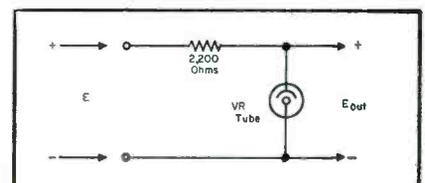
If the cathode of a diode is biased positively with respect to ground, and a potential applied between ground and plate, no current will flow until the



\*Ives, Ronald L., 'Scope Voltage Calibration Circuits, SERVICE, October, 1952.  
†From notes prepared by Ronald L. Ives.

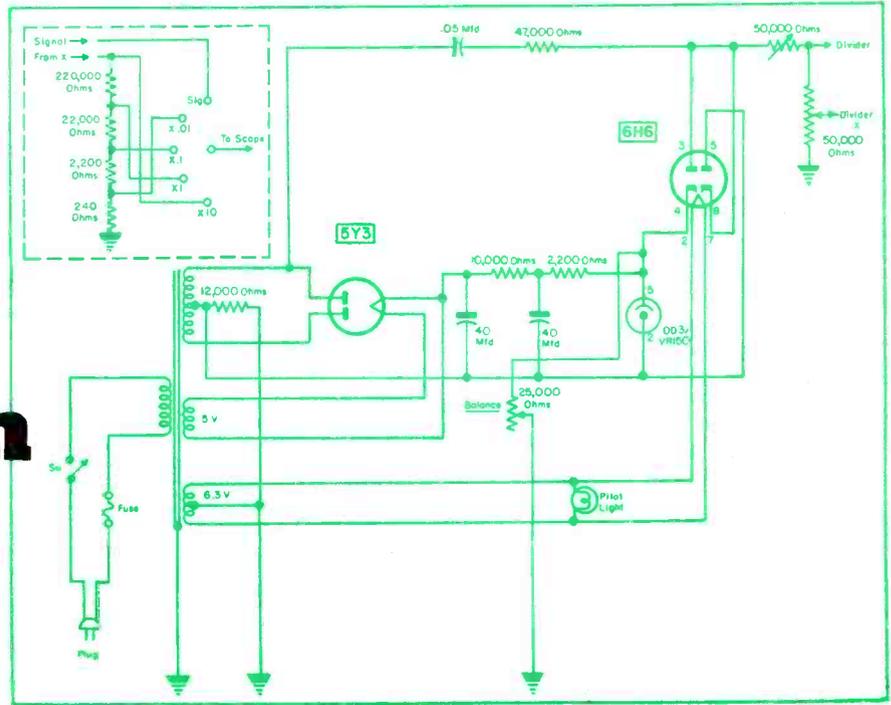
Fig. 1. Power supply elements in calibrator: waveforms at various points below at *a*, *b* and *c*. At *a* appears output from tube filament to transformer center tap, with no filter connected. When the filter is connected, a residual charge is stored upon it, and the ripple voltage across the terminals appears, as in *b*. Addition of the rest of the filter removes almost all of the ripple, producing an output of voltage, *E*, with negligible ripple, as shown at *c*.

Fig. 2. Voltage regulator circuit.



(Right)

Fig. 3. Circuit of 'scope voltage calibrator with voltage regulator.



# Operation

plate is not only positive with respect to ground, but is positive with respect to ground by the amount of the bias voltage. This is indicated in Fig. 4b. If a fairly high resistance is placed between  $E_{in}$  and the plate of the diode, the voltage between plate and ground ( $E_{out}$  in Fig. 4), will never exceed the bias voltage.

Accordingly, if  $E_{in}$  is an alternating voltage, and the bias level is set at some value less than the peak positive of the input voltage, then the positive peaks of the applied voltage will be flattened, or clipped, as in Fig. 4c.

For calibration purposes, we need a sine wave that is clipped at the same level on both positive and negative peaks. Thus two clippers and two bias sources are needed; but some elements of each can be shared. The dual clipper, in simplified form, is shown in Fig. 5a, and as it is actually used in a circuit in b: Two diodes are shown in a, the first connected as in b of Fig. 4, to clip the positive peaks, and the second, connected in reverse fashion, to clip the negative peaks. The biasing batteries are so polarized, with the negative of one grounded, and the positive of the other grounded, that a

single center-tapped voltage source can be substituted.

This voltage source is the regulated power supply previously described, and it is center-tapped by use of a pair of resistors, with their junction grounded. One of these (Fig. 3) is the fixed 12,000-ohm resistor from the transformer high-voltage center tap to ground; the other is the variable 25,000-ohm resistor from regulator output plus to ground. The variable resistor is adjusted until the positive and negative peaks are equal.

It will be noted, from a study of the clipper circuit, that the ac supply to the clipper passes through the 12,000-ohm resistor, and could, theoretically, put a small ac bias on the first diode. Because the total circuit resistance and reactance are very high (59,000 ohms plus the reactance of the .05-mfd capacitor at 60 cycles, plus the load resistance) current flow through this resistor will be about zero, and ac bias due to drop across the 12,000-ohm resistor will be negligible.

From the output of this dual clipper a semi-square wave is obtained, with a fixed peak-to-peak voltage which is de-

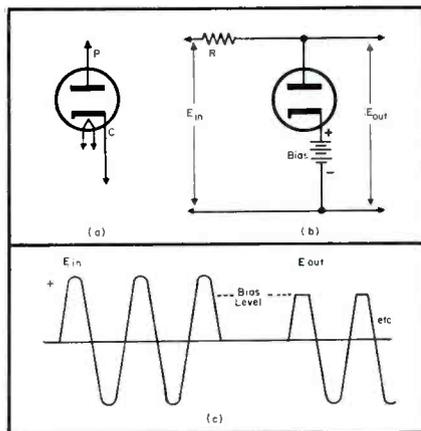
termined by the characteristics of the voltage regulator tube.

## Voltage Divider

For effective voltage calibration of a 'scope, it is necessary to have a semi-square wave output, with an adjustable and knowable peak-to-peak voltage. This is produced by the calibrated voltage divider, shown in detail in Fig. 6 (p. 86). This divider consists of three main elements: the calibration resistor, which is adjusted only once; the continuously variable resistor, a 50,000-ohm wirewound linear potentiometer; and a stepped divider, consisting of four resistors and a switch.

Calibration is performed by substitution, so that the peak-to-peak voltage output, with the continuously variable

(Continued on page 86)

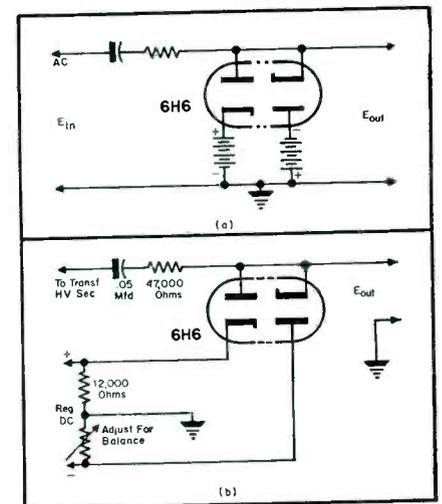


(Left)

Fig. 4. Operation of diode in clipper circuit. As noted in a, the diode conducts only when the plate is positive with respect to the cathode. Examining this further, b illustrates that the biased diode conducts only when  $E_{in}$  minus bias is positive. If  $R$  is fairly high,  $E_{out}$  never exceeds the bias voltage. Waveform result when positive peaks of applied voltage are flattened or clipped appears in c.

(Right)

Fig. 5. Elemental illustration of dual clipper appears in a, and in b appears a clipper as it is usually used in circuit.

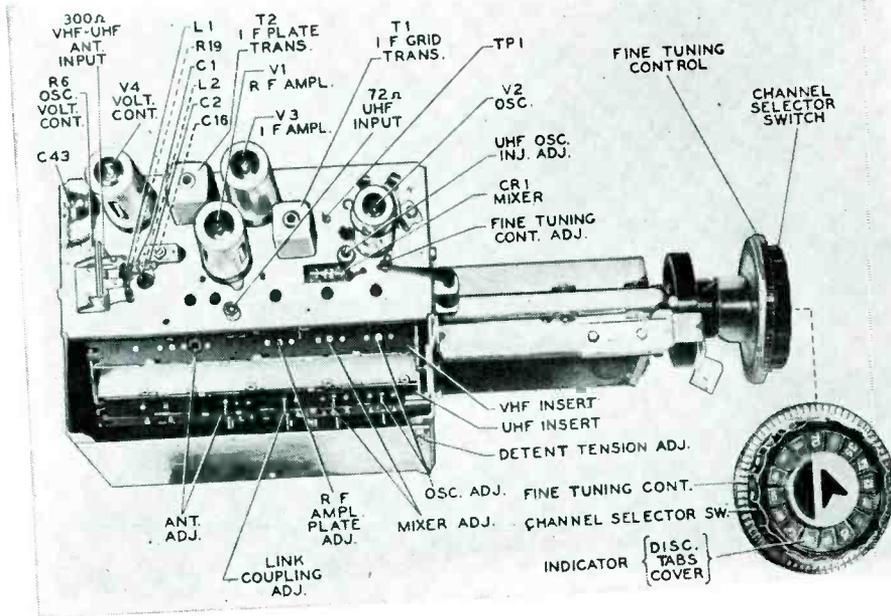


(Below)

Fig. 1. Top view of *rf* unit used in *vhf/uhf* assembly<sup>2</sup>.

# RF Unit Design for

by C. K. STERLING



is made possible by tuned inserts which are placed within a drum assembly in the *rf* tuner. A 2:1 step-down ratio is used in the turret drive assembly to rotate the drum.

## VHF Circuits

There are four different types of *vhf* inserts used in the tuner which cover channels 2 through 4, 5 and 6, 7 through 10, and 11 through 13, respectively. The four types of *vhf* inserts are similar in circuitry, with the exception that capacitive coupling is used between the mixer and oscillator circuits on channels 2 through 6, and inductive coupling is used on channels 7 through 13.

VHF signals are coupled through a balanced 300-ohm input to a tuned antenna transformer where channel pre-selection takes place. Two 43.5-mc *if* traps ( $L_1-C_1$  and  $L_2-C_2$ ) are located in the antenna input circuit. (FM rejection is effected with a separate  $4\frac{3}{8}$ " length of 300-ohm line terminated with a 5-70 mmfd trimmer capacitor at one end and with the other end shorted. It is placed along the 300-ohm antenna input lead.) The antenna transformer is mounted on the insert and its adjustment is accessible through the top of the *rf* unit (as are the *rf* plate, mixer and oscillator adjustments).

## RF Amplifier

The *vhf* signal is amplified by the *rf* amplifier, a 6BQ7A, connected in a driven grounded-grid amplifier circuit. An *if* trap ( $L_7-C_{16}$ ) is located in this circuit for additional *if* interference rejection. Amplified *vhf* signals are developed across the plate circuit of the *rf* amplifier, which consists of a capacity-coupled, double-tuned circuit. The primary of this circuit is tuned with the output capacitance of the plate of the grounded-grid section of the *rf* amplifier. The secondary is tuned with a 5-mmfd capacitor for all *vhf* channel inserts. Primary and secondary coils are tuned by threaded brass cores. The bandwidth of the

THE ARRIVAL of *uhf*, with broadcasters in over two-dozen cities now in full swing, has accelerated interest in these new bands, and brought a growing family of setmakers into the ultrahigh camp. Some have produced chassis with built-in *uhf* systems, and others have made provision for external converters or tuners. In one unique design<sup>4</sup>, through the use of one of three tuners, a chassis can be adapted for either *uhf* or combined *uhf/vhf* operation.

For *vhf*, conventional switch-type tuners<sup>1</sup> which differ mainly in their mechanical structure, are used. Featured is an elevator transformer input circuit, together with builtin traps for the *if* and FM broadcast frequencies. This input circuit is contained in its own separate housing. A dual *rf* stage is used followed by a combination oscillator-mixer stage. The tuner output is link-coupled.

The *rf* amplifier uses a driven grounded-grid type circuit, providing gain equivalent to a pentode. Effectively, two stages of *rf* are provided. However, maximum gain occurs in the second triode stage. Noise generation is minimum in the first stage where the gain is about unity. Thus, amplification and minimum noise factor functions are separated. The *rf* amplifier tube is a

6BQ7A twin triode. A tuned-grid circuit is used in the first stage input, and a tuned plate circuit in the second stage output. The plate of the first stage is coupled to the cathode of the second stage through an inductance.

AGC is applied to the grid of the first stage. To prevent variations of grid bias in this stage from causing undesired plate voltage variations in the second stage, a special type of bias circuit is provided.

Combination oscillator-mixer stages are built around a 6X8 triode-pentode converter. The pentode section used in this application has been found to provide increased conversion gain, and also prevents local oscillator feed-through to the *if* strip because of improved interelectrode isolation.

The local oscillator circuit is a modified Colpitts type, using the triode section of the 6X8. The *if* output of the tuners is in the 40-mc range, so that the oscillator frequencies are either 41.25 mc above the sound carrier or 45.75 mc. above the picture carrier.

## UHF-VHF Tuner

To permit coverage of the twelve *vhf* channels and four *uhf* stations a combination tuner<sup>2</sup> is available; actually any combination of the 16 *vhf* and *uhf* channels may be used. This coverage

<sup>1</sup>RCA KCS 82 chassis.

<sup>2</sup>RCA KRK-22.

<sup>3</sup>RCA KRK-12.

Right: Fig. 2. Circuit of switch-type *vhf* tuner<sup>1</sup> used in chassis which can be adapted for *vhf* or *uhf/vhf*.



coupled circuit is determined by the coupling capacitance and the crystal loading. (Crystal loading is determined by the crystal tap point on the secondary and the oscillator injection current to the crystal.)

#### Mixer Stage

A 1N82 silicon crystal diode is used in the mixer circuit. Here, the *vhf* signal is mixed with the local oscillator output to produce the *if* signal. The *vhf* oscillator voltage is injected into the mixer circuit capacitively on channels 2 through 6, and inductively on channels 7 through 13. (The variable inductance in the mixer circuit is adjusted for the correct level of *uhf* oscillator injection voltage to the mixer.) The oscillator injection level can be determined from a measurement of the voltage at the test point located on top of the *rf* unit.

#### Provision for Self-Bias

The current should be between .3 and 3 ma which will produce a voltage drop across  $R_{10}$  (100-ohms) of .03 to .3v. This can be read on the 1.5v scale of a *vtvm*. The primary function of  $R_{10}$  is to provide a small amount of self-bias on the crystal to improve the signal-to-noise ratio.

#### Oscillator and Voltage Control Circuit

The oscillator stage uses a 6AF4 in a modified Colpitts circuit. The oscillator tank is formed by 2 and 22-mfd capacitors,  $C_{12}$  and  $C_{13}$ , the fine tuning control and tuned elements which are located on each insert. The fine tuning control consists of a brass core inserted into a low inductance one-turn coil formed in the shape of a slit cylinder. For *vhf* operation the fine tuning control is effectively a capacitive adjustment; for *uhf* operation, it is inductive.

#### Voltage-Control Tube

Oscillator plate voltage is held to the limits of 85 to 115 by a voltage-control tube, a 6S4, wired in series with the oscillator plate supply. A 100,000-ohm potentiometer,  $R_6$ , part of a voltage-divider network in the grid circuit of the 6S4, is used to adjust the level of conduction and thus set the plate voltage of the oscillator. When this adjustment is required, a 0-50 ma meter is inserted in series with the 6S4 cathode through an adapter socket and, with the oscillator in a non-oscil-

latory state,  $R_6$ , is adjusted for a 28-ma reading. A non-oscillatory state can be had by switching the channel selector switch between channels. (Some 6AF4s, may still continue to oscillate. To insure a non-oscillating state, a finger can be placed across contacts 12 and 13 while the adjustment is being made. No *dc* potential exists on these contacts.) This adjustment may be required when the tube or other components are changed in the oscillator and voltage control circuit.

#### IF Amplifier

The *if* signal from the mixer is coupled through  $T_1$ , a 43.5-mc coupling transformer to the *if* amplifier.  $T_1$  is tightly coupled and provides an 8-mc bandpass. The 22-mfd crystal *rf* bypass,  $C_{11}$ , and the input capacitance of the *if* amplifier provide the required capacitance to tune  $T_1$  to 43.5 mc.

The *if* amplifier uses a 6BQ7A in a driven grounded-grid amplifier circuit. Neutralization of the input triode section is effected by a shunt inductance,  $L_{12}$ , which resonates with the grid-to-plate capacity of the *if* amp at the *if* frequency. The output of the amplifier is coupled through  $T_2$  to the *if* section of the receiver.

#### UHF Circuit

For *uhf* operation, the tuner uses essentially the same circuits as for *vhf* operation with one major exception. UHF signals are not coupled through the *rf* amplifier stage,  $V_1$ , but are fed through a triple-tuned preselector circuit to the mixer stage.

#### Preselector Circuit

The *uhf* preselector consists of a triple-tuned circuit using high  $Q$  tuning coils. An interstage coupling coil,  $L_4$  or  $L_{17}$ , is shaped similar to a race track to obtain the required coupling between the input and output coils. By having the proper center-to-center distance between the input and output coils, and by having the proper length for the coupling coil, it was found that the bandwidth of the preselector circuit could be made substantially constant across the *uhf* range.

#### Common U/V Input

When a common *uhf-vhf* 300-ohm antenna input is used for *uhf* reception, the signal is link-coupled into the input coil of the preselector circuit. Since the 300-ohm antenna coupling

coil does not have a grounded center tap, two 100,000-ohm static drain resistors,  $R_{18}$  and  $R_{19}$ , are used.

If a 72-ohm *uhf* input is used, a coax jack is provided to feed a tap on the input coil. In this case, the 300-ohm link must be removed from the circuit on each *uhf* insert to isolate the *uhf* input coil from the 300-ohm *vhf* input. Care must be taken when removing the link coil from the primary coil so that the latter is not damaged.

#### Mixer Stage

The output coil and capacitor of the preselector circuit serve as a tank circuit for the mixer stage. The coil is tapped so that a proper match is effected to the input of the crystal mixer. The *uhf* signals are applied to a 1N82 crystal diode which is also used for *vhf* operation.

Unlike *vhf* operation, where the oscillator signal was coupled directly into the mixer tank circuit, the oscillator signal for *uhf* operation is coupled into the mixer circuit between the ground side of the mixer tank on the insert and the *rf* ground of the chassis. The coupling element is in the form of a variable inductance which is adjacent to the oscillator tank circuit. The variable inductance is adjusted to give a crystal current of between .3 and 3 ma. Measurement of the resulting voltage drop can be made across a 100-ohm resistor,  $R_{10}$ , for *vhf* operation.

#### Oscillator and Voltage Control Circuit

This circuit is quite similar to that used for *vhf* operation with the exception that .5 to 3-mmfd trimmer capacitors are used in the oscillator tank circuit. The capacitors are mounted on the insert and can be adjusted through an opening in the top of the *rf* unit when the insert is connected in the circuit. The fine tuning for *uhf* operation is effectively a variable inductance in the grid-to-plate circuit of the oscillator.

The plate-to-grid and plate blocking capacitors,  $C_{12}$  and  $C_{13}$ , are used to compensate for oscillator frequency drift at the low end of the *uhf* range. At the high end, a short bimetallic strip is used near the oscillator trimmer capacitor for compensation of frequency drift.

#### Credit

Based on notes supplied by the technical publication group of the RCA Service Company.

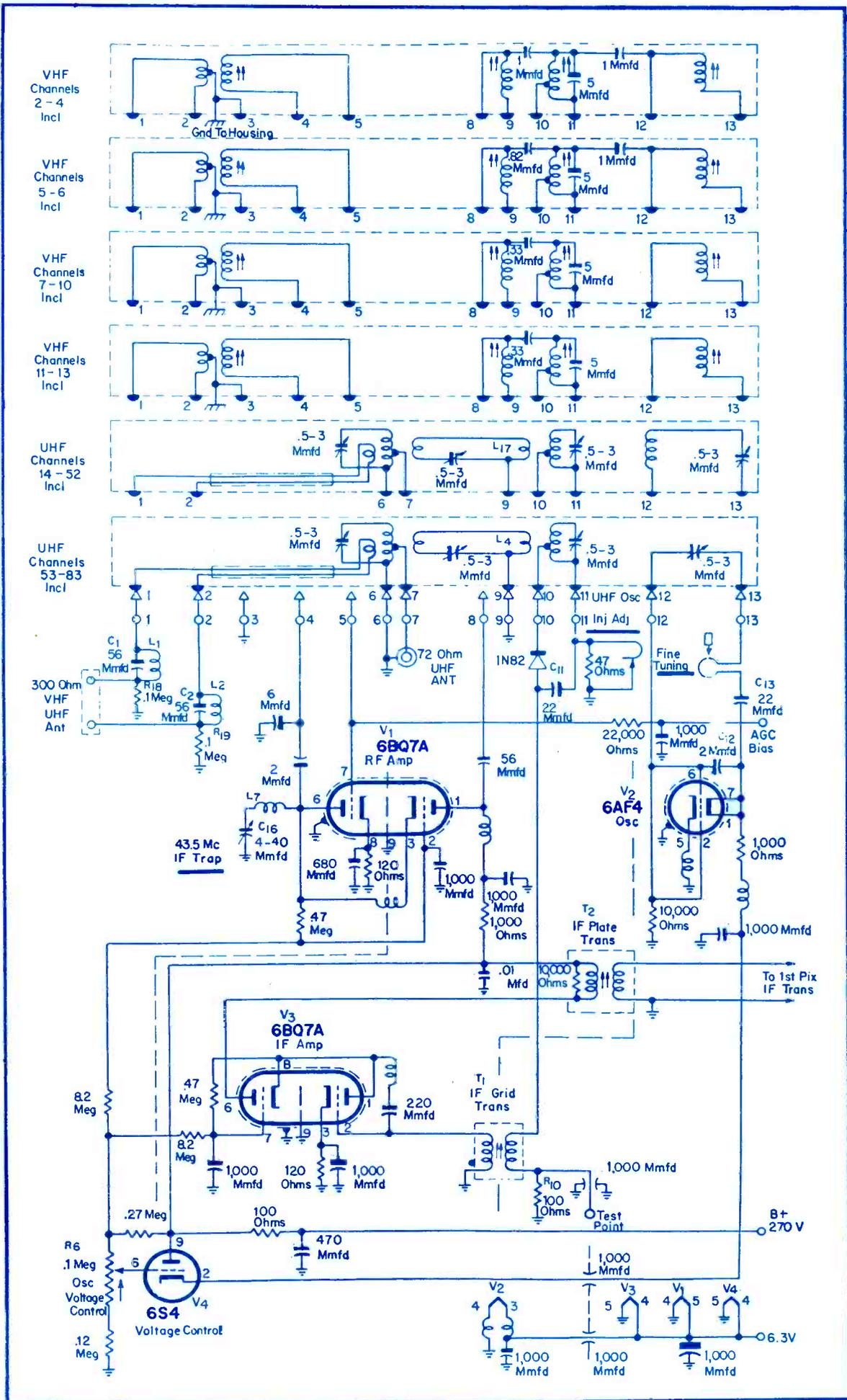
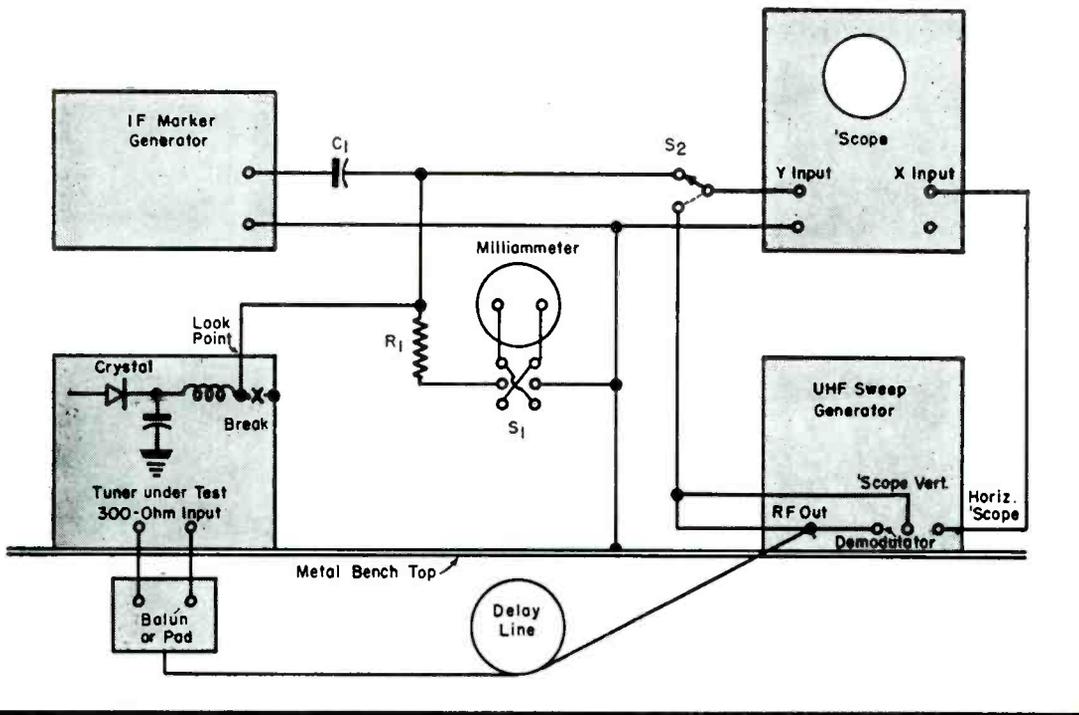


Fig. 3. Schematic of 44/44/44 tuner<sup>2</sup> with which it is possible to provide coverage of any combination of 16 vhf and 44 hf stations, through the use of tuned units which are inserted in a drum assembly in the rf tuner.



(Left)

Fig. 1. Test instrument setup for alignment of *uhf* tuner.

THE ACKNOWLEDGED PROCEDURE for the alignment of *uhf* tuners involves the use of a sweep generator sweeping over a band of frequencies in the vicinity of the *rf*-tuned circuit passband. The relative amplitude of the circuit response over the passband is then observed on a 'scope. For the alignment of *uhf* tuners and converters it is necessary to use a *uhf* sweep generator, calibrated *uhf* marker oscillator, 'scope, *if* marker generator, crystal-current meter, balun, and a delay line. The most important and critical item is the sweep generator which must have a tuning range (center of swept frequency) from 460 to 900 mc, a sweep width at least 10% of the operating frequency at the maximum position of a variable sweep control, and an output which must be at least .25 volt at an impedance of 75 ohms. The output must be variable through a range of at least 30 db. The

swept output must not have more than a 20% change over the swept band, and the output must not have any large irregularities anywhere within the tuning range of the generator. For ease of application the sweep generator should include a *uhf* calibrated marker oscillator. The *uhf* marker generator should have a range of 380 to 940 mc to align *uhf* local oscillators, using a zero beat technique to cover frequencies of local oscillators in converters as well as tuners. The calibrated marker oscillator need not have much output, but should be accurate and stable in its frequency calibration to provide a *uhf* marker pip on the response curve. The milliammeter, suitable for reading crystal current, should have a low range of 1 milliampere and a high range of 10 milliamperes.

Since practically all tuners are designed for a balanced 300-ohm input

and all signal generators are designed for 50 or 75-ohm coax output, it is necessary to employ a balun between the generator and tuner.‡ The last piece of equipment required is a *delay line*, which can readily be made in the shop by coiling up 50' of RG59/U coax cable and attaching suitable fittings on each end.

The test equipment setup is shown in Fig. 1; illustrated are the necessary instruments, placed in the most convenient locations for accessibility, and convenience of manipulation and adjustment. The sweep generator and the tuner or receiver to be aligned can be placed on the workbench, as shown. The workbench should have a metal top surface to provide good grounding between all pieces of equipment. The 'scope and *if* marker generator should be placed on a shelf at the back of the workbench, where they are visible and accessible, but out of the way of the main instruments requiring frequent adjustment. The crystal current meter and the associated resistor and capacitor should also be placed on the shelf where they are visible but out of the way. The resistor,  $R_1$ , should not exceed 100 ohms, and may be smaller if there is a sufficiently large response curve shown on the 'scope; this resistor is not a meter multiplier. The capacitor  $C_1$ , a small coupling unit from the *if* marker generator to the crystal, prevents shorting the crystal output and losing the audio-response

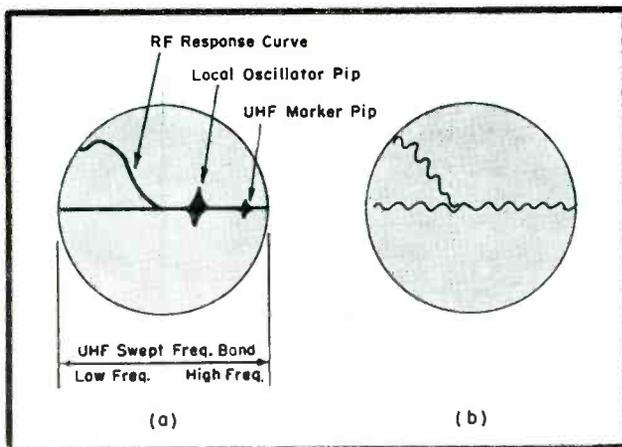


Fig. 2. Patterns obtained when aligning *uhf* local oscillator by the beat-frequency method. Wavform in a shows result when the local oscillator frequency is lower than the *uhf* marker frequency. A 'scope presentation showing the local oscillator frequency and *uhf* marker producing a low frequency beat frequency, and correctly aligned local oscillator, appears in b.

†'Scope should be similar to DuMont 304-A, and *uhf* sweep generator, RCA WR-40A.

‡Hesse, Henry, *UHF/VHF Tuners*, p. 39. SERVICE; April, 1953.

# ALIGNMENT

by HENRY R. HESSE

Senior Engineer, TV Receiver Division  
Allen B. DuMont Labs

## A Report on Special Types of Equipment Required and Their Application in Checking the Preselector Bandpass, Oscillator Frequency, Mixer Injection, Input Match and Alignment of IF Through the UHF Input

curve. The size of the capacitor should be adjusted so that the markers are of the correct amplitude with respect to the response curve. The markers should be about 1/10 of the total response vertical amplitude curve, and the response-curve amplitude should be 4" high on a 5" 'scope at full gain setting of the vertical amplifier. To reduce the size of the response curve the output of the sweep generator or the size of resistor,  $R_1$ , must be reduced, but the 'scope amplitude setting should be left at maximum gain. A meter reverse switch  $S_1$  is required because of different crystal polarities encountered in service. The delay line may be coiled up and placed behind the sweep generator or placed under the bench. When the delay line is not in use it should be disconnected at both ends, from the signal generator and the tuner, to avoid confusing responses on the 'scope. It would be convenient to provide the balun with a coax cable long enough to reach the generator directly; this would avoid unnecessary cables and adapters.

The mixer crystal in the tuner or converter is used as the detector and its *dc* and audio output amplitude, when fed to the 'scope, indicate the response curve of the tuner tuned circuits; Fig. 3. Some *uhf* tuners are equipped with test points for observation of the response curve of the *rf* tuned circuits, but many tuners and converters do not have these test points. In this case it will be necessary to break into the tuner circuit to make the test. The breakin point can be found by checking the tuner and its schematic and opening the connection of the crystal mixer circuit at the point where a connection is made to ground at its *if* or output side; this will be an *rf* choke or the ground connection of the primary of a double-tuned *if* transformer connected to the crystal. No connection should be made to the *rf*

end of the crystal as this will upset tracking and disturb alignment.

### Alignment Procedure

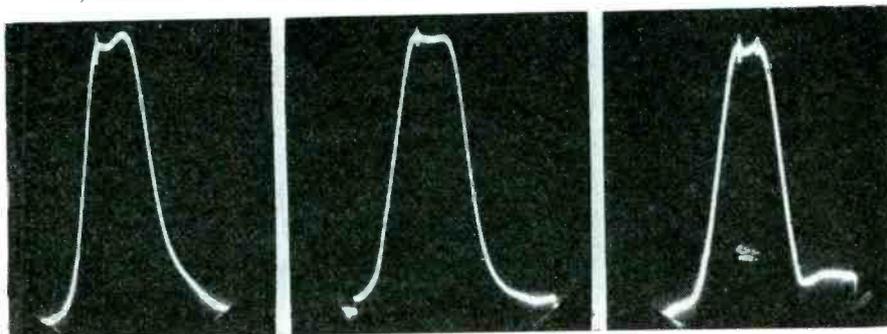
In the first step it is necessary to align the local oscillator, using a beat frequency indication in the 'scope of the local oscillator in the tuner, beating with the calibrated *uhf* marker oscillator. As one tunes the calibrated oscillator slowly back and forth, in the vicinity of the local oscillator frequency, the 'scope trace will thicken, as in defocussing, and then will appear to become a wavy line with many cycles across the screen. As the beat is tuned to a lower frequency definite cycles will be seen, as in Fig. 2*b*. Because of the ultrahigh frequency, it is very difficult to secure a steady beat frequency and almost impossible to get close to zero beat. In this test it is best to tune the sweep oscillator near the local oscillator frequency; in this instance the local oscillator will appear as a marker pip on the 'scope screen, and it will be possible to see the calibrated oscillator as another pip on the 'scope screen; Fig. 2*a*. The relative positions of the two pips will help in adjusting the oscillator frequency to the correct value. As the two pips

merge the beat frequency pattern (Fig. 2*b*) will appear. This is an odd situation. Actually, each pip is a beat between a swept oscillator and a fixed frequency oscillator, and the pip is the region where the beat between the swept oscillator and the fixed oscillator is low enough in frequency to give an indication on the 'scope, that is less than 50 kc to 1 mc, depending on the video amplifier in the 'scope. The beat pattern on the 'scope will appear along the full width of the trace on the 'scope screen; this is a beat frequency between two fixed-frequency oscillators. For best local-oscillator alignment procedure the calibrated marker should be set to the correct oscillator frequency<sup>2</sup>. The sweep generator should be tuned so that both the local oscillator pip and the *uhf* marker pip are visible on the 'scope as in Fig. 2*a*, and local oscillator adjusted so that its pip moves toward the marker pip. When the local oscillator gets within the beat range, as shown in Fig. 2*b*, the oscillator will be correctly aligned. Of course, it is assumed that the tuner dial had been set on the correct channel number for the frequency to be aligned. The local-oscillator alignment should be completed before any other tests, because

<sup>2</sup>Hesse, Henry, *UHF Converters, SERVICE*, p. 78; March, 1953.

(Continued on page 87)

Fig. 3. Ultrahigh-response curve waveforms. Pattern at left (a) represents response of converter at channels 50 to 51; 686 to 698 mc. Center (b) represents response at channels 60 to 61 or 746 to 758 mc, while 'scope pattern at right (c) is the curve for channels 70 to 71 or 806 to 818 mc.



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# RECORD PLAYERS

by MARK VINO

## Selecting Types Best Suited for Job, by Checking Motor RPM, Extent of Rumble, and Tone Arm Design and Operation . . . Recommended Installation Adjustment Techniques

THERE ARE SEVERAL simple but accurate operational checks that can be made, prior to purchase, which will provide important indices to record-player characteristics. One such check covers speed regulations, or the constancy of turntable rpm, particularly under changing load. This can be readily tested by the use of a stroboscope disc, which is placed over the record spindle and illuminated by a neon lamp or ordinary light bulb, as in Fig. 1; the light must be operated from an ac source. When the light is ac operated it is effectively blinking bright and dull at the frequency of the power line, or sixty times a second, if it is a 60-cycle line. The spokes or dots of the stroboscope disc are spaced in such a way that the disc pattern returns to its original configuration every one-sixtieth of a second when the turntable is revolving at the correct speed, and the pattern appears stationary. An increase of speed will make the stroboscope pattern seem to crawl forward; a decrease of speed will make the pattern crawl backward, while a very large departure from the

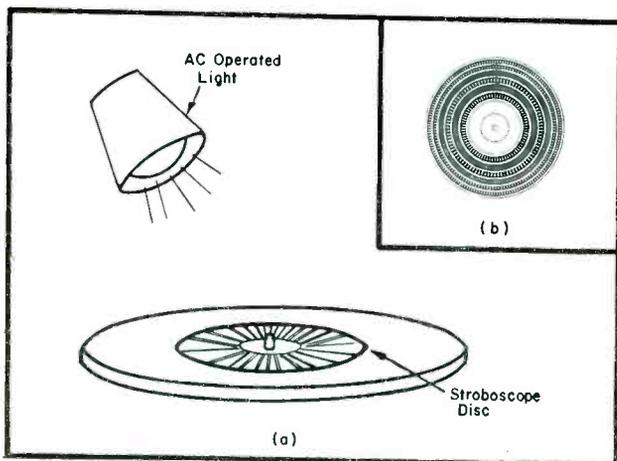
correct rpm will obliterate the pattern entirely.

While the correctness of the absolute rpm is a factor, how well the same speed is maintained actually is the all-important key to good operation. There are two types of variation to guard against; changes within a single revolution, creating a wavering tonal effect called *wow*, and overall changes resulting from increasing or decreasing the turntable load. The first will show up on the disc as a periodic advance and retreat of the stroboscope pattern with each revolution of the turntable. Since the same visual effect may be produced by a warped disc surface, care must be taken, in making this check, to see that the disc is in good condition and is lying absolutely flat on the turntable. When these conditions are observed a good turntable will create an optical pattern that is extremely steady.

The second type of variation results in a general lowering of the overall musical pitch, when the number of records on a changer builds up. This, too, may be checked quite simply, by

comparing the stroboscope pattern under conditions of minimum operational load (one record on the turntable, tone arm playing the end of the record) and heavy operational load (five or six records on the turntable, and the tone arm playing the beginning of the record, where the mechanical advantage with which the needle-groove forces oppose the motor torque is greatest). A well-regulated player will show little or no change in the stroboscope pattern between the two conditions. A poorly-regulated player may create a drop of a full half-tone from the beginning of an orchestral piece to the end; that is, the music may start in the key of *D* and end up in the key of *C#*. Such a change will be very gradual, however, and therefore not as annoying as the first type of speed variation described. The use of a heavy turntable, which acts as a flywheel to the motor, helps iron out speed variations.

Small deviations from the correct turntable speed (78.26 rpm for standard, 45 rpm for RCA microgroove, and 33 1/3 rpm for *lp*) are usually



(Above)  
Fig. 2. Rim drive mechanism of modern record changer. One of the three bushings or pulleys are brought against the rubber-rimmed idler wheel according to the turntable speed desired. (Courtesy British Industries, Ltd.)

(Left)  
Fig. 1a. Method of checking turntable speed with a stroboscope disc. The pattern remains stationary when the turntable is revolving at the correct rpm and without speed variation. In b appears a typical stroboscope disc, with patterns for 33 1/3, 45, and 78 rpm. (Courtesy Clarkstan.)

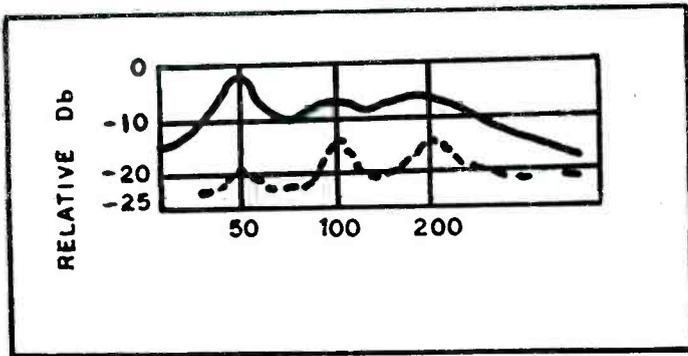


Fig. 3. Comparative rumble level of inexpensive (solid line) and high-quality (dashed line) turntable motor. (Based on Briggs data.)

tolerated without great ill effect. However, some may be very sensitive to changes of absolute pitch and disturbed by this inaccuracy. In such cases, the turntable must be checked for absolute speed, or one with a speed adjustment must be used. Most modern record players use a rim drive mechanism (Fig. 2), in which the turntable rpm is controlled by the diameter ratios between a driving metal bushing and a rubber idler wheel that engages both bushing and turntable rim. The rpm of a given make of changer can usually be changed somewhat by changing the metal bushing for another of the same model. When the revolutions are too slow, the only corrective measure that can be taken is to find another bushing with a larger diameter, but when the speed is too high the old bushing can be taken down with an ignition file or even nail file. The turntable should be removed, paper mask prepared to catch the brass filings and protect the rest of the player mechanism, and the file then held against the revolving bushing. Results should be checked by stroboscope disc every fifteen seconds or so to guard against taking down the bushing too far. This procedure should not be used unless the changer ex-

hibits no significant dropping of speed under heavy record load, and is definitely not recommended for players which do not have easily replaceable bushings. When the latter feature is not present a mistake can be very costly.

#### Rumble Check

Rumble is the random low-frequency noise produced by mechanical vibrations in the player mechanism, created by the motor. It is important to keep the rumble level low, not only because of its inherent nuisance value, but also because intermodulation between the rumble and recorded signals may produce distortion of the most intolerable kind. Extreme cases of this type of intermodulation distortion may result in sound with a quality very much like the *bubbling* playing-through water characteristic associated with defective filter capacitors.

Rumble can only be checked when the player is plugged into an operating sound system. With the volume high, it is important first to listen to the first unrecorded grooves of records. It is not wise to rely on any one record, which may contain excessive

groove irregularities. If a choice is being made between one or another type of relatively inexpensive record changer one should not expect to find a player without rumble; Fig. 3. Absence of rumble is one of the outstanding advantages of the professional type single-play turntables. However, record changers can give very satisfactory results when they are properly mounted. The changer manufacturer provides springs on which the base plate rests, either directly or by a suspension system, and the changer should *never* be mounted without them. It is also important to see that the changer rests freely on its springs, without touching any part of the cabinet either above or below the motor board. The motor board template which is supplied with the changer should be followed carefully, or a pre-cut motor board (as in Fig. 4) or mounting case may be purchased. Sometimes mounting hardware includes nuts, designed for permanent mounting in the motor board, which match bolts in the changer plate. Actually, these serve only for the purpose of securing the changer for transportation, and the

(Continued on page 54)

Fig. 4. Pre-cut motor board. (Courtesy Webster-Chicago.)

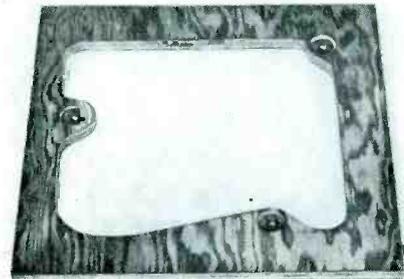


Fig. 5. Method of measuring tracking error. Since it is impossible to see through the tone arm, the angle of the cartridge may be marked off on a piece of cardboard and measurements taken from the cardboard; or the protractor can be rotated counterclockwise to bring its straight edge in line with the cartridge axis, and the angle then measured between the 90° protractor line and the base of the triangle. The triangle base line *must* pass through the center of the spindle hole.

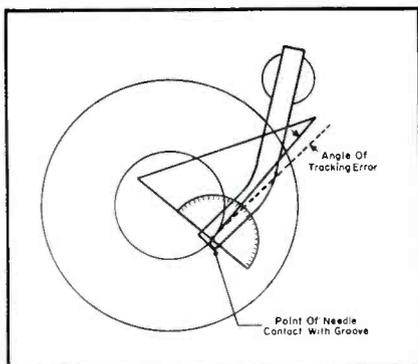
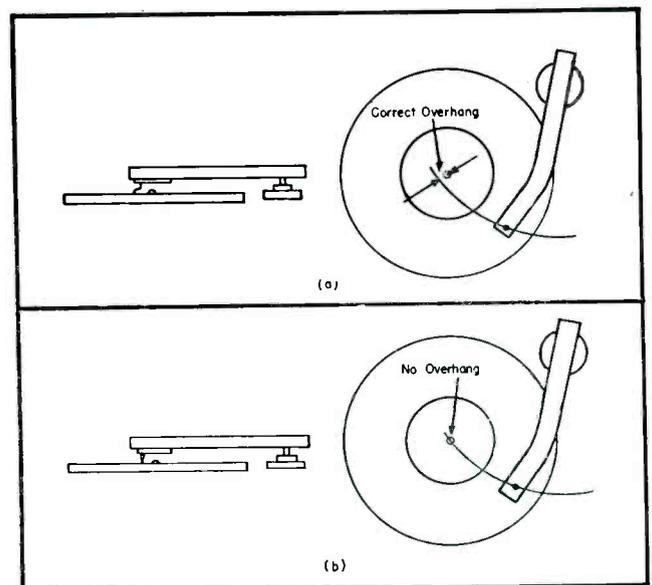


Fig. 6. How a change of cartridge or needle from the original design can change the correct overhang and introduce increased tracking error.



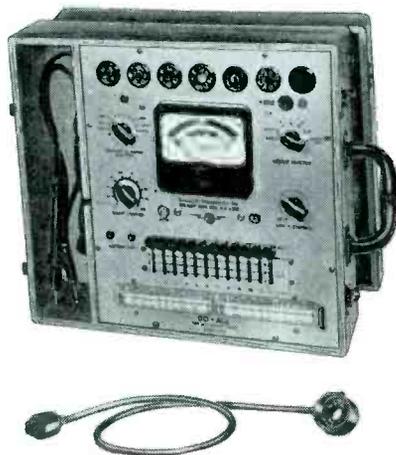
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## Record Players

(Continued from page 53)

bolts should be completely out of the nut threads during operation.

### Tone Arm Checks

Since the tone arm comes already mounted in most player mechanisms, it must be judged as part of the unit. It should have maximum unimpeded freedom to move both vertically and across the record, a characteristic determined by the care with which the pivot mount has been designed. The tone arm should also be free of random

torsional play around its long axis, and should hold the pickup so that the cartridge's short axis is parallel to the plane of the record.

The tracking error (deviation from tangency to the record grooves as the arm moves across the record) can be kept quite low even with the relatively short arms suitable to changers. The requirement is not added expense, but merely careful calculation of the offset angle and mounting position. The most critical portion of the record, from the point of view of tracking error distortion, are the grooves near the center. Fig. 5 (p. 53) illustrates

how a rough check of tracking angle can be made with a draftsman's triangle, or similar instrument, and a protractor. The error at the inner grooves should be no more than a few degrees, while the allowable error at the outer grooves is somewhat greater, perhaps as high as five to seven degrees for a changer.

In this connection, it is useful to recall that the exact mounting position of the tone arm (determined by its length and angle of offset) is critical within a small fraction of an inch, and that this mounting position may be specified by the amount of *overhang* of the needle tip past the turntable spindle. When the needle has a different position in the tone arm, than was intended by the designer, a change which may be caused by the installation of a different type of cartridge or needle, the delicate balance of factors can therefore be completely upset, and a large amount of tracking error introduced. With the tone-arm lengths and offset angles in common use in record changers the needle tip should overhang the center point of the turntable spindle by about  $\frac{3}{8}$ " or so. Eliminating the overhang may cause the tracking error to increase as much as fifteen degrees.

A final standard to apply to the permanently mounted tone arm is the ease with which needles can be replaced. There should be a reasonably simple method to do this; one which does not require special tools or special skills.

### Reliability of Operation

Not too many years ago record changers suffered from many design defects. Most of these deficiencies have been overcome in current designs. Center holes get worn a little, but records are not devoured. The gentleness of the record drop has also been improved, so that crashing noises coming from the interior of the set no longer wear our nerves thin.

### Repair and Adjustment

Changer repair is a specialized field. Even the Service Man must have special training for the more involved aspects of the work, although mechanical ability and a lot of extra time sometimes are substituted for this training. Basic adjustments on most changers, however, are easy to make. They involve:

(1) The let-down point of the needle into the play-in groove. This is adjusted as a compromise between various types of records of the same nominal size. Some of the older records, with wide, grooveless rims, may have

to remain outside the range of automatic operation.

(2) Sensitivity of the trip at the end of a record. Too insensitive a trip will result in no changer action, while too great a sensitivity may cause premature operation or undue drag on the arm as it moves across the record.

(3) Vertical tracking force of the pickup cartridge on the record. This adjustment is ordinarily made by varying spring tension on the tone arm or by the installation of an extra weight between the cartridge and arm.

#### Mechanism Lubricants

Special lubricant is made for changer mechanisms. In all cases, of course, the manufacturers' directions should be followed. Extreme care must be taken to keep the lubricant from the surfaces of the idler wheel and bushings which communicate the motor revolutions to the turntable. All types of lubricant must also be kept away from the shock mounts from which the motor is suspended. Grease attacks the rubber or composition washers in these mounts, and a frequent cause of increased rumble is loss of elasticity or other damage to the motor mounts.

#### Changers Versus Single-Play Turntables

There is occasional disagreement about the desirability of professional single-play turntables as compared to the more popular record changers for high-fidelity installations. There is really no conflict or even competition between the two. The record changer can provide excellent performance, at the same time offering the advantages of low price, small space, ease of installation, and the convenience of record changing. The professional turntable costs much more, and requires precise care in mounting of the separate tone arm, but the added care and expense pays for vanished rumble and the absence of *wow* or other speed change. An opportunity is also provided for installing a superior (and more expensive) tone arm with low tracking error, high quality pivot construction, and a freedom from the necessity of changing the angle to the record as the stack is piled higher. Some installations use both types of units, so that the operator can choose between the convenience of the one and the professional performance of the other, according to his requirements at the moment.

(Right)

Presentation of a scroll recognizing 50 years of historic progress to Peter L. Jensen (right) of Jensen Industries by Francis Florsheim, chairman of the Electronic Parts and Equipment Manufacturers, at a recent luncheon meeting in Chicago. The scroll accompanied a television set given to Jensen.

# COMING SOON-*Telechief!*<sup>®</sup>

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**SANGAMO ELECTRIC CO.** MARION ILLINOIS

#### AWARD TO PIONEER



#### FINNEY ANTENNA PATENT UPHELD

A patent interference suit, instituted in the patent office over a year ago, over patent 2,566,287, awarded to Louis H. Finneburgh, Jr. for a colateral antenna, has been settled in favor of The Finney Co., 4612 St. Clair, Cleveland 3, Ohio.

Final judgement declared Finneburgh as the first inventor of the antenna.

\* \* \*

#### U. S. WIRE AND CABLE MOVES

U. S. Wire and Cable Corp., formerly located at 27 Haynes Ave., Newark, N. J., has moved into a new plant at Progress Ave. and Monroe St.

# AUDIO installation and service

## Phono-Tape-Wire-PA-Amplifiers-Speakers

by KENNETH STEWART

**20 and 50-Watt Hi-Fi Amplifier Circuitry... 45/78 Changer Wow Cures... Noisy Amplifier Remedies... Extended Play Tripping Correction... Features of New Audio Products: Miniature Transformers... Very-High-Frequency Drivers... Amplifier With Loudness Contour Selector... Speaker Enclosures**

AUDIO AMPLIFIERS, long a rather staid item in design programs, has, with the accelerated interest in *hi-fi*, become one of the most important factors in the lab. As this column has revealed on many occasions, many unusual types have been developed to provide better and better reproduction.

Another example of this design trend appears in Fig. 1, displaying not only several new concepts in circuitry, but in component design, too.

In this amplifier<sup>‡</sup>, 100% coupling is said to be available between the two primary windings on the output transformer. This is achieved by winding the primaries together or bifilarly as if they were one wire. To cancel static magnetic fields, due to the flow of *dc* through the windings, and, at the same time, permit the *ac* components from

the tubes to add in-phase, a *take-turn* primary is used for the operation of the output tubes, in contrast to the conventional *push-pull* circuit, where one half of a series winding is used for one tube and the other half of the winding for the other tube. Because of the high mutual coupling between windings, from an *ac* standpoint, essentially the same coils can be used. This circuit is said to provide a large frequency response advantage over conventional output circuits, because the impedance between the two tubes has been reduced over the conventional circuit by a factor of 4:1, since the turns ratio is reduced by a factor of 2:1; a reduction of leakage inductance between primary and secondary of 4:1 is achieved because of the relative turn ratio reduction of 2:1. In addition, since the load

is divided, one-half in the cathode and half in the plate for each of the tubes, a feedback factor of approximately 12 db is obtained. The remaining feedback is obtained through a balanced loop to the input of the phase inverter.

The designers have also considered the problem of impulse distortion; one of the basic reasons for using the bifilar choke input to the final stage was to provide a low grid-circuit resistance path to *dc*, which circumvents the usual difficulty of excessive bias resulting from transient or impulse program material.

### Tubes in Circuit

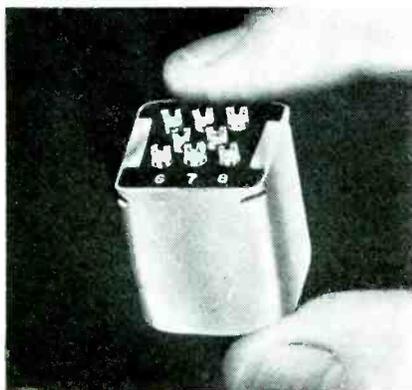
The circuit consists of two 6L6Gs in the final stage, driven by two 6J5s operated in push-pull, plus one 12AX7 consisting of two triodes for the inverter amplifier stage. This is the basic amplifier and is claimed to have

Very high-frequency driver that is said to take over from 3,500 cycles to the limits of audibility through a crossover. Includes both the driver unit and diffraction horn. Level control is also available for use with driver to adjust output level to individual taste. (T-35; Electro-Voice, Inc.)

<sup>‡</sup>McIntosh 20W-2 and 50W-2

Miniature hi-f audio transformers, made with nickel steel laminations, and sealed and potted in  $\frac{1}{8}$ " square, anodized aluminum cases with phenolic terminal boards. Total height, including terminals, is  $1\frac{1}{4}$ ". The case has two 2-56 threaded inserts,  $11/16$ " centers. Transformer weighs 1.3 ounces. (Tinytrans: TT-11 for microphone, pickup or line to single grid application; TT-12, mic, pickup or line to push-pull grids; TT-13, dynamic mic to single grid and TT-14, single plate to single grid; Stancor.)

Chet Warfield, coordinator of *hi-fi* equipment sales at Allied Radio examining 12" and 15" speaker baffles for bass-reflex cabinet. Four mounting screws are installed to take any standard 15" speaker; additional mounting board is furnished with each cabinet to reduce opening to standard 12" speaker size. Front of cabinet is solid hardwood (mahogany or blonde) with matching leatherette top and sides. Acoustic lining is visible inside. (Argos Products.)



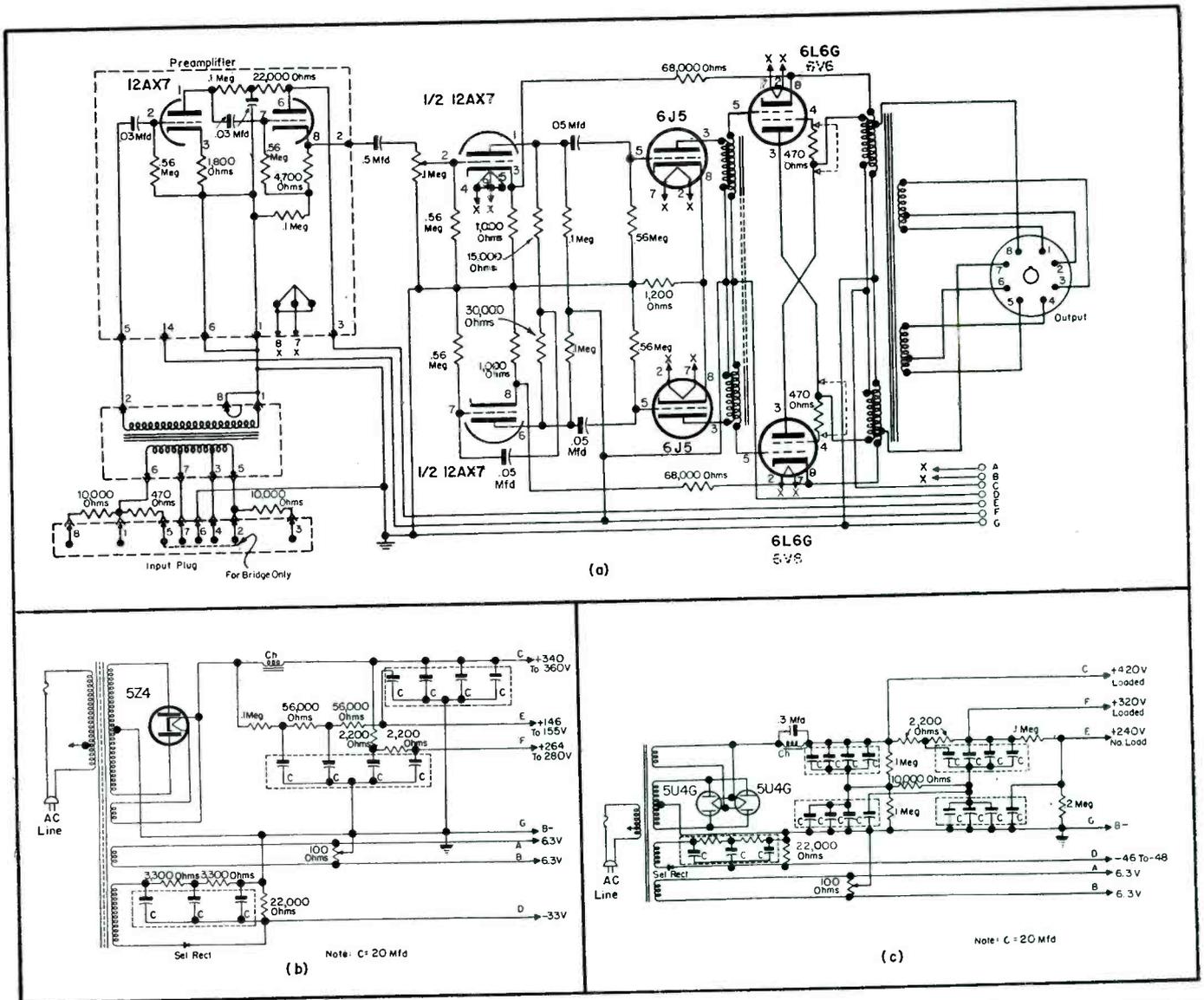


Fig. 1. Circuit of McIntosh 50-W-2 using 6Ls and 20-W-2 with 6V6s (dashed lines indicate change in circuit, with 470-ohm resistors omitted); and power supplies for each amplifier. Input and output plug connections provide assorted impedance matching for 4 to 600-ohm requirements.

a power gain of approximately 40 db, requiring a maximum of 2 volts input at the grid of the phase inverter. Incidentally, excessive grid-drive voltages when prolonged will injure the 6L6G tubes.

A preamplifier unit is also provided, resulting in an additional gain of 30 db.

The addition of a plug-in input transformer, included in this package, will provide an additional gain of 26 db for a 30-50 winding; 17 db through the 250-ohm winding; and 12 db through the 600-ohm winding. Approximately a 2-db gain can be realized through a bridging coil. These coils are available with double and triple shielding: The double-shielded coil provides 80 db of isolation to noise fields, while triple shielding provides 90 db isolation to noise fields.

#### Wow or Slow Speed Cures

Wow or slow speed is generally most noticeable in the 33 1/3 positions,

but may also occur at the 45 and 78 positions. On the RCA 930409 changers, either of four conditions might cause wow: Pin in slide plate restricting movement of slide plate, which prevents idler wheel from making firm contact with turntable rim; bind in idler wheel slide plate; oil on rubber tires, and idler wheel tension spring too long.

To correct the pin-movement problem, it is necessary to remove pin from slide plate and discard, removing all burrs from around the hole after pin is removed.

Since the slide plate must be free to move its full travel without binding, it might be necessary to straighten slide plate, and remove any burrs on slide plate. Slide plate and slots of casting should be cleaned with carbon tet; do not lubricate these sliding surfaces.

Oil on the rubber wheels can be removed by washing tires with carbon

tet; do not handle with oily fingers.

If the idler wheel tension spring is too long, turns should be removed if necessary; there should be only 18 active turns. It may be necessary to remove as many as 5 turns.

#### Hum or Noisy Amplifier Remedies

When a hum or noisy amplifier is encountered in the RCA 45EY3 units, the bottom of the output tube socket (50C5, 50L6GT or 25L6GT) should be observed for signs of leakage from the electrolytic capacitor. The lead end of this capacitor is normally directly above this tube socket.

Leakage from the capacitor onto the socket will establish an electrical leakage circuit between socket contacts. This leakage may cause hum, and corroded contacts will cause noise.

If there is any evidence of electrolyte leakage on the tube socket, the socket should be replaced and the

(Continued on page 84)

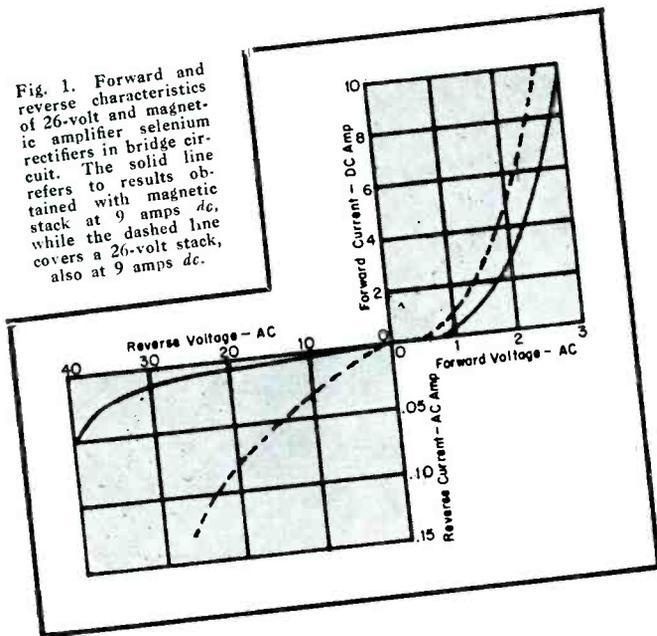
# Magnetic Amplifier

## Rectifiers

by J. T. CATALDO

**Design and Application Characteristics of Selenium Rectifiers Developed to Improve Efficiency of Tubeless Power Amplifiers, Which are Becoming Increasingly Popular in Many Commercial Electronic Systems**

Fig. 1. Forward and reverse characteristics of 26-volt and magnetic amplifier selenium rectifiers in bridge circuit. The solid line refers to results obtained with magnetic stack at 9 amps *dc*, while the dashed line covers a 26-volt stack, also at 9 amps *dc*.



MAGNETIC AMPLIFIERS, which are relatively simple tubeless power amplifiers, have been receiving an increasing amount of attention in the electronic field. Performance experience, to date, has proved this device to be extremely dependable for power amplification and control purposes.

Since this type of amplifier has no tubes which must slowly heat up, the equipment is ready for operation as soon as power is applied. Mechanically rugged, it can withstand considerable abuse. In most installations, the magnetic amplifier is no more bulky nor unconventional in appearance than any iron-core transformer or choke of similar ratings. Replacement and maintenance costs are low for this type of equipment.

This device, however, has the disadvantage in that it does not have the speed of operation of the tube amplifier or control circuit. Its speed depends upon inductance and operating frequency. In addition, it places a load upon the control signal source, since it draws current for control. Moreover, its high frequency limit is governed by the electrical and magnetic characteristics of the core material. However, it is anticipated that newly developed core materials may extend the operating range ultimately into the *rf* spectrum.

Within the limits of its operation, the magnetic amplifier provides exceptional stability in both *ac* and *dc* application. It has been reported\*\* that power amplifications as high as 100 million have been achieved. The am-

plifier makes a good non-mechanical relay or trigger capable of handling high power levels directly, finds use as a current transformer and as a translator in telemetering, may be used as a voltage regulator and as a general-purpose sensitive electronic control device controllable by phenomena as low-powered as the output of a photocell.

Additional interesting uses are low-frequency audio amplifiers, motor controls, low frequency oscillators, controlled output rectifiers, and audio modulators.

Designers have found that substantial improvements in *m-a* operation will obtain when selenium rectifiers with higher forward-to-reverse current ratio are used. It is customary, in the magnetic amplifier field, to derate the conventional 26-volt selenium rectifier plates to 16 or 20 volts so that a higher ratio may be obtained. Heretofore, this ratio, by derating, has been in the order of 500:1 and with careful selection a twofold increase in this ratio is possible.

In studying the problem it was found possible to develop 5"x6" selenium rectifier plates† whose forward and reverse characteristics differed from the conventional 26-volt units. Investigating their operation, with plates connected 4-1-1 (single phase bridge), it was found that the forward voltage drop of the magnetic amplifier stack was slightly higher than that for the 26-volt stack; Fig. 1. It is understood

that this increased forward voltage drop does not materially affect the operation of magnetic amplifiers. Since a high forward-to-reverse ratio is desired for magnetic amplifier applications, it is interesting to note that the magnetic amplifier stack had a ratio of 150:1 at 40 volts, while the 26-volt stack revealed a ratio of 65:1 at its rated voltage.

These ratios, however, do fall short of the ideal figure sought by magnetic amplifier designers; the current ratio is greatly increased at derated voltage due to the shape of the reverse current curve. A further examination disclosed that the slope of a portion of the curve (25 volts to origin) approaches zero. Consequently, current ratios in the order of 4000:1 or 2000:1 can be realized when the magnetic amplifier stack is derated to 16 and 20 volts, respectively.

### Current Ratios Realizable

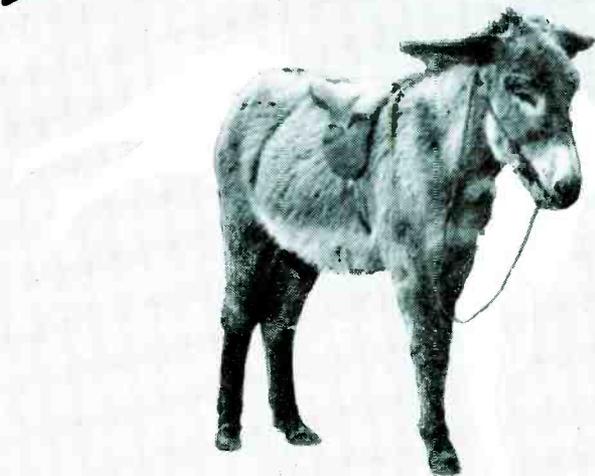
These magnetic amplifier selenium rectifiers are currently being used in the design of new types of amplifiers. This development and the current development of new core materials by various labs are concerned a promising step toward the goal of designing higher gain and improved magnetic amplifiers.

\*Portions of this article are based on a report on *Magnetic Amplifiers*, which appeared in *The C-D Capacitor*, May 1950; and a paper on the *Development of 40-volt Selenium Rectifier Plates*, by J. T. Cataldo, Electrical Manufacturing, May 1952.

\*\*Hedstrom and Borg, *Transducer Fundamentals*, Electronics, p. 88; September 1948.

†International Rectifier project.

take the kick  
out of  
TV

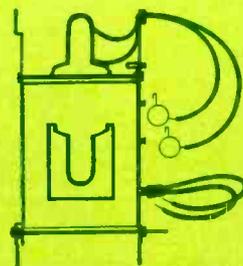
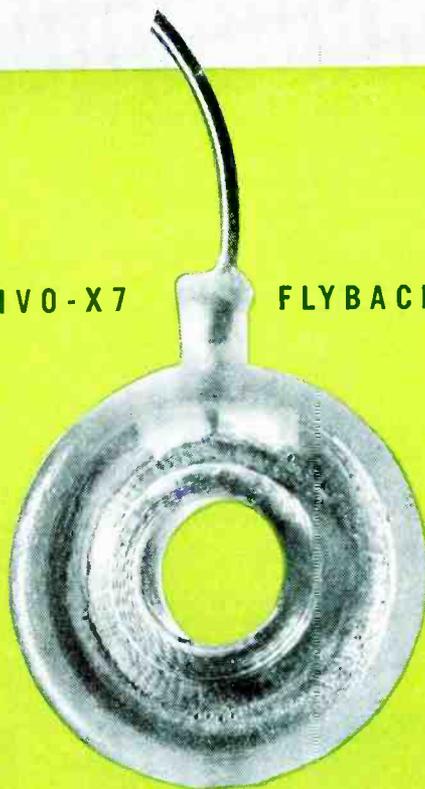


FREE

HV0-X7

FLYBACK TRANSFORMER

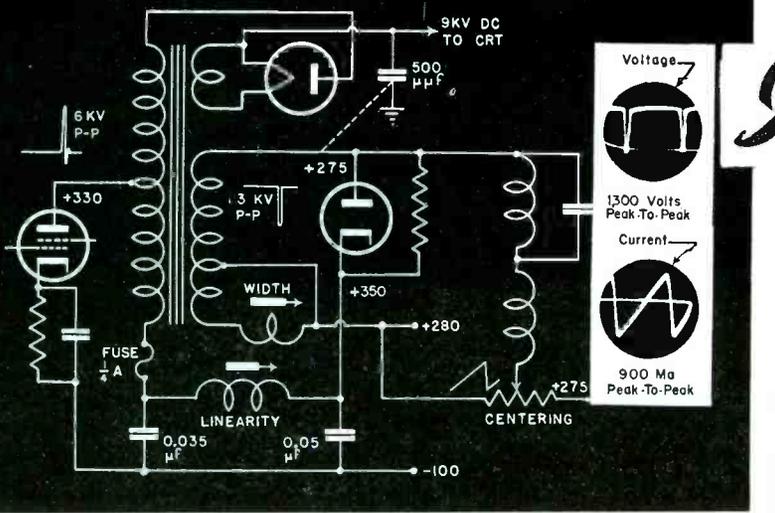
Servicemen are in for a *pleasant* shock as Merit designs a corona-free transformer! Merit's famous HV07—the world's most popular transformer—is now treated to a miracle-tough, new non-hygroscopic insulation. Liquid-molded, this insulation encloses the high voltage winding, is impervious to moisture and high humidity and forms a watertight seal for the high voltage lead. This, the latest development in insulating material, is unaffected physically or electrically by high humidity or cycles of heat and cold. It will withstand operating temperatures 50% above normal without change—and its high dielectric constant affords maximum protection with minimum distributive capacity. And this miracle new material resists oil, acid, corrosion and is non-flammable as well.



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# In The Field†



(Left)

Fig. 1. Different waveshapes of a voltage and current obtained when a non-sinusoidal voltage is applied across a reactive circuit, as illustrated. In this example, a sawtooth of deflection current flows through the horizontal-deflection coils, as a result of impressing an essentially rectangular voltage across the coils. The voltage waveform is obtained by applying the 'scope across the deflection coils; the current waveform is obtained by applying the 'scope across a resistor which is connected in series with the coils. In the example shown, the centering control serves conveniently for a 'scope connection to check the current waveform.

Do HARMONICS in the 'scope sweep produce kinks and hangovers in the response curve?

Occasionally, when using a phasable-blanking network, it will be found that the response curve on the 'scope screen will not be smooth, but will consist of fluctuating wiggles along the curve. In some cases, the wiggles or kinks in the curve start to go forward, then backward, then forward again. These puzzling minor distortions are caused by harmonics in the sweep voltage. If the 'scope sweep is switched to the sawtooth function, these minor distortions will disappear, as would be expected. The fixed capacitor used in the phase-shifting circuit of the phasable-blanking network serves to enhance the harmonic content of the sweep wave. It will be noted also that the presence of the harmonics causes bright spots to appear at some points along the horizontal portion of the display.

CAN picture pulling at top of raster be caused by poor regulation in power supply?

Picture pulling at the top of the raster is occasionally caused by poor regulation of the power supply; the vertical sweep circuit requires heavy surges of current, and these surges cause fluctuations in the B-supply voltage, unless the filter capacitors are sufficiently large and have a satisfactory power factor. The fluctuation in B-supply voltage affects the operation of the horizontal oscillator, and the horizontal-sync control circuit.

Does ringing in a vertical-oscillator transformer cause white bar or lines at top of picture?

Some vertical-oscillator transformers have a relatively high  $Q$  and will ring unless the damping resistor across the secondary has the specified value. Ring produces velocity modulation of the scanning beam, which develops the white line.

IT HAS BEEN SAID that the 'scope is basically an electronic milliammeter as well as an electronic voltmeter. If this is so, why?

An analysis of this statement is illustrated in Fig. 1. Examples of normal and abnormal current and voltage wave shapes are shown in Figs. 2, 3, 4 and 5. The current waveshapes can be obtained in each case by connecting a small resistor (2 or 3 ohms) in series with circuit to be tested, and connecting 'scope across resistor.

CAN THE *dc* component in the output of a square-wave generator impair accuracy of test?

When a square-wave test is made of a video amplifier, it is often essential to use a series blocking capacitor in the output lead to isolate the *dc* voltage component which may be present. A *dc* component will bias the input stage of the receiver amplifier to an incorrect operating point, and *impair* the accuracy of the test, *unless* a blocking capacitor is used.

Fig. 2. Examples of normal and abnormal waveforms in horizontal sweep system: A = primary current of horizontal-output transformer, normal sweep; B = raster produced by A; C = primary current of h-o transformer, when circuit is ringing; D = raster produced by C.

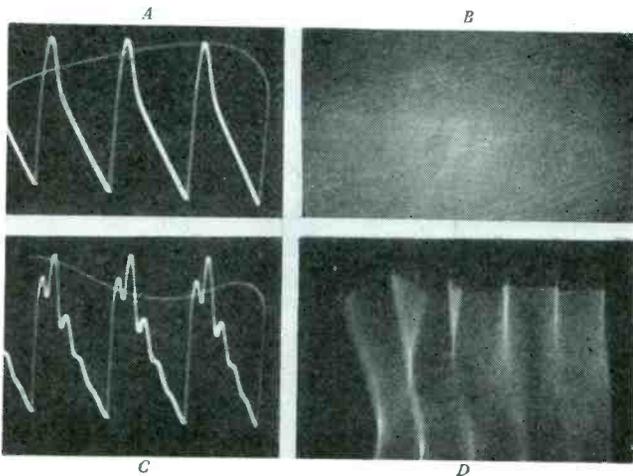
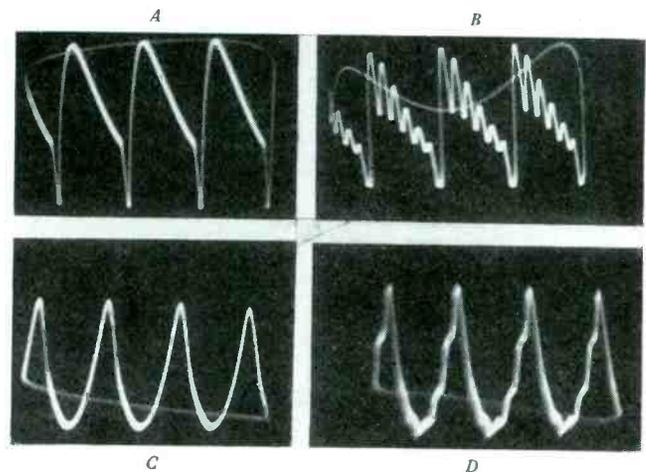


Fig. 3. Other examples of normal and abnormal waveforms in horizontal sweep system: A = normal damper current; B = damper current, when circuit is ringing; C = damper input voltage under normal operation; D = damper input voltage, when circuit is ringing.



# Checking Harmonics in 'Scope Sweep . . . Poor Regulation and Picture Pulling . . . Typical IF Stage Gains from Various Tube Types . . .

## Waveform Shape Analyses

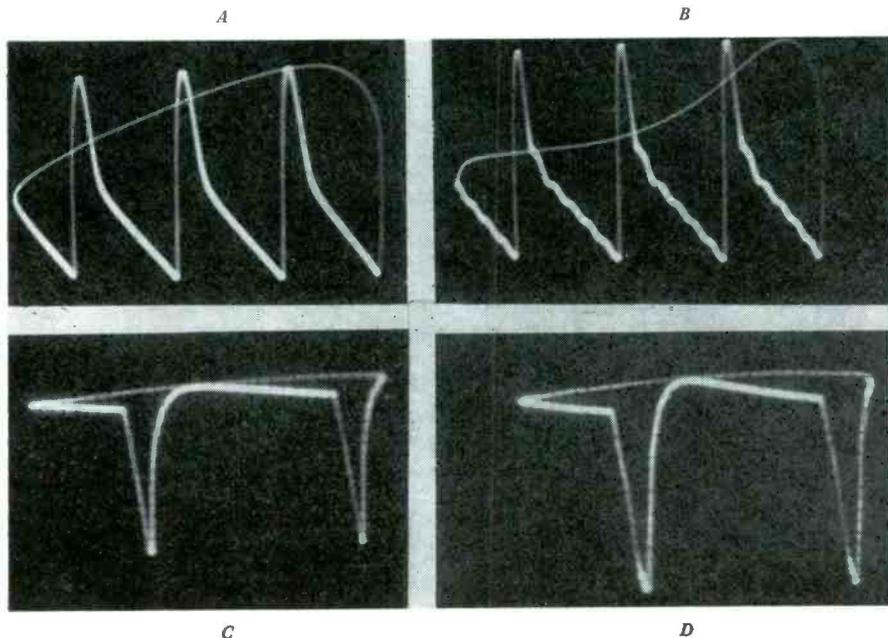
IS IT possible to confuse the over-all response curve with the feed-through *if* response curve?

When the over-all response curve is being checked, Service Men should be certain that the front end is actually being driven at *rf* frequency and not at *if* frequency. It is possible in some cases to obtain a sizable feed-through *if* curve by driving the antenna terminals of the receiver with a strong *if* signal. The feed-through *if* curve will have quite a different shape, in most cases, from the *rf/if* (over-all) curve. A good front end will reject the *if* sweep, but a mediocre front end will allow a considerable amount of *if* voltage to feed through.

WHAT ARE THE TYPICAL *if* stage gains from various tube types?

Typical *if* stage gains are: 6BA6 (24 mc), 6.0; 6AU6 (24 mc), 7.5; 6AG5 (24 mc), 9.0; 6AK5 (44 mc), 10.0; 6CB6 (44 mc), 11.0.

Fig. 5. Another assortment of normal and abnormal waveforms in horizontal sweep system: A = normal *h-o* transformer secondary current; B = secondary current, when circuit is ringing; C = normal secondary voltage; D = secondary voltage with yoke disconnected.



IT HAS been said that each variation in the shape of a waveform has a meaning to the experienced eye. What does this mean?

This point is illustrated in Fig. 6. Here we have the voltage across the horizontal-deflection coils under two conditions of operation. At *a* the damper circuit is operating correctly and at *b* there is a fault in the damper circuit which causes the damping to be incomplete. Because of the incomplete damping, there is a tendency for the sweep circuit to ring after retrace, as shown by the overshoot followed by a small undershoot.

CAN *rf* radiation interference be generated by a horizontal sweep system?

Built in antennas often develop *rf* interference in the picture due to pick-up of radiation from the sweep system. The radiation can be minimized at the source by trapping out with 10-microhenry *rf* choke coils connected in series with the radiating leads of the sweep system.

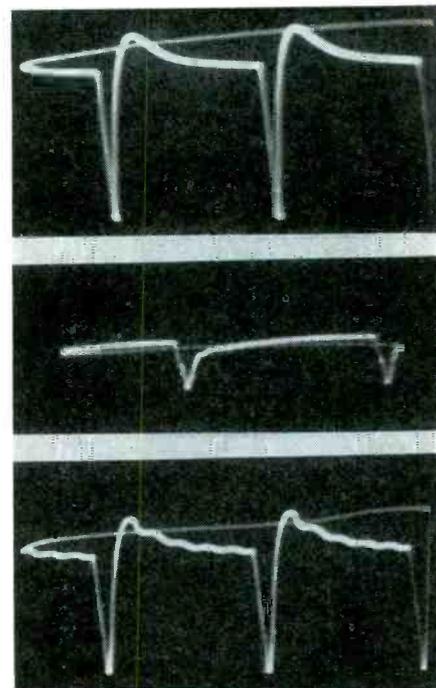
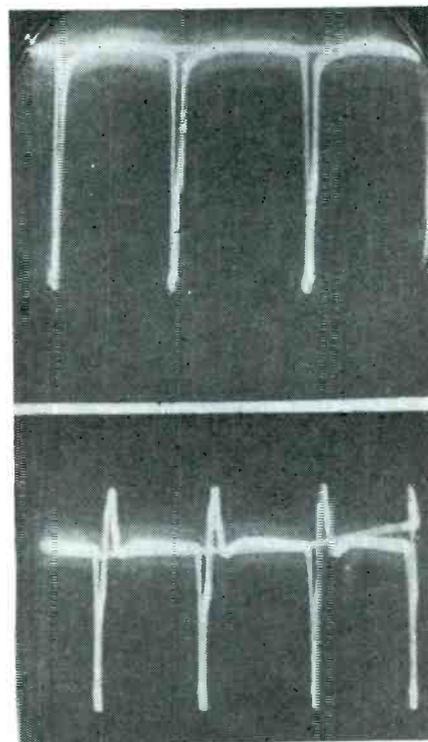
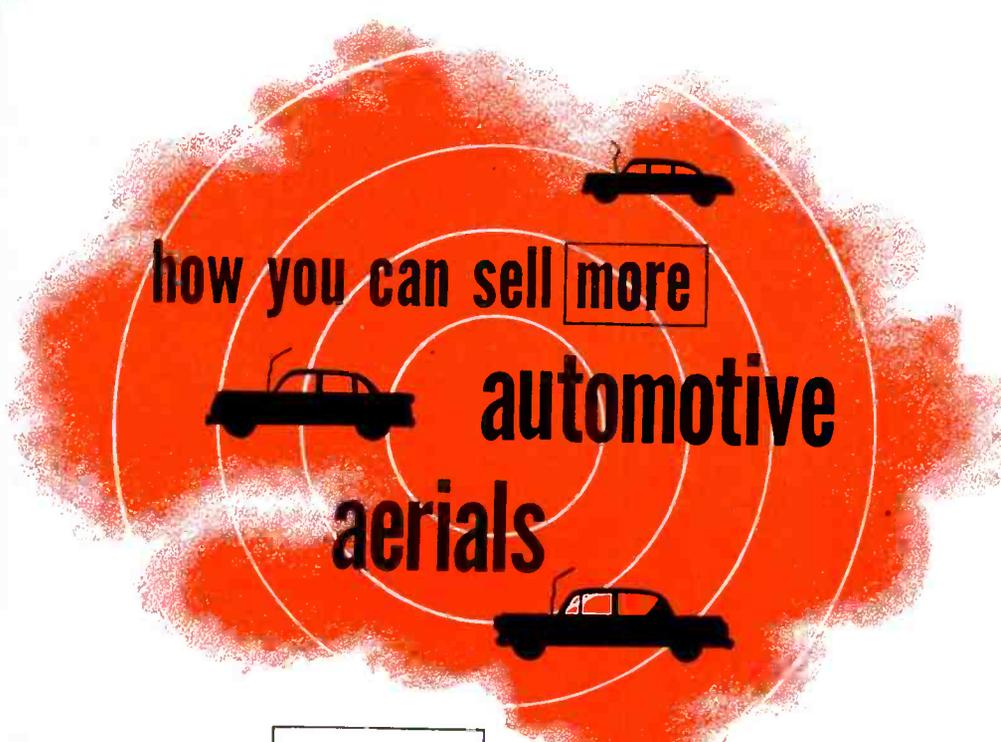


Fig. 4. Additional examples of normal and abnormal waveforms in horizontal sweep system: A (top) = secondary voltage during normal operation; B (center) = secondary voltage when there is a short in secondary winding; C (bottom) = secondary voltage, when circuit is ringing.

‡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.

Fig. 6a (top). Voltage across horizontal deflection coils when damper circuit has no defects. In (b) (bottom) pattern shows voltage across horizontal deflection coils when damping is incomplete, and a substantial amount of ringing occurs after retrace.





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# *SERVICE... The National Scene*

SURVEYS FORECAST CONSTANTLY-INCREASING DEMAND FOR SERVICE--A mounting need for service, maintenance and installation will obtain for many, many years, recently-completed surveys have disclosed: Specifically, it was noted that a 10-year-plus span of unparalleled activity was ahead for the boys in the shop and in the field, due not only to the rising sale of TV sets, but auto and home radios, too. It was predicted that at least 36 million more TV chassis will be sold during the next decade, bringing the total number of sets in use to over 57 million. In addition, at least 6½-7½ million home receivers will be sold and installed yearly, and between 4-5 million new auto models will also go into operation every year, during the next ten years or more. . . . Eventually, about 20% of those who have TV sets now will buy a second set. . . . This market, the survey experts said, should result in an annual parts business of nearly 1½ billion dollars, a substantial portion of which will be focused on replacement requirements. . . . Clock radios, which have become extremely popular during the past year, will account for a substantial portion of home-radio sales during the span of years. It was said that well over two million tick-tock chassis will be sold in '53 alone. . . . This expanding market, all agreed, will create a booming demand for service, maintenance and installation during the years to come.

COMPATIBLE COLOR TO GO BEFORE FCC THIS SUMMER--The NTSC color-TV system, now being field tested, will be presented to the Commission this summer, with a request that it be authorized for public use: So promised the vice chairman of the National Television Systems Committee at a recent broadcasting-engineering conference in Los Angeles. . . . "The NTSC now has what is believed to be a workable, practical set of standards for color," the official declared. . . . The system, it was noted, is fully compatible. In operation, a 3-tube camera looks at a scene through red, green and blue filters, and produces voltages which are proportional to those colors in the scene. This technique is very similar to the process of producing separation negatives in color photography. When these voltages are added together, a monochrome signal, like the one delivered by a black and white TV camera, becomes available. However, in the case of color, advantage is taken of the separate primary-color voltages, and it is possible to adjust the amplitudes in such a way to produce a picture of the panchromatic or color type. . . . Results of preliminary tests have been so impressive that even CBS has agreed to field study the technique in a series of experimental color telecasts. . . . Notwithstanding this unqualified acceptance, consumer chassis production will be delayed for many reasons: Months of legal wrangling are expected to follow presentation of the standard proposal; many additional months will be required to add chassis refinements to streamline operation and installation, and several more months of planning for general production and merchandising will follow. At present, according to the best guesstimates, color sets might be available for the Christmas of '54.

3-D TV STILL AN EXPERIMENT--In spite of the encouraging progress reports and demonstrations of 3-D TV offered by engineers of ABC in Los Angeles a few weeks ago, Mr. and Mrs. Public will be unable to participate in dimensional viewing for quite a long, long while. The technique is still a lab project, and will require a host of modifications before it can be submitted for home use. Even the engineers who conceived the 3-D system bluntly admitted: "We don't have the final answer for dimensional viewing in the home, but we are working toward a satisfactory system." . . . In the ABC approach, a single camera with mirror and rotating plastic-disc reflection setup is employed in conjunction with alternate picture transmission. To view the picture, a pair of prism-polaroid glasses are required to merge separate pictures appearing on the screen.

# SERVICE... The National Scene

OVER 170 TV STATIONS NOW ON AIR--More than 60 stations have begun telecasting since the thaw of July '52, with about an equal percentage operating on the veryhighs and ultra-highs, bringing the total number of stations now operating to over 170, located in 120 cities, and broadcasting to an estimated audience of about 90 million. . . . Recent reports from Washington indicate that ultrahigh grants are on the increase, and to many areas which have had no TV before. To illustrate, WKNE-TV in Keene, N. H., has received channel 45, and expects to begin telecasting on 24 kw perhaps in January, '54, using a 436' antenna located on the heights near Old Walpole Rd. . . . Others who have received TV approvals during the past few weeks include: KCOK-TV (channel 27), Tulare, Calif.; WCNO-TV (32), New Orleans, La.; WROW-TV (41) and WGTV (27), Albany and Rochester, N. Y., respectively; WMRF-TV (38), Lewistown, Pa., and WMEV-TV (50), Marion, Va.

PROPOSAL FOR CHANNEL 4½ SUBMITTED TO COMMISSION--A new vhf channel, between 4 and 5, which would be called 4½, and expand the 72-76 mc band to 78 mc, has been submitted to the FCC by Washington attorneys. This unique suggestion would, it was said, make possible the licensing of an additional veryhigh station in each of about 25 pressure areas\* of the country, such as Philadelphia, Pittsburgh, San Diego, Austin and Wichita Falls, Texas, and Jackson, Mich. The change would require adjustment and realignment of receivers, as well as the installation of a new tuning strip in chassis using turret-type rf inputs: channel 5 would be shifted to 78-84 mc and 6 to 84-90 mc. A comprehensive analysis of the proposal and its specific effect on all types of receivers will appear soon in SERVICE.

SNOW-WIND DAMAGE OVER 10,000 ANTENNAS IN MANCHESTER, N. H.--Snow and windstorms twisted and toppled over 70% of an estimated 20,000 roof-top antennas recently in Manchester, N. H. In several cases, even the chimneys to which the antennas were anchored were ripped away. Unfortunately, only around 30% of the affected set owners had antenna insurance covering any form of TV damage. . . . Service Men were obliged to work around-the-clock repairing antennas, and making new installations.

PERU, IND., TO TROUBLESHOOT TV INTERFERENCE--A complete TV-interference tracing system is being installed in Peru, Ind., to locate interference that might be caused by lines, transformers and other utility equipment. City officials indicated that if any interfering trouble is caused by light and power equipment, it must be eliminated, and promptly.

SIX MILLION-DOLLAR TV EXPANSION PROGRAM PLANNED FOR CANADA--A six million-dollar expansion plan, which will include the installation of new TV facilities in Vancouver, Winnipeg, Halifax, as well as additional gear in Ottawa, Montreal and Toronto, has been proposed by the Canadian Broadcasting Corp. . . . The program is expected to provide one million-dollar installations in the new centers, with broadcasting scheduled to begin around Thanksgiving of this year. . . . The drive is expected to boost sales of receivers to around \$70 million before the year is over. According to the general manager of CBC, when the proposed stations are completed, about half of the Dominion will be within range. About six more stations operating with private funds, and scheduled to be on the air sometime in '54, will increase coverage to three-quarters of the population. Within two or three years, it was said, at least half a million sets will be in operation in Canada.

SERVICE SETS A NEW RECORD--This is an issue of which we are particularly proud. Not only is it the largest we have ever published, with more advertising from more manufacturers, and more text, too, but it will reach the greatest number of subscribers we have ever been privileged to serve. . . . To our continuously growing family of loyal advertisers, and readers, too, we are very grateful for this support which has made it possible for us to set a new record.--L. W.

\* Major market areas now said to be lacking adequate vhf coverage.

SYLVAN A. WOLIN & ASSOCIATES



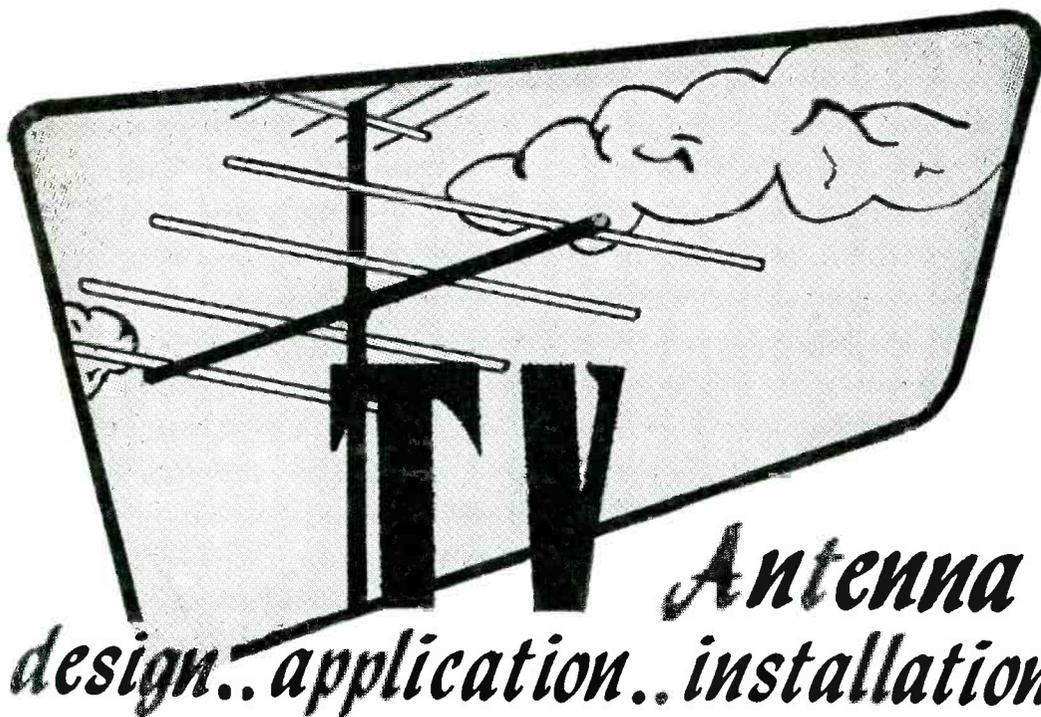
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# Antenna Digest

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

by **RALPH G. PETERS**

IN MANY AREAS, Service Men and set owners alike have been plagued by poor signal strength, ghosts, excessive local noise, and often all three in assorted combinations. An analysis of the factors which can best alleviate this situation leads to one inescapable conclusion: There is no substitute for adequate carrier level *at the receiver input terminals.*

In some receivers, 20 to 30 microvolts may provide a *usable picture*, whereas 100 microvolts can provide an *enjoyable picture*. Since these elusive microvolts are collected by the antenna, it is here, in the antenna system, that we must expect the greatest improvement to be possible. The an-

tenna itself has been the subject of continued research and development. It has been found that, often, single-channel truly-resonant antennas afford maximum gain, together with a minimum noise and reflected signal pickup, and the best match to the transmission line. Such installations might involve the use of several antennas, cut to specific channels and oriented properly.

Under such conditions one must use some switching system, preferably located at the mast top to secure the

utmost in gain. For this purpose there has been designed a remotely controlled multiposition switch<sup>2</sup> which can be used with but one transmission line to the set.

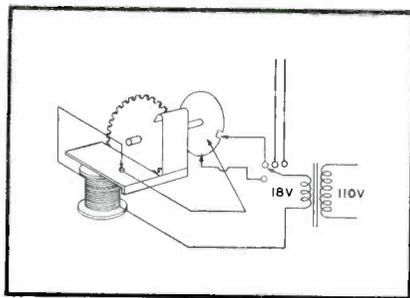
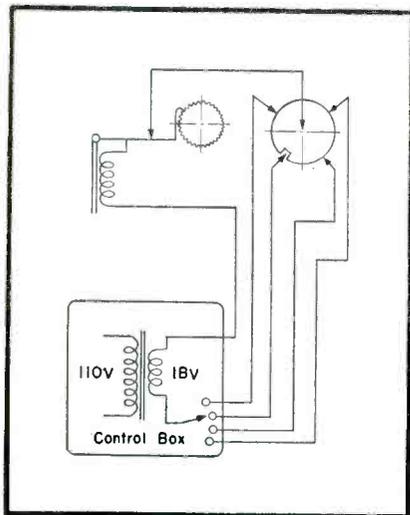
The switch features two ceramic wafers, with silver plated contacts, located so as to maintain a 300-ohm spacing. These wafers, and rotors, are arranged to provide a double-pole, 4-position switching function, their contacts being connected to appropriate external terminals by twinlead. In this way, a substantially 300-ohm impedance is provided through the entire

<sup>1</sup>From a report prepared by R. C. Blauvelt, chief engineer, Leader Electronics, Inc.

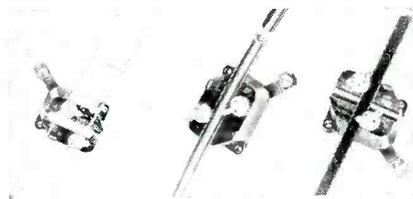
<sup>2</sup>Leader *Tenna-Switch*.

Figs. 1 (left) and 2 (below). Operation of antenna remote switch is illustrated in these schematics. Transformer, used, draws no current unless the switch is in operation. The motor power for the switch is a gear and vibrator arrangement as shown in Fig. 2. The vibrator is connected in series with one of the switch sections so that in the normal *off* position, the slot in the shorting wafer is lined up with the position selected by the control box in Fig. 1. Anytime another position is selected, 18v is applied to the vibrator which starts to rotate the switch until the new position and the vibrator stops. (Courtesy Leader Electronics)

Remote antenna selector switch and control units.



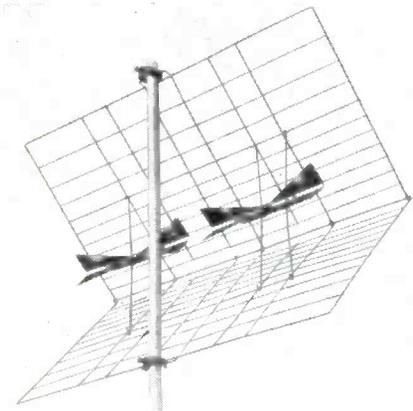
**Review of New Products, Accessories and Hardware for VHF and UHF: Remote Control Multiposition Switches . . . Yagis . . . Bow Ties . . . Corner Reflectors . . . U-V Arrays . . . Tubular Transmission Lines . . . Boosters and Converters . . . Rotators . . . Lightning Arresters**



Lightning arresters for *uhf*, which are said to incorporate filter networks to isolate *rf* from ground potential. High conductivity hardware used throughout. Designed to accommodate all types of commonly used transmission lines, including twinlead, tubular lead, and open line. Can be mounted flat or to the mast. (LA-UH3; RMS.)

(Below)

Twin-corner reflector for *uhf*. Model combines two antennas and is claimed to have substantially more gain than single-model *uhf* corner reflectors. High directivity characteristics, narrow forward lobe, no side lobes, and only a negligible rear lobe. Antenna is braced to the mast at the ends of the screen. The critical screen angle is said to be rigidly held in a fixed position. The dipoles have free space terminals to prevent the accumulation of dirt, ice, or rainwater at the feed points. (Model 406; Channel Master.)



Miss *uhf* with one-millionth TV antenna, a bow-tie corner reflector, made by Miller TV Co.

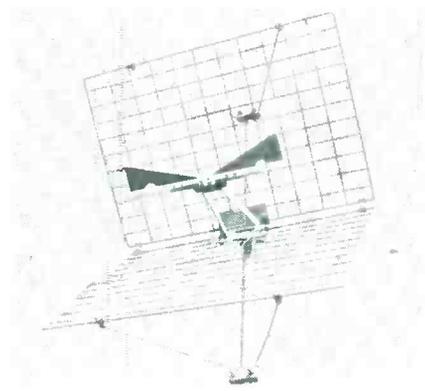


switch. The switch rotors are moved to a position selected by a ratchet-type drive mechanism operating on 18 v ac from a transformer secondary. The transformer has a high-impedance primary and draws no line current except during the short intervals when the switch is operating.

A third switch section, gauged with the antenna switches, opens the 18 v circuit when the selected position has been reached and the rotation ceases. A separate control wire (5 in all) is used for each position; thus it is said to be impossible for the antenna switch to get out of step or synchronism with the control switch. Operation of the ratchet is similar to that of a buzzer.

A small housing contains the transformer and control switch, with a

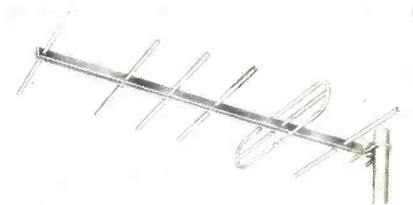
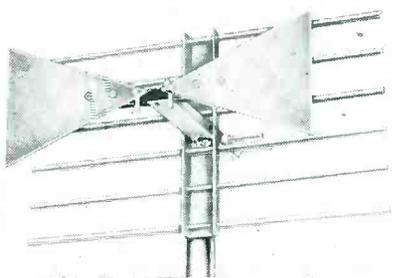
(Continued on page 110)



Corner reflector for *uhf*. Preassembled and three U-bolt supported. Has free-space terminals. (Model UHF 150; Q-Line.)

(Below)

Bow tie and reflector said to feature standard fitted unit design; each element is available separately. Reflector is comprised of tuned elements. Steel channel-type crossarm must mount extension is used. (Bo-Tenna, Model BT-10; RMS.)

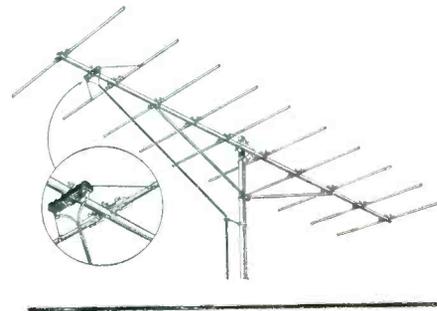
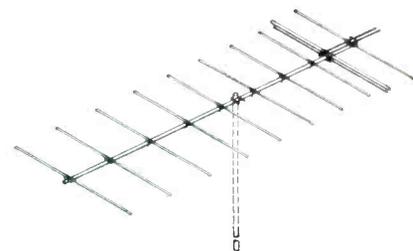


(Above)

Six-element *uhf* yagi design utilizing 3-wire folded dipole transformer. Elements are of 3/16" aluminum rod, and are force-fitted to channel-type aluminum crossarm. No plastic components are used. Six models are available to cover the entire *uhf* band. Stacked models are also available. (6Y SkyTrack series; RMS.)

(Below)

Bazooka tuning-type *vhf* (7 to 13) antenna which is said to have a front-to-back ratio of 13 1/2 db through the use of ten spaced elements, combined with a two-diameter dipole. Utilizes a click-rig assembly whereby spring-loading is claimed to eliminate loose parts and the need of tightening screws and nuts. (Model 1860; Taco.)

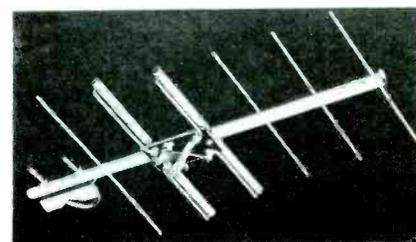


(Above)

Ten-element *vhf* yagi. On the high channels, model has wide element spacing. All aluminum construction is said to make antenna less than 1/2 the weight of 10-element yagis using steel booms. All models, both high and low channels, are provided with boom struts. All low channel booms use 1 1/4" drawn aluminum tubing, while the high channels use lock-seam tubing made from Reynolds TV alloy No. 41. (Delta-X series; Tee-D-X.)

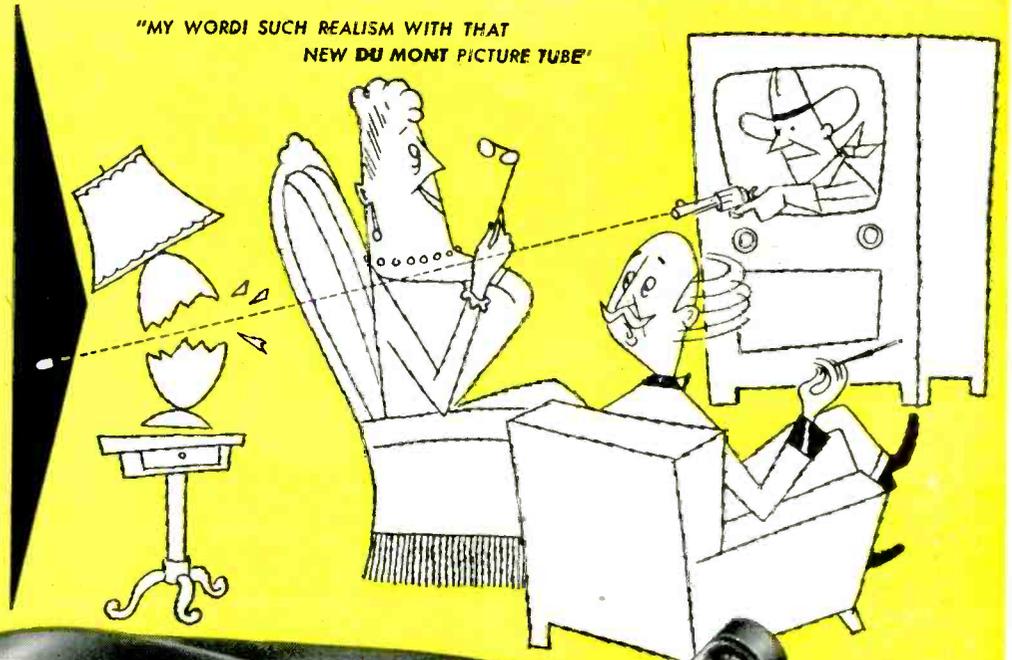
(Below)

Yagi for *uhf*. Four models available: for channels 14 to 26; channels 27 to 42; channels 43 to 60 and channels 61 to 83. (Trio.)



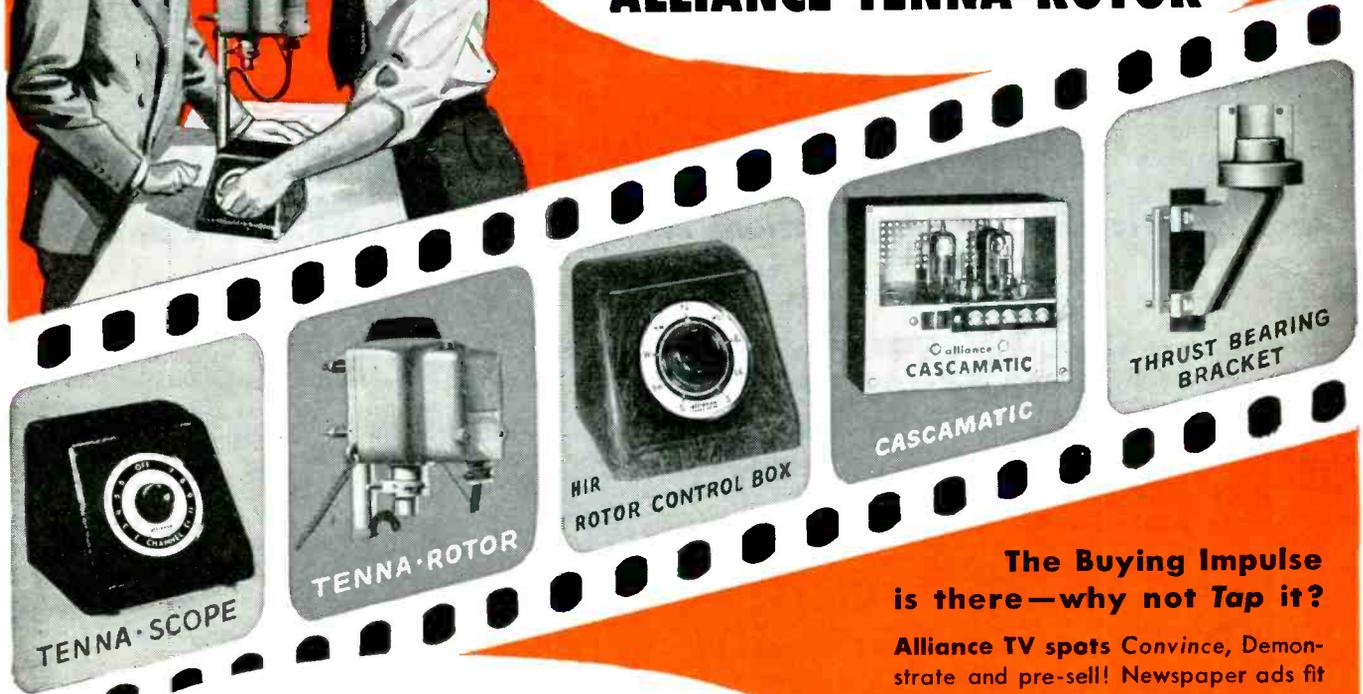
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# Service Engineering

## field and shop notes

by THOMAS K. BEAMER

### Photoelectric Recorder Applications . . . How to Drill, Bore, Ream and Bend Aluminum

PHOTOCELLS, long recognized as one of the most useful of the electronic tools, has been adopted by countless for all types of applications, such as guarding of chimneys in office buildings to report extent of smoke, counting of cartons sliding down chutes, turning on stairway lighting only when daylight is absent, protecting conveyor belts against injury by stopping conveyor movement when there is jamming, or guarding filtrate purity against contamination, resulting from break in filter cloth, by closing a valve. The unique cells have also been included in recorders as an aid in the detection of corrosion, machinability testing, paper-machine-speed measuring, and fatigue system evaluation.

Its widespread use has attracted many Service Men who have begun to specialize in the installation and maintenance of photocell systems.

According to a recent report<sup>1</sup>, public utility organizations have become one of the most enthusiastic users of photoelectric recorders.<sup>‡</sup>

They have found, for instance, that such equipment is a vital aid in combating pipe-line corrosion.

In the pipeline corrosion-detection system, current is generated in large water pipes in much the same manner that an ordinary dry cell produces current. Whenever the pipe runs between different types of moist soil such as sand and clay, a difference in potential is created. This potential causes currents as high as 80 amperes at about  $\frac{3}{4}$  volt in some pipes. Whenever this current leaves the pipe, damaging corrosion takes place.

To combat this corrosion either insulated joints can be installed to open the path through which the current is flowing or cathodic protection can be used; this consists of putting current back into the pipe in a direction opposite to the electrolytic flow. Both forms have been found expensive, and the photoelectric recorder has been

adopted instead, to determine not only the most effective location, but just where corrosion danger exists.

In one test application an electrolysis survey was made of a 94-mile stretch of pipe. Each section tested was from 1500' to 3000' long and contained concrete structures with man-holes through which wires could be attached to the pipes. Wherever a drop in current was found, corrosion was indicated.

Due to the photoelectric recorder's fast speed of response, it is useful where a fluctuating stray current is present and if the current is rapidly fluctuating, several feet of chart record can be taken to obtain the average steady flow.

Photoelectric recorders are also widely used in the measurement of speed by connecting it directly to a tachometer generator through suitable dropping resistors.

In this application, a constant voltage battery is connected *series buck-*  
(Continued on page 72)

<sup>1</sup>General Electric; bulletin GEA-5536.

<sup>‡</sup>Recorder employs a pair of phototubes in a light-beam circuit. An analysis of this circuit will appear soon in SERVICE.

Fig. 1. Photoelectric recorder circuit used to survey electrolysis of pipe lines.

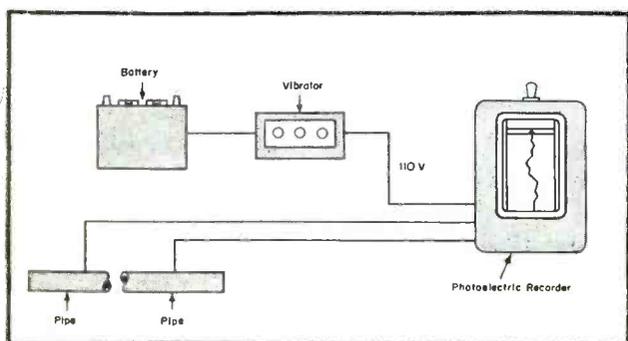
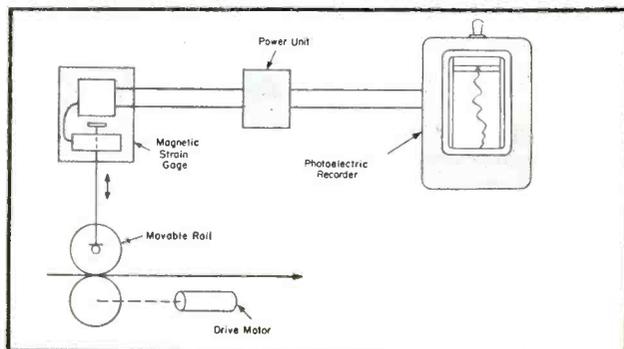


Fig. 2. Complete Pacific Evenness Tester, which uses a photoelectric unit to provide a record of the evenness of the textile material under test.



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**Service Engineering**

(Continued from page 70)

ing with the tachometer generator, and the photoelectric recorder is connected to measure the resultant voltage. Thus, for only .1 of 1% change in the speed of the machine drive and tachometer generator, the recorder has a deflection of 1/8".

This setup proves particularly valuable when adjustments are being made. By comparing the record obtained before the adjustment with that obtained after the adjustment, the effect on

drive-speed can be determined. This method of differential speed measurement is very versatile because by changing the value of the constant voltage source the center point of the speed span is altered. For example, with one source the span might be from 1200-1225 rpm, whereas with a different source the span would be from 1225-1250 rpm.

Another industrial use of the photoelectric recorder is in the *Pacific Evenness Test*, which is used in the textile industry to facilitate analysis and control of fiber processing from base material to final yarn. The tester

can measure the evenness and weight of textile material, a control that is mandatory to eliminate defective cloth and twisted yarn.

The complete setup of the tester is shown in Fig. 2 (p. 70); used is a drive motor, tongued and grooved rolls, displacement gage and recorder. The yarn or sliver that is to be tested enters through the set of tongued and grooved rollers. The bottom grooved roller is friction driven. When the sliver or yarn is introduced between these rollers, any variation in the thickness causes a linear (up and down) movement of the top roller. The movement of the top roll is converted into an electrical signal by means of a magnetic displacement gage. This electrical signal is then recorded on the photoelectric recorder.

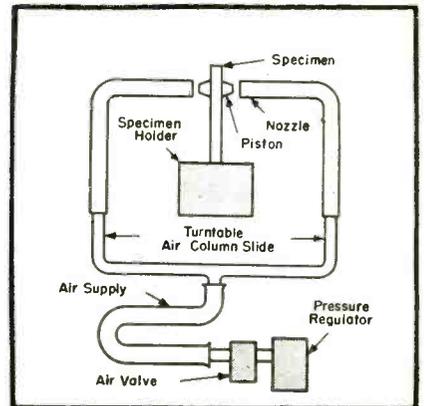
As an example of the recorder's sensitivity, it has been reported that a .002" deviation in strand thickness can represent full scale deflection of the recorder. This inherent photoelectric recorder property, plus its sustained accuracy and high speed of response, have helped make this tester a true process control device.

**Accelerated Fatigue Tests**

Before installing a part on a gas turbine, locomotive, or automobile, it is important to know how that part will withstand vibration. This can be accomplished by accelerated fatigue tests, which feature the use of a photoelectric recorder in conjunction with a pneumatic fatigue tester. The pneumatic fatigue tester is a device which vibrates a test part at resonant frequency by pulses of compressed air, and the recorder's function is to record the frequency and amplitude of this vibration.

The part to be tested is clamped in the specimen holder as illustrated in Fig. 3. Two small pistons are attached to the free end of the part; one is screwed into the other through

Fig. 3. Accelerated fatigue test setup, using a photoelectric recorder in conjunction with a pneumatic fatigue tester, which checks how a part on a gas turbine, locomotive or automobile will withstand vibration.



a hole in the sample. The nozzles on the end of the air column are adjusted for a small clearance and the air supply is turned on. The test part vibrates at its resonant frequency and the air column is tuned to give a maximum vibration displacement.

A vibration detector is attached to one of the nozzles of the device. The vibration is picked up electrically and transmitted to the photoelectric recorder. By means of an automatic switching device, both the frequency and amplitude are recorded on the same chart.

One of the most important applications of the fatigue tester is the testing of high speed, high temperature, gas turbine buckets or blades.

A typical vibration test would use 25 blades having essentially the same resonant frequency. These blades would be vibrated at various amplitudes until failure resulted. An abrupt decrease in frequency would indicate a change in the material or the beginning of a crack. A graph can then be made of stress versus failure time.

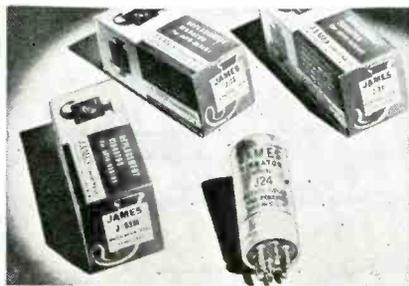
#### Machining Aluminum\*

Aluminum found throughout industrial 2-way and audio systems often must be machined to permit alteration in chassis, modification of component housing and room for substitute or additional parts. Normally, the metal is of the alloy type, and when drilling, boring, tapping, threading, reaming and sawing by power methods, it is usually possible to use tools similar to those used on ferrous metals. However, due to the high thermal conductivity and relatively low impact strength of aluminum, far superior results can be obtained when the conventional tools are modified.

Standard twist drills can be used for drilling and boring, but better results are said to be possible if the  
(Continued on page 82)

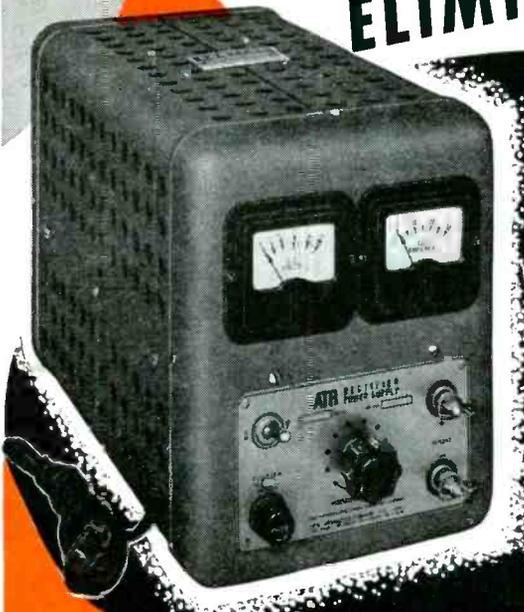
\*Based on data prepared for the Department of Commerce *Technical Aids for Small Business* bulletin.

Series drive vibrators designed for communications equipment. Series drive has been incorporated in all replacement models of this line where the original communications equipment has been designed to accommodate such an assembly. (James Vibrapowr Company, 4036 N. Rockwell St., Chicago 18, Ill.)



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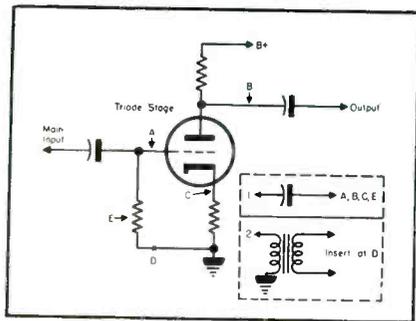
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# SERVICE ENGINEERING

## 'Scope Improvements

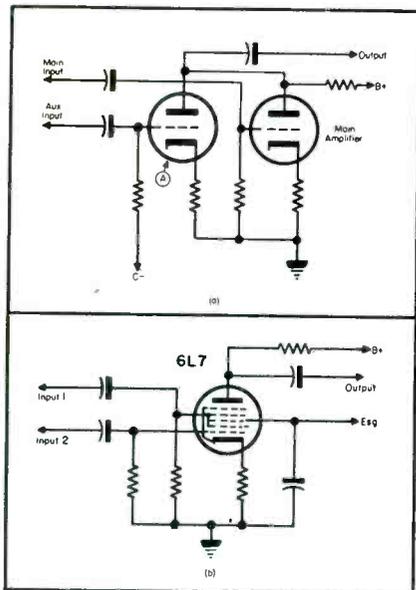
by RONALD L. IVES

### Part III of Series: Typical Communications and Electronic Applications of 'Scope with New Inputs . . . How to Reduce Hum in 'Scope Work



(Above)

Fig. 1. A triode amplifier circuit illustrating several types of injection, with 1 and 2 representing other signal sources.

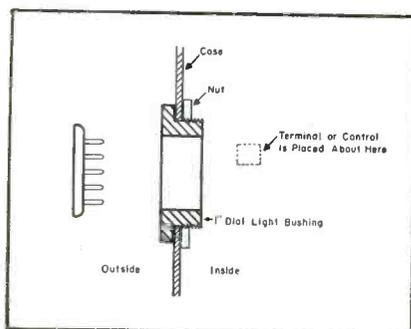


(Above)

Fig. 2. Injection circuits. In the *a* schematic, the tube (*A*) is biased normally to or beyond cutoff and responds only to + going pulses. In the *b* circuit, either a 6L7, 6SB7Y or 6SA7 can be used.

(Below)

Fig. 3. Cover for access holes.



SIGNALS may be injected into either the horizontal or vertical amplifier of a 'scope at various places, and the method of injection is much like that in the oscillator-mixer circuits of a superhet. A summary of triode-injection methods and connections appear in Fig. 1. As with a superhet, care must be taken to prevent or minimize unwanted interaction between circuits.

Quite obviously, any signal-injecting device changes the constants of the circuit to which it is connected, usually adding some shunt capacity to ground, to the detriment of the *hif* response, and increasing the capacity from the point of application to other circuits, lowering the overall stability of the amplifier.

Where the input pulse is strong and positive-going, a buffer triode may be used, and so biased that it is cut off until the desired pulse is received. This arrangement is quite satisfactory at frequencies up to about 10 mc, then becomes less and less effective as the frequency is increased. Typical circuits are shown in Fig. 2.

If the triode shown in Fig. 1 is replaced by a multi-grid tube, one of the grids can serve as the main signal grid, and additional signals can be injected at the other grids, the amount of circuit interaction depending upon the tube characteristics. When using multi-grid tubes, the signal level must be kept low, as an overloaded signal grid may develop sufficient bias to cut the tube off, due to rectification of the signal, particularly when the input circuit is of high resistance.

Another useful injection method, particularly for *dc*, is in any convenient bias circuit. The injected voltage, by altering the bias of an amplifier stage, changes its amplification, producing a change in the amplitude of the waveform being produced (provided that is not zero).

Each additional input installed in a 'scope loads the amplifier to which it is connected, tending to reduce overall

stability, and having possible effects (usually undesirable) on the frequency characteristic of the instrument.

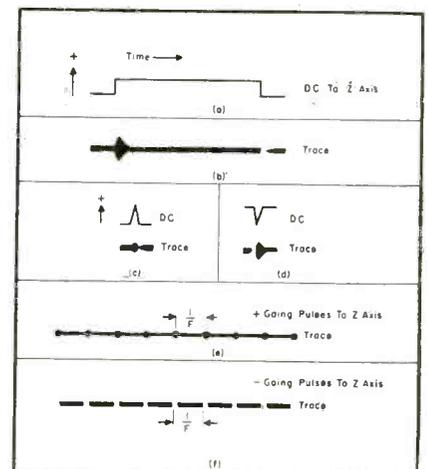
To minimize these potential difficulties, additional input devices should be made entirely separate from the main 'scope whenever possible; circuits should be isolated carefully and input connection leads should be as short as possible. This step usually requires the placement of input terminal somewhere at the chassis edge, and placed so that it is accessible through a hole in the case, which can be closed to improve shielding, when the input is not used. An effective and inexpensive access hole cover is illustrated in Fig. 3.

Additional inputs are particularly useful in studying the behavior (or misbehavior) of sequencing devices, such as lathe controls, servomechanisms, and telemetering devices.

Effects of introducing a potential step into the Z-axis are shown in Fig. 4, *a* and *b*; and those produced by a short pulse in *c* and *d*. When recurrent pulses are introduced, as from a timing oscillator the trace will acquire beads if the pulse is + going and have

(Continued on page 106)

Fig. 4. Typical results of Z-axis signal injection. Effects of introducing a potential step are shown in *a* and *b*; those produced by a short pulse appear in *c* and *d*.

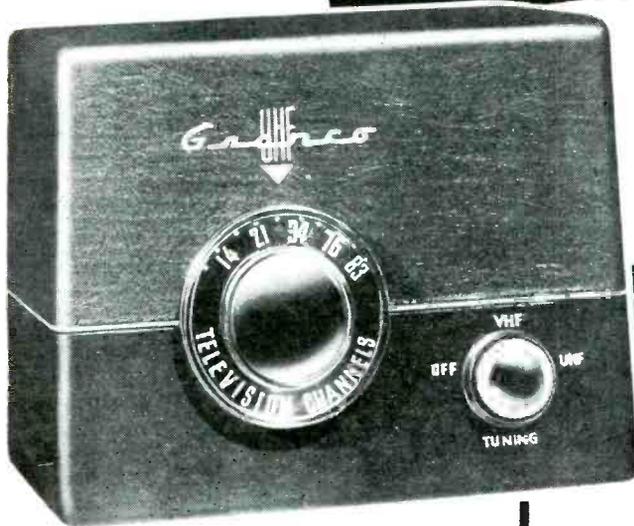




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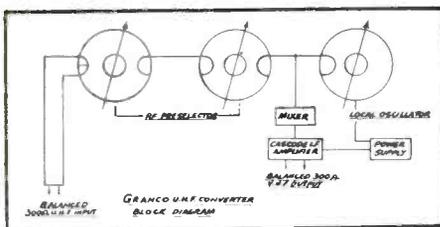
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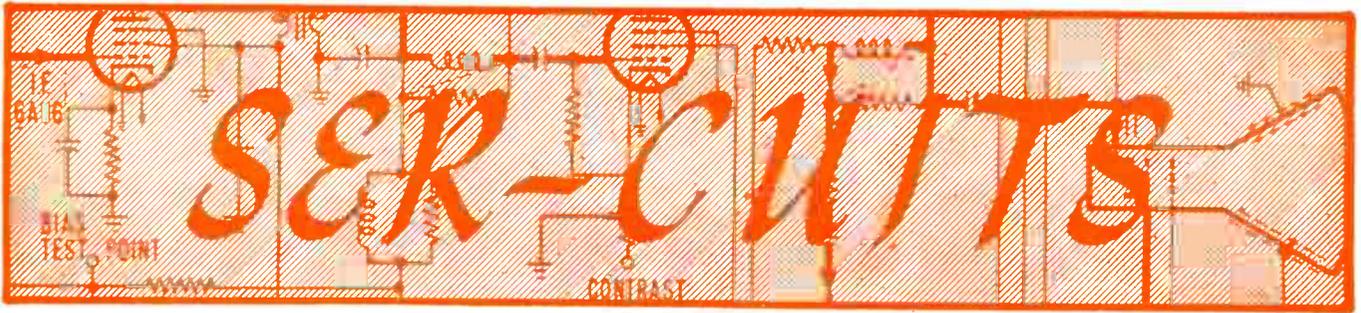
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by M. W. PERCY

## TV Field-Strength Meter Circuitry † . . . 12-Volt Auto-Radio Design Features

To ACHIEVE the maximum effectiveness from a TV antenna installation, one should be completely familiar with local reception conditions, and *know* about the direction of the transmitted signals, any interference problems which may exist, electrical faults which may obtain on the site mount,

†Based on copyrighted data appearing in the Jerrold *field-strength meter* operating and maintenance manual, 1704.

‡Jerrold 704.

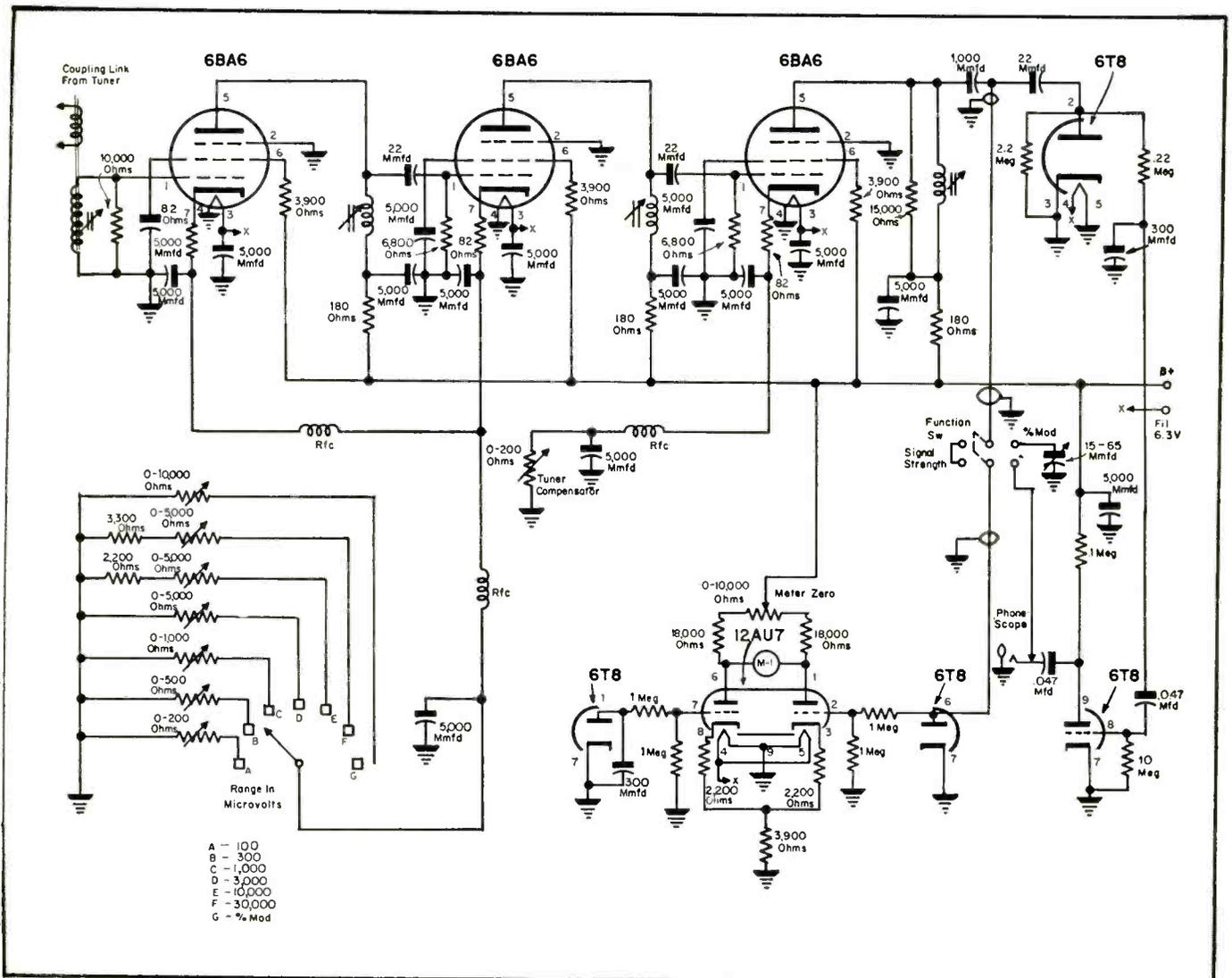
and intervening obstructions which might be present or will appear in the future. This is a large order, but with the aid of a field-strength meter most of answers can be supplied. For such an instrument can provide signal-microvolt information, disclosing typical conditions which will be encountered, and acquainting the installer with problems which will have to be solved

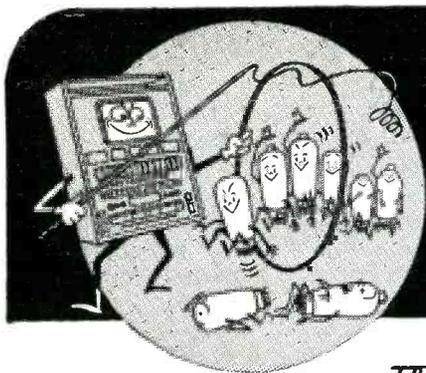
in the selection of the antenna, its position and height, type of leadin, rotor requirements, if any, and pre-am needs, too.

One type of *f-s* instrument<sup>1</sup>, capable of making measurements within a 54 to 220-mc range is illustrated in Fig. 1.

Tube complement of this unit includes three 6BA6s for the first, second and third *if* amplifiers; a 12AU7 dif-

Fig. 1. Circuit of *if* and meter system used in the Jerrold 704 field-strength meter.



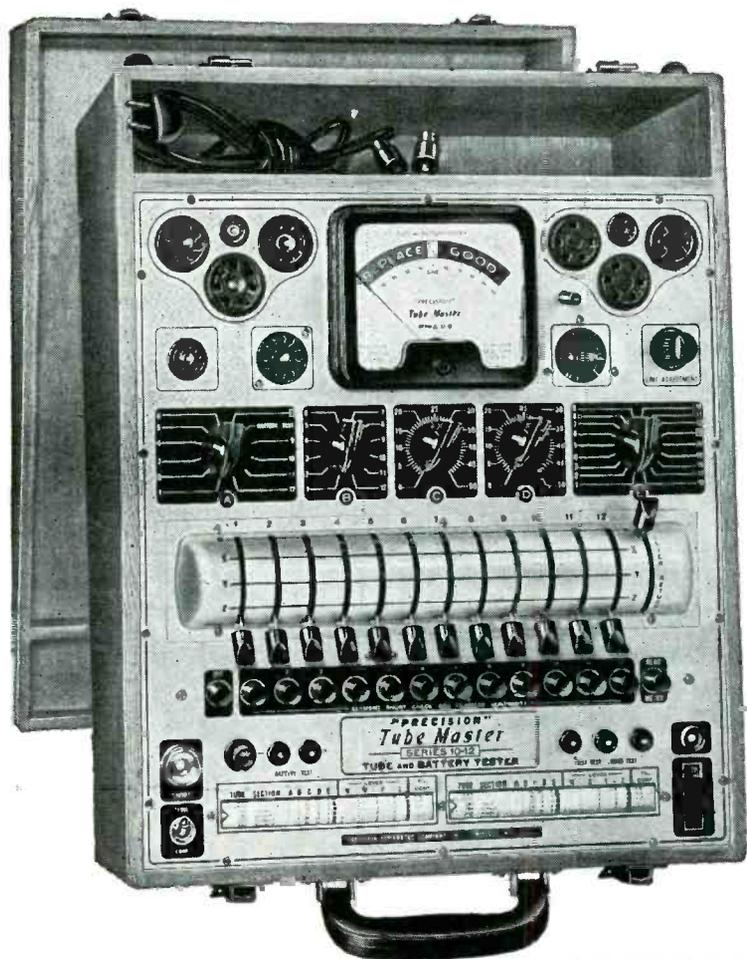


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The efficiency of this "Electronamic" test results from encompassing several fundamental tube characteristics, NOT JUST ONE. Accordingly, when a tube passes this demanding OVERALL PERFORMANCE test, it can be relied upon, to a very high degree, to work satisfactorily.

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ferential meter amplifier, and a 6T8 serving as a balancing diode (differential meter amplifier circuit), quasi-peak detector, and audio amplifier.

The instrument employs a continuous tuner designed for 72-ohm impedance match; tuner gain variation is said to be less than 3 db within the frequency range.

The output of the tuner is link-coupled to an *if* amplifier system in which a 25-mc *if* is used. The *if* system is synchronously tuned for a narrow .6-mc bandwidth. Synchronous tuning permits peaking of the *if* response, using an *rf* signal generator; the meter movement of the model itself serves as the indicating device.

#### Tuner Compensator

A tuner-compensator control varies a potentiometer in the cathode circuit of the third *if*. This control is calibrated to compensate for tuner-gain-variation with frequency.

From the *if* system, the signal divides, the major portion traveling through a function switch to the quasi-peak meter detector, and the remainder to the audio detector, audio amplifier and phone/scope jack.

With the function switch in the signal-strength position, the signal from the last *if* stage passes through the quasi-peak detector; a detector operating at near peak levels to assure that modulation will not affect readings.

From the detector, the signal goes to one grid of the 12AU7 differential

amplifier tube, which actuates the meter movement. The differential amplifier is a balanced *dc* amplifier circuit with cathode degeneration. Meter readings in this signal-strength position of the function switch represent peak *rf* carrier levels.

#### AM Carrier Per Cent Measurement

The audio detector circuit permits detection of the sound modulation of FM sound carriers, and of the video modulation of TV picture carriers. The detected signal is amplified and can be taken off at the phone/scope jack, or used to measure per cent of amplitude modulation of the carrier.

#### Field/Shop Meter Applications

This field-strength meter can be mounted in a station wagon, truck or helicopter, with a resonant dipole and mast, for plotting signal intensity at various distances from the transmitters.

Polar characteristics as well as frequency characteristics of antennas can be plotted with this meter. By measuring antenna signal levels over the band, it is possible to determine whether an antenna has a broad or narrow bandwidth. Relationship between picture and sound carrier levels can also be measured, and results used in determining amplifier and *agc* equipment requirements.

A simple dipole and the field-strength meter can also be used to

check noise levels (automobile ignition, diathermy, electrical disturbances, etc.). The approximate frequency of the interference can be determined on the frequency dial. By *walking* the meter, the location of the interference can be found. Measurements should be taken at two locations; lines drawn to the interference source from the two dipole locations will intersect at the source. The distance between the two locations should be measured or paced off, and the source location of the interference found through the use of trigonometry.

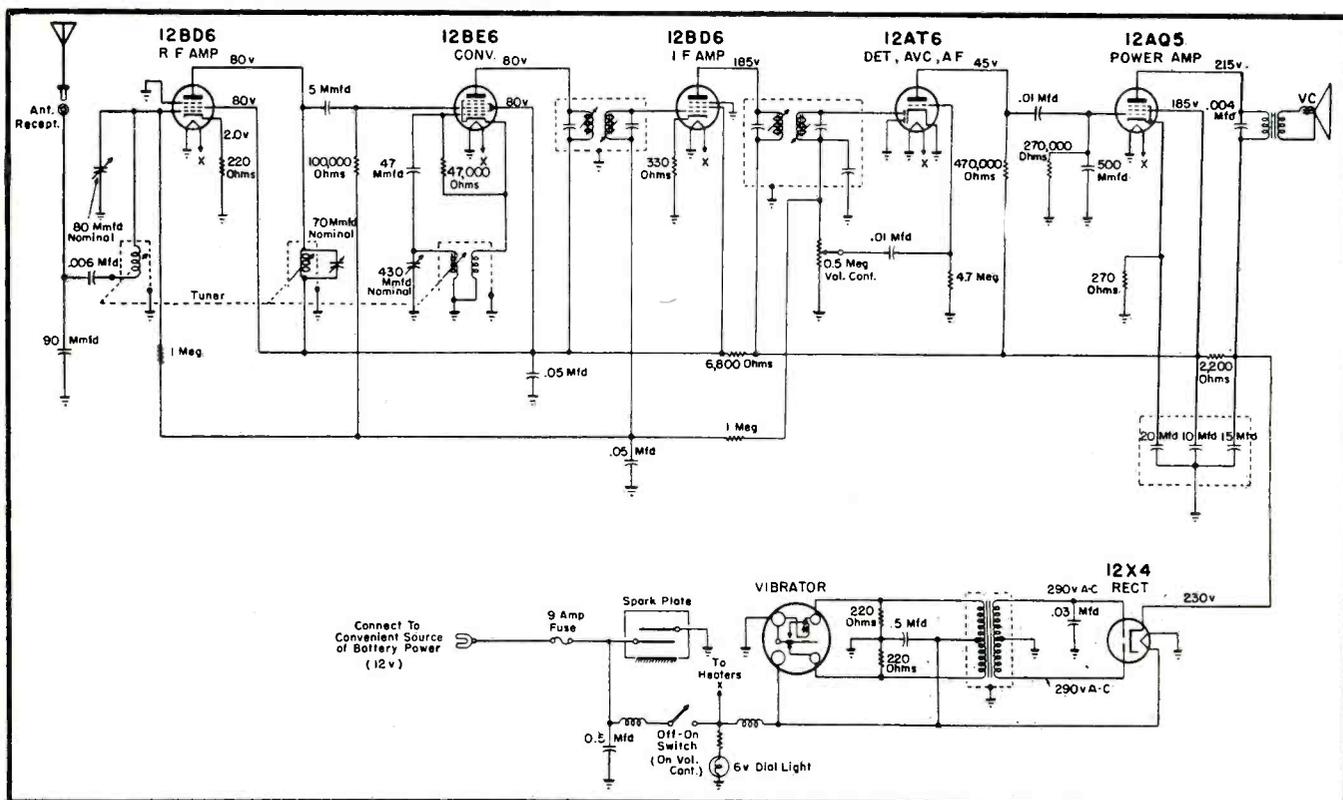
The instrument can also be used to localize interference beats, and the frequency and efficiency of trapping circuits evaluated.

#### Auto Chassis

Recently, in view of the increased use of car accessories, 12-volt power supplies have become standard equipment on some models. Accordingly it has become necessary to redesign radio chassis and employ 12-volt type tubes in the receiving portion of the circuit and 12-volt rectifiers in the power supply.

A circuit employing these revisions appears in Fig. 2; Motorola 412. In this model a 12BD6 is used as a *rf* amplifier, a 12BE6 as a converter, another 12BD6 as an *if* amplifier, 12AT6 as detector-*avc*-*af* amp, 12AQ5 as a power amplifier and a 12X4 rectifier with a vibrator.

Fig. 2. Schematic of 12-volt auto radio chassis; Motorola 412.



# Radion

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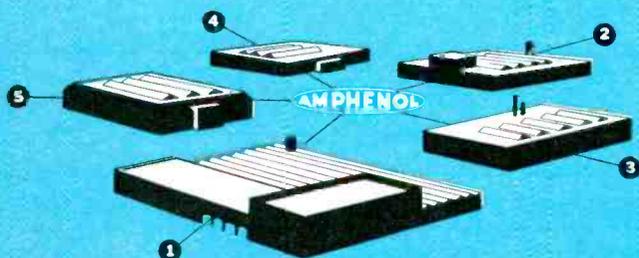
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# Dollars and

ENGINEERS may know what their sets are supposed to do, but it's the Service Man, out in the field where those sets are being used, *who know* whether given models are successes or failures, and why. It's no wonder that Service Men play such an important role in the design of next year's sets!

Frankly, there is no other line of work in which the workers are more interested in what they are doing. The average radio-TV Service Man is simply steeped in circuits, tubes, components and functions. He'd rather tackle a tough repair or alteration job than he would eat. And yet he must *eat*, if he's to stay around.

Someone has said that *work* is an *unpopular* way of earning money. That doesn't apply to Service Men for two reasons: First, your work is *popular* with you. Second, it may not be a way of earning money in many instances. Well, let's *keep the work popular* but let's also *make money out of that work*.

## The Cost of Doing Business

Too many Service Men in business for themselves have only created a *job* for themselves. Either through circumstance or through choice, they are now *on their own*. They are essentially *technicians*. They know troubleshooting; how to locate the source of trouble and then correct it. If they pick up a few dollars for the job, they are well satisfied. This money is considered in the same light as the salary they would be getting on the job. *But is it salary?*

The answer is *no!* For salary is the *fraction* or *share* the individual gets out of the sum total of the business effort. That business effort includes *other items* of cost such as rent, light, heat; depreciation of equipment and provision for buying new equipment; bookkeeping and even an allowance for uncollectible bills; transportation, even if it be the private car of the Service Men being used in lieu of a business car or truck; insurance on the transportation means, and for public liability, in the event some careless person trips over the doorstep or slips on an icy pavement; telephone; the cost of replacement parts and materials; etc.

Too many Service Men stuff all the money into their pocket as though it were all their own. It's not. There are other claims on that money which must be met.

This may all seem very elementary, yet if you read the reports on business failures, you'll soon discover that the majority of failures are due to *cost ignorance*. *Unsuccessful businessmen usually don't know their cost of doing business*.

First and foremost, it is important to *know your cost*. One should note what the business costs for rent, light, fuel, telephone, for transportation; for insurance of various kinds; for bookkeeping and for bad accounts; for replacement parts and materials; for salaries or wages other than your own which may have to be met; and for taxes, because Uncle Sam is not to be denied those income taxes.

Perhaps it's cruel for a Service Man to have to get down to such details as bookkeeping if he can't afford to hire a bookkeeper. But this must be done. Otherwise you're in the same predicament as a navigator who has no maps to go by, no sextant to shoot the sun or stars, and no compass for direction.

After you have a general idea of what it costs you to do business, you'll become *overhead-conscious*. That's your initiation into sound business. Like other businessmen, you'll be talking or thinking overhead when you're asked to quote on a job or to make out the actual bill. You'll soon be determining what that overhead means in terms of percentage of business done. If all the items of overhead amount to, say, \$250 per month, then you know that before you can get a penny for yourself, you've got to have \$250 for the other folks who share in your business activities; the landlord, utilities and garage man, insurance agent, and the jobber who supplies parts and materials.

Now the picture looks much different than when those dollar bills were simply pocketed. You realize at long last that all the money you take in is *not your money*. Once you think that way, you're getting on safe ground.

Since you now know what is your cost of doing business, you are ready to put aside a certain percentage of every dollar you take in. You know that your overhead is, say 25%, which is a good average, and that the parts and materials you must buy for repair jobs, may average another 25%. Therefore, you must set aside, say, 50% of every dollar you take in.

May you now pocket, say, 50c out of every dollar taken in? You could, but that wouldn't be sound business. If you really want to

\*From a talk delivered before the Philadelphia Radio Service Men's Association recently.

# Sense\*

by CHARLES GOLENPAUL

Vice-President, Distributor Sales, Aerovox Corporation

have a business and not just an excuse for not holding down a job, the better method is to deposit the entire dollar you take in, in a checking account. Yes, put everything that comes in, in the bank, because you'll need plenty there to take out for bills and salaries.

What about your salary, especially if it's a one-man service setup? That's simple. You estimate how much salary the business can afford to pay you, and you adjust your living to that salary just as you would have to do if working for others. Suppose the business averages \$100 per week. It looks as though you can afford to pay yourself a weekly salary of \$50. And so each week you withdraw \$50 from the bank, and that's your stipend. Meanwhile, there'll be money enough in the bank to pay the landlord and utilities and transportation costs and jobber and so on. *You're on a sound footing.*

But what if the business piles up more bank balance than you've withdrawn during the month? Nothing could be sweeter. At the end of each month, or better still at the end of each quarter (three months), you should determine how much surplus the business has made, over and above your salary withdrawals and the payments for different items. If the surplus is say \$330, it's yours, of course; but then again it may not be so if you have ambitions for a bigger and more profitable business. At this point we begin thinking about expansion.

There is no such thing as standing still in business. We either go ahead or we fall behind. While it may sound like an exaggeration, it is said that in most retail businesses there is an appreciable turnover of customers every seven years. This may be true of the radio-TV service business, for the neighborhood is bound to change in time; new people come along and old people move away, and your competition necessarily varies through the years.

At any rate, it's a mighty good policy to move ahead in your servicing business. This will mean, in time, a better store or shop, as your rising income warrants higher overhead.

Your equipment, too, should be stepped up as the years roll by. Time was when one was in the service business if he had a pair of pliers, screwdriver and soldering iron. But those days are long since gone. It is well known that, particularly in TV servicing, one must have a lot of instruments such as a scope, signal generator, channel tracer, bridge to measure capacitance and resistance, and so on. Like any real businessman, one should buy test equipment with the thought of making it pay for itself in say a year or less. Since the correct diagnosis of any radio-TV trouble is usually half the battle, adequate instrumentation for your work means a big saving in time and effort. You can turn out more jobs faster and better when you have the necessary checking means. Then, too, an array of test instruments on your workbench goes far in impressing prospects and customers that you know what you are doing.

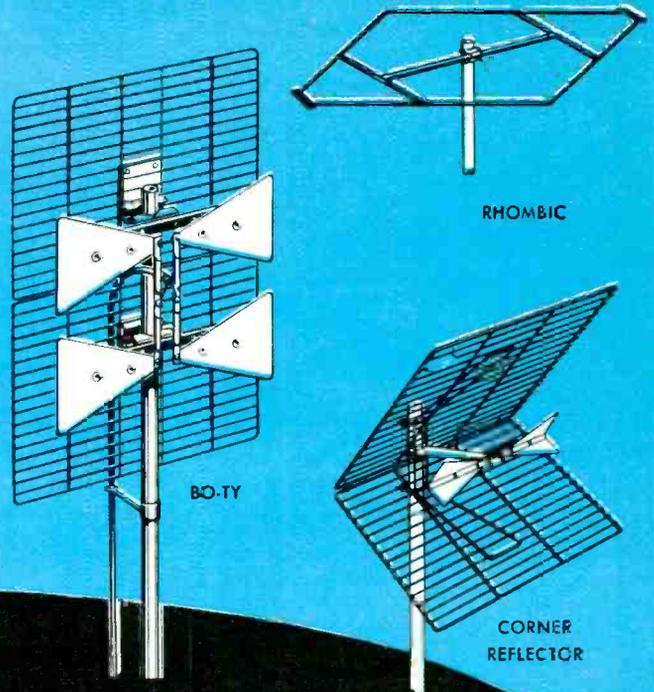
Nevertheless, all the test instruments in the world will be of no avail unless you know what you are doing. And this is where know-how comes into the act. Know-how can be of two general sorts: *Your own experience* which may be just as broad and deep as the number of years you have been handling radio-TV servicing; and *the experience of others* which is available to you through data services, through technical publications such as SERVICE, and through contact with other Service Men and authorities on the subject.

To build up a backlog of your own know-how, you should keep a case history file, or a record of unusual jobs you have handled, including the diagnosis, parts to be replaced and the time and effort expended. Not only will such data help you in tackling recurrent jobs with confidence and dispatch, but you'll also have that all-important element of cost-finding which comes in handy when quoting on a service job.

For example, suppose you have converted a 10' chassis to a 21" rectangular, with necessary alterations of the cabinet such as a new screen opening and safety glass. If you have kept a record of such a job, you know how much labor was involved and what the material cost. You can quote on a similar job without fear or hesitation.

With the trouble once diagnosed, you may need material for the job. Here again, as with the data, you can be a mighty lucky young man. For the radio parts business has come a long

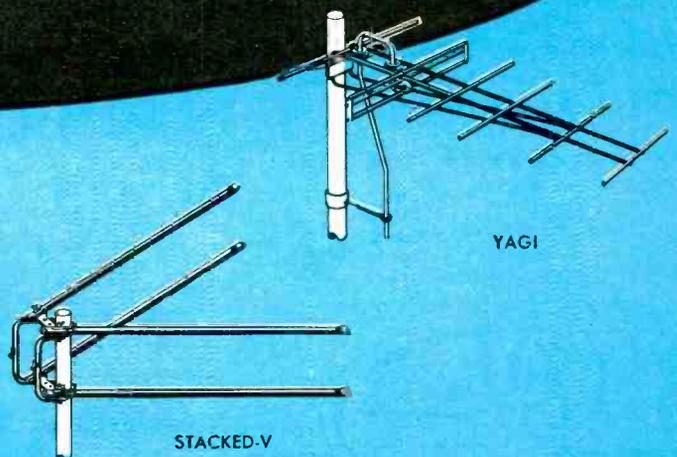
(Continued on page 104)



new

# UHF antennas

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## Service Engineering

(Continued from page 73)

drills have a larger than standard spiral angle and are sharpened with the point modified to 140° instead of the standard angle of 118°. If the drills are to be used for machining a high silicon type of aluminum alloy, the point must be modified to about 90°. A dull point can be used for drilling thin sheet aluminum, as this angle will force the drill to cut through to its full diameter before the point breaks through.

If heavier feeds are used, which will prevent long, curly chips from forming and entangling the tool, it will be necessary to change the lip clearance angle from the normal 12° to 16° or 17°. To produce short chips for easy ejection without clogging, the helix angle of the cutting edges must be decreased, or the feed of the drill should be increased and the speed of the spindle decreased. This will produce chips which are thick enough to break off of their own accord. Most efficient operation usually results when the speeds are high and feeds moderate.

A medium grain wheel can be used to rough grind drills to the required angles by hand. The fine-grain wheel should be used to finish grinding to produce a smooth cutting edge. Honing the cutting edge further increases its smoothness, and the drill, when used at the correct rate of feed, will then produce a very smooth, clean hole.

Very small drills should be ground with a 220-grain wheel, medium-soft grade. If many small holes must be drilled, therefore requiring frequent sharpening of the drill, it is advisable to use a microscope or some magnifying device for closer control of accuracy. An aluminum oxide 100-grit wheel will be satisfactory for larger holes.

### Boring Operations

Boring large holes in aluminum alloys, especially those with high silicon content, can be best accomplished with tools tipped with carbide or stellite or with tools made of cast tungsten cobalt materials. The suggested angles for these tools are: back rake, 0-15°; side rake, 5°-15°; side-cutting edge angle and end cutting-edge angle, 45° each. These tools should be sharpened with a silicon, 320-grit wheel, or with a diamond wheel of 200 to 300 grit.

The working life of these drilling and boring tools can be considerably extended if they are properly honed; in fact, to prevent cratering or built-

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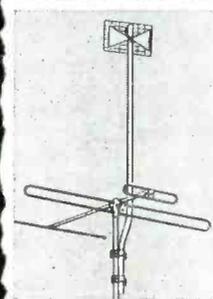
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up edges, many shops grind a chip-breaker in the tool with a 60-grit aluminum oxide or silicon carbide wheel. However, great care must be exercised in grinding so as to have this chipbreaker groove in the right place and at the right angle.

As ordinary drills may not be sturdy enough, especially when drilling sheets, a drill with shorter flutes possessing heavy web construction is recommended. If these are not available, a standard drill can be made to serve by cutting off one-third of the flute and resharping the drill. The best drill is one in which the flutes have a greater than normal spiral angle. This, together with a dull angle on the point, not only facilitates chip removal, but also minimizes burning of the metal.

#### Reaming

Carbon-steel reamers are satisfactory for most reaming operations. A negative spiral reamer is often used to keep the reamer from feeding itself into the hole. This also reduces the tendency of the tool to chatter. Reamers with varied angles between consecutive blades produce a fine surface finish. Holes should always be drilled undersize so that the reamer will have a positive cutting action, which is necessary for a smooth and accurate finish.

The blades should have a positive rake of about 5-8°, a marginal width of .020"-.060" and should be ground to a relief angle of about 4°-7°, blending into a 15°-20° clearance angle. Carbide-tipped reamers are recommended by many, and the blades should be about 20 per cent thicker than those of reamers made of high-speed steel, and with as little clearance as possible.

#### Bending Aluminum Pipes

The correct temperature for bending pipes may be obtained by the following procedure: An acetylene valve should be left wide open to obtain a sooty flame. The pipe should be heated where the bend is to be made with this flame. When the pipe, in the area of the bending, has become completely covered with a layer of carbon (soot), the oxygen valve should be opened and the flame adjusted to natural. The flame should then be moved steadily so as to heat evenly. Heating should be continued until all of the soot has been burned away. The pipe should then be cooled in water and bent in the same manner as one would bend a copper pipe. When making difficult or small radius bends, distortion of the pipe can be prevented by using sand or some low-melting lead and tin combinations, as filler material.

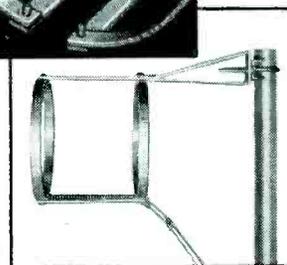
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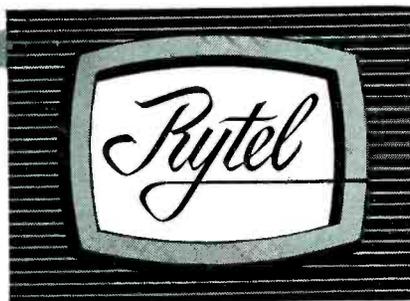
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### Audio

(Continued from page 57)

capacitor repositioned. The capacitor may be repositioned by sliding it through its mounting clip toward the rectifier end of the chassis. The lead end of the capacitor should be even with the edge of the speaker-magnet frame.

As a preventive measure, the elec-

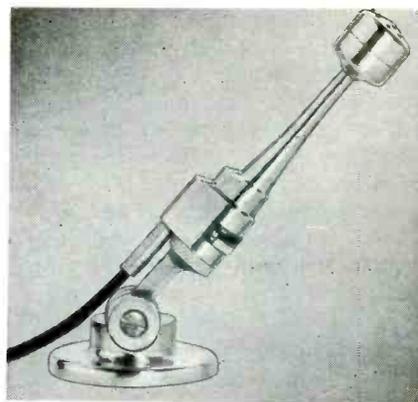
trolytic capacitor should be repositioned in this manner.

#### Extended Play Record Characteristics

Extended play record increased playing time has been made possible by



(Right)  
Phono needle display and storage case available free with the purchase of a special turn-over balanced assortment of 27 conventional Jensen needles. Counter case features identity tabs for instant selection of the proper needle. (No. 1470; Jensen Industries.)



Matching stand for Turner model 80 crystal microphone, built of die-cast zinc, satin chrome plated. It pivots the microphone at a 135° arc. (Turner Co., Cedar Rapids, Iowa.)

recording to a smaller diameter. These records may be recorded to a minimum diameter of 4.25", or 1 3/8" from the side of the centerpost of the record player.

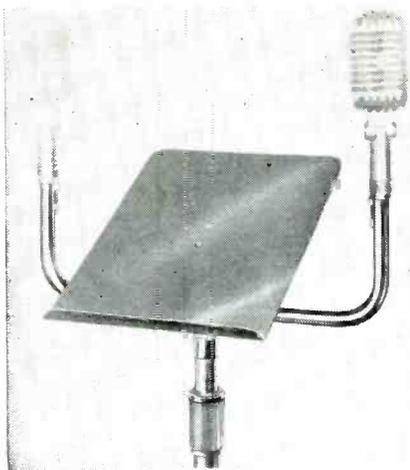
It is important to be aware of this minimum, to avoid pretripping. The record changer arm should trip when the stylus tip is 1 9/32" from the centerpost. Record changers which are adjusted to this specification will operate correctly with *ep* records.

Changers which have been improperly adjusted, or which have been adjusted to trip earlier on standard records, may trip at a diameter greater than 4.25". The player may not, therefore, reproduce the ending passages of the modulated grooves of those records which have been recorded to the minimum diameter. When this condition occurs, a tripping adjustment is indicated.

High-fidelity 7-tube 20-watt amplifier, featuring a *loudness contour selector*. Amplifier utilizes five separate feedback loops and a partial cathode-loaded output circuit. Loudness contour selector, which is used in conjunction with a conventional gain control, is said to compensate for high and low frequency losses of the human ear at low listening levels. Selector is a five position control, with steps of 10 db at 1,000 cycles. In addition to the *lcs* and the gain control, two other sets of controls are included; a seven-position record equalization control (included are equalization for Columbia LP, AES and NAB recording curves, American 78 records and European 78's, as well as a flat response curve and a sharp cutoff position for worn or low quality popular recordings), and separate treble and bass controls. Amplifier has four input selector positions: magnetic phono, radio, TV and tape. Designed with *dc* preamplifier filaments. (Model DB-20; David Bogen Co., Inc.)



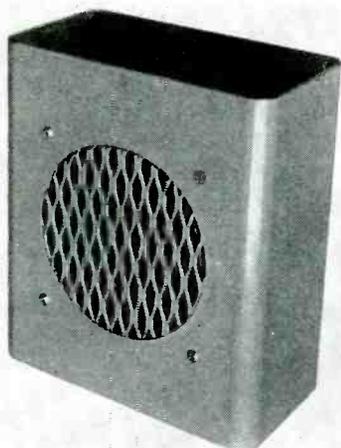
# Show Them! Tell Them! Sell Them!



Duplex microphone mount with desk attachment which permits the use of two microphones on a single stand or with either one or two microphone support arms. (Model TB-1; Atlas Sound Corp.)

(Below)

Metal speaker enclosure treated with a sound-deadening compound to eliminate metallic resonant sound. Enclosures said to have a bilateral feature which permits the sound to come from both the front and back of the housing. Can be attached to wall or ceiling by means of a bracket. Various sizes are made to accommodate speakers from 5" to 12". (Bud Radio, Inc., 2118 E. 55th St., Cleveland 3, O.)



(Below)

Point-of-sale display carton recently developed to help merchandise a telephone pickup, which picks up both sides of a telephone conversation without electrical connection to the telephone by slipping pickup unit onto the telephone earpiece. Due to the resulting close coupling between receiver and pickup, clear, hum-free reproduction of the telephone conversation is said to be possible. A high-impedance, high-gain device, it can be plugged directly into the microphone input of any tape or wire recorder. (M-53A; Permoflux Corp.)



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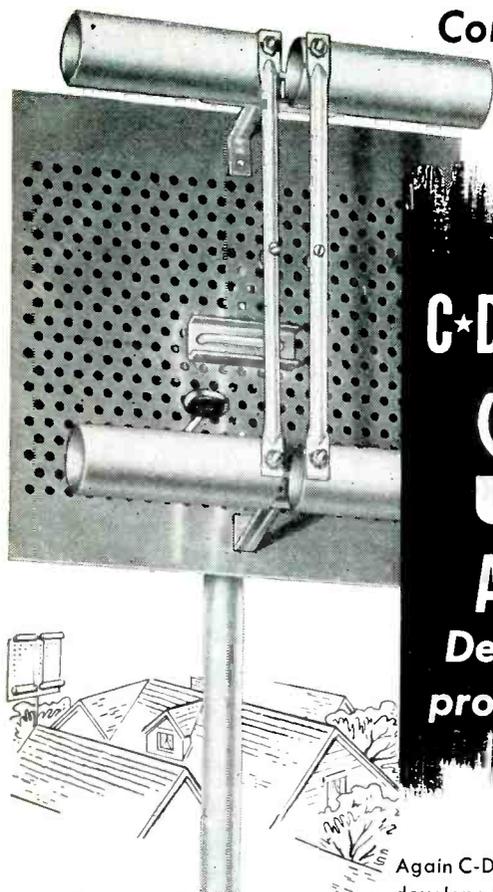
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- CONVERTERS

## Voltage Calibrator

(Continued from page 43)

resistor set at 10, and the stepped divider also set at  $X 10$ , is exactly 100 volts (peak-to-peak).

When this calibration is completed, voltage from the arm of the continuously variable resistor to ground can be adjusted from 10/10 of maximum, or 100 volts, down to 0/10 of maximum, or zero volts. When the stepped divider is set at  $X 10$ , the voltage output to the 'scope is the voltage between the potentiometer arm and ground.

Theoretically, it is possible to obtain

any fraction of the maximum voltage output simply by adjusting the potentiometer. Actually, because of the size of the potentiometer and the dial, and the fact that it is wirewound (so that a very slight stepping is present in the voltage output when the shaft is turned), it is virtually impossible to recover a small setting, such as .75 volt (peak-to-peak), even if an extremely good potentiometer is used.

To facilitate obtaining low voltages with desired accuracy, the stepped voltage divider, consisting of 220,000, 22,000, 2,200, and 240 ohms, connected in series, with the junctions

brought out to switch points (Fig. 6) is installed. This divider, for the purposes of the present discussion, has such a high resistance that its current drain is negligible.

To obtain voltages in the range from 10 to 100, the switch is set at  $X 10$ , and the potentiometer at the desired location for the voltage. For example, if 75 volts are wanted, the potentiometer should be set midway between 7 and 8. This dial setting, 7.5, is then multiplied by the switch designation ( $X 10$ ) to obtain the voltage.

### Stepped Voltage Divider at LV

When low voltages are desired, use is made of the stepped voltage divider. Here, the voltage between the switch arm and ground bears the same relation to the applied voltage (from the potentiometer) as does the resistance from switch to ground to the total resistance. In consequence, if the potentiometer is left at 7.5, and the switch moved from  $X 10$  to  $X 1$ , the indicated voltage will be 7.5 volts, and the actual voltage  $7.5/10 \times 100 \times 24,440/244,440 = 7.4985$  volts, which, for all practical, and most theoretical, purposes is 7.5 volts.

Similarly, a voltage of .75 will be obtained if the switch is moved to the  $X .1$  position, and a voltage of .075 if it is moved to the  $X .01$  position.

A general formula for any calibrated voltage divider of this circuit, when resistance values are quite high, and load is also of high resistance, is: Potentiometer reading/Number of dial divisions  $\times$  applied voltage  $\times$  divided output res./total divider res. = output voltage.

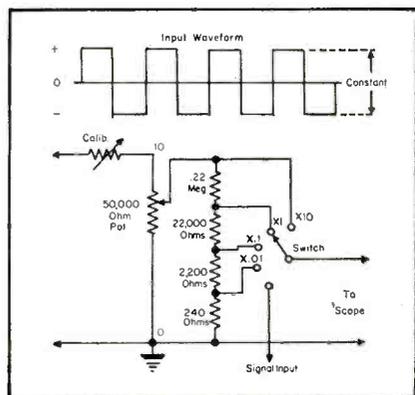
### References

Cruit Electronics Staff, *Electronic Circuits and Tubes*, Chapter 24, pp. 813-820; McGraw-Hill, 1947.

Seely, Samuel, *Electron Tube Circuits*, Chapter 14, pp. 306-308; McGraw-Hill, 1950.

Chapter on clipping, *Radio Amateur's Handbook*.

Fig. 6. Input waveform and circuit of calibrated voltage divider.



## UHF Alignment

(Continued from page 49)

it simplifies the test procedure to follow.

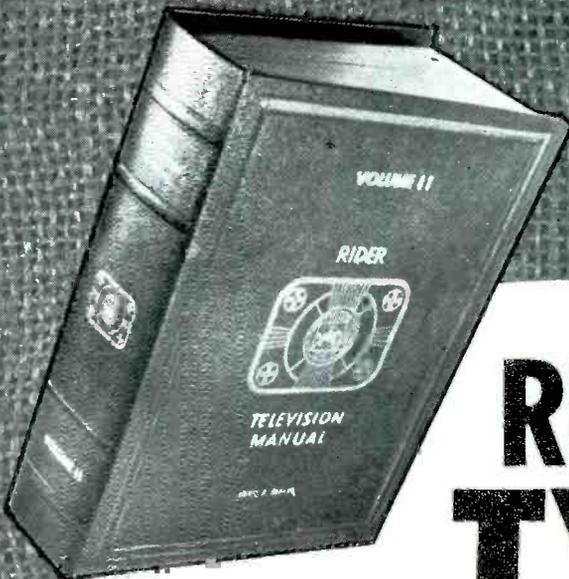
### UHF Bandpass Alignment

In the *uhf* preselector bandpass alignment procedure, *pix* and sound *if* markers are injected into the crystal mixer, which beat with the local oscillator to produce marker beats on the *uhf rf* passband. This procedure not only permits rapid alignment, but tracking of the *rf* response curve to the already adjusted local oscillator. The pips on the *rf* response thus correspond to the *if* *pix* and sound carriers, and the *rf* response can be easily adjusted so that the pips are always within the flat top of the response curve. At *uhf* the *rf* response must always be made quite broad (15 to 20 mc from peak-to-peak), so that the signal will always ride on the top of the response, even though the tracking cannot be made perfect, and also to take care of large oscillator frequency drift.

In this test the sweep generator must be connected directly to the balun or pad; the delay line is not used. This simplifies 'scope interpretation and avoids many confusing wiggles on the screen. A few typical *uhf* response curves appear in the 'scope photos of Fig. 3a, b and c (p. 49), taken on a *uhf* converter described earlier by the author.<sup>2</sup> In these photos, one *if* marker pip is shown in 3a and 3b; the other pip was lost in the photographic process, but in c both pips are clearly defined. Markers were set at 77.25 mc (channel 5 *pix* carrier) and at 87.75 mc (channel 6 sound carrier), since converter was designed for converting to either channel 5 or 6. In a we have a converter-response curve for channels 50-51; 686-698 mc. At b is the response of the converter at channel 60-61; 746-758 mc. And at 3c is the converter response curve for channels 70-71; 806-818 mc. It is thus possible to check the alignment of a tuner throughout the *uhf* band by just turning the tuner control with the left hand, while tuning the sweep generator with the right hand, and observing where the *if* marker pips appear on the response curve. If the marker pips do not ride on the top of the response curve it will be necessary to retune the tuner at these points; if the lower frequency pip slides down on the

(Continued on page 124)

<sup>2</sup>Hesse, Henry, SERVICE; August and September, 1952.



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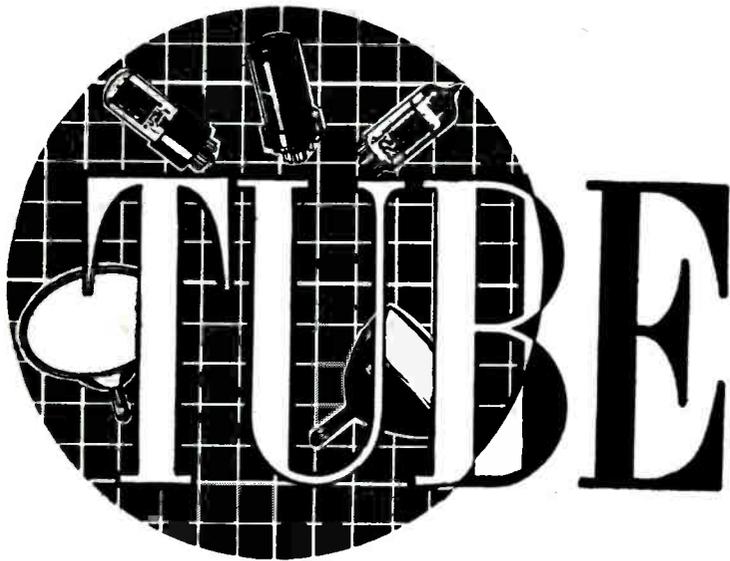


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**Internal Magnetic Focus  
Picture Tubes...TV and  
Its Impact on Tube  
Progress**

*News* \_\_\_\_\_ by **L. M. ALLEN**

THE TREND to small, highly-efficient TV chassis using larger picture tubes, has spiralled during the past year, prompting the development of many novel components, accessories, and particularly quite an assortment of tubes. Especially outstanding has been the self-focus tube which has been found to simplify construction, eliminate controls and improve performance. Further simplification in tube structure and application has now been reported, through the design of an *internal magnetic focus tube*, which eliminates the external focus element and ion trap, by including the magnetic devices within the tube. The only components directly associated with this tube are said to be a magnetic focus trimmer sleeve, centering device and deflection yoke.

In an explanation of the design of this picture tube at the recent annual IRE meeting in New York City<sup>1</sup>, it was pointed out that the cathode, heater, first and second grids, and anode are similar to those used in the conventional tube. The electrons leaving the cathode are controlled by the first grid and then accelerated by an electrostatic field through the aperture of the second grid, where they enter the accelerating lens field existing between the second grid and anode. This field has been tilted through an angle of 10° to provide a part of an ion trapping action. Electrons and negative ions alike travel a curved path through this field leaving it aimed so that they would strike the anode cylin-

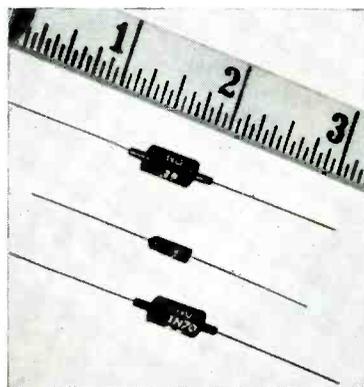
der. If the electrons are to arrive at the screen and thus produce light, their paths must be bent back and brought into coincidence with the axis of the focus lens cylinder. To accomplish this, a small magnet assembly has been oriented in and welded to the anode cylinder so that it produces the needed magnetic deflecting field. Such an arrangement is possible only at a specific value of high voltage. For other voltages the beam enters the lens at some angle with respect to its axis. This change in angle would result in serious centering problems were it not for the action of the focusing field which reduces the effect to negligible signifi-

cance. However, this angle change does act to define an upper and lower limit of useful operating voltages.

In an analysis of the nature of the electron beam, it was said that the beam leaving the cathode converges rapidly to a crossover. On leaving the crossover it has a wide angle of divergence which is reduced by the convergent action of a skew lens field, but it still enters the high-voltage area of the gun as a divergent beam. This divergent electron beam enters the axial magnetic field of the focus structure; the field acts to redirect the beam elements so that they leave the focus lens as a convergent beam. When the magnetic field strength is of the proper value, the beam converges to a point on the tube screen and is properly focused. It was noted that the focus unit has been designed to produce the required strong axial magnetic field. This field has as its source cylindrical rod alnico magnets. Washers of magnetically soft iron and a lens bushing provide a suitable path for the flux to enter the field of focal action. The outside diameter of the washers was selected as a practical maximum so that an air path length between them and an external soft iron sleeve would be small. This sleeve was found to increase the total leakage field, thus loading the magnets and decreasing the available mmf. The soft iron sleeve was also found to provide a convenient trimmer adjustment of the focus field.

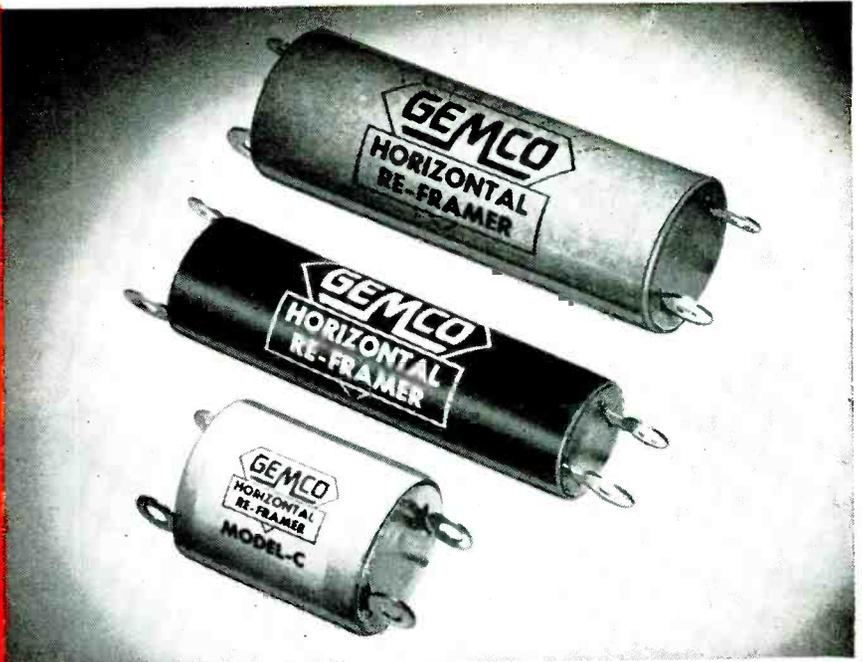
Because the iron washers constitute a magnetic short circuit, the centering

(Continued on page 90)



Point-contact germanium diodes developed for video detectors, *uhf* mixers to 900 mc, as well as for general-purpose operation up to 200 volts. Stiff terminal pins are said to permit clipping of the unit into spring terminals either for test or for circuit application; flexible leads permit soldering or other suitable connection means. Types available include NU38, NU39, NU58, IN48, IN51, IN64, IN65, IN69, IN72, and IN81. (Transistor Division, National Union Radio Corp.)

<sup>1</sup>Presented by R. B. Gethmann and L. E. Huyler, General Electric.



**IT'S A BREEZE**

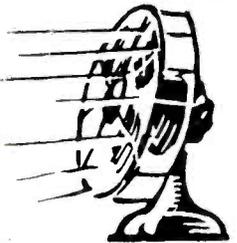
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**MODEL C**

This low cost model can be installed on any T. V. set. The average gain in sweep will be about fifteen per cent with a very slight loss in high voltage.

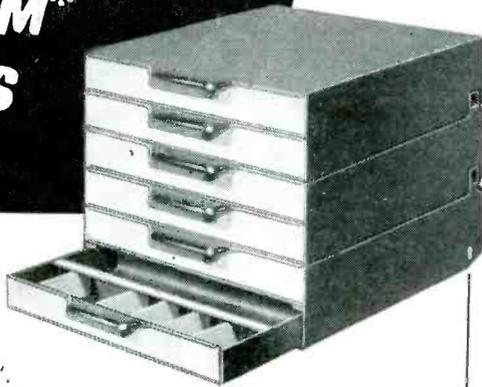
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## Tube News

(Continued from page 88)

device must be designed so that it is located away from the front washer and near the deflection yoke.

When using permanent magnets, it is desirable to provide one which is stronger than necessary. It is customary to magnetize the magnet to saturation and then knock it down to the desired value. Fortunately, it was said, this magnetizing procedure can be accomplished after the tube has been constructed and is under test. The indications of correct focal and ion trap adjustments were noted as being

sufficiently precise so that consistent magnetization of these elements can be maintained.

### TV and Tube Progress<sup>2</sup>

The development of TV, which brought forth the most complex and critical electronic equipment ever designed for home use, has been credited with stimulating important post-war advances in the design and production of receiving tubes.

As a result of television's impact on the tube manufacturing industry,

<sup>2</sup>Based on comments by L. S. Thees, general sales manager, RCA tube department.



Boxcar of 800 picture tubes representing an investment of \$40,000, shipped recently by Rauland Corp. to one of its distributors, Miller-Jackson, Inc., in Oklahoma City, Okla.

tubes produced today can run rings around receiving types of a decade ago, it was noted.

### Design-Material Advancements

Some of the advances now featured in tube design are gold-plated grids used in certain tubes intended for applications requiring tight control of critical tube characteristics; lead-glass envelopes, which replace conventional lime-glass envelopes in a number of high-voltage tube types to provide better life performance; cathode clips and inverted-pinch cathodes, employed in certain tube types for greater resistance to vibration and to minimize microphonics; and double-helical coil heaters, which provide tube types having greater freedom from hum and better overall performance for certain applications.

Most receiving tubes made by one company<sup>3</sup>, it was said, used carbonized nickel-plated anodes, which were claimed to provide 97 per cent of the radiating effectiveness of a true black body, as compared with 68 per cent for conventional carbonized nickel-plated anodes. This increased effectiveness is said to lead to better tube life because the anodes operate at lower temperatures.

Among other engineering and production advances listed were individual matching of cathode base metal and carbonate coatings for each tube type; adherence to strict mica tolerances to improve tube stability and reduce microphonics; and appreciable reduction in the number of tube welds to minimize the number of possible failure points.

### Tube Developments

Two 24" rectangular all-glass magnetically-focused and deflected picture tubes with gray filter glass spherical face plates, have been developed and have been made available to receiver manufacturers for experimental purposes<sup>4</sup>.

By using a deflection angle of 90°, the overall length of the new tubes is

<sup>3</sup>RCA.

<sup>4</sup>Sylvania.

<sup>5</sup>Rauland.



Personalized Service shop identification plaque designed by RCA tube department, for their current promotion on radio and TV receiving tubes. In background is 3-D, a six-color display for window or counter, which features replica of plaque.

21 3/8". Total picture area of 327 square inches is provided by a screen area approximately 17" high by 21 1/2" wide.

A series of flat-face tubes<sup>7</sup> made particularly for long persistence screens has also been developed. To obtain high contrast, the conventional gray filter glass (Luxide) faceplate is used with aluminum backing.

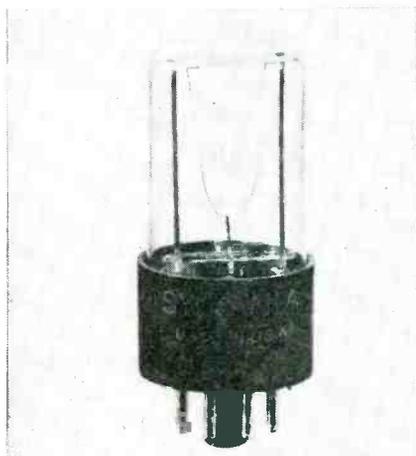
Manufactured in three basic bulb sizes because of their varying characteristics, they are like the 12UP4, 16AP4 and 16GP4 type picture tubes, except for the flat faceplates, with all sizes available in any registered RTMA persistence value. Produced for magnetic deflection, but available with either magnetic or electrostatic focus.

Also available now is a miniature twin triode<sup>8</sup> designed for service in low noise *vlf* cascode TV amplifiers.

Consists of two independent medium mu triodes contained in a T-6 1/2 envelope. Has internal shielding between sections.

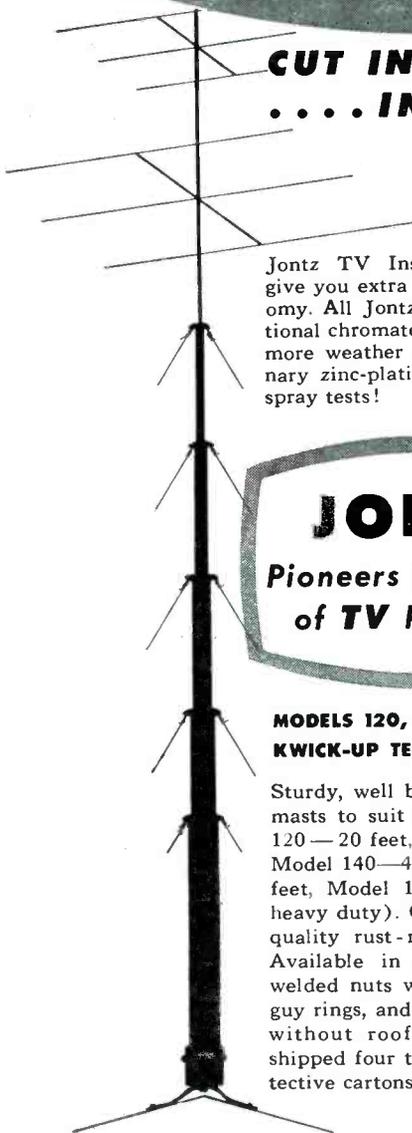
<sup>8</sup>Sylvania 6BZ7.

Horizontal deflection stabilizer tube, which serves as the cathode bias resistor for the horizontal output tube. The non-linear resistance characteristic of the filament tends to hold the cathode current of the horizontal output tube relatively constant despite line voltage variations. The result is said to be a stabilized horizontal deflection and second anode voltage. (Sylvania type 40B2.)



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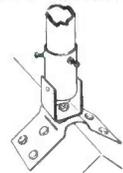
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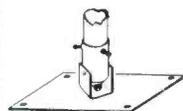
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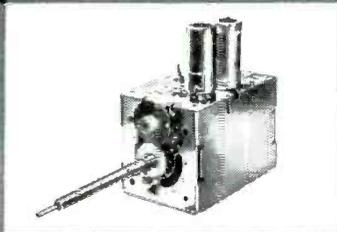


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**Tuner Division • Bloomington, Indiana**

fluctuations (AM). To obtain these conditions, the tube must be biased to operate on the correct portion of the characteristic curve. A 500-ohm quieting control provides a means of adjusting the bias for maximum AM rejection.

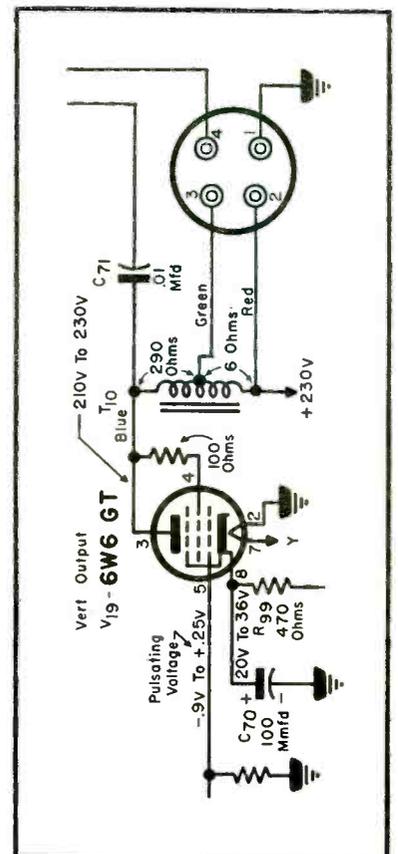
**Emerson Service Notes**

*Repeated Fuse Failure . . . 120169-B, F and D Chassis:* This condition can be caused by momentary arcs in tubes or components which occur intermittently and soon heal themselves. These causes of fuse failure can be overcome by replacing the burned-out fuse with a ½-amp slow-burning type fuse.

*Replacing 6BQ7A or 6BZ7 for 6BQ7 in Tuners:* In 120169 series of chassis, the tuner used may now incorporate either a 6BQ7, 6BQ7A or a 6BZ7 tube. These tubes are interchangeable, but due to possible variations in interelectrode capacities, several tubes may have to be tried for best results.

*Popping Sound in Audio When Picture Starts to Roll Vertically or When Vertical Hold Control is Adjusted (Chassis coded triangle F):* This trouble can be eliminated by installing a 100-ohm ½-watt resistor between the plate and screen of the vertical output tube, 6W6, as shown in Fig. 2.

*Black Horizontal Streaks Over Picture When Tuned to Channel 6:* In the



**Servicing Helps**

*(Continued from page 92)*

velops a pulsed voltage across the resistor. This voltage, when fed through the tube and wiring capacitances to the quadrature grid, is of the proper phase to reinforce the voltage at the quadrature grid. The amount of voltage fed back in this manner af-

fects the distortion, AM rejection, and output voltage.

A signal voltage of 1.25 at the limiter grid is sufficient to drive the tube from plate-current cutoff to plate-current saturation. With the tube operating between cutoff and saturation, higher inputs cannot increase the plate current. Therefore, amplitude limiting occurs when the signal voltage at the limiter grid exceeds 1.25 and the detector is insensitive to amplitude

Fig. 2 (right). Revised circuit for Emerson 120169-F chassis evolved to eliminate popping sound in audio when the picture starts to roll vertically or when the vertical hold control is adjusted. A 100-ohm ½-watt resistor has been installed between the plate and screen of the 6W6 vertical output tube.

120169 Emerson series of chassis, this condition is usually only apparent in the fringe areas, and is caused by harmonics of the picture *if* generated in the video-detector coupling to the front end, causing regeneration of certain frequencies. This condition is tunable with fine tuning and can sometimes affect channels 5 or 7.

If this condition exists, it can be eliminated by connecting a 10- $\mu$ h *rf* choke or a 20- $\mu$ h *rf* choke in series with the .047-mfd capacitor ( $C_{21}$ ), connected to the grid of the 6CB6 video amplifier tube; as illustrated in Figs. 3 and 4.

#### Horizontal Reframers

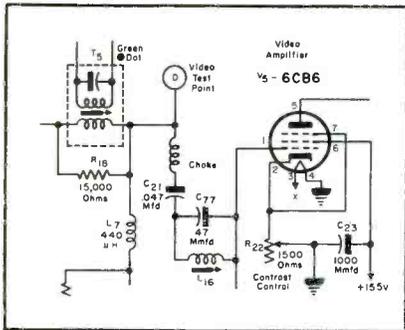
To compensate for low line voltage or conditions which leads to horizontal shrinkage, a series of horizontal reframers<sup>‡</sup> have been developed.

One type features an anti-saturation network plus a capacity circuit for optimum sweep and minimum change in high voltage. Another has been designed for sets where centering is accomplished without a centering potentiometer.

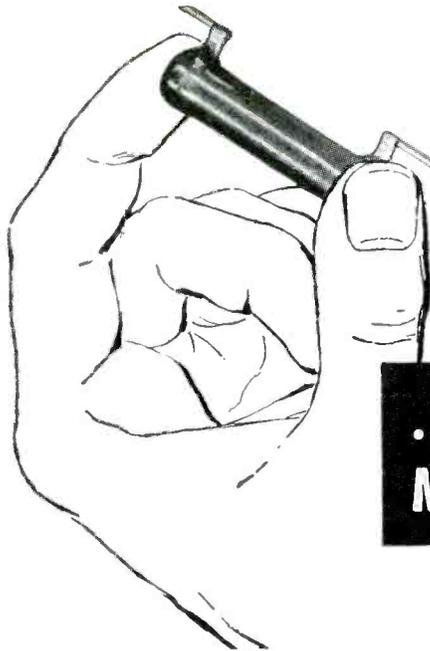
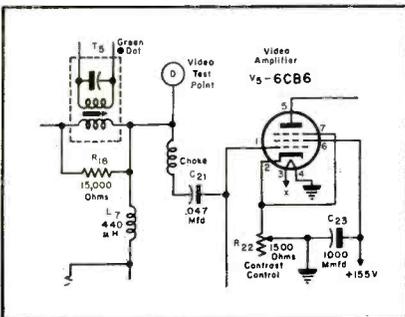
Both models have been designed to add width to sets where centering is accomplished by setting the focus coil. They can be used on any set, but will

<sup>‡</sup>Gemco; Great Eastern Manufacturing Co.

(Continued on page 96)



Figs. 3 (top) and 4 (bottom). Black horizontal streaks over the picture, when tuned to channel 6 in 120169 (triangle A to D) Emerson chassis, may be eliminated by connecting a 10- $\mu$ h *rf* choke in series with .047-mfd capacitor; Fig. 3. Same remedy may be applied in 120169 (triangle E or higher) chassis; Fig. 4.



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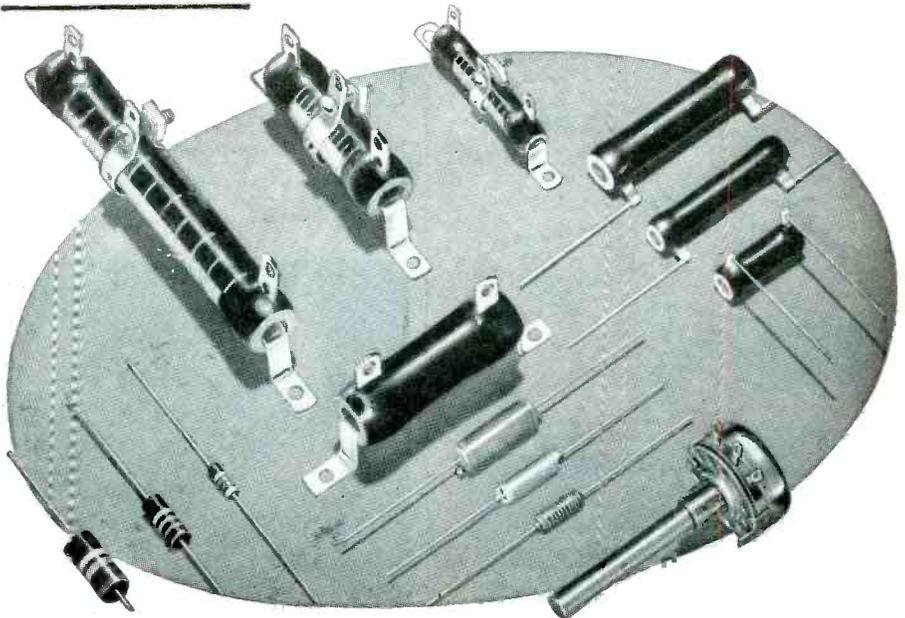
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## Servicing Helps

(Continued from page 95)

render centering controls inoperative. These units are polarized; the copper lugs must be hooked in series with the B+ return lead of the yoke.

A non-polarized unit that can be used on any set is also available; this type will not disturb centering controls.

### Frozen Yokes\*

Occasionally, during a picture-tube replacement job, the problem of a yoke frozen tight to the picture-tube neck may arise. Breaking the neck of the old tube can be dangerous; not only is implosion a serious consideration, but the job can turn into an ordeal.

A solution has been found in the application of first, a light coat of *lubri-plate* on the tube neck between the yoke and the base. In the next step the yoke leads should be unsoldered, and the vertical and horizontal windings hooked up in series. Then, using a *variac* transformer, a voltage of about 50 should be applied across the total windings for about five minutes. The yoke should now be felt; it should be about as hot as a TV set power transformer which has been in use for about

\*From the experiences of Allan F. Kinckiner.

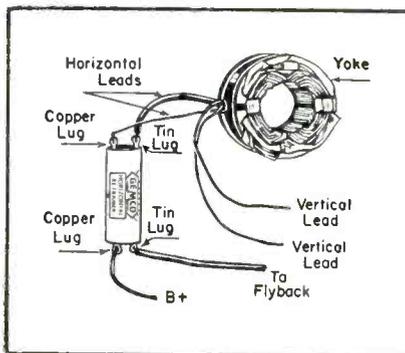
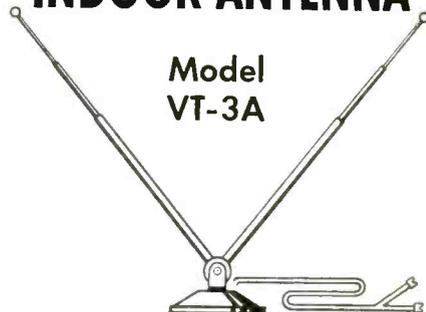


Fig. 5. Circuit illustrating installation of horizontal reframer. Fig. 5a. Three types of horizontal reframers available to compensate for low line voltage which can lead to horizontal shrinkage. (Courtesy Gemco)



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an hour. If necessary, the voltage can be increased to meet these heat conditions. When the yoke reaches this heated stage, it will be quite simple to slide the yoke off the picture-tube neck.

A *variac* transformer must be employed because of the variations in the resistance of various yokes. A light bulb might be employed in series with a 117-volt supply, but it is advisable to utilize a meter as a check to protect the yoke. Incidentally, the application of *ac* in the yoke will remove or reduce any residual magnetism in the core, making the picture easier to center.

## Coax UHF Converter

(Continued from page 37)

is possible to receive weak transmissions in some scattered geographical locations, on both these channels, high *if* attenuation through the preselector permits substantially interference-free *uhf* reception. Since the output tuned circuit is sufficiently broad to pass both channels, no readjustment of the oscillator is necessary to shift frequency, in the presence of strong local signals.

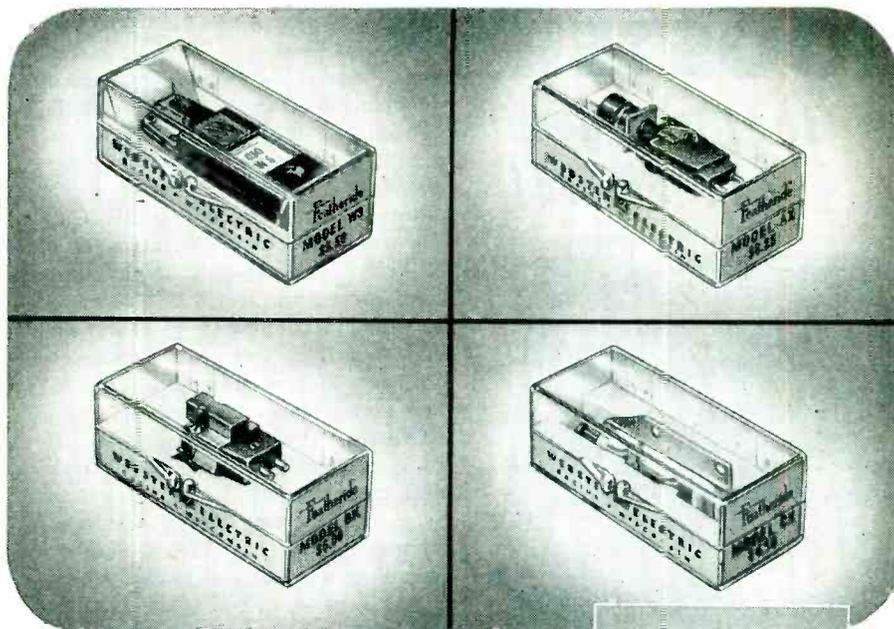
A 6BQ7A cascode *if* amplifier is provided to compensate for the conversion loss inherent in a crystal mixer. It also insures an overall low noise figure. The amplifier shown was found to have a noise figure of less than 6 db and a power gain of approximately 15 db. Three tuned circuits are claimed to provide a uniform response from 76 to 88 mc (channels 5 and 6) with relatively steep skirts to prevent spurious responses at *vhf* image frequency, and to sharply attenuate *vhf* oscillator feedback to the converter. Because of the broad flat-top response, no retuning is required whenever an alternate channel is selected.

### Tuning Elements

The individual tuning element is a modified, coax-line section shorted at both ends and center loaded by lumped capacitance to attain the necessary electrical length within small practical dimensions. Tuning is accomplished by a metallic plunger traveling in a low-loss dielectric sleeve which varies the value of center loading capacity. The plunger serves only as a transfer medium and makes no physical contact with either the cavity or loading capacitor. Suitably formed loops couple in and out of the cavity field with the degree of coupling controlled by physical dimensions and placement. The tuning

(Continued on page 102)

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Mail the coupon—we will send you our handy new Featheride Replacement Chart No. YF-2 showing how only four Featheride models fill almost every replacement need.

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Model WS • for 78 RPM replacement. Develops 1.5 volts for low output or 4.0 volts for high output. Tracks at 3/4 oz.; mounts in any 1/2 inch mounting.

Model BX • for replacement on R.C.A. automatic record changers and Columbia Record Players. Has high fidelity, is compact and light in weight; tracks perfectly.

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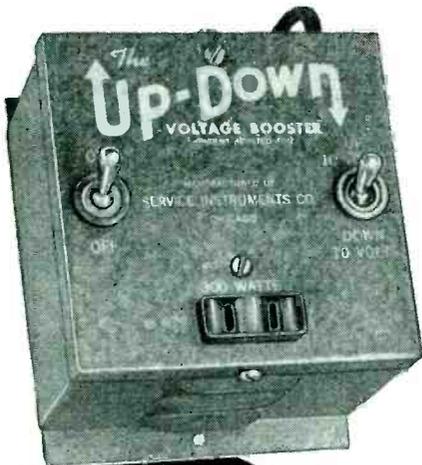
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# ASSOCIATIONS



## NATESA

THE NATIONAL ALLIANCE OF TELEVISION and Electronic Service Associations awarded its *Friends of Service Management* award to the G.E. tube department for *outstanding contributions to service management in creating better customer relations*, at its recent national convention in Kansas City, Mo. *John T. Thompson*, manager of the tube department's replacement sales accepted the award and addressed the convention audience of nearly 400 on *service salesmanship*. Awards were also made to Sylvania and Sprague for their service consumer programs.

Others at the meeting were *Lee Allen*, Amphenol, who spoke on *uhf* technical presentations; *Frank Mansfield*, Sylvania, reporting on *service trends and statistics*; *Lloyd Austin*, Simpson, describing *uhf test equipment*; *Harold Rieth*, Regency division of I.D.E.A., analyzing *uhf converters*; *Robert Artman*, Empire Coil, covering the subject of *uhf* telecasting; *Larry Kearny*, LaPointe Electronics, who reviewed *uhf* antennas; *Chet Jur*, Merit Transformer, discussing *TV servicing* and *Albert C. W. Saunders*, Saunders Radio & Electronic School.

The official registration indicated that delegates from 35 states and 62 cities, ranging from the Pacific to the Atlantic, and from the Canadian border to the Gulf were in attendance.

There were 30 exhibits at the convention.

## ESFETA

AT THE ANNUAL meeting of the Empire State Federation of Electronic Technicians Associations, held in the Hotel Arlington, Binghamton, N. Y., *Max Liebowitz*, ARTSNY prexy, was reelected president. Others named included *John Wheaton*, Long Island Radio Technicians' Guild, vice president; *Charles Cohl*, United Electronic Technicians Association, Kingston, N. Y., treasurer; *Wayne Shaw*, Radio Servicemens Association, Binghamton, N. Y., secretary; and *Andrew Wentworth*, Radio Technicians' Guild of Rochester, sergeant-at-arms.

A program for an extensive series of state-wide lectures was proposed at the meeting. It was hoped that such a plan might be inaugurated this fall.

## TTA, Perth Amboy, N. J.

AL FRIEDMAN and Victor Markosian, national field sales engineer, and chief engineer of Ram Electronics, were guests of the Television Technicians Association of Perth Amboy recently, and offered talks on TV sweep components.

Sponsor of the meet was the Monmouth Radio Supply Co., a Ram authorized distributor. Discussion also featured actual trouble-shooting case histories and field-proven service hints.

## PRSMA

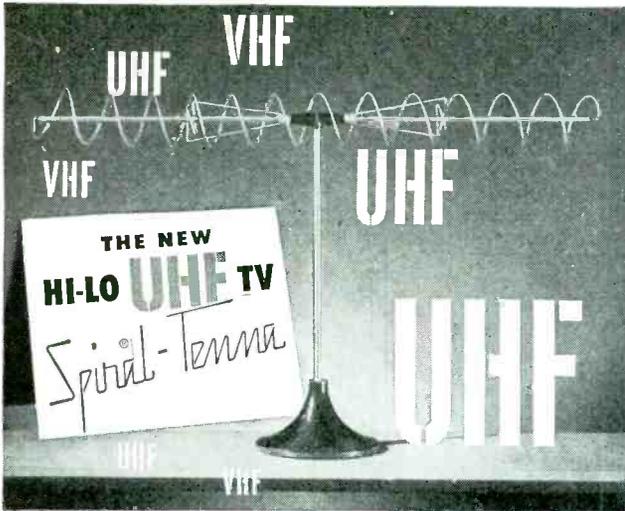
THE 20TH anniversary dinner of the Philadelphia Radio Service Men's Association will be held at McCallisters, in Philadelphia, on May 26.

For oldtimers, in the industry for 25 years, special tables have been set aside.

Treasurer for the affair is *Stanley W. Myers*, 1643 S. Wilton St., Philadelphia 43, Pa.

## TEN YEARS AGO

LIMITATION ORDER L-265, calling for transfer from Service Man to a consumer, of a new part in exchange for an old part of similar kind when needed for repair was issued by Washington. . . . Automatic tuning devices, electric, mechanical manual and motor-driven mechanical, were discussed by Alfred A. Ghirardi. . . . Some practical wartime service expedients were described by Howard J. Foht. . . . Audio degeneration, an important design feature in many of the late '42 receivers, was analyzed in the Ser-Cuits section. . . . *Dudley E. Foster* was elected vice president in charge of engineering, and *Arthur W. Freese* became vice president in charge of production of the Majestic Radio and TV Corp. . . . *S. N. Shure* was honored at a meeting of the Association of Electronic Parts and Equipment Manufacturers, commemorating an Army-Navy E production award. . . . *R. E. Onstad*, formerly vice president and general manager, was named president and general manager of the Thordarson Electric Manufacturing Co., following the resignation of C. H. Thordarson as president. *L. G. Winney*, former treasurer, was named vice president and treasurer, and *W. R. Mahoney* was elected assistant treasurer. . . . *G. E. Gustafson* was elected vice president in charge of engineering of Zenith Radio Corp. . . . *Oden F. Jester*, sales director of Utah Radio Products Co., was elected to a vice president post. . . . *Roy S. Laird*, sales manager of Ohmite Manufacturing Co., was also elected vice president.



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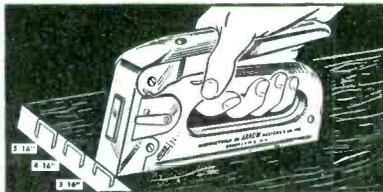
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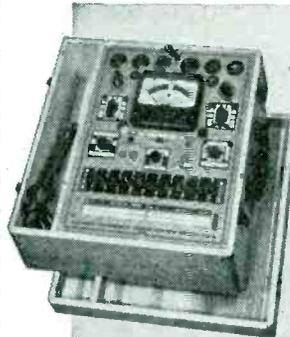
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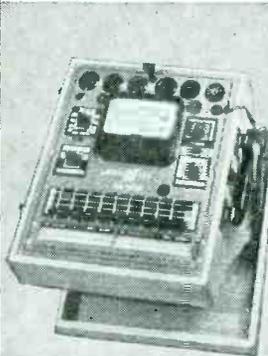
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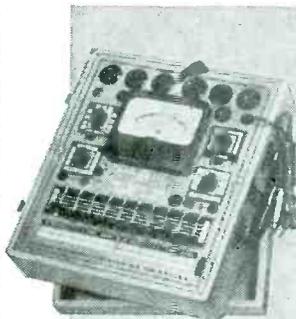
### model 205 TUBE TESTER

- Tests all tubes including Noval and sub-miniatures
- Completely flexible lever type switching arrangement
- Tests all tubes from .75 volts to 117 filament volts by standard emission test
- Tests all cathode, magic eye, voltage regulator and ballast tubes
- Has pilot light indicator
- Line voltage control compensates for line variations between 105 and 135 volts
- Checks for shorts and leakages
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MODEL 205P—with hand-rubbed oak carrying case (illustrated)

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MODEL 205C—Sliding counter case  
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### model 204 TUBE-BATTERY-OHM CAPACITY TESTER

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## On Book Row

### Basic Electronic Test Instruments . . .

. . . by Rufus P. Turner: An excellent book, covering test instruments used in the TV, radio and the electronics field. Author describes basic principles of test instruments, their operation and construction, and practical applications. Sixteen chapters include discussions of ohmmeters and volt-ohm-milliammeters, *vtvms*, power measurements and power meters, impedance meters and measurements, capacitor and inductance checkers, 'scopes and their applications, *rf* test and audio test oscillators and signal generators, frequency-measuring devices for *rf* and *af*, audio-amplifier testing devices, *rf* signal tracers and tube testers.—254 pages, priced at \$4.00; Rinehart Books, Inc., 232 Madison Ave., New York 16, N. Y.

\* \* \*

### Television Receiver Design I, IF Stages . . .

by A. G. W. Uitjens: First of a series of fundamental books on television circuits. Some of the subjects covered include gain and bandwidth with two-terminal coupling networks, distortion, noise and feedback. Offered is an extremely complete analysis of pentode amplifiers operating in a frequency range between 10-100 mc.—188 pages, priced at \$4.50; Elsevier Press Inc., 155 E. 82nd St., New York 28, N. Y. (Distributors for Philips Technical Library, Eindhoven, Holland.)

\* \* \*

### How To Understand And Use TV Test Instruments . . .

by Milton S. Kiver: Detailed explanations of test-instrument circuits are presented in this book, a paper-covered edition, along with practical applications of instruments. Equipment discussed include the *vivm*, AM signal generators, sweep-signal generators, 'scope and special TV test instruments (marker generator, cross-bar generator, field-strength meter). TV and FM receiver alignment and use of test instruments in TV servicing are treated in special chapters.—147 8½ x 11 pages, priced at \$3.00; Howard W. Sams and Co., Inc., 2207 E. 46th St., Indianapolis 5.

\* \* \*

### TV Sweep Alignment Techniques . . .

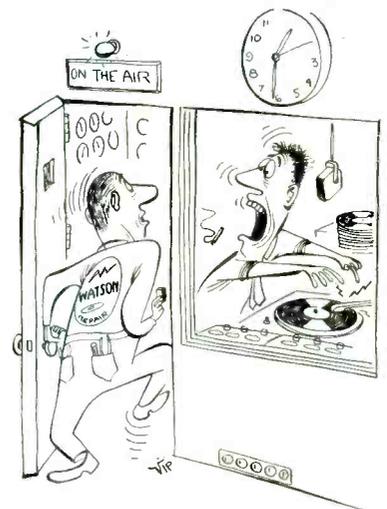
by Art Liebscher: New uses for test equipment, and application of a single basic test equipment setup for sweep alignment, are explained in this text. Also described is a new *supermark* method, as well as *uhf* sweep alignment. All phases of TV sweep alignment are covered: markers; sweep curves; tuner curve information; *if* alignment and curve adjustment; sound *if* and sound detector alignment; video amplifier response testing, etc. Featured are sweep curve pictures taken from actual jobs using the techniques and test equipment setup discussed by the author.—122 pages, priced at \$2.10; John F. Rider, Publisher, Inc., 480 Canal St., New York 13, N. Y.

\* \* \*

### SPEAKER PLANT



New block-long factory and executive offices of the Quam-Nichols Co., on Chicago's south side, at the intersection of Marquette Road and Prairie Ave. Features an experimental and development lab designed by board chairman James P. Quam. Building, occupying an estimated 75,000 square feet will, it is said, have more than twice the productive capacity of the old plant.



"Quick, Watson, the JENSEN!"

## WANTED

To Manufacture and Sell—  
Electronic Accessory Items

For — FACSIMILE, RADIO,  
TELEPHONE, TELEVISION

NOTE — We have a special immediate  
need of Facsimile Equipment  
for Intra-Office and Plant use.

Will furnish capital if necessary to  
complete desirable developments.

What have you to offer?

**RADIO ENGINEERING CO.**  
INQUIRER BLDG., PHILA. 30, PA.



THE ANSWER TO **UHF**  
RECEPTION PROBLEMS

. . . and refreshments too!

SEE US IN ROOM 660 at the  
**CHICAGO PARTS SHOW**

AMERICA'S LEADING PRODUCER OF  
**OPEN LEAD WIRE**

*Imperial* **RADAR & WIRE CORPORATION**  
820 EAST 233rd STREET • NEW YORK 66, N. Y.

# PERSONNEL

**Jack Grand** has been elected chairman of the board of directors of Granco Products, Inc., 36-17 20th Ave., Long Island City, N. Y.



Jack Grand



G. R. Rahmes

**Gordon R. Rahmes** has been named district sales manager for G. E. replacement tubes, and will headquarter in the eastern regional sales offices at Clifton, N. J.

**H. A. Triplett**, previously chief staff engineer for Pacific Oerlikon, has been appointed research director for Littelfuse, Inc., Des Plaines, Ill.



E. V. Sundt, Littelfuse proxy, congratulating H. A. Triplett.

**Charles E. Balz** has been appointed sales manager of the Burgess Battery Co. Freeport, Ill.



C. E. Balz

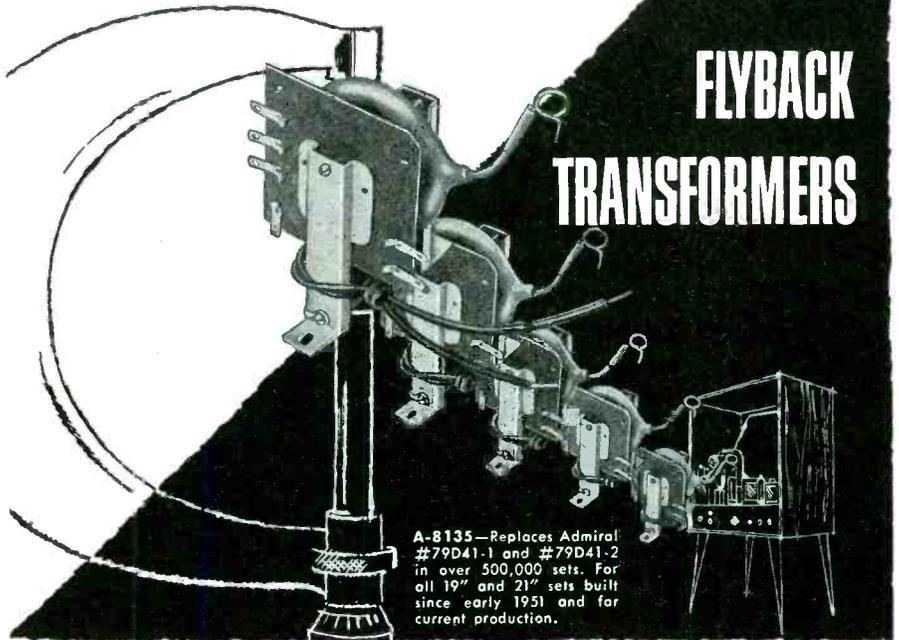
**Gustav Hofeller**, formerly major appliance and TV-radio sales manager and buyer for the Gertz department store, has been named general manager of Spirling Products Co., Inc., 62 Grand St., New York City.

**Henry F. Argento** has been appointed vice president and general manager of Raytheon TV and Radio Corp., Chicago, Ill.

**Dr. John Ruze** has been appointed director, in full charge of The Gabriel Laboratories, Needham Heights, Mass.

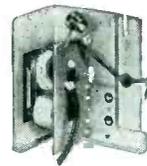
# STANCOR *Exact* REPLACEMENT

## FLYBACK TRANSFORMERS



**A-8135**—Replaces Admiral #79D41-1 and #79D41-2 in over 500,000 sets. For all 19" and 21" sets built since early 1951 and for current production.

Ask your distributor for Stancor bulletins 461 and 465, listing replacement applications of these transformers—or write directly to Stancor for your free copy.



**A-8132**—Replaces Muntz #TO-0031; used in 1951 and 1952 production. Covers approximately 300,000 Muntz sets.



**A-8136**—Replaces Philharmonic #80-263, #80-265-2 and #80-265. Used in all sets built since early 1951 including AMC, Pathe, Silvertone, and other "private label" sets.

Stancor Transformers are listed in Howard W. Sams' Photofact Folders, John W. Rider's Tek-Files, and the Howard Company's Counterfacts.

## STANDARD TRANSFORMER CORPORATION



3588 ELSTON AVENUE • CHICAGO 18, ILLINOIS

EXPORT SALES—

Roburn Agencies, Inc., 39 Warren St., New York 7, N.Y.

**Benjamin Katz**, who formerly headed his own advertising agency, has been named director of promotion and public relations of the Jerrold Electronics Corp., Philadelphia 46, Pa.

**Caleb A. Shera**, previously Hallicrafters credit manager, has been promoted to a newly created post of distributor sales counsellor.

**Henry Sears, John H. P. Gould and Charles E. Saltzman**, all associated with Henry Sears and Co. of New York City, and **Henry L. Shepard**, Shepard, Murtha and Merritt, have been appointed to the board of directors of LaPointe Electronics, Inc., Rockville, Conn.

**John Spargo**, previously with the merchandizing section of Collier's magazine, has been named sales promotion manager for the TV and radio division of the Bendix Aviation Corp., Baltimore, Md. Spargo also was with Raytheon Manufacturing Co., as commercial products division ad manager.

**A. George Rogers**, formerly assistant division manager, has been appointed manager of operations for the Westinghouse TV-Radio division, Metuchen, N. J.

**Hiram Prince** has been named divisional sales manager for Permo, Inc., in Texas, Oklahoma, Arkansas, Kansas, Nebraska, Iowa and Kansas City, Mo.

**RAM COMPLETES THE SWEEP...  
NEW VERTICAL COMPONENTS**

**Now the most complete Sweep Replacement Line.**

Simplify your replacement problems with the **RAM** combination of vertical components, horizontal output transformers, deflection yokes, width and linearity coils. **RAM**, as original manufacturers, assures you the highest quality and performance standards.

**RAM** For complete specs. and local Jobber's name, write Dept. S.  
**ELECTRONICS SALES CO.** IRVINGTON, N. Y. 

**WINCHARGER Telescoping TV ANTENNA SUPPORT**

**SAFE**  
**FAST**  
**INSTALLATION**

*one man can install*

No more "high climbs" with this modern, rugged Telescoping Mast. One man can do the whole job right from the bottom 10' section.

**HOT-DIPPED GALVANIZED**  
inside and out for maximum rust resistance. 18 gauge welded tubing — all hardware plated. Properly guyed, this Mast will support large antenna arrays in high winds and under heavy ice loads.

**EXCLUSIVE 3-POINT SAFETY CLAMPING RING**

**AUTOMATIC SAFETY CLIP**

Provides maximum rigidity against tubes twisting and loosening due to high winds. Has smoother guying surface, aids in erecting a straighter mast.

This unique Wincharger assembly tool safety feature warns you with a "click" when the tube has been pulled out as far as it can safely go.

**A WINCHARGER BASE FOR EVERY TYPE ROOF**

**HINGED FOOT** for flat and sloping roofs.

**RIDGE STRADDLER** for broad or ridged roofs.

**RIDGE STRAPS**... where there is no ridge roll to bridge.

**WINCHARGER CORP., 2107 East 7th, SIOUX CITY 2, IOWA**

## Coax UHF Converter

(Continued from page 99)

plungers are ganged together and moved by a simple linkage which provides substantially linear frequency calibration. Dial and intercavity tracking are adjustable at three points by positioning the plunger, trimming the loading capacitance and an additional mechanical means of changing the electrical length of the cavity which is the *uhf* equivalent of a padder.

The converter, it is said, can be serviced with a *vhf* signal generator supplying harmonics in the *uhf* band, and a grid dip oscillator, or communications receiver tuning to 88 mc. This equipment can be used because of a hairpin coupling loop employed between the preselector *rf* cavities. By withdrawing this interstage hairpin coupling loop one half way out of the cavities the *rf* transformer shifts from an overcoupled to an undercoupled condition which can then be peak aligned at discrete frequencies similarly to the tuned *rf* stage of any receiver. The coupling change is accompanied by a shift in center frequency from 82 to 88 mc. Utilizing the 88-mc receiver or grid dip oscillator coupled into L3, the preselector output may be detected with either earphones, output meter or 'scope. Using a modulated *vhf* signal generator the 3-cavity padders are then peaked for maximum response at 468 mc, the 2 *rf* trimmers peaked at 900 mc, and the 3 tuning slugs finger adjusted for maximum response at 800 mc. Pushing the hairpin loop back all the way into the cavities broadens out the response, and the alignment is completed.

If a high output (0.5 volt) *uhf* sweep generator is available, the *rf* bandpass may be observed at a top chassis test point provided. This point can also be used to measure crystal injection current by connecting a 5-ma meter between it and chassis. This is a rapid way of determining whether crystal or oscillator tube performance is normal. Current readings below  $\frac{1}{4}$  ma (equivalent to  $\frac{1}{2}$  ma because of 27-ohm shunt) will indicate either a defective tube or crystal, or both.

### TRUCKLOAD OF UHF CONVERTERS



Earl Templeton, manager of the distributor division of P. R. Mallory & Co. Inc., and Ray Sparrow, executive vice president of the company, inspecting truckload of Mallory converters headed for St. Louis, where WTVI began *uhf* telecasting recently on channel 54.

# DON'T BE STAMPEDED

You can always cash in with **ALLIANCE**—  
**THE PRE-SOLD LINE!**

Be sure to look us up at the  
**Parts Show—BOOTH 225**

ALLIANCE TENNA-ROTOR—  
ALLIANCE BOOSTERS  
ALLIANCE MANUFACTURING CO.  
ALLIANCE, OHIO

## ILLINOIS CAPACITORS HAVE BEEN SERVING SERVICEMEN FOR OVER 19 YEARS



TYPE IHT

The complete dependability of ILLINOIS electrolytic capacitors has made them a favorite with servicemen everywhere!

For over 19 years, ILLINOIS CONDENSER COMPANY has been producing quality capacitors—and during this time has been responsible for many important advancements in electrolytic capacitor construction. Millions of ILLINOIS capacitors, now in service, are proving their absolute dependability.

Used as original equipment by leading TV and radio manufacturers, ILLINOIS electrolytics are "first choice" of servicemen for all replacements!

Write for new catalog!



**ILLINOIS CONDENSER CO.**  
1616 NORTH THROOP STREET • CHICAGO 22, ILL.

# CATALOGS, BULLETINS ETC.



**Tube Department, RCA Victor Division, RCA, Harrison, N. J.**, has published a 33-page booklet, *This Business of Radio and TV Servicing*, that includes descriptions of business practices and essential test equipment for efficient radio and TV service operations. Business-guide sections cover budget planning, wage and salary considerations, materials, stock control, employee training, customer relations, and methods for reducing operating costs and expenses. . . . A 24-page booklet, *RCA Receiving Tubes for AM, FM and TV Broadcast*, form No. 1275-F, describing 495 different receiving types and picture tube characteristics, together with socket connection diagrams, is also available.

\* \* \*

**Standard Transformer Corp.**, 3580 Elston Ave., Chicago 18, Ill., has prepared a *Tape-Wire Recorder Replacement Guide*, listing 63 models of 22 companies manufacturing tape and wire recorders. Guide includes manufacturer, model, part number, and Stancor part number for replacements of power and audio output transformers and filter chokes. . . . A revised edition of the Stancor-Williamson amplifier instruction sheet, complete with performance curves, schematic and parts list is also available.

\* \* \*

**Rohn Manufacturing Co.**, 116 Limestone, Bellevue, Peoria, Ill., has released a brochure, describing three self-supporting steel towers, fold-over tower kit, telescoping masts, TV service table, and a line of towers and accessories.

\* \* \*

**United States Wire and Cable Corp.**, Progress and Monroe St., Union, N. J., has issued a 24-page catalog, *No. PM-3*, which lists and illustrates wires and cables. Contains reference tables, diagrams, and charts. Each class of wire or cable is described in detail as to construction, chemical and physical properties, and typical uses.

\* \* \*

**Phalo Plastics Corp.**, 25 Foster St., Worcester, Mass., has published a 42-page catalog, 353, describing insulated wire and cable, and cord set assemblies. Included are specifications for transmission line, intercom and pa, microphone, phono pickuparm, photoelectric cell, twin and general cables. Catalog also features a comprehensive appendix, offering definitions of terms, temperature conversion tables, fractions and decimal equivalents, copperweld wire tables, etc.

\* \* \*

**Aerovox Corp.**, New Bedford, Mass., has released a bulletin, describing high-temperature metallized-paper capacitors, Aerofilm capacitors, electrolytics operating above the present 85° C range, micas for working temperatures up to 125° C, hv plate assemblies and ceramic capacitors, and printed-wiring developments.

\* \* \*

**G. and H. Wood Products Co.**, 75 N. 11 St., Brooklyn 11, N. Y., has issued a revised catalog on a line of custom-styled hi-fi cabinets and kits. Included are individual specifications and cabinet layout, and equipment requirements.

# Sarkes Tarzian

## "Centre-Kooled"

PATENTS NO. 2618692 & 2620394

## SELENIUM RECTIFIERS



### Power Type

Available over a range that includes a few volts and milliamperes of current to hundreds of volts and thousands of amperes. Fourteen cell sizes provide widest available range of selection.

### Radio Type

Versatile low-cost rectifiers that have found application in all types of electronic equipment as well as radio and television receivers. A complete line is available.



### Embedments



A recent "first" in the industry, Sarkes Tarzian embedments offer the advantages of hermetically sealed rectifiers at a fraction of the size, weight and cost.

### Diodes

Currently available in two sizes, (1/8" and 5/16" housings) Sarkes Tarzian diodes are designed for use as limiters, bias voltage, low current relay voltage and many other very low current applications.



### High Voltage

This popular line of tubular rectifiers offers the design engineer a compact—long lived high voltage—low current source of DC power.

Please write, wire or phone for complete information on all types of Sarkes Tarzian Selenium Rectifiers.



**Sarkes Tarzian, Inc.** RECTIFIER DIVISION

Dept. S-3, 415 N. College Ave., Bloomington, Ind.

look at other models . . . compare . . .  
then you'll agree . . .

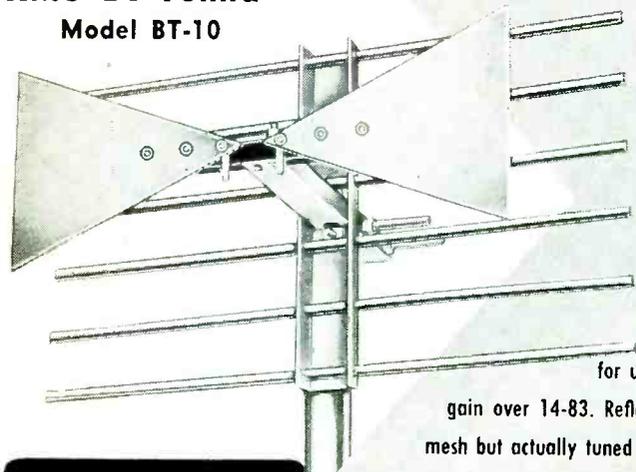
NOTHING  
COMPARES

with

RMS UHF  
BO-TENNA<sup>®</sup> and SKYTRAK<sup>®</sup>

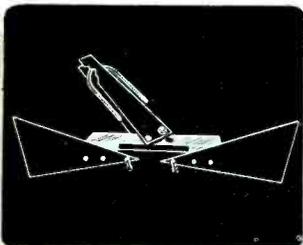
HERE'S PROOF!

RMS Bo-Tenna<sup>®</sup>  
Model BT-10



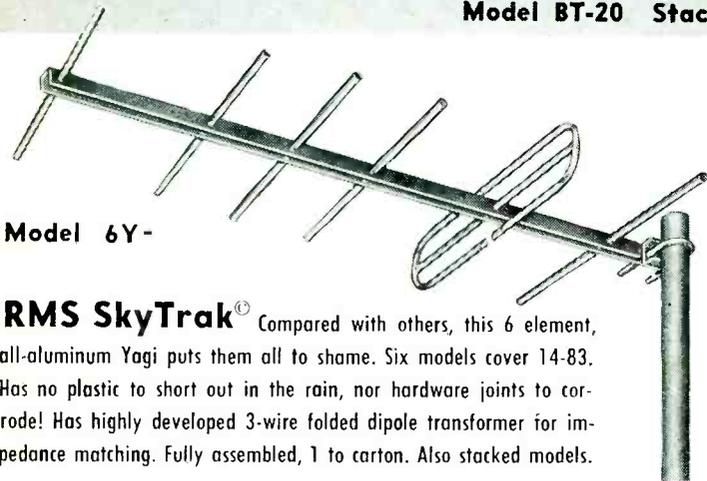
Universally  
accepted  
for uhf . . . excellent

gain over 14-83. Reflector is not wire  
mesh but actually tuned elements. 1 to a  
carton, preassembled. Bowtie  
element alone Model BT-5.



Note: Greater air gap at signal take off  
prevents shorting common with other  
makes after excessive rains. Crossarm  
is steel . . . not plastic!

Model BT-20 Stacked



Model 6Y-

RMS SkyTrak<sup>®</sup> Compared with others, this 6 element,  
all-aluminum Yagi puts them all to shame. Six models cover 14-83.  
Has no plastic to short out in the rain, nor hardware joints to cor-  
rode! Has highly developed 3-wire folded dipole transformer for im-  
pedance matching. Fully assembled, 1 to carton. Also stacked models.

SEE US AT PARTS SHOW BOOTH 586



RMS



2016 BRONXDALE AVENUE, NEW YORK 60, N. Y.

## Dollars and Sense

(Continued from page 81)

way in the past two decades. Yes, twenty years ago the only available replacements were more or less the overruns or surplus made for set manufacturers. Little was packaged or even labeled. There were few established prices, so you paid what the traffic would bear. Guarantees were simply unknown. Perhaps you got the part you needed; perhaps you didn't. More likely you picked up what you stumbled across and made it fit the job, somehow.

Well, that has changed. Today, there are branded parts properly packaged, sold at established list prices less trade discounts, and duly guaranteed. What's more, there are exceptionally complete listings in the catalogs of recognized parts manufacturers. Where standard or so-called universal replacements are feasible, you have minimum stock covering maximum requirements. But where replacements must be especially fitted, both mechanically and electrically, you have exact-duplicate numbers which correspond to the initial equipment. With recognized brands, you can readily select the correct replacement. There's no longer the grab-bag uncertainty of the early days; instead, you enjoy supreme confidence in getting the right replacement for your job.

And yet, yes, and yet, there are Service Men who would forget all this assurance of correct replacements, and even jeopardize their work for the sake of a few pennies supposedly saved. In my own field, with which I am most familiar, we come across surplus lots of capacitors offered at a fraction of the cost of standard items. It is a big temptation to pick up, say, metal-can 8-mmfd 450s at a quarter apiece. The bargain-minded Service Man may buy a couple of dozen and figure he's dollars ahead on such replacements. But, and this is the sad part of the story, does he really know what he's getting? I doubt it. As likely as not those bargain electrolytics may have been made several years ago. They may have been in storage for a long time. They may be dried out, far off in operating efficiency, and may no longer provide the necessary filtering performance.

Unless you know precisely what you are buying by way of bargains, especially test checking every item for performance, you just cannot afford to take a chance on these non-descript parts. Undoubtedly, behind the financial failure of many TV service contract firms, there was the widespread use of surplus parts. Unscrupulous service organizations have used quantities of these questionable parts only to have them break down in short order. And when the callbacks started to pile up, those service outfits just couldn't keep up with the extra work load.

So it's important to look at it this way: The average radio-TV service job calls for more labor than material. Therefore, there is not the margin of saving in the material end that there can be in the labor end. It follows, then, that one cannot afford to save mere pennies on parts when one is gambling with dollars in labor. And if you have callbacks to make good on defective parts you have installed, you are sunk in short order.

It is imperative to use standard, branded, properly packaged fully guaranteed parts every time. They will save you time and money and reputation every time.

This brings the distributor or jobber into the picture. You have an invaluable business collaborator in your jobber. He's in business to serve you with parts, materials and equipment. He has invested large sums of money in adequate stock, so that you can get the items you require in a hurry. Whether your jobber is one of the truck fellows who calls at your door with a remarkably complete stockroom on wheels, or whether he operates a nearby store from which you get your needs right over the counter, or again a distant outfit from which you can get your parts in a hurry by mail or express, that jobber is always at your beck and call. In addition to carrying a big inventory, the usual jobber can get nonstocked items from his factories in a big hurry. You must appreciate what the jobber is trying to do for you. Give him sizable orders where you can. Pay your bills promptly, for the jobber needs your money in order to pay his own bills.

If you work closely with your jobber, you'll find that he'll work closely with you, with mutual benefits to all concerned.

Customer relations are so important in any business. It is a positive fact that the finest advertising is the satisfied customer. By the very nature of the repair business, the Service Man is usually a suspect until he proves himself honest.

But, how is the customer to know that the TV set needed a new capacitor, a couple of new resistors, three tubes, and even a rebuilt picture tube, any more so than that the old jalopy needed a new clutch, a new distributor, and other things?

Fortunately, the auto repair boys have blazed the way for us in justifying repair bills. Many auto repair shops, especially those connected with car agencies, do a grand job of analyzing their charges for the customer. They often have cost sheets or billing forms supplied by car manufacturers or by form

printers, which indicate the various things that have been done, with corresponding parts and labor.

You should do likewise. Either use the forms provided by parts or set manufacturers, or again by form printers, or make up your own. It means much to the set owner if he has a breakdown of his bill, indicating what has been done, involving specified parts and materials, and with so many hours of labor.

Some Service Men and shops go so far as to return the replaced parts to the set owner, say in a bag or box. That's a perfect plan. There can be little cost argument when the set owner sees the old capacitor or the tubes taken out of his set.

Certainly those round-figure bills are cause for suspicion. When the bill says: "Repairing TV set, \$30," the set owner has every reason to be suspicious. But if that same job is billed in breakdown form, with replacement parts and tubes indicated, and with so many hours of labor, there is much less occasion for an argument.

In collecting for your service, there is the problem of the sort of guarantee that can be given on a repaired set. Many Service Men have no end of difficulty on this score. For with an old radio or TV set, there is always the chance that while the immediate defect has been cleared up, something else may go in a matter of days or weeks. Here is where customer enlightenment is again necessary. The customer should be told precisely what has been replaced or repaired, and that other troubles are apt to arise which, obviously, cannot be covered by this service charge.

Be truthful, explicit, and be practical! When you are called in to repair a radio or TV set, tell the owner what seems to be the trouble and how much it may cost to do the job. Of course there can be qualifications to cover any unexpected complications. But, by all means *point out that in an old set there can be other elements of trouble* which may not be covered by the immediate repairs.

There is ample profit in honest servicing. Charge fair prices. Don't cheat, for if you do, you will soon run yourself out of business.

As indicated earlier, a satisfied customer is your best advertising. Word-of-mouth advertising spreads rapidly in your locality. One satisfied set owner tells another and another until you are known as a dependable and honest Service Man.

Still, there are things you can do beyond dependable and honest servicing, to accelerate your business growth. Here are a few advertising ideas:

(1) Use a sign to indicate your place of business. Either use one of the signs supplied by a manufacturer, or have your own made up. A neon sign is worth many times its cost, because of maximum attention value by day and by night.

(2) If you have a store window, use it. Show typical replacement parts and tubes. If you can get hold of any historical stuff, display it. If you supply a breakdown of your jobs, make it known to passersby.

(3) By all means, be listed in the classified telephone directory. Many folks turn to that source of information when something goes wrong in their household.

(4) Join suitable local organizations where you can get to know people and they in turn get to know you. Social clubs, fraternal organizations, service clubs, churches, volunteer fire departments; such groups all help build up your business.

(5) Leave your business cards around freely. People will look up such cards when in need of service.

(6) Give talks before various groups, on radio and television. You can't beat that means of advertising your business. Get favorable mention in local newspapers.

(7) Make full use of stickers, folders, letterheads, billheads and other advertising helps supplied by set and parts manufacturers.

(8) By all means, use whatever window display material is offered by manufacturers. Ask your jobber for such promotional material.

(9) When you can afford to do so, run small-space advertising in the local newspapers; particularly classified advertising under suitable headings.

(10) Put effective signs on your truck or car, to let people know that you're about your business of keeping radio-TV sets perking.

Be a topflight radio-TV Service Man, of course. Know your servicing. But also pay attention to the *dollars and sense*, for you must make money out of your work. By all means learn all you can about *business*, for if you are on your own, you're in business. And even if you work for someone, you are still in business through your employer, and unless he makes money you are not going to get the salary you expect.

There is no great mystery about success in any line of endeavor. Get the right return for your work. Even though you may love your radio-TV activities, nevertheless make a good living out of your efforts.

# first and only

LIGHTNING ARRESTOR  
SPECIALLY DESIGNED FOR

# UHF



MODEL  
LA-UH3

SEE US AT  
PARTS SHOW  
BOOTH 586

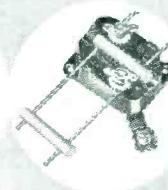
takes all transmission lines



TWIN LEAD



TUBULAR  
LEAD



OPEN LINE

By use of specially designed filter networks, r.f. is isolated from ground potential and the unit effectively operates to safeguard against static and lightning charges. LA-UH3 is another industry standard engineered by RMS... largest producer of TV lightning arrestors.

**Protect installations—customers—and your reputation. Ask your Jobber for RMS UHF lightning arrestors.**

WRITE FOR NEW CATALOG

# RMS

2016 BRONXDALE AVENUE, NEW YORK 60, N. Y.

# ERIE 413

## HIGH VOLTAGE CERAMICONS®

Thousands and thousands are in use . . .

**and not one has ever failed**



**ERIE 413**  
is fast becoming  
**THE REPLACEMENT**  
for high voltage  
TV filter  
applications

The ERIE 413 High Voltage Ceramicon is an innovation in capacitor design and has had wide acceptance by servicemen everywhere.

The Reason . . . ONE BODY, plus the correct combination of replacement terminals, permits any serviceman to carry a minimum stock, but at all times to have the correct replacement available. It's as simple as that and greatly reduces inventories. The illustrations on the left tell the story.

*ERIE components are stocked by leading electronic distributors everywhere.*

**ERIE**  
RESISTOR CORP.

ERIE RESISTOR CORPORATION . . . ELECTRONICS DIVISION

Main Offices: **ERIE, PA.**

Sales Offices: Cliffside, N. J. • Philadelphia, Pa. • Buffalo, N. Y. • Chicago, Ill. • Detroit, Mich. • Cincinnati, Ohio • Los Angeles, Calif.

Factories: **ERIE, PA. • LONDON, ENGLAND • TORONTO, CANADA**

## Improving 'Scope

(Continued from page 74)

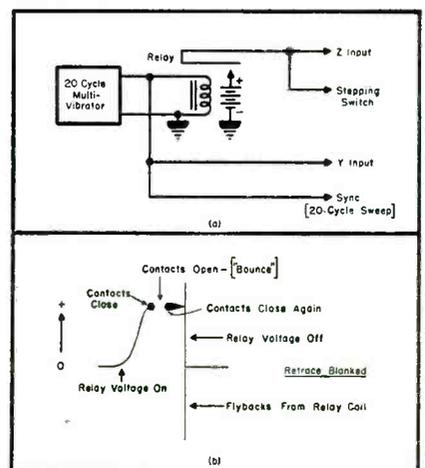
short gaps if the pulse is — going. It will be noted that the Z-axis input responds only to change of potential, and not to steady potentials. In consequence, the trace change resulting from a positive two-volt change in one microsecond at the Z-axis input will be the same whether the actual voltage changes from 0 to + 2, or from 1,000 to 1,002.

### Typical Problem

To illustrate a typical problem solved by use of a 'scope with a Z-axis input, let us investigate the remote relay in a demand type remote indicator, an instrument which supplies specific information when you dial for it. Suppose the complaint is *wrong numbers*, and the difficulty seems to be in the sensitive relay which is operated by the weak dialing impulses at the far end of the line, and which, in turn, operates the stepping switch.

For this check, the sensitive relay is operated at a reasonably fast rate from a multivibrator, so that a composite 'scope pattern is present. Connections are as in Fig. 5 (top); 'scope pattern (below) indicates that the contacts make, open, and then make again at each closure of the relay circuit. This is the common trouble known as contact bounce, and can be corrected (to a point where it causes no trouble) by adjustment of contact spacings and spring tension. In this particular study, the flybacks from the stepping switch coil augment the negative-going pulse produced by opening the circuit. When the contact bounce is reduced to a tolerable value, the Z-axis pips are replaced by a single tadpole-shaped bead, whose length depends upon the

Fig. 5. Connections for detecting relay misbehavior (a), and pattern indicating contact bounce (b).



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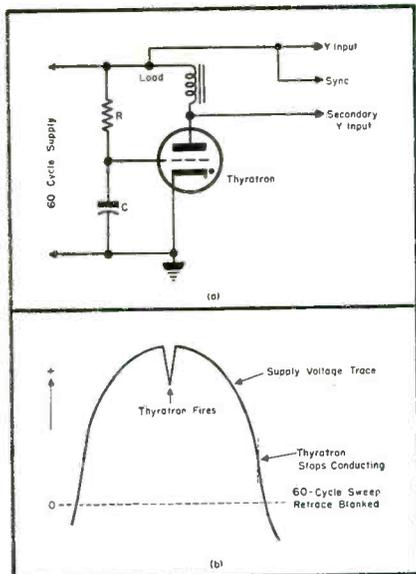


Fig. 6. Circuit used to determine firing point of thyatron appears in *a*. At *b* is a trace showing thyatron operation.

*rc* characteristics of the Z-axis circuit.

The important technique here is the cycling of what is normally a *one shot* operation, so that it can be investigated by use of an ordinary 'scope. Were cycling impossible, use of a single sweep 'scope, and probably of a synchronized camera, would be necessary.

Use of the 'scope having one additional Y-axis (vertical) input, either internal or external, to determine the firing point of a thyatron, is illustrated in Fig. 6. Here, the thyatron is operated directly from the *ac* line, and its operating point is determined by the *rc* constants of the grid circuit. This type of control is used in many variable output power supplies, and in automatic spot welding equipment. For proper operation, the firing point must be set at a definite point on the supply cycle. If the secondary input is separated from the 'scope deflection plates by an odd number of stages, phase reversal will occur (in most circuits), so that a minus-going pulse will produce an upward spike on the observed trace. In many circuits of this type, it is desirable to replace the load (such as a motor, transformer, or filter) by a pure resistance, to reduce flyback troubles.

#### Timing Oscillator

Use of a timing oscillator to analyze a complex waveform is outlined in Fig. 7 (p. 108), where the current through a neon lamp, used as an *rc* oscillator, is applied to the Y input, and a 1000-cycle repeating pulse to the Z input. Beads on the resultant trace are 1-millisecond apart, so that duration of each part of the complex wave can be determined by inspection. Because it is not always possible to synchronize both the com-



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plex wave and the timing pulses, it is common practice to synchronize the complex wave to obtain a stationary pattern, and then to inject timing pulses from a calibrated oscillator at the Z-axis input. The pulse repetition frequency is varied until a stationary pattern is obtained, and the time between pulses, which is the reciprocal of the *prf* in cycles per second, is computed from the oscillator calibration.

In making this measurement, it was necessary to insert a resistor,  $R_1$ , in series with the neon bulb, to obtain a

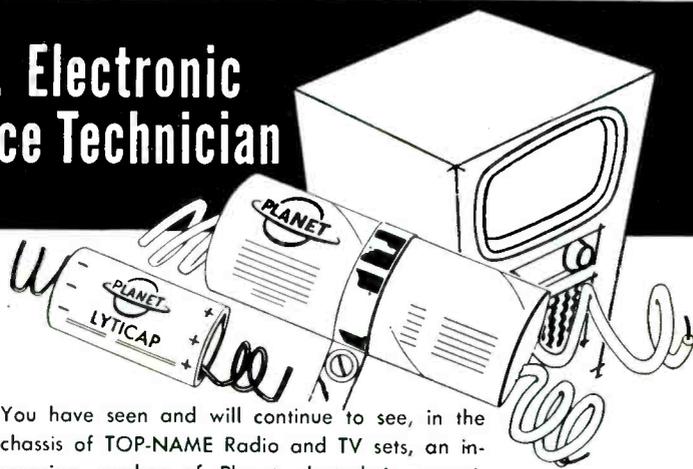
measurable output. Actual tube currents can be determined by applying Ohm's law to the voltages obtained, due allowance being made for the effect of the inserted resistor.

#### Hum Reduction

One of the most annoying and serious difficulties encountered in the use of 'scopes is the problem of hum at line frequency and many of its harmonics. Despite some rather fantastic

(Continued on page 108)

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## Improving 'Scope

(Continued from page 107)

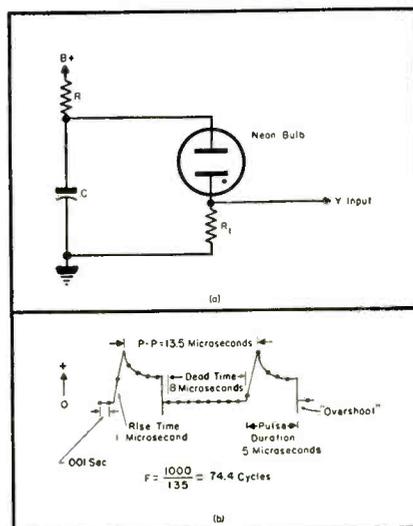
claims to the contrary, hum cannot be eliminated entirely in or near any locality which is wired for *ac*. Hum can, however, be reduced to an entirely negligible value, in most instances, at a relatively low cost.

Hum is introduced into conventional electronic devices through the plate and filament supplies, and by electrostatic and electromagnetic pickup. Plate-supply problems, already discussed, are usually the easiest to solve.

Hum introduction through the filament circuits is a frequent cause of trouble, even when heater-type tubes of modern design are used. Methods of reducing filament-introduced hum are shown in Fig. 8. In *a* of this figure is shown a fairly common filament circuit, which uses a minimum of wire, and may introduce a maximum of hum, because it is not only unbalanced with respect to ground, but one side of the circuit, not at ground potential, is shared with the return circuits of other components. At *b* is shown another common filament circuit, which works quite well at times, but becomes erratic if and when the tubes develop heater-cathode leakage. This circuit can be stabilized by grounding the transformer center tap, as in *c*; grounding one side, as in *d*; or, if there is no center tap, grounding a resistive tap placed across the circuit. This can be a fixed center-tapped resistor, or a small potentiometer, which is adjusted for minimum hum. Circuits *c* and *e* are theoretically better than circuit *d*; but the difference in performance is slight as long as all the tubes are good.

When hum must be reduced to an absolute minimum, the diode effect

Fig. 7. Use of a timing oscillator to analyze complex waveform. At *a*, in circuit, 1000-cycle Z input retrace is blanked. Trace and analysis is shown in *b*; sweep is about 38 cycles.



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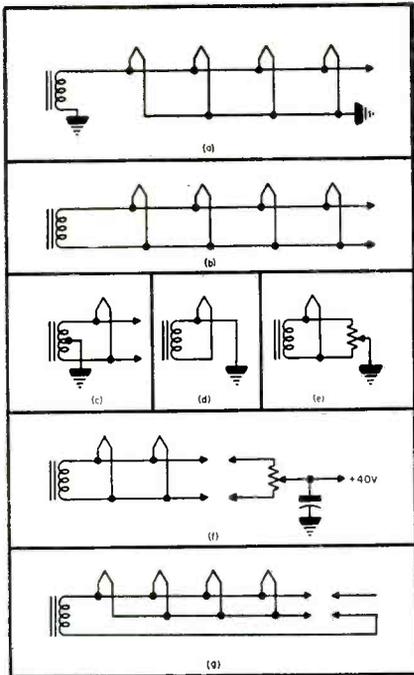


Fig. 8. Various filament circuits. At *a* is common type of filament setup which uses a minimum of wire, and may introduce a maximum of hum, because it is not only unbalanced with respect to ground, but one side of the circuit, not at ground potential, is shared with the return circuits of other components. Circuit shown at *b* can become erratic when the tubes develop heater-cathode leakage. This circuit can be stabilized by grounding transformer center as shown in *c*, or grounding one side as in *d*. Circuit in *f* can be used when hum must be reduced to absolute minimum. The *g* arrangement will also be found to be effective in hum reduction, because it provides equalization of currents in the filament wires, which also provides each tube with the same voltage.

between cathode and heater of the tubes can be biased out by keeping the filament center tap at an appreciable voltage, about 40, and positive with respect to ground, as in *F*. This arrangement is also very satisfactory in preamp and similar equipment.

Hum from the filament circuit can also occur due to coupling between the filament wires and some part of a signal circuit. As the magnetic field of a wire is a direct function of the current carried, equalization of the currents in the filament wires, which also gives each tube the same voltage, as in Fig. 8g, sometimes reduces hum markedly.

Filament wires should be run as twisted pair, to cause partial cancellation of their magnetic field, and they should not be cabled with any signal circuits, or filtered *dc*. Shielding of filament leads is usually not necessary, but sometimes brings about a reduction in picked-up hum. Copper tubing is very effective for this purpose. Although it is not commonly realized, wires carrying *ac* are in continual mechanical oscillation, and may, in a few instances, produce microphonics by mechanical coupling. A No. 20 wire, for example, carrying 3 amperes, and run in close proximity to a steel



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chassis, may vibrate at line frequency, or some low-numbered harmonic of it, with an amplitude of as much as .005", which is easily observable under a low-power microscope.

In most instances, hum due to filament connections can be reduced to a negligible value by following the foregoing suggestions, only until the hum with *ac* filaments is reduced to about the same level as is obtained when the filaments are heated with *dc*. Beyond this point effort will be wasted, as the remaining hum will not be coming from the filament circuit.

Hum due to electrostatic or electromagnetic pickup is more difficult to

eliminate, although the cure for it is the correct amount of shielding in the right place. Electromagnetic shielding, which provides a *magnetic short circuit*, is usually composed of soft iron, and is effective for most locations except the immediate vicinity of the *crt*. Electrostatic shielding, which limits the extent of an electrostatic field, is usually made of thin copper, and must be effectively grounded, or it will acquire a charge of its own, tending to increase, rather than to eliminate, electrostatic coupling.

[Additional Improvement Data,  
Next Month]

SERVICE, MAY, 1953 • 109



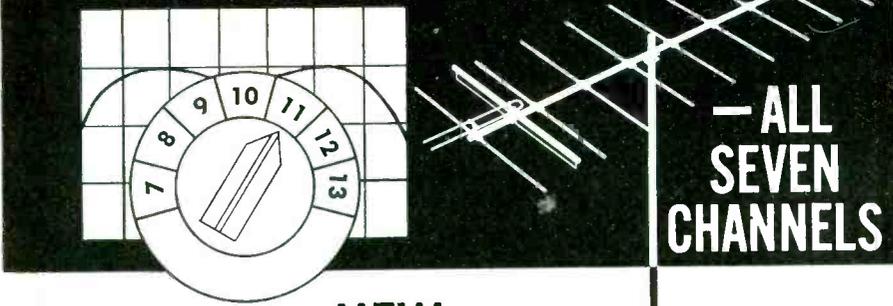
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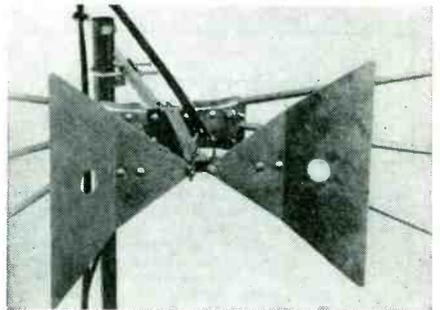
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## TV Antennas

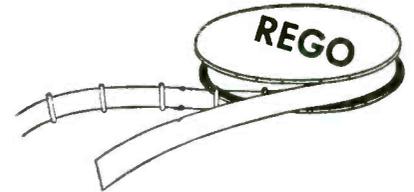
(Continued from page 67)

place to mark channel numbers. The antenna switch and ratchet are located in a larger unit to be attached to the mast near the antennas.

Switch has been designed to work with any combination of antenna installations, such as multiple antenna arrays on a single mast, antennas on separate masts, with various channel yagis, and for combination *uhf* and *vhf* antenna installations. Three models are available for two, four and seven positions.



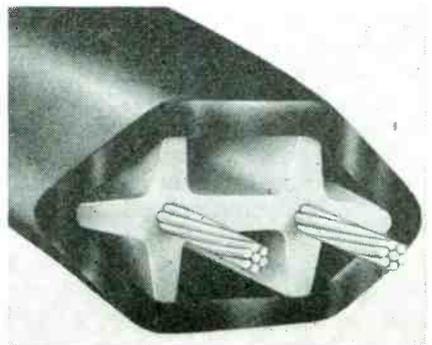
A *uhf* antenna adaptor; an all-channel, *uhf* triangular dipole. A preassembled unit, it can be fastened to the front end of *super fan*. The distance is said to be pre-fixed, and the *uhf* dipole is veed forward so that it is always parallel to the *vhf* fan elements which function as a sheet reflector. Designed for use with separate *vhf* and *uhf* leads to TV set or converter. (Model 415, Econo-Dapter; Channel Master.)



A 300-ohm transmission line with No. 18 copper or copperweld, and polystyrene spacers 4½" apart. (Rego Insulated Wire Co.)

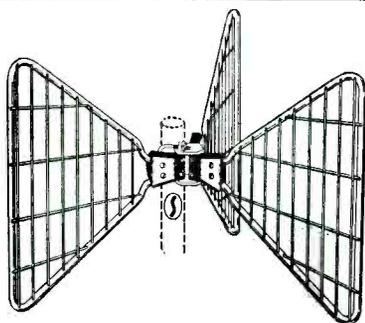
(Below)

Tubular twinlead for *uhf*. Transmission line has leads spaced several millimeters within the tube equidistant from the outer insulation. Magnetic field between leads said to be unaffected by moisture or salt which may condense on the outer covering. Ends may be sealed by heating with a match. (SynKote Ultratube; Plastoid Corp.)





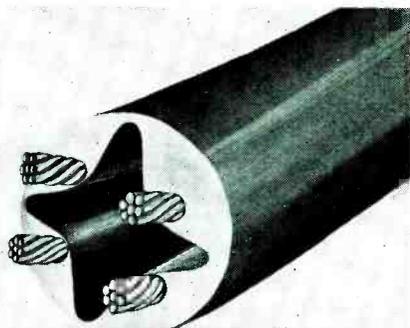
Ben Friedman, Eugene Ross and Joseph Friedman, of Imperial Radar and Wire Corp., with first run of 6-strand prime, galvanized guy wire, prepared in 100' continuous coils, totaling 1000' to a standard package. Protective finish on the wire strands is said to offer maximum resistance to corrosion.



Bow-screen uhf antenna for channels 14 to 83 and vhf channels 7 to 13. Has two fan type galvanized elements. Other features are a thermostetting plastic mount, and U-clamp mast mounting. (UHF-2; Snyder.)

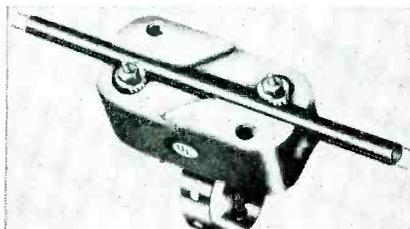
(Below)

Four-conductor tubular transmission line claimed to have approximately 300 ohms between every two of four conductors. Diameter of transmission line, approximately 3/8". Polyethylene used for wall and bead insulation. Air between every two of the four conductors. Has four conductors consisting of seven strands of No. 28 copper wire. Attenuation loss said to be less than 4.1 db per 100' at 900 mc when wet. (All-Channel Corp.)



(Below)

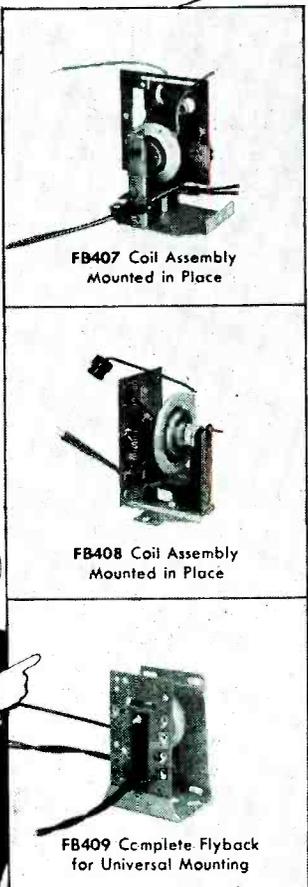
Another type of uhf lightning arrester that is claimed to minimize stray capacitance and inductance. Incorporates patented UL-approved strain-relief lips that prevent twisting or ripping of tubular downlead against saw-tooth contact washers. Constructed of porcelain. (Model AT 103; JFD.)



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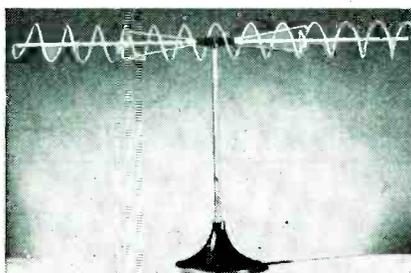
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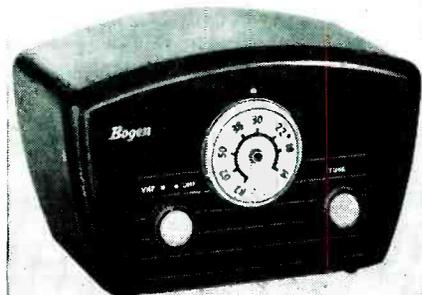
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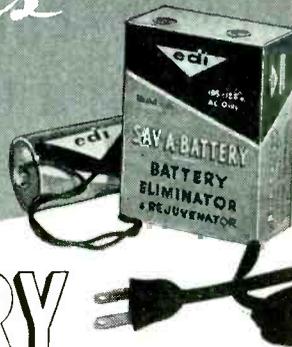
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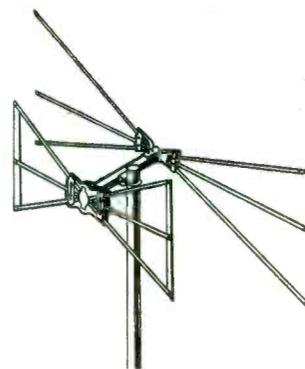
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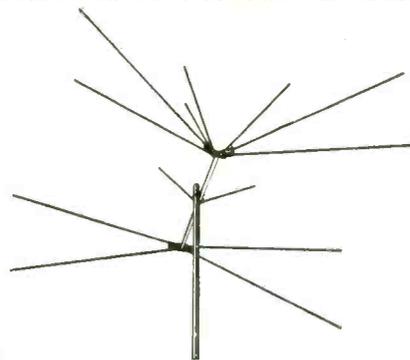
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## TV Antennas

(Continued from page 111)



UHF bow-tie featuring open design. Available in single and two-bays. (Model 8950 and 8952; Television Hardware Manufacturing Co., division of General Cement.)

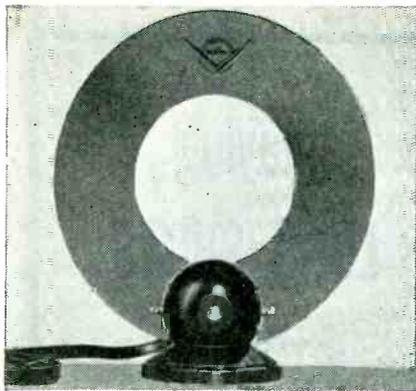


A *uhf-vhf* array, said to have one major in-line lobe, with constant center impedance. Array can be stacked up to four bays. Extension of the *conical-V-beam* theory is claimed to be effected by mounting onto the standard head of two additional splines with decreased vortex, to compact and add-in-phase *uhf* voltages into one major lobe. The *hi-V* reflector is mounted on the same cross arm in back of the *vhf* dipoles, to reinforce the pattern and increase the forward gain while increasing the front-to-back ratio. Transition from *vhf* to *uhf* is said to be automatic. (Duo-Band Conical-V-Beam, model 410; Telrex.)

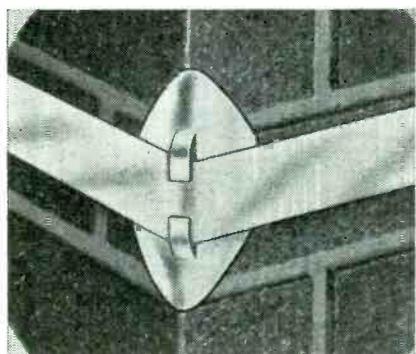
(Below)

All-channel 3-tube *Tenna-Top vhf* TV booster. Features low-noise broadband circuit. Mounts at antenna ahead of the lead-in. Self-tuned to all *vhf* channels. Turns on and off with TV receiver switch. Junction control box placed at TV set has *hi-lo* gain switch. Built-in tapped transformer said to permit operation up to 3000' with high quality lead-in. Single twinlead line carries power up and brings the signal down. (Model 3012-A; Electro-Voice, Inc.)





Indoor uhf full-wave flat-loop antenna. Model is ten inches high and nine inches wide, and weighs under a pound. The loop is of rose gold-colored anodized aluminum, with a mahogany phenolic base which is weighted to prevent tipping. (Buliseye; Radion Corp.)



Chimney mount corner guard, a formed, diamond shaped, aluminum protector, that fits on to the chimney corners under the chimney mount banding. Guard, it is said, will prevent chipping of chimney corners, prevent fraying of chimney mount banding, and permit tightening of chimney-mount banding uniformly by providing a smooth surface at each corner while banding slack is taken up. Has a snap-in feature which is claimed to allow installation of guards at each corner, after mount is partially installed. (South River Metal Products Co., Inc.)

Antenna rotator styled with an in-line silhouette. Said to have a unique new gear train, positive antenna stop, weather-resistant finish, and will support over 200 pounds. Control console, available in heather green or cordovan mahogany, has a control lever with both compass and numerical reference points, control circuit that requires no screwdriver adjustment, and a dial covered with a glass window to avoid electrostatic charging. (VEE-D-X.)



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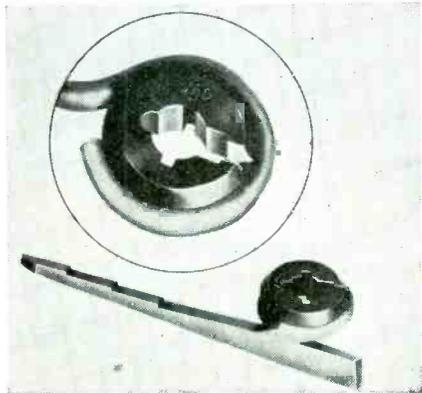
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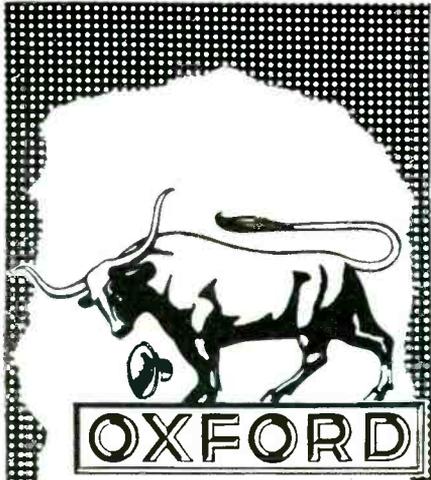
Universal insulator grommet for all TV down-leads. Polyethylene insert secures both tubular and ribbon lead as well as oval, rectangular and coax. (NUT350; JFD.)



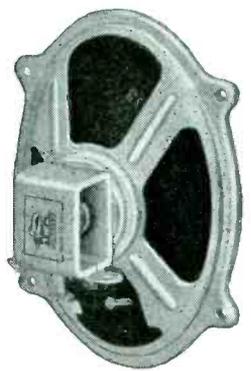
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### MALLORY PHONO-MIKE JACKS

Phono and microphone watersealed jacks, *WS-1A* and *WS-A2B* have been developed by P. R. Mallory and Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind.

Jacks are said to be capable of withstanding a six-foot head of water for a 24-hour period. Type *WS-1A* is a phono jack with terminals for one circuit and ground. Type *WS-A2B* is a microphone jack with terminals for two circuits and ground. Dielectric strength of jacks is 500 volts rms with contact resistance of .02 ohm maximum; insertion force is approximately 6 pounds.

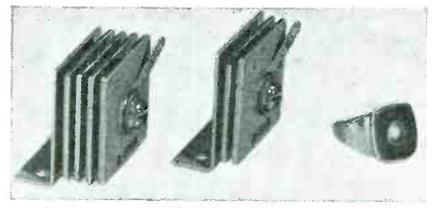
\* \* \*

### INTERNATIONAL RECTIFIER SELENIUM REGULATORS

A series of selenium regulators, *D-568*, *D-923* and *D-1064*, for the regulation of relatively low *dc* voltages, have been developed by the International Rectifier Corp., 1521 E. Grand Ave., El Segundo, Calif.

Type *D-568* is recommended for the regulation of *dc* voltages in the order of 1.5 volts. Unit consists of two specially processed selenium plates connected in series on a mounting bracket. For operation, the selenium regulator is connected in shunt with the load; a voltage dropping resistor is connected in series with the source voltage and the load, and regulation is accompanied by utilizing the forward characteristic. Voltage across the voltage-dropping resistor varies inversely with changing load current and the desired voltage is maintained.

Types *D-923* and *D-1064* are recommended for regulation of 2 and 3 volts *dc*, respectively.



International Rectifier Selenium Regulators

\* \* \*

### ELECTRONIC DEVICES BATTERY-AC CONVERSION UNIT

A device, *Sav-A-Battery*, which is claimed to convert portable battery-type (personal) radios for *ac* operation has been developed by Electronic Devices, Inc., 429 12th St., Brooklyn 15, N. Y.

Unit is also said to rejuvenate weak *B* batteries.



E-D Sav-A-Battery

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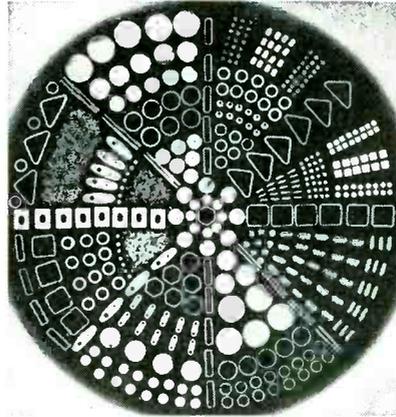


4055 Redwood Ave. Venice, California

## KESTER SOLDER FORMS

Tin-lead alloy forms, with or without a flux, available in any required shape such as a ring, disc, pellet, washer or spring, and known as *Solderforms*, have been developed by the Kester Solder Co., 4201 Wrightwood Ave., Chicago 39, Ill.

Other metal components can be included if required, as in the case of soldering germanium diodes, where silver is added to the basic alloy. Units can be soldered with flame, carbon resistance, oven, hot-plate, induction heating, infrared, or a conventional soldering iron.



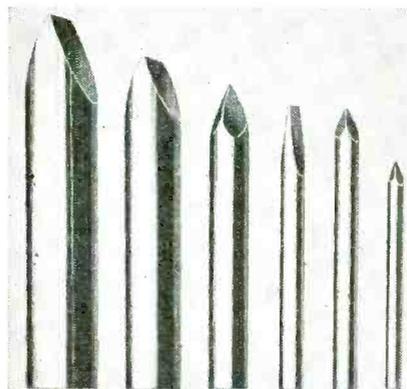
Kester Solderforms

\*\*\*

## AEH PLATING PROCESS FOR SOLDERING TIPS

An improved process for iron-plating industrial soldering iron tips, which is said to increase the life of soldering tips, in production-line use, up to 100 hours, has been announced by the American Electrical Heater Co., Detroit 2, Mich.

New method of electroplating deposits a 2"-long coating of commercially pure electrolytic iron on the tip. Further treatment obviates oxidation and corrosion, and in addition, prevents amalgamation of the solder and copper.



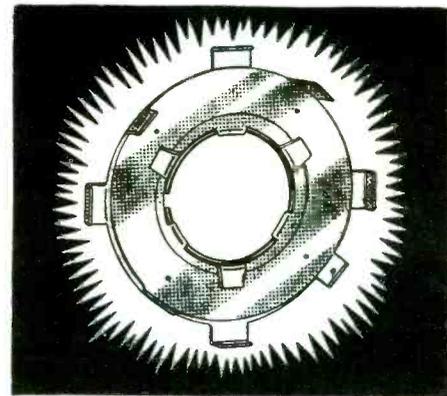
American Electrical Heater Soldering Tips

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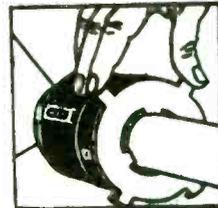
## TRANSITRON GOLD-BONDED DIODES

Gold-bonded germanium diodes, that are said to feature a back resistance greater than 1 megohm at 100 volts inverse, as well as high forward conductance, have been introduced by Transitron Electronic Corp., 407 Main St., Melrose, Mass.

Diodes are mechanically interchangeable with clip-in types, and are also available in standard grades.



## CENTER TV PICTURES IN 3 SECONDS with the **PERFECTION BeamaJuster**



- 1 Snap BeamaJuster on back cover of tube yoke. (Fits any standard yoke and any size tube.)
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## PYRAMID VOLT-AMP TESTER

A snap-around volt-amp tester, *Amprobe Junior*, is now available from the Pyramid Instrument Corp., Lynbrook, N. Y.

Tester features an ammeter which measures current and voltage instantly without shutdowns or ammeter connections. To measure current without ammeter connections, trigger-operated jaws are snapped around one conductor (insulated or uninsulated). To measure voltage, test leads are plugged into instrument and clipped to load.

Available in four models: model 10, 0-10 amps ac, 0-125/250 vac; model 25, 0-25 amps ac, 0-125/250 vac; model 50, 0-50 amps ac, 0-125/250 vac, and model 100, 0-100 amps ac, 0-125/250 vac.

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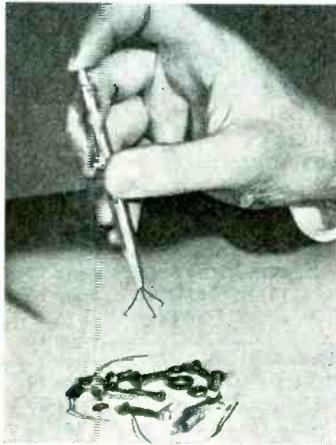
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**WIN PICKUP TWEEZERS**

A stainless-steel pickup tweezer, designed so that it can pickup oddly shaped and hot objects, has been developed by Win Sales Co., Dept. 37-H, P.O. Box 257, Forest Hills, N. Y.

Depressing the top plunger causes three hooked, steel fingers to extend from the tip and flare out. Releasing the plunger causes them to withdraw towards the tip and close together. Fingers extend out to approximately 1 1/4" between tips.



Win Sales Tweezers

\* \* \*

**BAFFLES AND REAR DECK AUTO KITS**

A series of wall baffles and a rear deck auto kit, have been introduced by Utah Radio Products Co., Inc., Huntington, Indiana.

Wall baffles, sold under the trade name *Utone*, feature morticed joints, secured with waterproof glue. They are self mounting, needing no metal brackets for installation. Baffles are available in four sizes, accommodating 6", 8", 10" and 12" speakers and come in red or brown mahogany finish, or futuristic blonde finish. All sizes are available in natural wood, unfinished.

The rear deck auto kit, includes a speaker with its own off and on switch, permitting it to be turned on or off in conjunction with the front speaker, or operated independently of the front speaker. In addition, it has its own volume control to enable those in the back seat to get the amount of sound they desire.

Speakers all have rotated pots. Flange is scored so it can be broken off to simplify installation.

Kit has been designed to fit all makes of cars.

\* \* \*

**TELECHRON CLOCK-RADIO TIMER**

A timer, which is said to simplify clock-radio operation and alarm setting, has been introduced by the Telechron Department, General Electric Co., Ashland, Mass.

Timer incorporates a musical wakeup sleep switch and alarm signal, and has two knobs, instead of three, to make demonstration and operation easier. Left knob, with off, on and sleep positions, controls radio and pulls out for automatic go-to-sleep-to-music and wake-up-to-music operation. Right knob sets alarm and pulls out for signal alarm approximately 10 minutes after radio turns on. Unit has a separate alarm-set hand.

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IMPEDANCE MATCHING ..... Page 9

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**ERSIN MULTICORE SOLDER**

Multicore solder, featuring a *comsol* alloy said to have a melting point of 296° C., is now available from Multicore Sales Corp., 164 Duane St., New York, N. Y.; *comsol* is a special soft silver solder.

Solder may be applied either simultaneously with the soldering iron or after the components have been treated by a torch or other means.



**LABELON SELF-WRITING TAPE**

A plastic *write-on-it* tape, that sticks without moistening to any clean, smooth surface, has been introduced by Labelon Tape Co., Inc., 450 Atlantic Ave., Rochester 9, N. Y.

Information regarding circuit, including number, voltage, amperage, phase, *ac* or *dc*, can be noted on a strip of the tape with a sharp instrument. Tape is claimed to strip off cleanly.

Writing appears *beneath* a transparent outer layer of plastic which is said to protect the writing against smudging, grease, dirt and most liquids.

**WILLIAMS PUNCHES AND CHISELS**

An expanded line of punches and chisels, with the addition of cape, diamond-point, round-nose and extra-long cold chisels, and pinch bars, has been announced by J. H. Williams and Co., 400 Vulcan St., Buffalo 7, N. Y.

Forged from octagon alloy steel.



**DIVCO SOLDERING FLUX TEST KIT**

A soldering flux test kit, that includes 24 test quantities of fluxes, thinners, residue removers, and chemical wire strippers, has been announced by the Division Lead Co., 836 W. Kinzie St., Chicago 22.

Kit also includes a soldering flux chart, No. 52, which describes each flux and its application, rates it for use in soldering more than 20 metals and alloys, and gives relative solderability, solvents for residues, dielectric strengths, corrosion resistances, and other facts.



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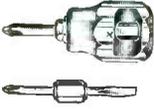
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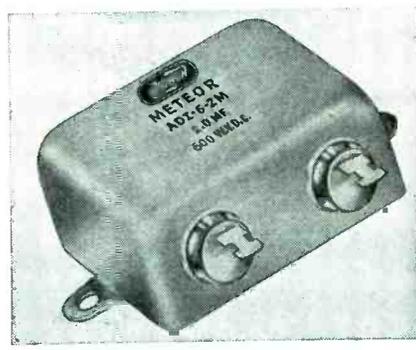
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**ASTRON PAPER CAPACITORS**

A paper capacitor, *Meteor* type ADZ, that is said to operate from 65° to 125° C without derating, has been announced by Astron Corp., 255 Grant Ave., East Newark, N. J.

Available in the Jan-C-25 bathtub case styles CP-53 to CP-55, capacitors are furnished with glass-to-metal terminals to insure hermetic seal and dependable operation at high temperatures and altitudes, and are supplied only in the extended foil, non-inductive type construction. Multiple as well as single section capacitor construction is available.



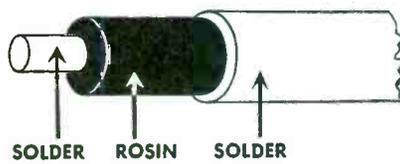
Astron Meteor

\*\*\*

**ALPHA ROSIN-FILLED SOLDER**

Rosin-filled solder, *Gen-Tri-Core*, consisting of a solder wire coated with rosin, over which is formed the outer solder sleeve, has been announced by Alpha Metals, Inc., 56 Water St., P.O. Box 34 Bergen Station, Jersey City 4, N. J.

Solder rosin is said to be non-corrosive and electrically non-conductive.

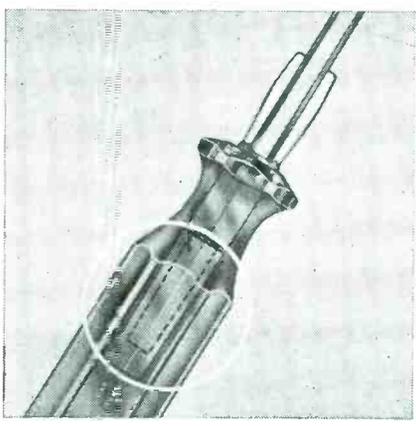


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**UPSON SCREWDRIVERS**

Screwdrivers, *Hold-E-Zee*, that are said to have an increased resistance to torque and penetrating force, due to a new blade-locking method, have been announced by Upson Bros., Inc., Rochester 4, N. Y.

Construction method features a precision-molded hexagonal block of plastic which drive-fits into a hexagonal cavity in a transparent insulating handle. Plastic insert contains a hexagonal cavity into which the screwdriver blade fits.



**NEW DATA**

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**Mandl's Television Servicing**

THE NEW REPRINT of this widely used service guide includes new data on the cascade tuner, servicing of newer types of i.f. systems, automatically focused tubes, UHF station listings and antenna calculations, transistors and other recent developments. Everything you need to know for quick, efficient servicing is given here in the most practical, useful way. You'll learn simple signal tracing procedures, how to improve reception in fringe areas, how to use all test equipment, and many trade tricks for diagnosing troubles accurately and in minimum time. All faults likely to occur, including those hard-to-find troubles, are dealt with; there are hundreds of helpful illustrations, and a complete master trouble chart to help you pin point the cause of trouble from the symptoms and turn quickly to the specific directions for correcting it.

**BASIC TV BOOKS**



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By Matthew Mandl

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- TV & FM Antenna Guide, \$6.25
- Hearing Aids, \$3.50
- TV for Radiomen, \$7.75

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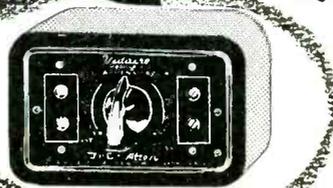
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**G AND H WOOD TO MAKE  
KLIPSCH SPEAKERS**

An exclusive license agreement, between Klipsch and Associates and G and H Wood Products, for the manufacture and distribution of a Klipsch designed loudspeaker enclosure line has been announced. Units will be made under the Klipsch Rebel IV patent. They will be marketed through parts-distributors in assembled and kit form.

\* \* \*

**ARROW ELECTRONICS OPENS  
HEMPSTEAD STORE**

Opening of a store at 215 Front St., Hempstead, L. I., N. Y. has been announced by Arrow Electronics, 82 Cortlandt St., N. Y.

Hempstead store is managed by Frank Gallagher.

\* \* \*

**PIONEER BUILDING PICTURE-TUBE  
PLANT**

A plant to manufacture TV picture tubes, is now being built by Pioneer Electronics Corp. Santa Monica, Calif.

Located in West Los Angeles, near the Santa Monica city line, plant will have 30,000 square feet of enclosed space and 20,000 square feet of paved ground for parking, loading and for potential expansion. Laurence M. Parrish is Pioneer's prexy.

\* \* \*

**AEROVOX BUYS CINEMA  
ENGINEERING**

Aerovox Corp., New Bedford, Mass., has purchased the Cinema Engineering Co., Burbank, Calif., which will become the Cinema Engineering Division of Aerovox.

Plans call for retention of the present operating staff, with A. C. Davis, formerly owner and chief engineer, becoming divisional manager, and James L. Fouch, general manager, continuing in that capacity.

Cinema is presently building a new plant at 1100 Chestnut St. with nearly 20,000 square feet of floor area. Its location currently is 1510 W. Verdugo Ave.

**AT IRE MEETING**



Le Roy Lowe, Radio Parts Equipment Co., Philadelphia, (center) at the recent IRE convention in N. Y. City, watching Len Mazel, ITI commercial sales manager, demonstrate the IT-105RB, suitable for vhf and uhf measurements, which can be powered either by 115 v ac or by a portable IT-116B rechargeable battery pack. Bob Karet, mid-western rep is at left.

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| 12-H1    | 262 KC INPUT I.F. TRANS.                                  | \$1.50    |
| 12-H2    | 262 KC OUTPUT I.F. TRANS.                                 | 1.50      |
| 12-H6    | 262 KC OUTPUT I.F. TRANS. WITH<br>DIODE FILTER CAPACITORS | 1.59      |
| 12-C1    | 455 KC INPUT I.F. TRANS.                                  | 1.32      |
| 12-C2    | 455 KC OUTPUT I.F. TRANS.                                 | 1.32      |
| 12-C6    | 455 KC OUTPUT I.F. TRANS. WITH<br>DIODE FILTER CAPACITORS | 1.41      |
| 1463     | 10.7 MC INPUT OR INTERSTAGE F-M TRANS.                    | 1.65      |
| 1464     | 10.7 MC F-M DISCRIMINATOR                                 | 1.98      |
| 1465     | 10.7 MC F-M RATIO DETECTOR                                | 1.98      |



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by J. W. Miller Company.

\*Manufactured under "K-TRANS" Patent  
Numbers 2435630 and 2429468 of Automatic  
Manufacturing Corp.

**J. W. MILLER COMPANY**  
5917 S. MAIN ST. LOS ANGELES, CALIF.

### RIDER OFFERS TEST RECORD WITH HI-FI BOOK

An arrangement between John F. Rider  
Publisher, Inc., and Columbia Records,  
Inc., permitting an exclusive 7" lp record  
offer to purchasers of the book, *High  
Fidelity Simplified*, by Harold D. Weiler,  
has been announced.

The test record, obtained through a  
special coupon included with the book,  
and accompanied by twenty-five cents,  
entitles the sender to the record.

### GRAND PRIZE WINNER



James T. Roberts, Kearney, Nebraska, grand  
prize winner in the Burgess portable radio bat-  
tery '52 prize contest, receiving keys to '53  
Chevrolet he received as his award, from L. H.  
Harriss of the Burgess Battery Co.

### AT ANTENNA PLANT OPENING



On doorsteps of the newest addition to the JFD  
Manufacturing Co., at 6215 15th Ave., two  
blocks from the main office, in Brooklyn, N. Y.  
The new, all-brick building provides 140,000  
square feet of additional space for the firm. Left  
to right: Morton Leslie, assistant sales manager;  
James C. Sarayiotos, ad manager; Ed Finkel,  
sales manager; Burton Browne, head of Burton  
Browne Advertising, Chicago agency for the com-  
pany, and Al Finkel, general manager.

### BOOSTER PROMOTION



Earl H. Kirk, distributor sales manager for  
I.D.E.A., Indianapolis, Ind., manufacturers of  
Regency vhf boosters and uhf converters, display-  
ing booster promotional brochure to Mary Hurn  
of Burton Browne Advertising, Chicago, agency  
for the firm. Miss Hurn is holding the first of  
the card-of-the-month sales tips, also part of  
the Regency booster sales campaign.

### UHF ANTENNA TELECAST



KXLY's Norman Hawkins interviewing Martin  
Bettan, RMS engineering head, recently on sta-  
tion's public service program beamed to 20,000  
set owners in Spokane area. Bettan explained  
tv reception problems in simplified terms. Fol-  
lowing the televised program, Bettan conducted  
a forum at the Ridpath Hotel in Spokane. Over  
500 Service Men participated.

# TOP TV SERVICE REQUIRES TOP Quality COMPONENTS

and for  
TOP QUALITY  
ask for

# Elmenco Paper Tubulars



That white, cer-  
amic-cased paper  
tubular is appear-  
ing in more and  
more TV cir-cuits  
as new models roll  
off the lines . . .  
your assurance that  
this unit excels  
those which pre-  
ceded it.

Follow the lead of these manufacturers by  
offering your customers complete satisfaction  
with components which will require no fur-  
ther replacement during the life of their  
sets . . .

**Air-Tight,  
Water-Tight,  
Yet  
Reasonably  
Priced**

Just  
Wire In  
and  
Forget.

And you can keep  
a stock of Elmenco  
Capacitors on hand  
without worry of de-  
terioration on the  
shelf. They have un-  
limited shelf life.

Contact your local job-  
ber for full informa-  
tion and ask him about  
our handy paper tu-  
bular kits.



**STANDARD  
PAPER KIT**  
5 Each  
of 25  
Capacities

.001 to .1—600V; .25—400V & .5—200V  
List Price \$37.50

1000 Volt Paper Kit 5 Each of 17 Capacities  
.001 to .05 MFD  
List Price \$35.00

**ARCO ELECTRONICS INC.**  
103 LAFAYETTE ST., N. Y. 13, N. Y.

**TOMORROW'S ANTENNA**

Patented

**TODAY**

**NOW! 32 ELEMENTS**

**THE SKYLINE UHF-VHF**

- ONE LEAD-IN
- ALL CHANNELS
- ALL FREQUENCIES

The only antenna of its type with separate, built-in UHF-VHF circuits.

Parts Warranty  
Lasting Performance Warranty  
Nationally Advertised

**SKYLINE MFG. CO.**  
1458A10 EAST 17th ST.  
CLEVELAND 14, OHIO

**HIGH VOLTAGE POWER SUPPLIES**

Many models are available in ranges from 2,500 to 25,000 volts D.C., with or without built in meters. Regulated or unregulated types are available. Delivery good on all standard models. Send for free catalogue — Dept. S 5

**PRECISE MEASUREMENTS CO.**  
942 Kings Highway, Brooklyn 23, New York  
Phone: ES 5-9435

# Rep Talk

A NOVEL application of closed-circuit TV has been evolved by RCA and the *Reps* for the Chicago parts show. Names of those awaiting messages at the Reps message center will be flashed on a large screen, which will be scanned by a fixed, focus camera and transmitted to several TV sets spotted throughout the exhibit hall, fifth and sixth floors and various other locations in the Conrad Hilton Hotel. . . . *A. W. Arnold and Fred Fore* have formed a rep firm at 1321 Rose-dale Ave., Chicago 40, Ill. . . . *Marvin Gettleman and Yale Saffro*, have joined forces and formed the rep firm of *Saffro and Gettleman Co.*, 100 West Chicago Ave., Chicago 10, Ill. Gettleman was formerly midwest district manager of *Reco-ton Corp.* . . . *Adolph L. Gross Associates, Inc.*, 45 W. 45th St., New York 36, N. Y., has been named rep for *Portable Gramophone Co., Inc.*, in metro-politan New York and northern New Jersey. . . . *Victor W. Williams*, Mar-gate, N. J., is now a rep for *Merit Coil and Transformer Corp.*, in Maryland. Virginia and the District of Columbia. . . . *Ronald G. Bowen*, Denver, Colo., has been appointed rep for *Permo, Inc.*, in the Rocky Mountain states, exclud-ing Colorado. . . . *James Murray* has joined the staff of the *Gerber Sales Com-pany*, 739 Boylston St., Boston 16, Mass. . . . *Watkin Davis* is now with the *George Davis Sales Co.*, Los Angeles, Calif., as an associate, and will handle jobber accounts. . . . *Elmer Watrous* has been appointed office manager for the Los Angeles office of *Frank A. Em-met Co.* . . . *Frederick Kantor*, 4010 Saxon Ave., New York 63, N. Y., has been named rep for the *R. T. Bozak Co.*, in the metropolitan New York-New Jer-sey area. Kantor has also been named rep for *Sound Workshop* in this area.



Salesmen representing the receiving tube dis-tributor sales operations of the *Raytheon Manu-facturing Co.* throughout the country, at a recent symposium on tubes and allied products, con-ducted in the *Newton, Mass.*, plant auditorium. *N. B. Krim*, vice president and general manager of the division, addressed the symposium. Also at the meeting were *Raytheon* prexy *C. F. Adams, Jr.*, and *F. E. Anderson*, renewal tube sales manager of the receiving tube division.

At the recent biennial *Cornish Wire* sales meeting, with 47 reps from all sections of the nation. Meeting began with inspection tours of the *Cornish* plants, at *Rutland, Vermont*, *Williamstown, Massachusetts* and *North Adams, Massachusetts*, and was concluded with a three-day general session at the *Roosevelt Hotel* in *New York City*. The new *Cornish* catalog, 63, was introduced, and present production and material problems, as well as plans for new products and plant expansion, were discussed.



At the recent IRE show in New York, during which *Elvera Bendt*, secretary for the *Reps* presented national president *Norman Neely* (left) of *Los Angeles* with the first *Rep* membership pin. Looking on is *Leroy W. Beier* of *Chicago*, chairman of the *Rep's* national board of governors.

. . . *John T. Butters*, 4924 *Oleander Dr.*, *Wilmington, N. C.* and *Harry A. Cole*, *Box 852, Jacksonville, Fla.*, have been appointed reps for *United Technical Labs*, for *North and South Carolina, Tennessee, Georgia, Alabama, Mississippi and Florida*. . . . *Morris Burgess*, 571 *Yonge St.*, *Toronto, Canada*, has been named rep for *Davis Electronics* in all of the *Dominion* except *British Colum-bia*. . . . *Herbert L. Dienes*, 7431 *Wood-bine Ave.*, *Philadelphia 31, Pa.*, has been appointed rep for *Ram Electronics Sales Co.*, in *Virginia*. . . . A comprehensive two-day meeting for *Regency* rep and key personnel held at the *Marott Hotel*, *Indianapolis, Ind.*, featured a program of lectures, instruction in merchandising and suggestions for exploiting sales promo-tional materials, conducted by *Dick Mitchell*, vice prexy of *I. D. E. A. Inc.* Among other *Regency* key personnel who addressed the group were *Edward Tudor*, prexy, and executive vice presi-dent *John R. Pies*. Also at the meeting were *Raymond A. Morris*, chief en-gineer; *Earl H. Kirk*, distributor sales manager and *Burton Browne*, head of *Burton Browne Advertising*, *Chicago* agency for *Regency*. *C. B. Parsons and Co.* has moved to larger quarters at 3028 *First Ave.*, *Seattle, Wash.* *Parsons* is secretary-treasurer of the *Pacific North-west* chapter of the *Reps*. . . . The *Los Angeles* chapter of the *Reps* at its annual spring meeting, presented miniature en-graved ebony gavels to its presidents of the last decade.



Victor W. Williams

Engineered for the Purpose . . .

# Copperweld GUY STRAND

TRADE MARK

provides REAL GUYING CONFIDENCE

## Copperweld doesn't STRETCH

Soft wire guys frequently stretch badly in service and go slack. This means a wobbly antenna and poor reception. Copperweld Guy Strand is hard drawn—has the strength to stay taut—holds the antenna firmly in place—improves reception. And, it's easy to install.

## Copperweld combats RUST

A guy weakened by rust may go unnoticed until a storm brings down the antenna, causing damage many times the cost of the guy. Copperweld Guy Strand is protected against rust by a molten-welded layer of pure copper on each wire. Its strength is lasting.



LEADING UTILITIES rely on Copperweld Strand for guying poles and towers

Write today for further details.

COPPERWELD STEEL COMPANY • Glassport, Pa.

**Copperweld GUY STRAND**  
**ANTENNA WIRE • GROUNDING WIRE**  
**GROUND RODS AND CLAMPS . .**

SOLD BY RECOGNIZED PARTS DISTRIBUTORS

# GOLDEN WAND

## INDOOR Television ANTENNA

VHF UHF FM Models-UHG53-TG84-TG62

3 BEAUTIFUL MODELS COVER  
 ALL TV CHANNELS

WITH PEERLESS  
 YOU PROFIT



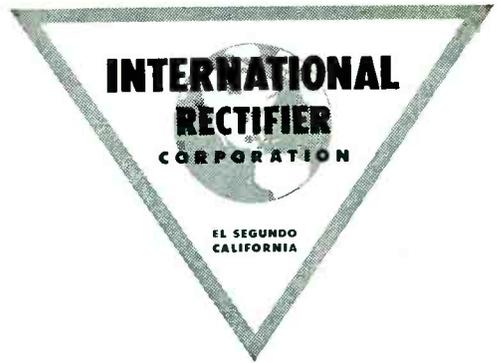
Model TG-62

\$5.95

LIST

The late Model TG62 "GOLDEN WAND" has now become the most popular seller in the line. Heavily weighted walnut-mahogany felted base. Admiralty brass dipoles finished in sparkling gold. Polystyrene insulators that match the base and gold finish hardware. 3-section velvet smooth telescopic action, free from dripping oil. (Brass does not rust.) The terminal connections to the 300 ohm line are enclosed in walnut-mahogany polystyrene insulators to prevent breakage. A truly quality product at a popular price.

**PEERLESS PRODUCTS INDUSTRIES**  
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ALL TYPES AVAILABLE  
 FOR PROMPT SHIPMENT  
 WRITE FOR BULLETIN GD-1

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WHY STOCK 3  
 WHEN 1 WILL DO

ONE iE UHF INSERT  
 HOLDS ALL THESE CABLES



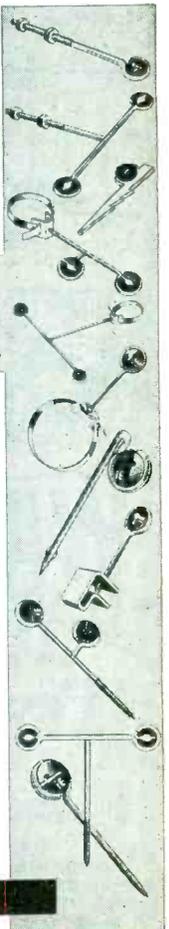
SMALL OVAL ANACONDA TUBULAR ROUND

ALL iE STANDOFFS NOW AVAILABLE WITH NEW UHF INSERT — SPECIFICALLY DESIGNED TO CARRY THE NEW UHF LEAD IN CABLES AND SIMPLIFY YOUR BOOKS; CUT DOWN YOUR INVENTORY AND REDUCE YOUR SHIPPING PROBLEMS

SEE THIS INSERT AND THE MOST COMPLETE DISPLAY OF THE LATEST TV HARDWARE AT THE ELECTRONIC PARTS SHOW—BOOTH 24  
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DR Double-Reentrant Projectors



Paging & Talk-Back Speakers



ALNICO-V-PLUS Driver Units



Dual Speakers



FULL-GRIP, VELVET-ACTION Mike Stands

## DEPENDABLE QUALITY:

The latest electro-acoustic research and engineering—and over 20 years of manufacturing know-how—are behind every ATLAS product.

## DEPENDABLE SERVICE:

Coast-to-coast and around the world today—in every Industrial, Marine, Railroad, Military, Educational, Civic, U.S. and Foreign Government application—under every kind of climate and noise condition—ATLAS sound equipment is famous for highest efficiency and durability. That's the proof of ATLAS performance dependability.

## DEPENDABLE DELIVERY:

Yes, ATLAS gives our Government highest priority. And yes, we too feel the pinch of material shortages. But our customers will continue to get our usual dependable delivery—because we believe in equitable and dependable distribution to all ATLAS users.

## DEPENDABLE PROFITS:

Completeness of line, excellence of product, dependable delivery, right prices—that's the ATLAS combination that means high, steady Industrial Sound profits for You!

JUDGE for yourself, COMPARE ATLAS at your local Jobber today. See why ATLAS is the preferred line for utmost dependability. Write NOW for FREE latest Catalog 551.



# WANTED

WE NEED YOUR SURPLUS ELECTRONIC EQUIPMENT

WE PAY TOP \$\$\$ FOR:

- ★ TUBES
- ★ TRANSFORMERS
- ★ COILS & PLUGS
- ★ ARC-1
- ★ ARC-3
- ★ ART-13
- ★ CLAMPS
- ★ RELAYS
- ★ RESISTORS
- ★ CONNECTORS
- ★ RADIO RECEIVERS
- ★ TRANSMITTERS
- ★ CONTROL BOXES
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- ★ CORDS
- ★ TELEPHONE MATERIALS

WE BUY ANYTHING!

Write, Wire today! Tell us what you have.  
TALLEN CO., Inc., Dept. F  
159 Carlton Ave., Brooklyn 5, N. Y.

## UHF Alignment

(Continued from page 87)

response curve it will be necessary to retune the preselector circuits lower and vice versa.

### Mixer Crystal Injection

This test may be conducted simultaneously with the preceding test since it involves only the reading of the crystal current as the band is tuned. The sweep generator must be operated at a low output; this is extremely important. The sweep generator output should be adjusted below the level at which it will increase the crystal current of the mixer. The mixer-crystal current should be between .5 and 2 milliamperes for best operation, and if possible should be maintained as near the .5-ma level as possible.

### Input Match

Testing the input match is particularly important at *uhf*, because of the poorer propagation conditions. In all low-signal level conditions it is very important to deliver the signal power to the receiver with as little loss as possible. An input match and low-loss transmission line accomplish this delivery of signal power to the receiver most efficiently.

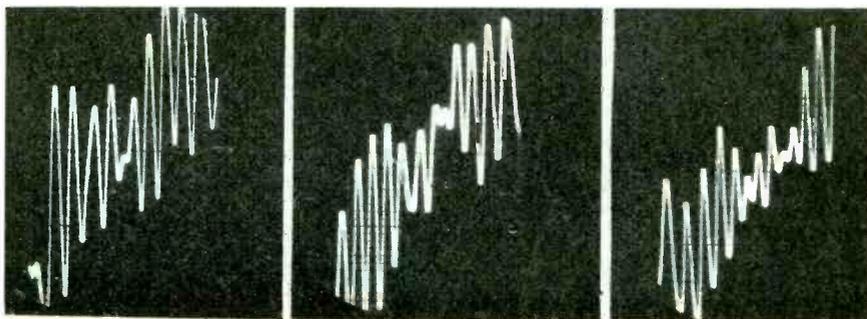
It has not been standard at *vhf* to test for input match. In this test the voltage variation must be measured at the input end of a long (many wavelengths) line, which is terminated in the tuner input circuit. This is why a delay line is used in this test. In a transmission line that is terminated in a resistive load equal to its characteristic impedance, there will be no standing waves on the line, and the voltage will be the same all along the line. In a line that is not properly terminated the voltage along the line will not be the same, but will vary between a minimum value and a maximum value; the ratio of these two values of voltage on the line is called the *vswr*. The standing-wave ratio can be measured by means of a movable probe inserted

in a slotted section of line. Such an instrument is called a slotted line; in view of its cost and the fact that it is also too slow for alignment purposes, the frequency is varied (sweep generator) into a long line terminated in the receiver to be matched. By reading the voltage at the input to the line with a crystal detector, whose output is connected to a 'scope, it is possible to see the voltage variation at the input to the line as the frequency is swept through its range. The voltage will vary, because at one frequency the length will be correct to produce a voltage maximum, while at a slightly different frequency the line will correspond to an extra quarter wavelength, and this will correspond to a voltage minimum. A match will be indicated by a minimum voltage variation on the 'scope. Since the input to a tuner is a resonant circuit the match will only occur at a particular point, while a mismatch will be indicated at another part of the 'scope pattern. This procedure actually measures the wave reflected back to the generator, and because of this the test is called the *reflection-coefficient* test.

A few 'scope photos of typical reflection coefficient tests of a 75-ohm input circuit of a converter are shown in Fig. 4a, b, and c. These waveforms reveal that the best match is in the center, where the amplitude of the wave variation is smallest. The best match occurs where the preselector circuits are resonant, and couple the crystal mixer through the circuits to the antenna to produce the resistive loading required for match. On either side of the response curve, it will be noted that the match becomes poor and the voltage variation becomes increasingly larger. The ratio of the number of 'scope screen divisions, when matched, divided by the number of scope screen divisions when not matched (on either side of the matched point) equals the reflection coefficient,  $R$ :  $vswr = 1 + R/1 - R$ .

[To Be Concluded in June Issue]

Fig. 4. 'Scope photos illustrating various degrees of input match using reflection-coefficient method; a, b and c, left to right.



Now SWISS CRAFTSMANSHIP BRINGS YOU  
SUPERB REPRODUCTION



## THORENS CONCERT CD-43 VARIABLE SPEED RECORD CHANGER

Compare these features:

- DIRECT DRIVE, governor controlled, four pole induction type motor provides completely silent wow-free operation.
- EXACT SPEED maintained through specially designed centrifugal governor which automatically compensates for variations in line voltage, heat and load.
- CAREFULLY ENGINEERED long, low-mass tonearm provides excellent tracking and complete freedom from parasitical resonances.
- PATENTED SPEED CONTROL for variable speed adjustments around each of the three main positions.

Two plug-in heads adaptable for your favorite cartridge. Automatically intermixes 10" and 12" records, special selector for 7" size with all metal spindle for large hole records sold separately. Automatic fast record shut-off, reject, repeat, and pause controls complete with muting switch and tracking weight adjustment screw.

For the latest in record players see our  
CBA-83 Automatic Player

Write for complete catalogue on THORENS record changers and record players.

**THORENS COMPANY**

BOX 1665

NEW HYDE PARK, N. Y.

## ANNOUNCING THE NEW SCALA BZ-4 VOLTAGE DOUBLER OSCILLOGRAPH PROBE

A teammate for the famous simplified, super-efficient SCALA oscillograph probes—the new BZ-4 Voltage Doubler, at \$10.75. Provides virtually double deflection on scope screen provided by conventional half-wave probes. Offers a high degree of 60-cycle hum rejection. Contains dual demodulators of low-capacitance, high-impedance design, selected for balance and sensitivity, useful to 500 Mc. No probe marketed in this price field possesses a range anywhere near the range of the BZ-4.

Check with your local distributor or write about the BZ-4 and the other SCALA probes:

BZ-1 SIGNAL TRACING PROBE . . . useful to 500 Mc.

BZ-2 LOW CAPACITY PROBE . . . adjustable to any scope for minimum loading at laboratory accuracy.

BZ-3 100:1 VOLTAGE DIVIDER PROBE . . . may be applied to horizontal output circuits without endangering oscilloscope.

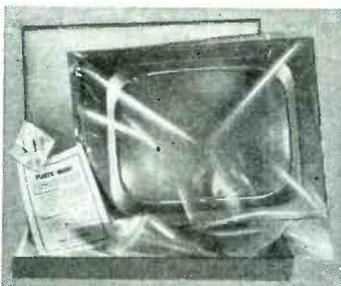
SCALA RADIO CO., 2814 - 19th St., San Francisco 10, Calif.

## TV PLASTIC TUBE MASKS

A complete line of TV masks . . . for 14" to 27" rec. tube sizes . . . precision optical perfection . . . beautifully framed in durable gold leaf finish . . . Packaged in plastic envelopes and individually boxed. Immediate delivery.

NEW 21" SPHERICAL  
23" RECTANGULAR  
NOW AVAILABLE

write for name of nearest jobber  
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all mats packaged as shown

**TELE plastics CO.**  
DIVISION OF WILLMAX MANUFACTURING CO.

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VEE stocks for immediate shipment branded merchandise, tested and aged for top-flight performance . . . individually boxed. EVERY TUBE TYPE AVAILABLE FOR RADIO, TELEVISION AND AUDIO CIRCUITS.

LOOK at our prices!

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|------|-----|------|------|-------|-----|-------|------|
| 1B3  | .63 | 6AL5 | .40  | 6J5   | .40 | 12AV7 | .79  |
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| 1S5  | .47 | 6AU5 | .78  | 6S4   | .46 | 12SA7 | .62  |
| 1T4  | .56 | 6AU6 | .43  | 6SA7  | .52 | 12SK7 | .60  |
| 1U4  | .55 | 6AV5 | .78  | 6SK7  | .50 | 12SN7 | .54  |
| 1U5  | .46 | 6AV6 | .37  | 6SN7  | .54 | 12SQ7 | .42  |
| 1X2  | .67 | 6BA6 | .45  | 6SQ7  | .42 | 19BQ6 | 1.39 |
| 3Q4  | .60 | 6BC5 | .53  | 6T8   | .77 | 25BQ6 | .80  |
| 3Q5  | .65 | 6BE6 | .46  | 6V6   | .46 | 25L6  | .48  |
| 3S4  | .55 | 6BG6 | 1.34 | 6W4   | .45 | 25W4  | .48  |
| 3V4  | .56 | 6BJ6 | .48  | 6W6   | .57 | 25Z6  | .42  |
| 5U4  | .40 | 6BK7 | .88  | 6X4   | .34 | 85L6  | .47  |
| 5V4  | .73 | 6BQ6 | .89  | 6X5   | .33 | 35W4  | .30  |
| 5Y3  | .29 | 6BQ7 | .98  | 12AT6 | .48 | 35Z5  | .30  |
| 6AB4 | .46 | 6C4  | .37  | 12AT7 | .68 | 50B5  | .47  |
| 6AC7 | .75 | 6CB6 | .53  | 12AU6 | .43 | 50C5  | .47  |
| 6AG5 | .54 | 6CD6 | 1.85 | 12AU7 | .53 | 60L6  | .47  |
| 6AK5 | .95 |      |      | 12AV6 | .37 | 117Z3 | .39  |

All prices FOB New York

MINIMUM ORDER \$5.00. Prepaid shipments if check in full with order. C.O.D.'s Sure. 25% deposit required with order.

Jobbers—why not check with us for your fill-in requirements?

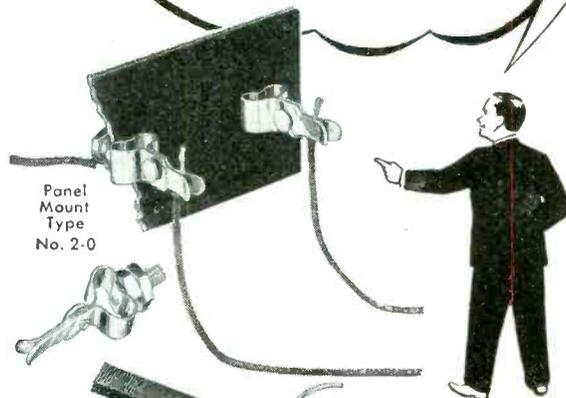
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Dept. S-4

BOX 134, QUEENS VILLAGE 29, N. Y.

THERE IS NO FASTER  
OR BETTER WAY TO MAKE TEST  
CONNECTIONS THAN OFFERED BY  
THE SIMPLIFIED GRAYHILL PANEL  
MOUNT, SPRING PRONG CLIP AND  
THE GRAYHILL FULLY INSULATED,  
TIGHT-GRIP TEST CLIP.

Ask for Samples.



Panel  
Mount  
Type  
No. 2-0

Insulated  
Alligator Type  
No. 16-1—Black  
No. 16-2—Red

## Grayhill

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Phone: La Grange 8000

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**ELECTROX  
BATTERY ELIMINATOR**  
*For Servicing Both*  
**6 and 12 VOLT AUTO RADIOS**



MODEL AR 56-12

**Quality Built Throughout  
Outstanding Value at \$52.50**

Service both 6 and 12 Volt auto radios with this one, dependable power source. Electrox Model AR 56-12 provides amply filtered, adjustable D.C. that will operate any type and size auto radio, either push-button or manually tuned.

**OUTPUT:** Low range: 7½ volts at 12 amps., continuous; 20 amps., intermittent. High range: 15 volts at 6 amps., continuous; 11 amps., intermittent. High and low range controlled by selector switch.

Built of quality components throughout. Selenium rectifiers. Equipped with accurate 0-20 V. and 0-20 A. meters.

**ALSO AVAILABLE:** Model AR 46-12, only \$41.50. Built to same quality standards as AR 56-12. Output not adjustable. Equipped with high-low switch to change from nominal 6-volt to nominal 12-volt power.

SEE YOUR ELECTROX JOBBER OR  
WRITE FOR FULL DETAILS

Rectifier Division  
**SCHAUER MANUFACTURING CORP.**  
4512 Alpine Ave. Cincinnati 36, Ohio

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YOUR ADDRESS**

Be sure to notify the Subscription Department of SERVICE at 52 Vanderbilt Avenue, New York 17, N. Y., giving the old as well as the new address, and do this at least four weeks in advance. The Post Office Department does not forward magazines unless you pay additional postage, and we cannot duplicate copies mailed to the old address. We ask your cooperation.

**TV Parts . . .  
Accessories**

**CREST VARIABLE INDUCTANCE KIT**

A variable inductance universal substitution kit, 200K, that features a replacement set of 8 variable inductance coils which cover a range from 1 to 590 microhenries has been announced by Crest Laboratories, Inc., Rockaway Beach, N. Y.

Coils may be used for video peaking, rf, and if circuitry. Individual calibration charts permit adjustment to required inductance value without test equipment. A spring clip mounting, designed for single 5/16" hole and an extra terminal for tiepoint convenience, is also included.



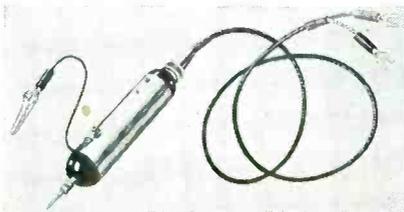
Crest Variable Inductance Coil

\* \* \*

**SCALA VOLTAGE DOUBLER PROBE**

A voltage doubler probe, BZ-7, that is said to double the deflection on a 'scope screen, provided by conventional half-wave probes, is now available from the Scala Radio Co., 2814 19 St., San Francisco 10, Calif.

Probe is said to offer a high degree of 60-cycle hum rejection, contains dual demodulators of low-capacitance, high-impedance design, and is useful to 150 mc.

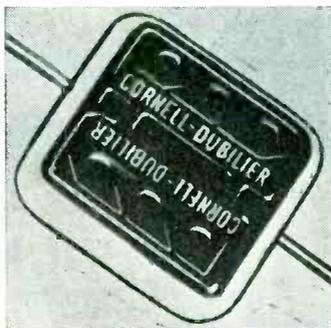


\* \* \*

**C-D HV MICA CAPACITORS**

A series of hv, midget mica capacitors, Hivomikes, available in ratings of 1000, 1500, 2000 and 2500 wvdc, have been announced by the Cornell-Dubilier Electric Corp., South Plainfield, N. J.

Capacitance values range from 5 to 750 mmfd for one series and 240 to 5100 mmfd in another group.



pass up the long Shots!  
cash in on the Favorite!  
put yours on ALLIANCE!

See us at the May Show—  
**BOOTH 225**

ALLIANCE TENNA-ROTORS—  
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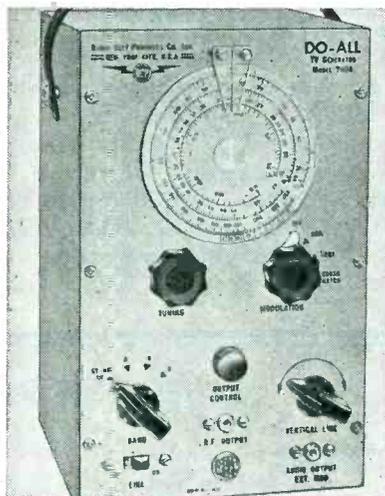
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## RCP TV GENERATOR

An improved TV generator, model 740A Do-All, for uhf and vhf applications, has been introduced by Radio City Products Co., Inc., 152 W. 25th St., New York 1, N. Y.

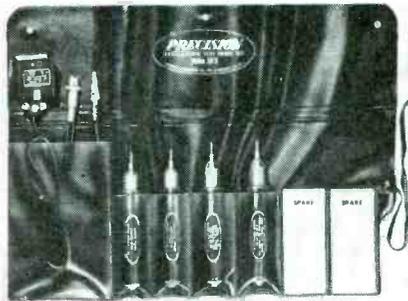


\* \* \*

## PRECISION 'SCOPE TEST PROBE SET

A 'scope test probe set, series SP-5, that includes four test probes for general purpose as well as specialized TV signal-tracing, alignment, troubleshooting and waveform analysis, has been introduced by the Precision Apparatus Co., Inc., 92-27 Horace Harding Blvd., Elmhurst 17, N. Y.

Types are: high impedance-low capacity probe; signal tracing-crystal probe; resistive-isolating probe; and a shielded-direct probe. A single universal, coax cable accommodates each probe through a quick-change connector. A specially designed, shielded plug provides cable attachment to type ES-500 and ES-500A vertical input posts. Each probe head terminates in a clip-on type of probing tip permitting operator's hands to be free during test procedures.



\* \* \*

## PRECISE HV POWER SUPPLIES

A series of hv power supplies, in both transformer and rf types, are now available from Precise Measurements Co., 942 Kings Highway, Brooklyn 23, N. Y.

Built-in current meters can be obtained in any standard power supply for direct leakage measurements. Current limiter circuits are said to protect the meter on shorts. Models available include: 6000, 2500 v, 1 ma; 6005, 5000 v; 6010, 10,000 v; 6015, 15,000 v, and 6025, 25,000 v, all 100 microamps.

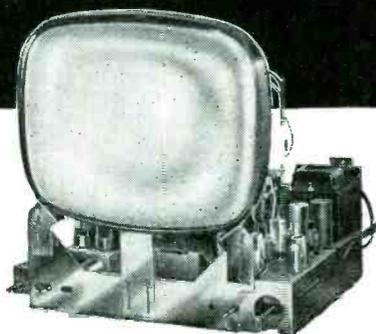
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Industrial  
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# TECHNI-TOPICS

By **LEN MAZEL**

## HOW TV INSTALLERS SAVE TIME AND MONEY WITH THE ITI IT-105RB FIELD STRENGTH METER

Noise is distributed randomly across the entire spectrum. Much more noise is picked up by TV receivers than by the IT-105RB FIELD STRENGTH METER because the IT-105RB band-pass is narrow (400 kc), while the TV receiver band-pass is about 4.5 mc. Consequently, the IT-105RB FIELD STRENGTH METER is more satisfactory for installation adjustments than any receiver could be since the IT-105RB is comparatively unaffected by noise.

Except when otherwise requested, as shipped, the narrow pass band of the IT-105RB is tuned to the video carrier of each channel. This is why, when properly utilized, a picture carrier buzz is heard over the loudspeaker.

In every installation, maximum signal pick-up is the result of maximization of several individual sections (such as mast-location, antenna height, antenna orientation type of lead-in, lead-in location, booster used, etc., etc.).

The individual signal maximizations may sometimes be small. Small as the individual gains may be, the total effect will usually be very considerable.

Though the technician may strain his eyes, the results of small gains are practically imperceptible on a TV receiver. On the IT-105RB, however, each change causes a very obvious needle swing. The four-position multiplier switch arrangement results in far more visible meter deflections than if a cheap, compressed movement, meter scale had been used.

As a result, the IT-105RB can be used to improve parts of an installation although such improvement might not have been possible with a regular receiver. Consequently, the best signal pick-up is easily and logically obtained with the IT-105RB being used to maximize the individual components of the system.

Of course in addition to all the above advantages, the portable IT-105RB is far more easily moved to test many possible locations than bulky TV receivers.

When desired, the IT-105RB can also be taken far from available 115 Volt power supply, if the portable IT-116B RECHARGEABLE BATTERY PACK is utilized to supply power.

### Industrial Television, Inc.

369 LEXINGTON AVENUE CLIFTON, N. J.  
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## JOTS AND FLASHES

FORECASTS that TV set production would soon exceed that of home radios became a reality during the early months of the first quarter of '53. According to RTMA, nearly a million and a half TV sets were produced during January and February alone, in contrast to about 800,000 broadcast chassis. Clock-radio set manufacture also spurted, with over 400,000 units being made during the first two months of the year. . . . Picture-tube production spiraled, too; nearly 700,000 tubes were sold to set-makers in February. Of these, over 73% were 19" and larger in size. . . . *Ungar Electric Tools, Inc.*, has moved to a new plant at 4101 Redwood, Venice, Cali-

fornia. . . . *Rohn Manufacturing Co.* has changed its mailing address from 2108 Main St. to 116 Limestone, Bellevue, Peoria, Ill. . . . *Continental Electronics Corp.*, 5307 Lancaster Ave., Philadelphia, Pa., is expanding factory facilities. Company manufacturers *Piktron*, an exchange line of TV picture tubes. . . . *Thomas Paxton*, formerly district sales manager for Hallicrafters, has been named general manager of the company. . . . The national office of NEDA is now in Suite 1114, Builders Building, 228 N. LaSalle St., Chicago, Ill. . . . *Peter Hagedoorn*, president of *Jersey Specialty Co.*, Mountain View, N. J., has announced that JSC is going to produce tubular transmission line.

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