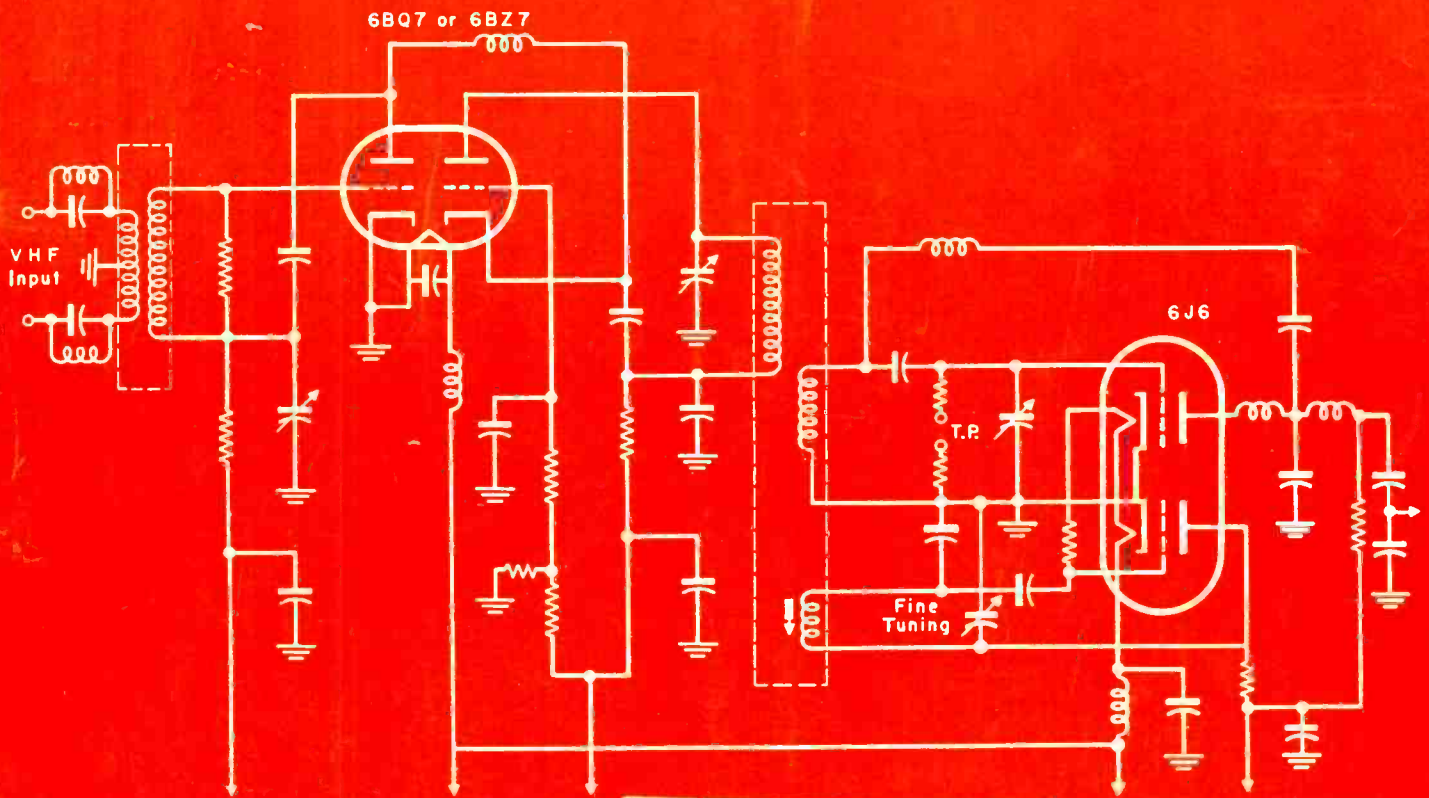


# SERVICE

VOL. 23

THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE

APRIL  
1954



PEARSON RADIO&TV 2-59  
 3062 E 65 ST  
 CLEVELAND 27, OHIO  
 SU S 3-5-54 CR

RF assembly of ultrahigh TV generator designed to demonstrate efficiency of uht sets on all channels.

[See circuit analysis, this issue]

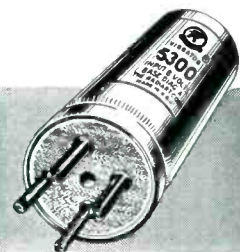


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**Seal-Vent**  
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are **TOPS**

The complete rugged service line of vibrators that has dominated the field for years. Exclusive design plus controlled manufacture guarantees long-life performance! Built to "take it", they work under the most adverse conditions. You too will agree RADIART VIBRATORS are the STANDARD of COMPARISON!

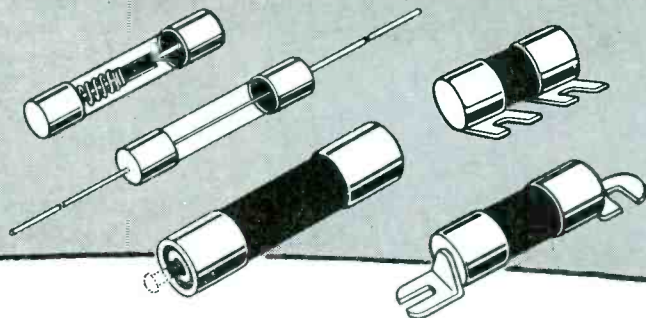
the Complete  
Replacement Line



THE **RADIART** CORPORATION  
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TV ANTENNAS • AUTO AERIALS • VIBRATORS • ROTORS • POWER SUPPLIES

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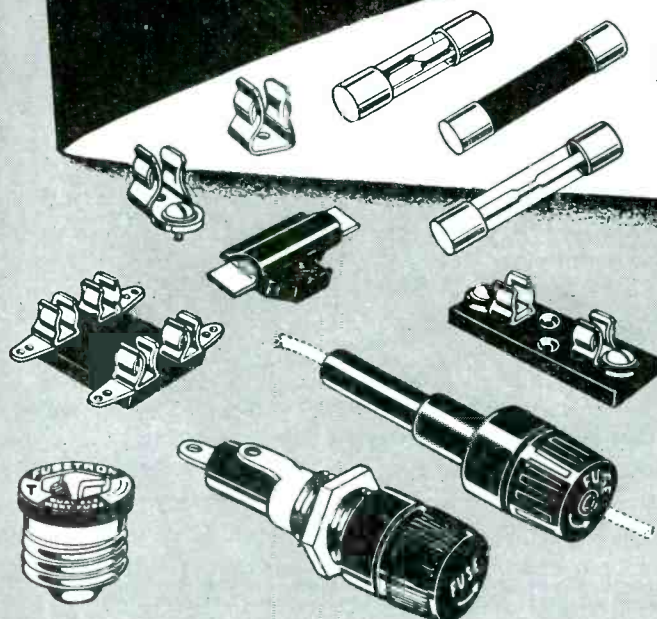


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Please send me bulletin SFB containing facts on BUSS small dimension fuses and fuse holders.

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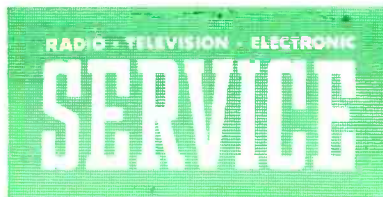
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**THE NEW**

*Carry-all*  
**tube caddy**  
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Only \$13.95\*  
8 x 15 x 21 in.  
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A proud new "tube caddy"—to save even more time and money for the TV serviceman. **PAYS FOR ITSELF.** Carries up to 262 tubes. A complete tool and tube kit—helps technician to give efficient service that builds confidence. Ruggedly built with

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## ... RIGHT AWAY!



## NEW Picture Tube Selector

**Instantly Gives Information On Picture Tube Interchangeability!**

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Replacement Sales: Cathode-ray Tube Division • ALLEN B. DUMONT LABORATORIES, Inc. • 750 Bloomfield Avenue, Clifton, New Jersey

# WIN \$8,000<sup>00</sup>



STAN MUSIAL

**1<sup>ST</sup> PRIZE** \$  
**\$1,000<sup>00</sup>** \$  
**CASH** \$



MICKEY MANTLE

## Westinghouse LEAGUE LEADERS

### AND DEALERS AID CONTEST

You never saw such an easy contest! Just fill in the names of the teams which were leading each major league on August 1, 1953. Then you have the first leg on the \$1,000 CASH First Prize in the exciting League Leaders and Dealer Aid Contest.

Fill in the Entry Blank on the opposite page. Have your distributor salesman certify that you have purchased 25 Westinghouse Receiving Tubes OR 1 Westinghouse Picture Tube. And mail your Entry Blank

NOW! An early entry can win one of the big prizes for you.

After naming League Leaders on August 1, 1953, write your answer to the cartoon situation pictured on the Entry Blank. Winners will be judged on the basis of correctness of team selection, and aptness, originality and effectiveness of cartoon solution.

Enter as often as you wish. The more entries you submit, the better chance you have at the 209 Big Cash and Merchandise Prizes. Ask your distributor salesman for additional entry blanks. He will be glad to sign them when he takes your tube order.

ET-95049

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

## RELIASTRON<sup>®</sup> TUBES

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

# IN PRIZES...

## 209 PRIZES FOR SMART SERVICE MEN

2<sup>ND</sup> PRIZE— \$700 in YOUR Choice of Merchandise

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4<sup>TH</sup> PRIZE— \$300 YOU Choose the Merchandise

FIRST, SECOND, THIRD AND FOURTH PRIZE WINNERS WILL MEET MICKEY MANTLE OR STAN MUSIAL IN THE BIG PRIZE AWARD DINNER WESTINGHOUSE HAS PLANNED FOR YOU IN NEW YORK

5 Fifth Prizes of \$140 Each in Merchandise • 30 Seventh Prizes of \$35 Each in Merchandise  
20 Sixth Prizes of \$70 Each in Merchandise • 50 Eighth Prizes of \$20 Each in Merchandise  
100 Ninth Prizes of \$15 Each in Merchandise

**FILL IN THIS ENTRY BLANK TODAY!**

1. League Leaders on August 1st, 1953, were:

AMERICAN LEAGUE

NATIONAL LEAGUE

2. Here is what I would say to the lady in the Cartoon:

.....  
.....  
.....

(ATTACH AN ADDITIONAL SHEET OF PAPER IF NECESSARY—100 WORDS MAXIMUM)

MY NAME .....

SHOP NAME .....

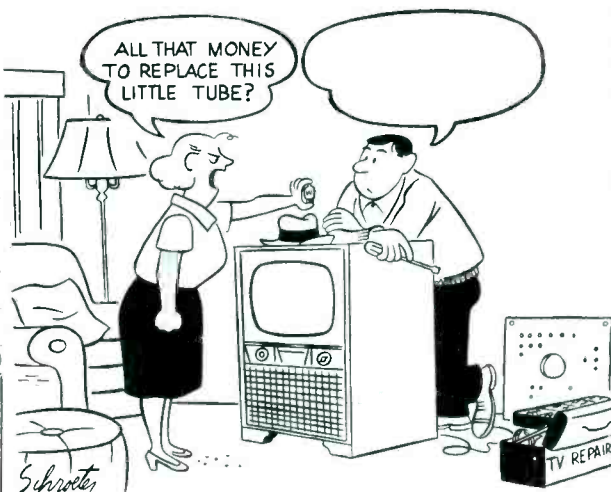
STREET .....

CITY.....STATE.....

SEND ALL ENTRIES TO:

**WESTINGHOUSE TUBE CONTEST**

Box 610, Grand Central Station, New York 17, New York



### THIS SPACE FOR DISTRIBUTOR SALESMAN'S CERTIFICATION

I certify this Entry Blank has been qualified by the purchase of (25 Westinghouse Receiving Tubes) (1 Westinghouse Picture Tube)

SALESMAN'S SIGNATURE .....

COMPANY NAME .....

CITY.....STATE.....

# Push the tube that PROTECTS YOU TWO WAYS!

**SYLVANIA  
PICTURE TUBES  
GUARD YOUR  
REPUTATION  
AND PROFITS!**



Be sure to show your customers the name SYLVANIA now etched on the lower left face of every Sylvania Picture Tube.

These letters are small in size (imperceptible when the tube is lighted), but they're mighty big in importance! For, they identify a genuine Sylvania Picture Tube... the tube found best in exhaustive tests conducted by an independent laboratory on tubes of 9 different makes.

Naturally, this high performance record helps maintain your reputation. It

also helps protect your profits... eliminates customer complaints and costly call-backs.

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### **Sylvania Television Program telling millions!**

Most of your customers have seen and heard about Sylvania's high quality during the big popular show "Beat the Clock" on CBS-TV. Week after week, from coast to coast, the facts about Sylvania quality are being demonstrated to millions.



**Get this new booklet  
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# SYLVANIA

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In Canada: Sylvania Electric (Canada) Ltd.  
University Tower Bldg., St. Catherine Street, Montreal, P. Q.

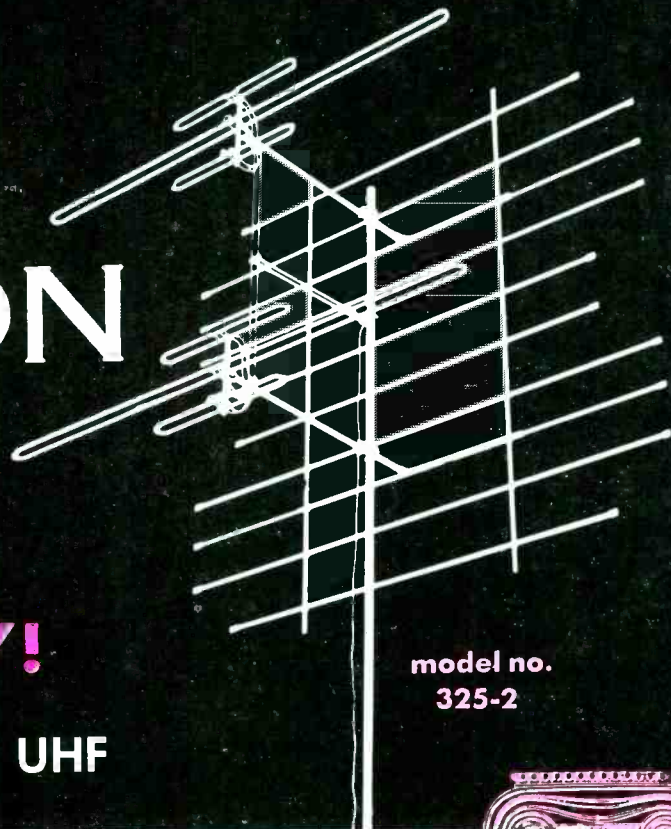
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# MORE DEALERS ARE INSTALLING

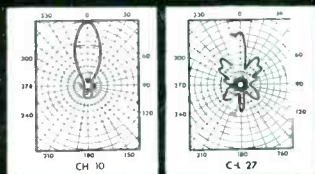
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All-channel reception: VHF & UHF

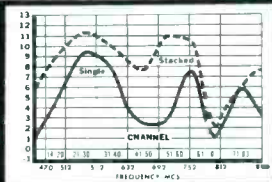
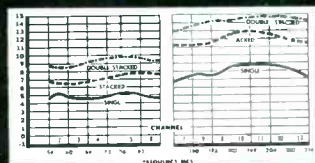


model no.  
325-2

HORIZONTAL POLAR PATTERNS  
(Relative Voltage)



Gain  
(above tuned reference dipole)



**ONLY THE CHAMPION** enjoys this overwhelming acceptance: over 300,000 already sold!

**ONLY THE CHAMPION** is powered by the unique "Tri-Pole," the triple-powered dipole system that provides fabulous VHF-UHF fringe area performance. 100% aluminum; rugged, exclusive alloy. Installs in a flash!

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- ★ **FREE** consumer literature

See your Channel Master distributor for full details.

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Introduced to millions through the editorial pages of their favorite magazines and newspapers, and on TV.

**DON'T BE MISLED BY "LOOK-ALIKES" . . .  
THERE'S ONLY ONE REAL CHAMPION!**

Model no. 325, Single bay; Model no. 325-4, Four bay; Model no. 325-6, Super Champ



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

The World's Largest Manufacturer of Television Antennas

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# FACTS

# NOT JUST CLAIMS

**FACT-** 53 CLAIMS GRANTED  
IN 5 UNITED STATES PATENTS -

#2,585,670; 2,609,503; 2,625,655; 2,644,091; 2,661,423, others pending.

**FACT-** These antennas positively receive **ALL** channels 2-83 from **ALL** directions without a rotor motor.

**FACT-** These antennas have consistently **OUT-GAINED** and **OUT-PERFORMED** all others in actual public demonstrations.

**FACT-** These antennas will unquestionably **OUT-PERFORM** all others, on **YOUR** roof, with **YOUR** set, or **YOUR** money back.

**FACT-** **SAVES YOU MONEY.** Eliminates rotor motor, uses only **ONE** transmission line, uses only **ONE** antenna for both UHF & VHF—and only **ONE** simple, quick installation.

**FACT-** Perfect pictures have consistently been received as far as 3 times the guaranteed distances.

**FACT-** **ONLY** one antenna, **ONLY** one transmission line, **ONLY** one installation. You solve once and for all your **PRESENT** and **FUTURE** antenna problems.

**MONEY BACK GUARANTEED TO RECEIVE All CHANNELS 2-83 FROM All DIRECTIONS AND POSITIVELY OUTPERFORM All OTHER ANTENNAS WITH OR WITHOUT A ROTORMOTOR**

**Guaranteed**  
60 mi UHF  
60 mi VHF



**SUPER 60**

LIST PRICE  
**\$36.75**  
SEE YOUR  
JOBBER

**Guaranteed**  
100 mi VHF  
30 mi UHF



**ULTRA 750**

LIST PRICE  
**\$43.50**  
SEE YOUR  
JOBBER

**9 POSITION  
ELECTRONIC  
ORIENTATION  
SWITCH**

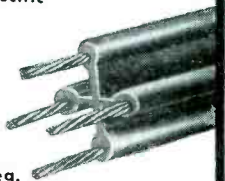


**PRICE INCLUDES**

Antenna arrays - necessary stacking bars - 9 position switch - switch-to-set coupler - necessary hook-up harness - 7 1/2" stand-offs  
Individually boxed in mailable carton.

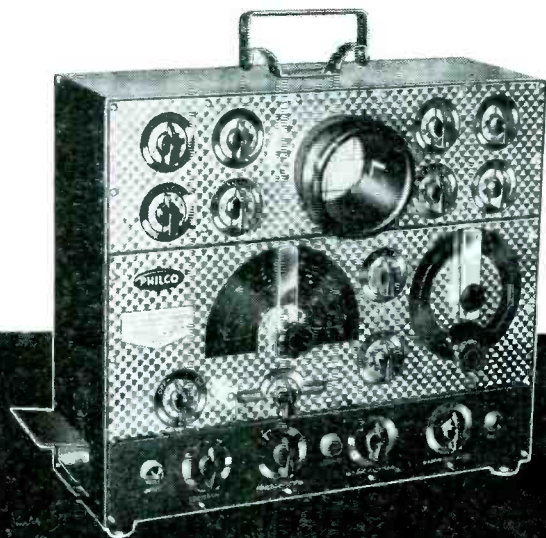
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4 CONDUCTOR TRANSMISSION LINE

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# PHILCO

## VISUAL ALIGNMENT GENERATOR

### Oscilloscope, Sweep and Marker Generator

*All in One Instrument!*



### **NEW! PHILCO FIELD STRENGTH METER**

Here's more than an antenna signal checker. The new Philco Field Strength Meter provides direct readings of RF signal level... has built-in electronic sensitivity control. Signal levels above 100 microvolts are read directly on the calibrated dial. Read 10 to 100 microvolt levels on the high sensitivity meter. High gain, low noise TV tuner provides exceptional wide range of sensitivity. Now, measure both strong and weak signals with the Philco reference calibration method... it's the same type found in expensive laboratory equipment. MODEL M-8104.

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1. Only two external cable connections necessary...minimizes regeneration and feed-back.
2. Shielded multiplier attenuator provides accurate control
3. RF output increases with frequency to offset the fall off in gain which normally occurs on the higher frequencies.

of RF output from a few microvolts up to .1 volt.

**AVAILABLE THROUGH YOUR PHILCO DISTRIBUTOR  
ON A NEW SPECIAL PAYMENT PLAN**



Take advantage of the great  
**SHARE and PROFIT Program**  
on Philco Receiving Tubes  
Parts and Accessories

**NOW AT YOUR PHILCO DISTRIBUTOR**



# SERVICE MAN'S DREAM

... the most compact TV set ever made!

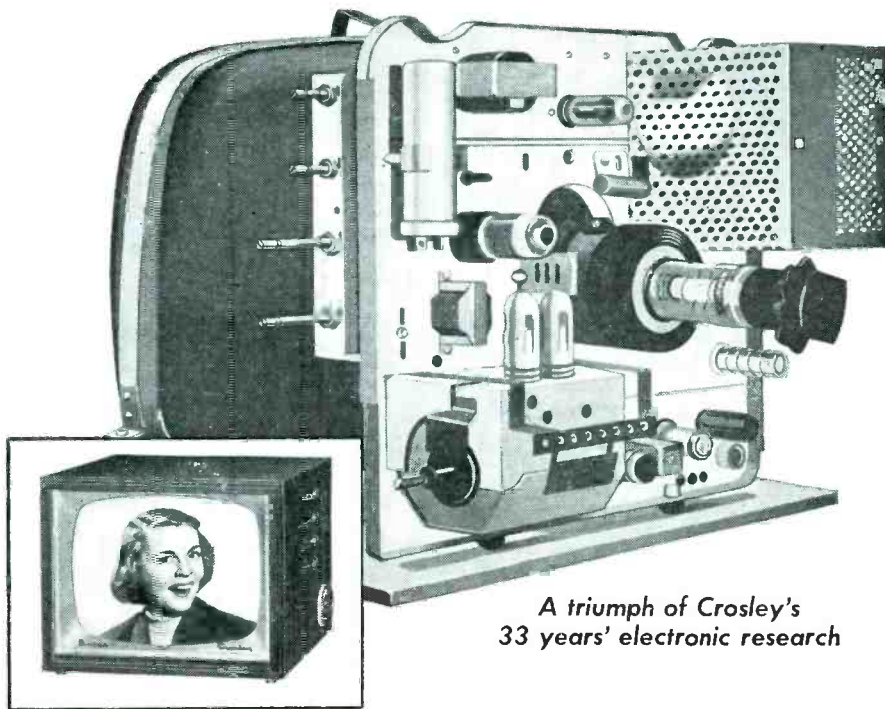
(Yet easily accessible)

## CROSLY SUPER-V IS DRAMATICALLY DIFFERENT INSIDE

Here's one set that is designed with the TV service man in mind. Removing the back of the Super-V plainly exposes all secondary controls and every tube in the set. And as you know, 9 out of 10 service calls merely require the change of a tube.

For any other service job, it's as simple as opening the hood of your car, no chassis to pull, just slide the entire Super-V cabinet up off the chassis. More repairs can be made in the home. You can get at the works immediately and without obstruction, service the Super-V in lots less time than you'd spend on an ordinary set.

The Super-V is a cinch to install. It's compact, weighs only 53 pounds. And in many places, you'll find its built-in antenna is all you need for perfect reception. Service men who've seen the Super-V call it the greatest forward step ever taken in TV chassis design.



A triumph of Crosley's  
33 years' electronic research

# CROSLY

17-INCH

# Super-V

- TAKES UP TO  $\frac{1}{3}$  LESS SPACE THAN OTHER 17" TVs—FITS WHERE OTHER SETS WON'T
- FRONT ALL SCREEN—CONTROLS ON THE SIDE
- CHOICE OF THREE FINISHES (MAHOGANY, WALNUT, BLOND)
- FULL-YEAR WARRANTY ON PICTURE TUBE—90 DAYS ON CHASSIS PARTS
- ROLLING OFF CROSLY PRODUCTION LINE IN VOLUME—PRICED FOR PROFIT AND ACTION NOW!

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CALL YOUR CROSLY DISTRIBUTOR NOW!

Suggested retail prices start at

\$ **139** <sup>95</sup>  
coast to coast

(Walnut-finished)

You can **SELL** them better on a **CROSLY**

Division  Cincinnati 19 Ohio

Now a

# COLOR

## TELEVISION

### HOME STUDY COURSE

by RCA Institutes



"Color Television is here—no: around the corner, or in the developmental labs, but here! The big question now is . . . Are You ready for Color TV?"

"You may now have a successful TV servicing business. When color sets come to your bench for servicing, will you be able to handle them?"

"Color Television is a vast new field, embodying entirely new concepts . . . principles of light and vision, radically new circuitry."

#### First Home Study Course in Color TV

Now is the time to prepare. Now, for the first time, you can train yourself for the

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#### Costs so little to gain so much

RCA Institutes makes it easy for you to prepare yourself now for color television. Not only is the cost of the home study course for qualified servicemen extremely low, but you pay for the course on a pay-as-you-learn basis.

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Send for **FREE Booklet**—Mail the coupon, today. Get complete information on the RCA INSTITUTES Home Study Course in Color Television. Booklet gives you a general outline of the course lesson by lesson. See how thoroughly you can learn Color TV. Mail coupon in envelope or paste on postal card.



#### MAIL COUPON NOW!

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Without obligation on my part, please send me copy of booklet "RCA INSTITUTES Home Study Course in COLOR TELEVISION." (No salesman will call.)

Name \_\_\_\_\_ (please print)

Address \_\_\_\_\_

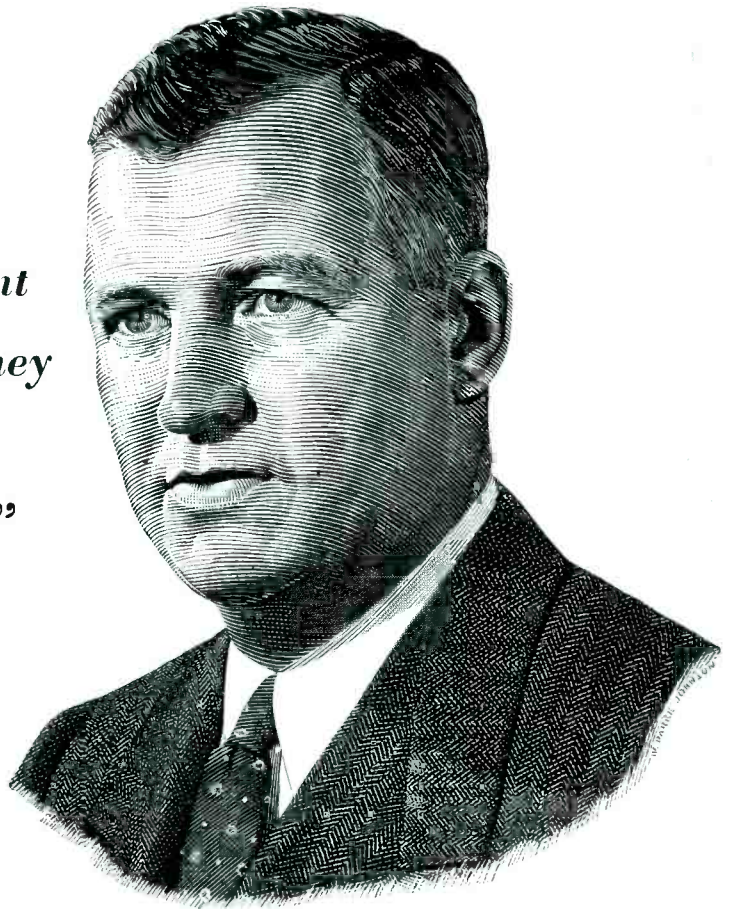
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**RCA INSTITUTES, INC.**  
A SERVICE OF RADIO CORPORATION of AMERICA  
350 WEST FOURTH STREET, NEW YORK 14, N. Y.

*“Wise public debt management  
with its goal of sound money  
is of prime concern  
to every American.”*

**MUNDY I. PEALE**

*President  
Republic Aviation Corporation*



*“Wise public debt management with its goal of sound money is of prime concern to every American. Regular purchase of U. S. Savings Bonds contributes importantly to the achievement of this objective and, at the same time, helps assure our future security, individually and as a nation. We at Republic Aviation feel a deep sense of pride in the knowledge that 94% of all our employees became investors as a result of our most recent campaign and that \$631,000 in bonds are purchased each month on our automatic Payroll Savings Plan.”*

Perhaps the importance of U. S. Savings Bonds and the Payroll Savings Plan as factors in wise debt management and the achievement of sound money may not have occurred to you.

Here are a few facts and figures:

- For every dollar of public debt held by a commercial bank, about five new dollars may be created in the form of credit. Obviously, the larger the amount of the public debt held by individuals, the greater the check on inflationary tendencies.
- At the end of 1953, the cash value of Series E and H Bonds held by individuals was more than 36 billion dollars. This total is growing steadily, thanks largely to the month after month purchases of Series E Bonds by more than 8,000,000 Payroll Savers.
- Sales of E and H Bonds in 1953—23% higher than in 1952—provided cash for all E and H Bond maturities and

redemptions and still left over \$210,000,000 *net* for the reduction of bank-held debt.

- The ownership of more than \$36,000,000,000 in Savings Bonds by millions of Americans constitutes a reservoir of future purchasing power—an asset to industry and business as well as to the individuals who built it by their Bond-conscious thrift.

Why not team up with Mr. Peale and other leaders of industry in their efforts to help America reach its goal of wise public debt management and sound money? All you have to do is (1) show a *personal* interest in your Payroll Savings Plan. Get the figures on the percentage of employee participation and the amount of monthly savings by your employees. (2) Wire, phone or write to Savings Bond Division, U. S. Treasury Department, Washington, D. C. You'll get all the help you need to build up or install a Payroll Savings Plan that will reflect your company and its interest in America.

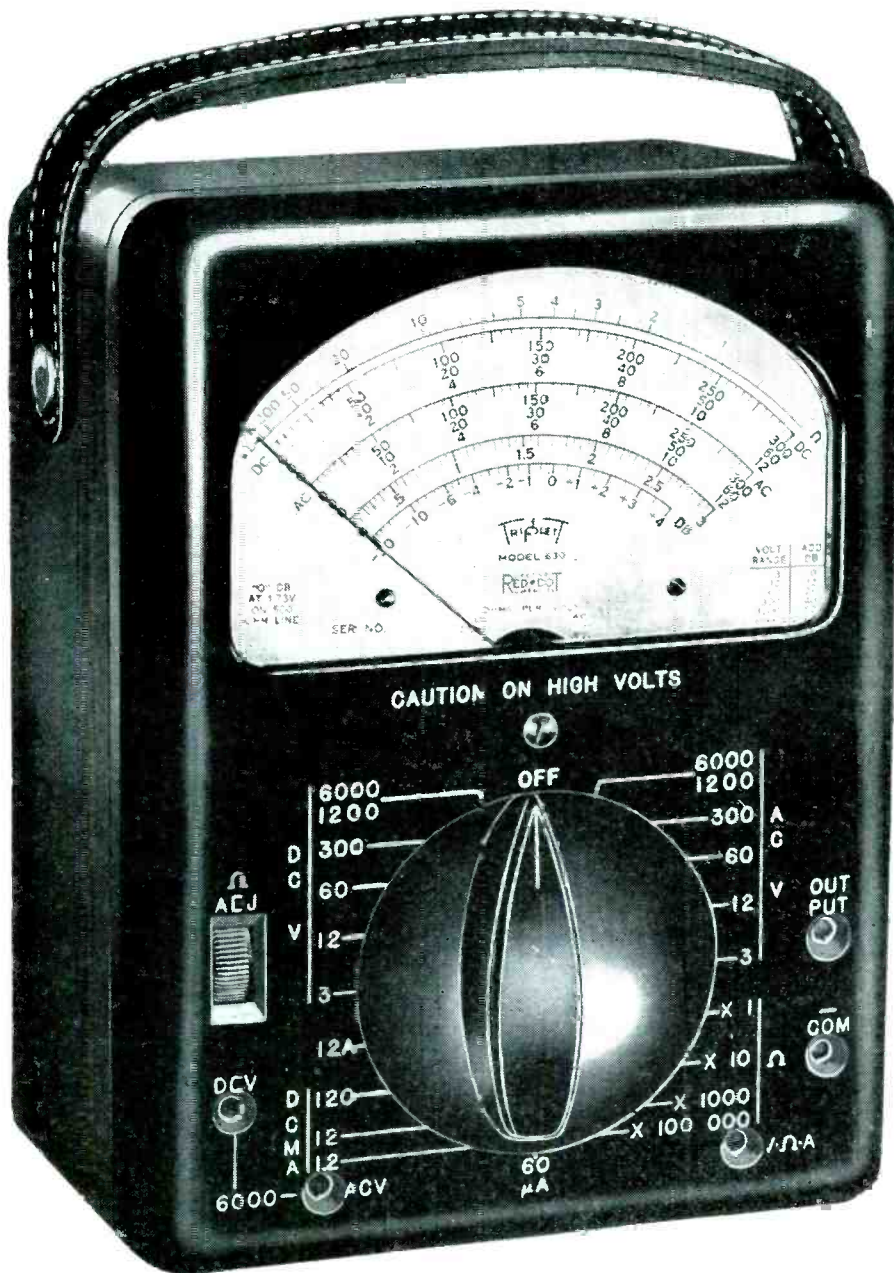
*The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and*

**SERVICE**



# TRIPPLET 630 Volt-Ohm-Mil-Ammeter

## "speaks" for itself in any company



ing to desired circuit thru a single 2½" knob flush with the face panel. The molded switch itself embodies the most advanced engineering practices. Fully enclosed, the silvered contacts are kept permanently clean. Its rugged construction means stronger performance and longer life.

These two factors are but samples of the many ways in which on-the-job needs have been anticipated and provided for in a beautiful streamlined tester. It provides A.C.-D.C. Volts, D.C. Micro-amperes, Milli-amperes, Amperes, Ohms, Megohms, Decibel and Out Put readings in a no-short design embodying interior construction with all direct connections; no harness cabling. Its fool-proof unit switch construction houses precision resistors in insulated recesses in direct connection with switch contacts.

Study the following Ranges and descriptions and compare them point by point with any similar instrument for conclusive proof that Triplet 630 "speaks" for itself in any company.

### Ranges

**D.C. Volts:** 0-3-12-60-300-1200—at 20,000 Ohms/Volt (For Greater Accuracy on TV and other High Resistance Circuits.)

**A.C. Volts:** 0-3-12-60-300-1200-6000—at 5,000 Ohms/Volt

(For Greater Accuracy in Audio and other High Impedance A.C. Circuits.)

**Decibels:** -30, +4, +16, +30, +44, +56, +70. (For Direct Reading of Output Levels.)

**D.C. Microamperes:** 0-60—at 250 Millivolts.

**D.C. Milliamperes:** 0-1-2-12-120—at 250 Millivolts.

**D.C. Amperes:** 0-12—at 250 Millivolts.

\*Ohms: 0-1,000-10,000—(4,4-44 at center scale).

\*Megohms: 0-1-100—(4,400-440,000 center scale).

**Output:** Condenser in series with A.C. Volt ranges.

\*Resistance ranges are compensated for greatest accuracy over wide battery voltage variations. Series Ohmmeter circuits for all ranges to eliminate possibility of battery drain when leaving switch in Ohms position.

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TRIPPLET ELECTRICAL INSTRUMENT COMPANY  
BLUFFTON, OHIO

**T**RIPPLET 630 Volt - Ohm - Mil - Ammeter has many significant advantages and features that make it stand distinctly apart from similar instruments in its price class. Actually in components, in engineering, in minutely accurate performance, Triplet 630 closely approaches laboratory standards.

Since the scales of any VOM comprise the means by which it makes its multiple services most valuable, the legibility and easy-read-ability are of prime importance. Triplet engineers have created in Triplet 630 the longest scales available in this size tester. (The upper arc by actual measurement is four and three-eighths inches.)

This long-scale factor accounts for the ease with which precise readings are easily made. Further legibility is gained by use of black and red scale markings. D.C. and D.B. are black and white. A.C. and Ohm markings are red on white. Ohms from one hundred million to one-tenth ohm mark the range of this amazing scale. On low ohms, center scale reading is 4.5 ohms.

### The Single Switch

Further indication of the practical skill and engineering "know-how" behind Triplet 630 is the Single Switch. Its simplicity of operation assures no burn-outs thru momentary memory lapses. There is instant switch-

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**On Stage . . . Packaged Hi-Fi**

HIGH FIDELITY has moved within the past year from a hobby for long-hair musical enthusiasts to a packaged, ready-made product of volume production for the masses. Dollar-wise, it has multiplied several times, and is expected to grow and grow. Industry estimates indicate that hi-fi equipment sales in '54 may top a quarter-billion dollars and more.

These are truly revealing facts; particularly so because they appeared in an official government talk, made during a recent symposium on audio, by one of the nation's leading authorities, currently a member of the Federal Communications Commission.

Hi-fi has found a new rabid family of friends, with a variety of musical tastes. Today, hi-fi is not restricted to the classics; it's a bright feature of the pop discs, too.

The boom acceptance of hi-fi and its transformation into a popular commodity has spotlighted the Service Man. Not only is he being called in to maintain and service this equipment, but to recommend—serve as technical counsel and evaluate the packages or systems that are now available. The latter is quite an assignment; to sift the barrage of claims now being fired about, and provide sensible interpretations, is a husky task. Charged with this new responsibility, Service Men must now analyze for the consumer such terms as power intensities, linearity, supersonic vibrations, noise, turnover frequencies, perceivable ranges, and, of course, hum, rumble, wow and distortion.

Recently, a couple of experts\* in the West were confronted with this situation, and they came up with some very clarifying answers. First, they said, let's consider the system as one which consists of a record, pickup, amplifier, transducer, and most important of all, the listener, all in tandem. In such a system all of these components, except the listener, could be designed to have a bandwidth sufficient to pass all frequencies produced by a standard, which might be a symphony orchestra. The listener, then, would determine the bandwidth of the system, and so no component need have a bandwidth greater than the listener.

A large symphony with instruments, producing an abundance of bass notes and overtones, extends over a frequency range of 30 to 16,000 cps. The overall volume range of such a symphonic group, from the softest passages to the loudest and peaks, has been found to be from approximately 30 to 100 db, with an average level of 88 db above 10-16 watts per square centimeter. For 90% of the population, in which we have the average listener, the normal range of hearing is from 20 to 15,000 cps at a near-pain intensity level of 120 db. The extreme range of frequency that can be perceived by an individual with acute hearing, experts say, extends to 60 to 22,000 cps, at intensities of 120 db.

Now, one must consider the problem of noise, for noise acts as though it deafens an individual exposed to it by masking sounds of lesser intensities. The average residential noise level has been found to be 42 db;

only 5% of the homes in the country have a noise level of 30 db or less. Thus, for full reproduction, the softest passages of a recording must exceed these levels. The average symphony orchestra has a 70 db range, and so the loudest passages are at near-pain intensities; too great for the average listener. Thus, it becomes necessary to reduce the intensity, and we are faced with a dilemma; the perceivable frequency range is reduced, and noise masking takes place. Therefore, we find that at a typical listening intensity of 55 db (a sensible level if one wishes to converse above it), the perceivable range falls between 175 to 5800 cps. And, at intensities lower than this, mid-frequency noise masking takes place.

Critical listeners usually operate their system at 75 db, and perceive a range of 60 to 15,000 cps. But, if the average listeners used this intensity, his range would fall within a 85 to 11,000 cps bracket.

It is well known that high and low-frequency cutoffs are related to each other for limited fidelity reproduction, if listeners are to gain the most pleasing impression of effective balance. A low cutoff of 75 cps is usually required to balance the high cutoff of 8,000, and 65 cps will normally balance 11,000 cps.

One finds, therefore, that an audio system which might have a maximum response of 75 to 8,000 cps could readily satisfy most listeners. The super-critical, or audiophile, might require a 65 to 11,000 cps range if his home were sufficiently quiet.

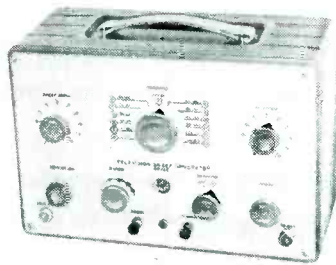
In judging a hi-fi system, flat response is always a factor. In interpreting this fine point, our friends in the West declared that amplifiers are normally flat if any reasonable care is exercised in their design. But, because all pickups do not have completely uniform frequency response, and recording characteristics are changed from constant amplitude to constant velocity at some turnover frequency, amplifier flatness appears to be inadequate. And thus we have to use equalizers which compensate for the various recording characteristics of manufacturers and for the different pickups available.

However, this approach does not always provide us with a flat result. To illustrate, if a turnover at 1,000 cps is compensated by an equalization curve breaking at 500 cps, the error in response will be, at most, 4 db; with the adjustment of the bass response control, one would find the error to fall to about 2 db over a range much less than an octave. Commercially, variations in pickup response are considered good if they fall within  $\pm 2$  db, while a speaker is satisfactory if its peaks and valleys of response can be held within a  $\pm 5$ -db range. Unfortunately, many listeners are not concerned with figures, so they proceed to adjust the bass and treble controls and vary the response from 6 to 12 db from uniformity to provide what they feel is a most pleasing result. Of course, this is not hi-fi, but a form of intentional distortion.

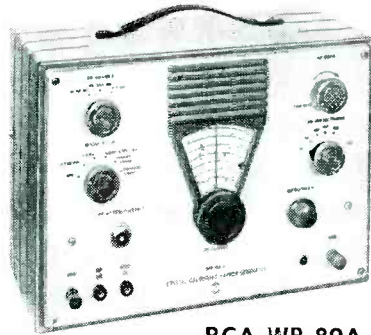
Sitting in judgment of hi-fi phonos is a formidable job. But to the alert Service Man, this represents a bold challenge which we know he'll accept with gusto!—L. W.

\*Ned Wildie and Bennett Basore, Albuquerque, N. M.

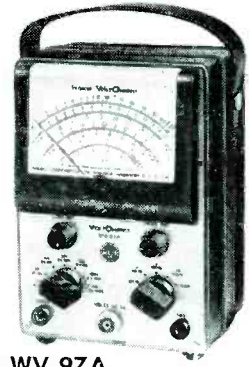
# YOUR BEST BET for BLACK & WHITE and COLOR TV



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Television Sweep Generator

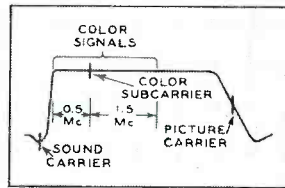


**RCA WR-89A**  
Crystal-Calibrated  
Marker Generator

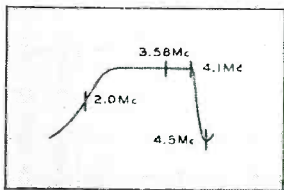


**RCA WV-97A**  
Senior VoltOhmyst®

In color receivers, all of the color information is contained in the region from about 2 Mc to 4.1 Mc on the overall rf-if response curve, as shown in Fig. 1. Any loss of gain in this region will weaken the color signals. If the loss is appreciable, it may result in such effects as poor color sync, poor color "fit" (incorrect registration of color and brightness information on the kinescope), or cross-talk or color contamination between I and Q channels.



**Fig. 1. RF-IF Response**

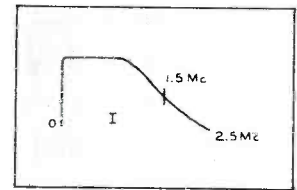


**Fig. 2. Bandpass Filter Response**

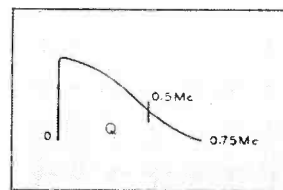
The rf-if amplifier must be aligned correctly to provide flat response for modulating frequencies up to 4.1 Mc. The RCA WR-59C Sweep Generator and WR-89A Marker Generator pro-

vide the flatness of sweep output and crystal accuracy that are essential for aligning color circuits.

In color receivers, there are a number of video-frequency sections, including the video amplifier, the bandpass amplifier, I and Q channels (See Figures 2, 3, 4), and the green, red, and blue matrix networks—including the adders and output stages. A flat video sweep extending down to 50 Kc is a necessity in checking or aligning the tunable bandpass filter and the I and Q filters.

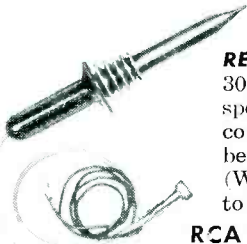


**Fig. 3. I Channel Response**



**Fig. 4. Q Channel Response**

Late models of the RCA WR-59C Sweep Generator now provide a flat video sweep extending down to 50 Kc. It also covers all rf and if ranges required for both color and black-and-white receivers.



**RCA WG-289**  
High Voltage Probe

**REMEMBER** that the high voltage (up to 30,000 volts and more) must be set to the specified value before adjusting purity or convergence. The RCA VoltOhmysts can be used with the RCA High Voltage Probe (WG-289 and WG-206 Multiplier Resistor) to measure dc voltages up to 50,000 volts.

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# SERVICE... *The National Scene*

SERVICE MEN FROM 22 STATES AT FIRST COLOR TV SYMPOSIUM--The city of brotherly love, long the center of intense association activity, won new honors when it played host to the first industry-wide Colorama--a splashing color-TV show featuring exhibits by over 20 set, test and component manufacturers, and a 3-day symposium, during which over a score of the nation's outstanding experts on color demonstrated and described every phase of color television, present and future. . . . Nearly 1500 Service Men and engineers, from 22 states, and Canada and England, attended and listened to talks on: Color-TV business systems. . . . Field and shop applications of color TV test equipment. . . . Flat frequency considerations in the tuner, if and antenna. . . . The luminance signal. . . . Testing and monitoring the color signal. . . . Use of today's test equipment in color. . . . Receiver installation. . . . Color-circuit troubleshooting. . . . Bar and dot generators. . . . Single-gun picture tubes. . . . Convergence and purity. . . . Subcarrier sync and matrixing. . . . Color fundamentals. . . . and . . . Picture tube design and installation. . . . A highlight of the session was a three-screen setup for slide projection, accompanied by demonstrations.

EXHIBITION HALL offered an historic display. Here, for the first time since the FCC came to New York to watch the performance of prototype color sets and decide what should be done about color, a lineup of typical production-line color sets was on view, and all were operating, too. A flying-spot scanner fed color signals to all of the receivers throughout the days, and everyone was able to adjust controls for hue, chroma, flesh tones, etc.

ALL OF THE INSTRUMENTS designed specifically for color, such as bar and dot generators for adjusting color phasing and convergence, and wide-band 'scopes, were not only on view, but in operation. . . . Also displayed were a wide variety of special components developed for the color picture tube and allied circuits. Picture tubes in 15, 19 and 21-inch round and rectangular envelopes, were there, too.

PICTURE TUBE CALLED CRUX OF COLOR SET DEVELOPMENT--In several enlightening talks on color TV picture tubes, at the Philadelphia show, it was stressed that the picture tube represents the key to the future design that all color sets will take. While receivers with the currently-available, 3-gun, 15-inch tubes operate satisfactorily, it was reported, larger tubes with probably single guns will eventually provide the answer to mass-produced chromatic chassis. . . . Some were very optimistic on the availability of the larger tubes, declaring that the Fall will see receivers with single and 3-gun types in 19 and 21-inch plus sizes, offering up to 205 square inches of viewing area. . . . New methods of focusing and beam indexing will be used in some of the new models, the experts said, to minimize or eliminate problems of convergence, and also make it possible to ship sets with the picture tubes installed.

NEED FOR COMPLETE ARRAY OF TEST GEAR STRESSED--Speakers at the symposium emphasized that in color-set servicing, it will not only be necessary to use the supplementary dot-bar test equipment, but all of the instruments presently used in b-w repair, such as signal marker and sweep signal generators, 'scopes, vt ms, probes, and tube testers.

COLOR BLINDNESS NO BAR TO COLOR-SET ADJUSTMENT--In a review of alignment and picture-tube adjustments, at the Philadelphia meeting, it was noted that color blindness did not seem to effect a Service Man's ability to adjust for a good picture on a color set. The opinion was based on observations made during a clinic program. . . . It was said that if one can adjust a color chassis to receive a satisfactory b-w picture, the prospects of getting a satisfactory color picture were good, since the intensities of color will have been already focused; reception of a good b-w picture lies in one's ability to focus all three primary colors with equal intensity. . . . Thus, it appears as if a tantalizing problem has vanished.

# *SERVICE... The National Scene*

PERMANENT EASTERN TV CONFERENCE AUTHORIZED AT PHILADELPHIA MEETING--Formation of an Eastern TV Service Conference, composed of 37 associations on the eastern seaboard, was authorized at the second annual session of the group in Philadelphia. Elected were Harold B. Rhodes, chairman; Bert Bregenzer, vice chairman; John Rader, treasurer; and Ferdinand J. Lynn, secretary. Roger K. Hains, Albert M. Haas and Max Leibowitz, were named trustees of the Conference. Haines, Haas, Leibowitz, Rhodes and Charles Pierce, were named as incorporators of the group. . . . Certificate of incorporation, setting forth the purpose of the organization, declared that the group will sponsor and establish adequate and proper mechanical and electronics education for all persons, firms and corporations engaged in the servicing, maintenance and repair of radio, TV, electronic and related devices, and will also educate the public in the proper use and care of the foregoing equipment. . . . The resolution, creating the Conference, said that the new alliance shall constitute . . ."a regional organization in which all local, state and national groups retain their autonomy" . . . and it shall serve to . . . "provide a closer liaison between segments of the TV service industry in the east and with national service groups" . . . so that eventually a semblance of national unity may obtain.

COLOR STRIPE GENERATOR TO PROVIDE TEST PATTERNS--To make it possible for Service Men making color TV receiver installations to determine whether color signals are reaching the set, even though no color programs are being broadcast, a manufacturer has designed a color-stripe generator for transmitters, which produces a greenish-yellow bar ( $\frac{1}{4}$ " to  $\frac{3}{8}$ " wide) at the extreme right-hand side of the picture. . . . Instruments are currently being used in one station in New York, and in another in Wilmington, Del. And within the next few months the strippers will, it is expected, be installed by other broadcasters throughout the country. . . . The stripe assures one that not only is the receiver operating properly, but that the antenna, transmission line and overall system is in order, and all propagation-path problems have been overcome. The stripe should help to minimize callbacks during this period when there are few color programs on the air, and only an actual on-the-air test can guarantee color-set performance. . . . The color signal is also received by b-w receivers, but such chassis are relatively blind to this added signal component, because most sets have a relatively low response at the frequency of the transmitted stripe. It was pointed out that during the past month the stripes have been transmitted, as a test, from a New York TV station, and no one has been aware of the stripe on b-w sets.

PROGRAM TO CURB TV RECEIVER INTERFERENCE PROPOSED--A voluntary program of self-regulation, designed to minimize interference of TV and FM receivers, caused by radiation and spurious emissions, has been submitted to all members of industry. The plan calls for strict adherence to the recommended if of 41.25 mc, to proposed radiation limits of TV and FM sets, and for the voluntary submission of sets, for testing and certification, to an independent laboratory to be selected by a special committee. Under this plan, manufacturers whose sets pass the lab test will be able to affix a seal certifying that the approved model is free of objectionable radiation which would cause interference. All set manufacturers have been asked to sign a statement of intention, declaring that they will adhere to the proposed plan and also submit their sets for certification. . . . It was also reported that the certification lab will report regularly to the Commission detailing the sets approved or rejected.

PA. STATE FEDERATION PROGRESS REPORT ISSUED--Delegates to the Eastern Conference received an unusual booklet describing the progress made by the Federation of Radio Servicemen's Associations of Pennsylvania since its formation in 1946. In a review of its activities, the Federation cited the public-relation and educational programs developed for all chapters (of which there are now 9) in conjunction with local stations and newspapers, as well as the trade press. . . . Manufacturers, distributors and broadcasters have applauded the Federation for its outstanding work on behalf of the servicing fraternity. We, too, salute FRSAP for a job well done.--L. W.

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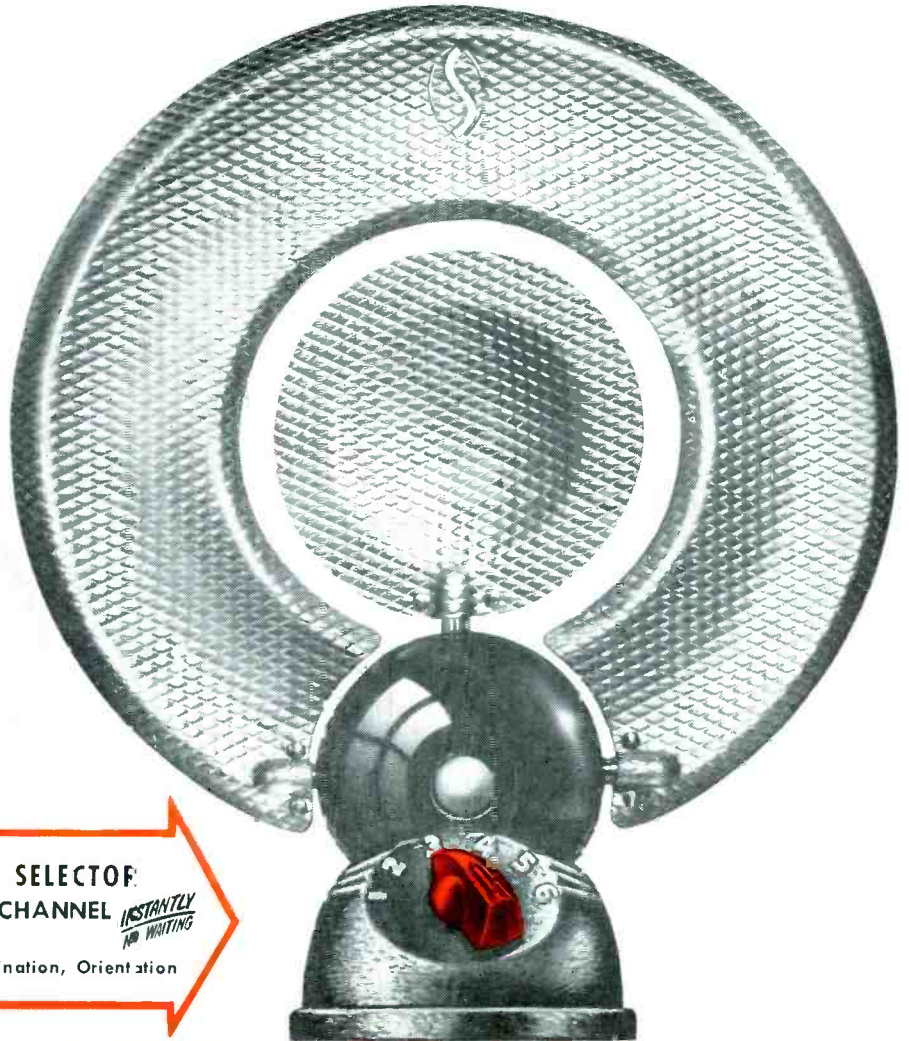
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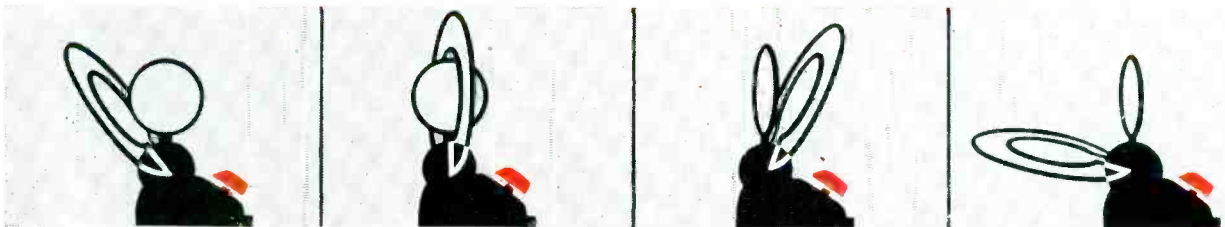


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## Equipment and Installation Techniques Recently Developed

### for Mountain/Hilltop Multi-Channel

# COMMUNITY TV

by M. F. MALARKEY, Jr.\*‡

Trans-Video Corporation

SEVERAL YEARS AGO, during the early days of the freeze, people living in hundreds of smaller cities and towns, the geographical and topographical locations of which precluded the possibility of normal TV reception from the then-existing stations, were continually asking dealers and Service Men why they could not enjoy the same good reception that large cities and nearby suburban areas were enjoying.

The answer to those living in the mountainous areas that the very high TV signals were being blocked by the mountains, and the reply to those residing out on the plains that the signals were being projected off into space because they lived below the horizon of the transmitter, only created additional confusion and a whetted appetite.

A definite need existed. The problem of devising ways and means of reaching up and capturing that signal, harnessing it and making it available to thousands of eager, potential subscribers presented a challenge that appealed both technically and economically to a few who were soon able to enlist the valuable aid of several manufacturers of electronic equipment.

As far back as 1930 many large hotels and apartment houses were feeding low-frequency AM radio signals to hundreds of receivers through a multiple distribution wire or cable system fed by one master antenna erected on the roof.

Then, not too many years ago, industry developed a multiple distribution system for TV, similar in many respects to the old AM system, and hotels and apartment houses began installing hundreds of receivers all coupled to one master antenna array.

Community TV pioneers and equipment manufacturers have actually put a new twist on the tail of an established principle and practice by apply-

ing, on a horizontal plane, a principle that originally had been developed for the multiple distribution, on a vertical plane, of low frequency AM radio signals.

Community TV is, purely and simply, the utilization of the processes involved in relaying, reamplifying, and making available for subscribers' use, regulated TV signals from a remote pickup point to and throughout a community by means of a coax cable system designed for maximum coverage.

If a community TV system is to be successful, the signals available at the tower site must provide pictures of good entertainment quality at least 90 to 95 per cent of the time. Obviously the location of the tower, antennas, and other related equipment including preamps, converters, automatic gain controls, and transmission amplifiers, which, added together, make up any system's head-end, is of major importance technically as well as economically.

#### Antenna Height Factor

Another important factor is the height of the master antennas.

One must consider terrain, wind velocity conditions, and transmitter to receiving tower line-of-sight conditions. The majority of community TV operators have spent considerable amounts of time and money probing for, testing, and recording signals at as many locations as were available to average out propagation anomalies before arriving at a decision on a permanent signal pickup site. Consequently, towers used in community TV vary in height from 50' to 300' and

are usually the guyed *I* or *H* type tubular steel structures.

Signal levels determine the types of antennas used. If strong signals averaging 400 to 500 microvolts-per-meter are found, and the possibility of co-channel or adjacent channel interference does not exist, it is possible to use a single, well constructed broadband antenna with a good frequency response and adequate gain. The more common practice is to use a separate heavy duty, individually tuned antenna for each available channel, since many systems operate from low initial input signal levels. Since most antennas are of 300-ohm impedance, a balun or matching transformer is inserted to match them to the 75-ohm coax cable, which is generally used as the lead-in from the antenna to the head-end equipment at the base of the tower. Under certain extreme receptive conditions, rhombic or horn antennas are being used with excellent results.

Several community TV operators are experimenting with passive relay-rhombic antenna systems to reflect signals from distant stations to their tower site several mountains or miles away.

Very often exceptionally high towers are used where the signal levels are low. To offset the loss in the lead-in from the antenna to the head-end equipment, channelized antenna preamps having nominal gains of 10 to 18 db are mounted as close to the antenna as possible.

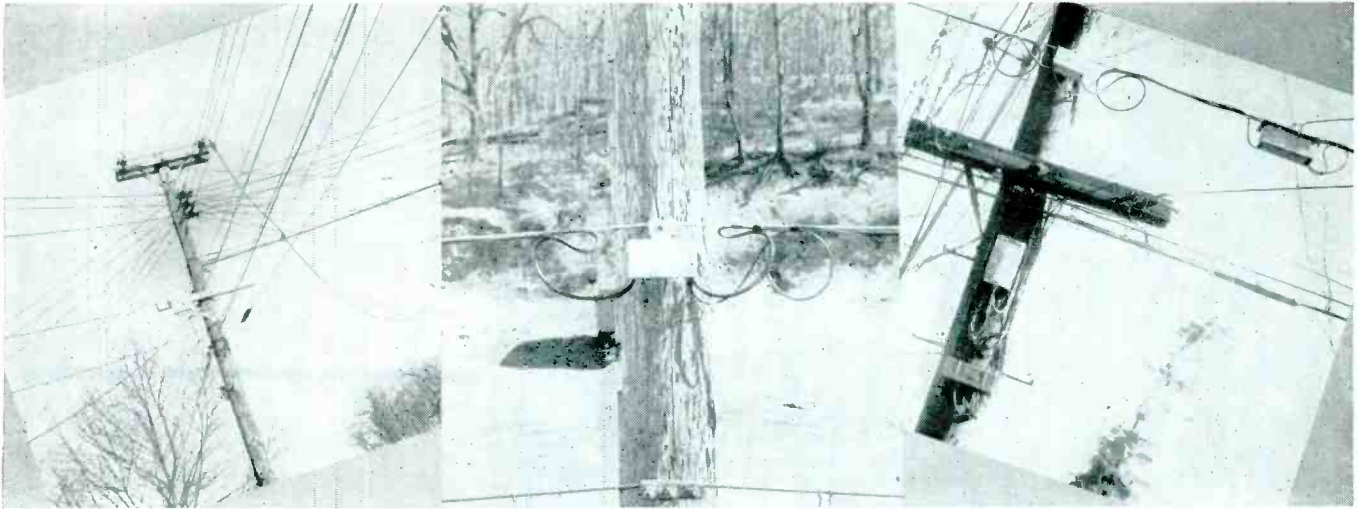
Changes in signal level at the tower due to weather conditions between the transmitter and receiving antennas, variations in transmitter output, and other vagaries, have indicated the advisability of inserting automatic gain control amplifiers at the head-end before final transmission amplification.

Two basic types of amplifiers are being used for both transmission and distribution. One is the broad-band amplifier with gains of 20 to 40 db and a flat frequency response characteristic from 40 to 225 mc. The other is the channelized or strip-type amplifier with gains up to 60 db and a flat frequency response characteristic on a tuned 6-mc bandwidth. Quite a few systems successfully combine these two basic types of community TV amplifiers.

One manufacturer has evolved channelized equipment, using the high-band

\*From a report prepared for the AIEE Committee on TV and Aural Broadcasting, presented at annual convention of AIEE in N.Y.C.

‡President, National Community TV Association.



Distribution-transformer housing for dividing signal.

Housing for device to tap distribution line to feed signal to one home.

Tap-off housing and dividing network housing for delivering signal to four homes.

vlf frequencies, making it possible to deliver at least five channels to a subscriber.

Several others are also manufacturing equipment that will provide subscriber reception from five or more stations.

The amplifier is the heart of a community television system. The cables of the distribution system are the arteries.

Coax cable types in common use, all having a nominal impedance of 75 ohms, are: K-14, also known as 21-125, always used for transmission<sup>1</sup>; RG/11U or RG8/U, used for both transmission and distribution; and RG59/U, commonly used, because of

its lower cost, for consumer service drops. A semi-flexible, aluminum sheathed, low-loss cable has also been developed. It is available in seven diameters ranging from  $\frac{3}{8}$ " to  $3\frac{1}{8}$ "; the  $\frac{7}{8}$ " diameter is said to have a nominal loss of .3 to .4 db per 100' in the low-band frequencies. Because of the cable's relatively high initial cost its use has been limited to a very few systems.

Most systems having exceptionally long transmission runs, up to 10 or more miles, are using K-14 or 21-125 coax, because of its low loss factor of .6 to .8 db per hundred feet at the low

<sup>1</sup>FTR.

frequencies. This feature has been found to permit amplifier spacings in excess of one mile. Long distances from tower to community, or the necessity of stringing cable through desolate or virtually inaccessible terrain, make the use of low-loss cable of this type almost mandatory, since it considerably reduces the number of amplifiers, thereby minimizing maintenance costs.

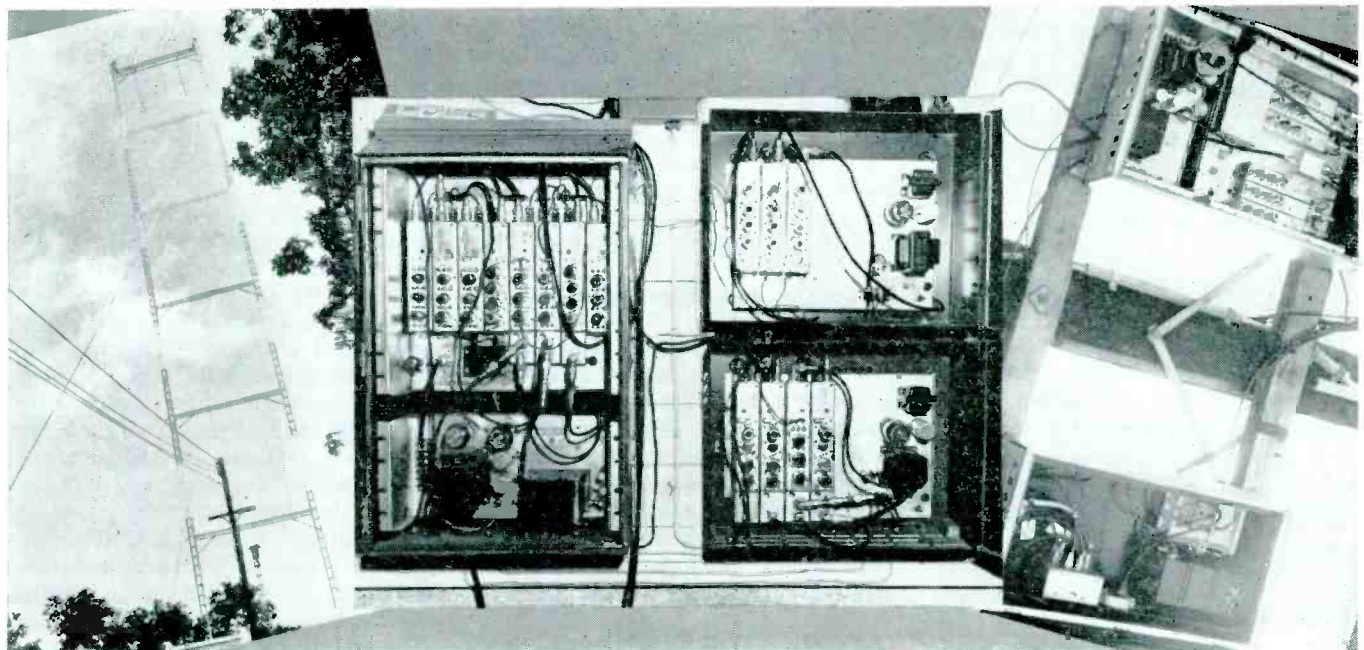
There have been very little data available regarding the life expectancy of the standard cables being used today. Initially the cable was expected to last two or three years. There is now every indication that there may be

*(Continued on page 50)*

A 150' antenna tower atop Sharp Mountain, south of Pottsville; elevation is 1425' above sea level.

Part of head-end amplifier system installed in building at base of tower atop Sharp Mountain.

Community TV master amplifier and utility cabinet mounted on a pole. The utility cabinet houses the voltage control regulator, ac outlets, safety switch and distribution amplifier.



# Reducing ANNUNCIATOR System TVI

by RONALD L. IVES

WITH THE EXPANSION of the TV spectrum into higher frequencies, the increased ownership of TV equipment, and the increasing sensitivity of TV receivers, annunciator interference, particularly in densely-populated urban areas, has become a serious problem.

Annunciators in common use consist of vibratory bells and buzzers, magnetic door latches, and magnetic annunciator drops. These are commonly operated from a high-reactance bell transformer (as required by Underwriters' specifications), and a city block of apartment houses can contain several hundred interconnected individual circuits, the common elements being the transformers. Many of these systems, like Topsy, *just grewed*, so that the circuits are poorly laid out, and usually poorly maintained; and the components in common use are either those originally designed for *dc* operation, or similar designs, made operable on *ac* by addition of a crude shading ring, or other cheap expedient.

Annunciator components of excellent mechanical and electrical design are manufactured by many,<sup>1</sup> but a vibratory bell which will operate on 60-cycle *ac*, giving a clean tone and a minimum of radio and TV interference, is quite expensive in contrast to plain bells which are excellent noise-makers in every sense of the word.

## Basic Circuit

The basic annunciator circuit, in common use, is a simple series affair,

consisting of a bell transformer secondary, a push button, and a vibrating bell, connected as in Fig. 1. Additional annunciators are connected across points *A* and *B* in this illustration, there being usually three circuits in an average apartment (front bell, back bell, front door latch). Frequently, interphone buzzers, dumbwaiter alarms, and maid calls are also tied in to the same system. Less commonly, night lights or push button illuminators receive current from the bell transformer.

Wiring is commonly with cheap cotton-covered annunciator wire, fished between the components in any expedient fashion, and connections are usually neither soldered nor taped. The system is usually not intentionally grounded at any point, although accidental grounds of some part of the circuit to a water or gas pipe, or to a section of metal lath, are quite common. As these accidental grounds are loose connections, usually having non-linear resistance characteristics, they are frequent trouble makers.

## Types of Annunciator Interference

The standard type of annunciator interference, as detected on an AM receiver, is a loud *Bronx cheer* from the speaker whenever the annunciator is used. When picked up on a communications-type receiver, equipped with a noise limiter, this same interference is much less, and is commonly evident only as a slight *mushing* of signals, with resultant minor loss in intelligi-

bility. Receivers incorporating a properly adjusted Lamb-type noise silencer are substantially immune to annunciator interference.

TVI from annunciator systems takes many forms, being evident as almost anything from slight snow through bad streaking to tearing and floppers. The exact effect of the interference is determined by its relative strength at the point where it enters the receiver, and by the receiver characteristics.

FM receivers, which use balanced detectors, bring in little annunciator interference, as this type of noise is approximately an AM signal, to which the system does not respond. The same interference which makes reception impossible on AM is usually detectable only as a few faint clicks on FM.

## Waveforms of Annunciator Signals

Oscilloscopic studies of annunciator circuit waveforms disclose that they are extremely complicated groups of recurrent transients, with major power output below 30,000 cps, but with minor, and not-negligible, outputs scattered irregularly through the frequency spectrum to, and perhaps beyond, 250 mc.<sup>2</sup> Present here are line frequency (60 cps), oscillation frequency of bell armature, resonant frequency of open circuit, resonant frequency of closed circuit, and various electromechanical reflections of the frequency of the bell proper. Also present are various sum and difference frequencies produced by interaction of

<sup>1</sup>Such as Automatic Electric Co.  
<sup>2</sup>Limit on tests made.



# Comprehensive Analysis of the Types of Annunciator Interference ... Waveforms of Annunciator Signals ... Reduction of Annunciator Interference in AC and DC Systems

the foregoing original frequencies and of many of their harmonics. Perhaps all possible sum and difference frequencies are present, but not many of them could be identified with confidence in the cases investigated.

Voltage across the coil of an extremely well-built double magnet *dc* bell, carefully adjusted for clean tone, as observed on a 'scope, is shown in Fig. 2; much of the fine structure of the trace has been omitted here. This consists of superposed *grass*, plus some high-frequency damped oscillations of small magnitude. Notable here is the great amplitude of the flybacks, and the damped oscillations occurring when the bell contacts are open. When the bell has a ragged tone, which is produced when the resonant frequency of the bell proper is not a whole number

multiple of the oscillation frequency of the electromechanical vibrator, the 'scope display becomes much more complicated; and if this bell is now supplied with *ac*, a further increase in the complexity of the waveforms results, and is accompanied by a great increase in radio interference.

### Reduction of Annunciator Interference

Radio and TV interference from annunciator systems cannot be entirely eliminated except by disconnecting the annunciator system, but it can, in most instances, be reduced to a negligible value, usually by simple and quite inexpensive means.

Interference of this type may reach the receiver by two paths—direct radi-

ation and pickup by the antenna or other receiver component, and via the power lines. To determine the interference input path, one should disconnect the annunciator power supply (usually a bell transformer) from the line, and reconnect it through impulse-noise filter,<sup>3</sup> using special care to follow the grounding instructions exactly. The system should be tested, determining the effect of the change on the noise. If a noticeable reduction is produced, a line filter is necessary. If no change is noted, then the interference is not radiated by the power line.

Now, the annunciator transformer should be reconnected, and the filter inserted between the line and receiver, noting the effect of the change on the

(Continued on page 63)

Fig. 1 (above, right). A standard bell circuit. E is usually from 8 to 15 volts, at no load.

(Below)

Fig. 2. Waveforms of voltages across the coil of a *dc* bell.

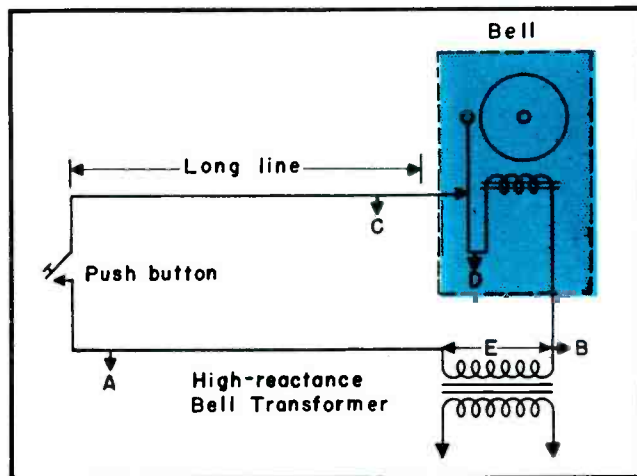
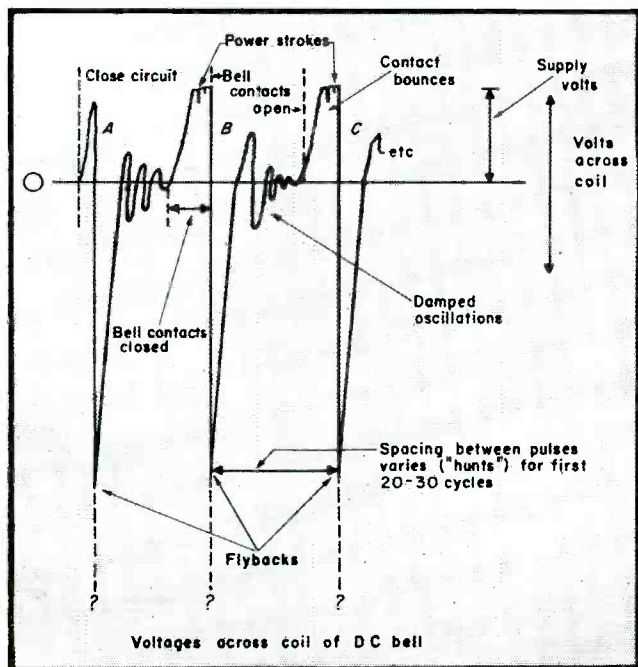
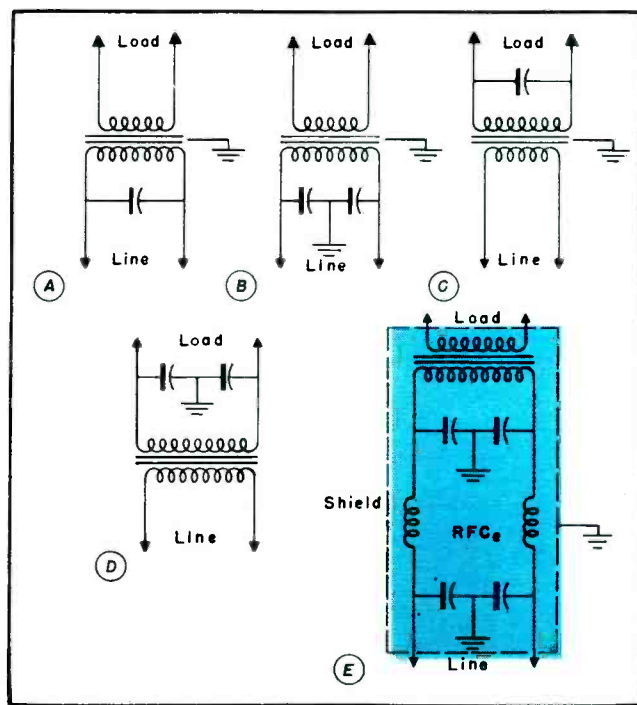
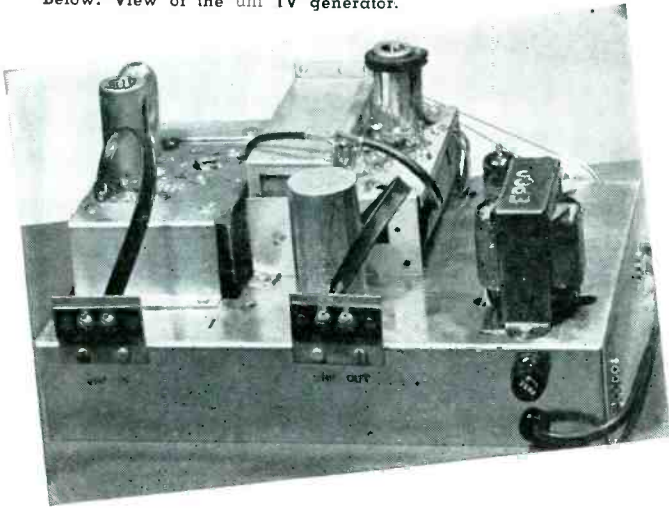


Fig. 3. Simple line filters. At A and C are the simplest form of line filters using shunt capacitors. Filters in B and D use a pair of capacitors, whose common terminal is grounded, shunted across a transformer. The filter illustrated in E is a balanced L-C type designed for severe powerline induced interference.



Below: View of the uhf TV generator.



# UHF TV Generator\*

IN NEW UHF AREAS, during the period when ultrahigh broadcasters are tuning up their gear and transmitting test patterns only at infrequent periods of the day or night, it is difficult to demonstrate or test, on any systematic basis, strips, converters, boosters or allied equipment.

To solve this problem, an instrument,<sup>1</sup> diagrammed partially on the cover and completely in Fig. 4, which generates *uhf* signals on all of the channels (14 to 83) has been designed. In operation a standard veryhigh signal is translated to the higher bands; thus the *vhf* program material can be used to display actual pictures on the high-band model, permitting immediate judgment of the quality of signal on the upper channels.

Not only can the instrument be used for demonstration, but it is useful for lab and production tests. It can be used to check overall picture quality, sensitivity, freedom from extraneous beats, etc. Various field difficulties also can be simulated and corrective procedures devised. For example, many receiving systems, both continuous and strip, are susceptible to interfering signals such as AM, broadcast, short-wave, FM, and amateur signals. Such

\*Based on notes supplied by **Walter V. Tyminski**, Engineer in Charge, Commercial Products, Industrial Television, Inc.

<sup>1</sup>Industrial Television model IT-130R *uhf* generator.

conditions can be simulated and studied under conditions without limitation as to the special time and location at which the interfering condition takes place.

The generator also provides a means of adapting *vhf* test equipment to *uhf*. It is only necessary that a *vhf* oscillator cover one frequency in the 50 to 90, or 170 to 220-mc range to obtain an oscillator output continuously tunable from approximately 460 to 900 mc. In a like manner a *vhf* sweep generator capable of covering any of the *vhf* channels (2 to 13) can be used with the generator as a *uhf* sweeper for channels 14 to 83, inclusive.

## Theory of Operation

The design of the generator has been based on the non-linear circuit theory which states that a non-linear device, such as a crystal, can be used not only for rectification (demodulation), but also for the reverse process of modulation.

## Basic UHF Converter Design

In the basic *uhf* converter design, in Fig. 1, a *uhf* signal is selected by a preselector, usually a double-tuned circuit, and mixed with a *uhf* oscillator signal in the demodulator to produce a *vhf* signal. If no unidirectional devices, such as *rf* amplifiers, are used in the converter the process can be

reversed. A *vhf* signal can be introduced into the demodulator to modulate the oscillator to produce a *uhf* signal. The *uhf* preselector then passes the desired output frequency and attenuates any spurious signals.

While this system could theoretically be used for any modulating frequency by providing separate calibrated controls for the preselector and oscillator, the unit would be extremely difficult to use. Another disadvantage is the large signal loss through the unit of approximately 13 db, and the lack of a suitable method of controlling the level of the output signal.

The tuning difficulty can be overcome by tracking the preselector and oscillator controls, but the unit would then be limited to operation at the one intermediate frequency. Also there is still the large conversion loss which results in only 1/20th of the original power being available at *uhf*.

## RF Amp at VHF

The *uhf* TV generator shown in Fig. 4, uses a *vhf* *rf* assembly to amplify the *vhf* signal and to convert each of the *vhf* channels to the desired *if*, as shown in Fig. 2. This *if* is then used to modulate a *uhf* oscillator to obtain the desired *rf* output at *uhf*. The inclusion of an *rf* amplifier at *vhf* provides a means of overcoming the signal loss in the *uhf* section, and thus there is no signal loss in the process of conversion from *vhf* to *uhf*. A

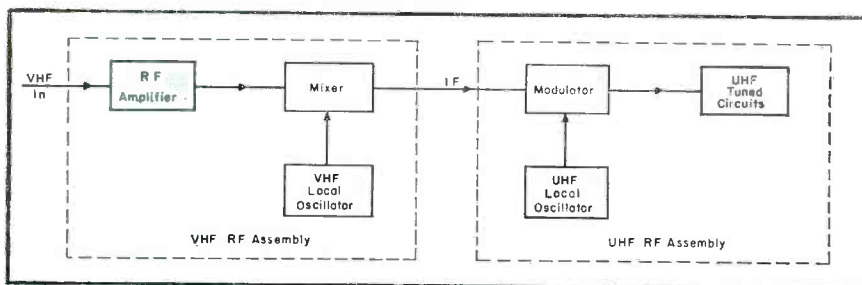
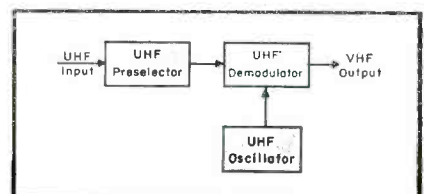


Fig. 1 (below). Basic *uhf* converter design.

Fig. 2. Block diagram of *uhf* TV generator.



variable bias supply is provided to vary the overall gain so as to control the output level.

The operation of the unit, to translate a *vhf* signal to *uhf* is illustrated by Fig. 3. As an example, for the case of *vhf* channel 2 input converted to a *uhf* channel 60 output, the respective frequencies in Fig. 3 would be:

- vhf*  $f_p = 55.25$  mc and  $f_s = 59.75$  mc
- if*  $f_p = 45.75$  mc and  $f_s = 41.25$  mc
- vhf* Lo  $f_{o1} = 101$  mc
- uhf* Lo  $f_{o2} = 853$  mc
- uhf*  $f_p = 807.25$  mc and  $f_s = 811.75$  mc

In this figure only the picture and sound carriers are shown, but all other modulation remains the same during the process of double conversion.

**Signal Direction**

The generator serves to translate *vhf* to *uhf* and cannot be used in the reverse direction. Ultrahigh signals can be received at the *if* terminals of the *uhf* rf assembly, with a *uhf* signal input at the antenna terminals, but the *if* is approximately 40 mc.

**Applications**

A typical arrangement for the demonstration and comparison of *uhf* receiving equipment is shown in Fig. 5 (p.60). For use of the generator with single receiver the two-set *uhf* coupler is omitted and a direct connection made from the generator to the *uhf* receiver. For a large number of sets several *uhf* couplers<sup>a</sup> can be cascaded.

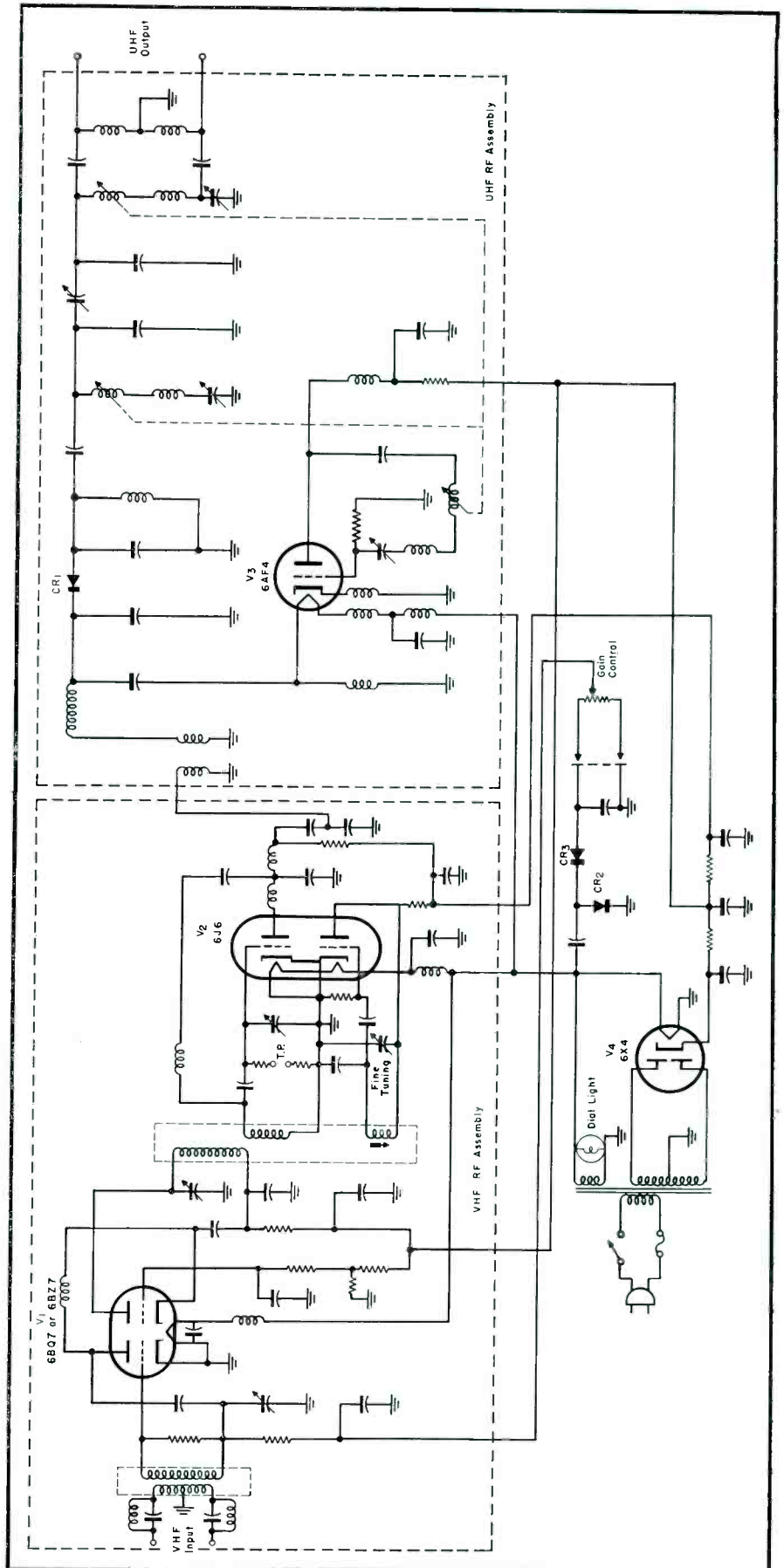
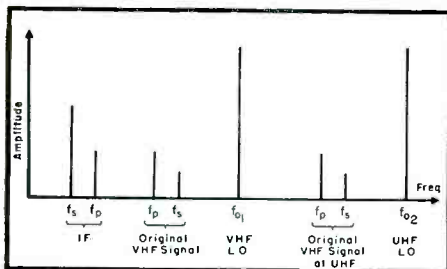
The generator can also be used to demonstrate *vhf/uhf* receivers as shown in Fig. 6 (p. 60). If a single *uhf/vhf* input is provided, the *vhf* and *uhf* signals can be combined by the use of a

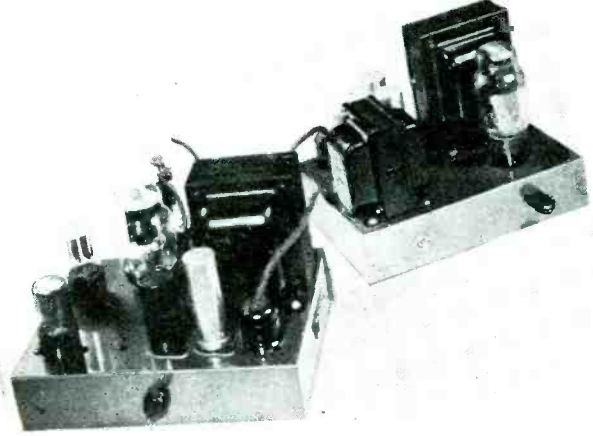
(Continued on page 60)

<sup>a</sup>ITI model IT-135A *uhf* AutoCoupler.

Fig. 3 (below). Frequency spectrum of *uhf* TV generator operation in translating a *vhf* signal to *uhf*.

Fig. 4. (right). Schematic of ITI *uhf* TV generator.





Left: Modified Williamson amplifier, featuring ultra-linear design, and power supply. (Courtesy Stancor)

# An Analysis of the

# WILLIAMSON AMPLIFIER

by **MARK VINO**

AN INCREASING NUMBER of commercial audio amplifiers featuring the *Williamson* design are appearing on the market. In common with all other electronic devices these amplifiers, rugged though they may be, will require repair, and Service Men should be familiar with their circuitry.

The Williamson boom started when D. T. N. Williamson described his amplifier in the Spring of '47 in a British publication.<sup>1</sup> This unit, a *fixed basic gain model*, was rated at 15 watts output, and was intended to serve only as the high-level section of an audio amplifying system; that is, preamp and tone-control sections were not included. Signal input for the full 15 watts output had to be about 2 volts. Subsequent articles by Williamson described circuits for preamp and control sections; but the tag *Williamson circuit* is in general meant to refer to the original fixed gain amplifier.

The Williamson amplifier contains nothing revolutionary or tricky; it is a well-engineered, conservative circuit that takes full advantage of the progress of the audio art. It is especially suited to large-scale production because the conservatism of its design makes its quality least susceptible to

<sup>1</sup>Wireless World.

the differences between laboratory and production line construction.

### Basic Circuit Design

Williamson's original circuit, naturally, used British tubes: KT66s, L63s, and a U52 rectifier. The main differing feature, however, between British and American tubes is the physical shape, and our tubes can be, and usually are substituted in this country for the British types, with suitable changes in bias resistor values where necessary. The identifying characteristic of a Williamson amplifier is the basic circuit design illustrated in block form in Fig. 1.

A pair of push-pull output triodes form the output stage; Williamson used triode-connected pentodes. These output tubes are driven by a pair of medium  $\mu$  push-pull triode voltage amplifiers, which in turn are fed by a cathode-loaded phase-splitter. The input voltage amplifier is directly coupled to the phase-splitter, eliminating the low-frequency phase shift introduced by coupling capacitors, and about 20 db of feedback is taken from the voice-coil winding, back over the entire amplifier to the cathode of the first stage. The application of this

block layout to the actual circuit is shown in Fig. 2.

Although the original Williamson circuit uses pentode output tubes, the screen grids are tied to the plates, and the tubes function as triodes. The plates and screens are connected through 100-ohm stopping resistors rather than directly, but this has no significant effect on the triode characteristics.

### Output Stage Characteristics

Because the output stage is operated in class *A* and not *AB*, and because the push-pull signal currents are well balanced, the common cathode resistor for the output stage bias is left unby-passed. This helps to maintain dynamic balance, and will not introduce current feedback so long as the signal voltages across the common resistor are exactly equal and out of phase. Some amplifiers, designed on the Williamson model, however, have reintroduced a cathode bypass capacitor, usually with a value of 100 mfd or so.

The potentiometer in the output stage cathode circuit of Fig. 2 varies the relative bias on each tube, so that the flow of *dc* current through each can be equalized. The simplest method of determining the correct setting is to adjust the potentiometer for zero *dc* voltage between the two output plates. Some Williamson type amplifiers eliminate this potentiometer.

In recent years a further modification of the original design of the Williamson output stage has been introduced: the so-called ultra-linear connection. In this design configuration the output tubes are operated neither as pentodes nor as triodes, but

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## Original Circuit's Basic Design Features . . . Characteristics of Output and Driver Stages, Phase Splitter, and the Feedback Circuit . . . Installation and Maintenance Notes

as a compromise between the two. For pentode operation the screen grids must be connected to the center tap of the output transformer; for triode operation the screen grids are connected to the top or plate end of the output transformer. For ultra-linear operation the screen grid is connected to a tap on the output transformer primary winding, in-between the two extremes, as shown in Fig. 3 (p. 61).

This connection divides the load between the screen grid and plate and introduces negative feedback to the screen, permitting more power output at the same distortion, or lower distortion at the same power output. Commenting on this design change recently in an article, with the somewhat ironic title *Amplifiers and Superlatives*, Williamson pointed out that once an amplifier has, by one design or another, achieved the performance characteristics of the original circuit (less than .1% distortion at 15 watts, frequency response over the audio range uniform within .2 db, noise level 80 db below the signal output, very high damping factor, etc.), it will sound exactly like every other amplifier that has achieved or surpassed these standards. The only way such an amplifier can be improved upon is to lower the cost, size or weight without sacrificing quality. Thus the real contribution of the ultra-linear circuit was not to make the original Williamson circuit sound better, but to open the way for less expensive *Williamsons* or other *hi-fi* amplifiers. The use of the ultra-linear connection in an amplifier that has not followed the original Williamson specifications should, of course, make an audible difference.

### The Driver Stage

The phase-splitter in the Williamson does not feed the output tubes directly but through a pair of push-pull drivers. These, having a common unbypassed cathode resistor, help to correct any imbalance that may be present due to imperfect operation of the phase-splitter. The benefits of

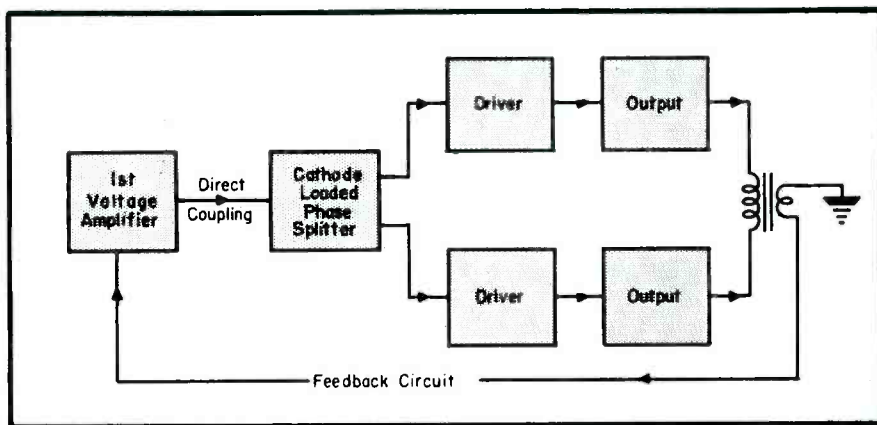


Fig. 1. Block diagram of Williamson amplifier circuit design.

push-pull operation in reducing even harmonic distortion are applied to the driver stage, which of all the voltage amplifiers must handle the highest signal voltages, and is thus most subject to harmonic distortion.

The potentiometer between the plate resistors of the push-pull drivers serves to adjust signal balance. A method for making this adjustment with a pair of earphones has been outlined by Williamson and was described in a previous issue of *SERVICE*.<sup>1</sup> Some Williamson amplifier circuits, including one modified by Williamson himself, eliminate this potentiometer and connect the junction between the two plate resistors directly to *B+*, as shown in Fig. 4 (p. 61). The self-balancing characteristics inherent in the circuit, plus the stabilizing effect of the large amount of negative feedback, are relied upon for proper balance.

### The Phase-Splitter

The phase-splitter is one of the distinguishing features of the Williamson circuit. The first voltage amplifier and phase-splitter are designed together, and the circuit combines cathode loading with direct coupling from plate to grid. The high *dc* positive voltage applied to the phase-splitter grid by

the previous plate is counterbalanced by a slightly higher negative bias voltage derived from the large cathode resistor, and the resultant bias on the grid is about 5 volts negative. The bias voltage between grid and cathode can be measured with a *vacuum*.

### Phase-Splitter Matching

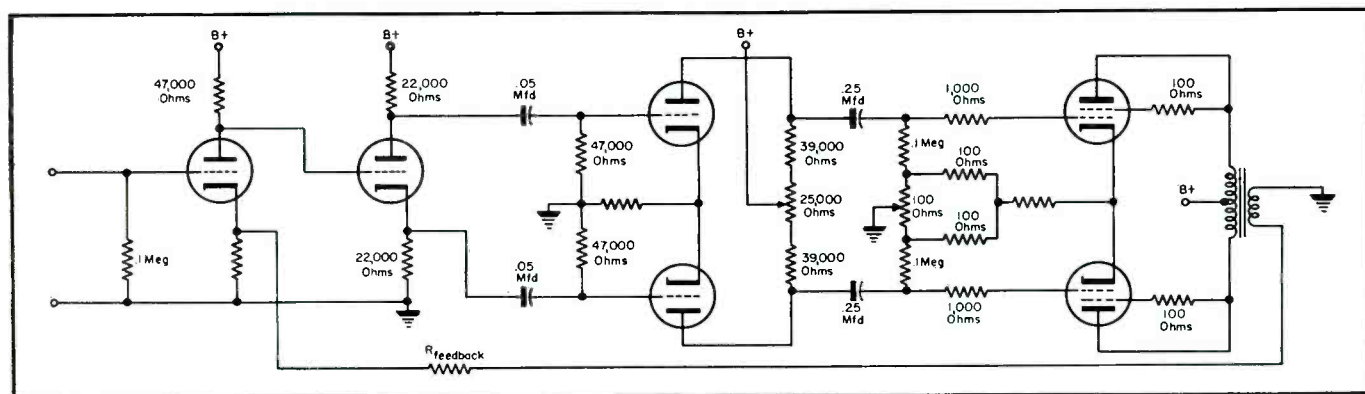
Williamson has used direct coupling to reduce the low-frequency phase shift within the feedback loop. Such phase shift limits the amount of feedback that can be used without low-frequency peaking or oscillation in the form of motorboating.

The balance between the plate and cathode resistors of the phase-splitter determines the signal balance of this stage's output. Therefore, when replacing either of these resistors, a high quality unit, whose value is matched to its mate *with an ohmmeter*, must be used. All of the paired plate and grid resistors following the phase-splitter are preferably matched in this way, but matching is especially important in the case of the components of the phase-splitter itself.

Negative-voltage feedback is taken from the voice-coil to the input stage

(Continued on page 61)

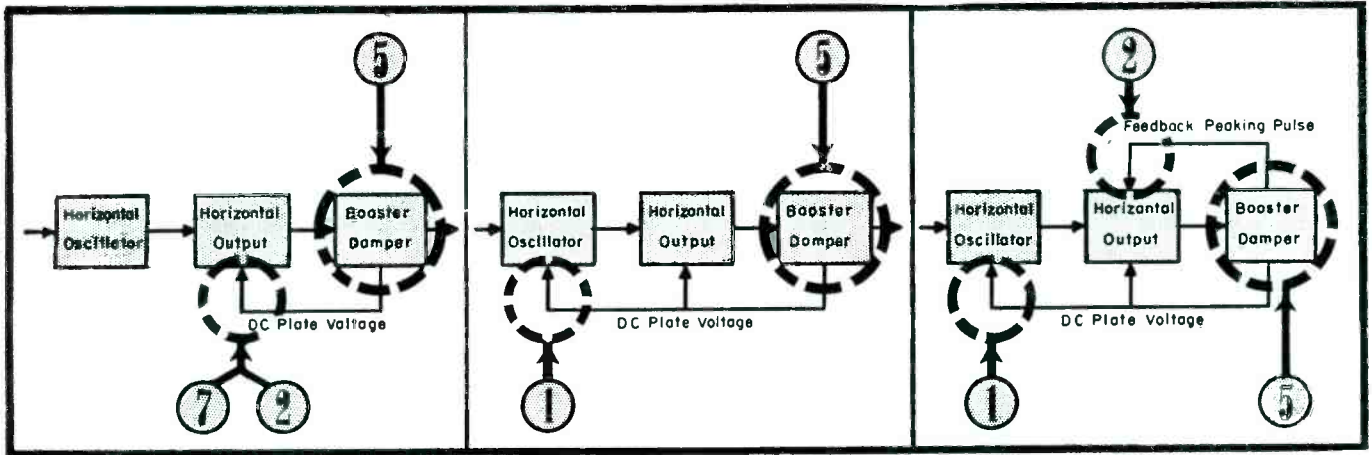
Fig. 2. Simplified schematic of Williamson amplifier, showing some of the values used in the original circuit. Bias resistor values are determined by the tubes used.



# Troubleshooting SWEEP CIRCUITS

**Cures For Dark Screen . . . Subnormal HV . . . Vertical Barber-Pole Interference . . . Short-Life HO and HV Rectifier Tubes** by **CLARK R. ALISEN**

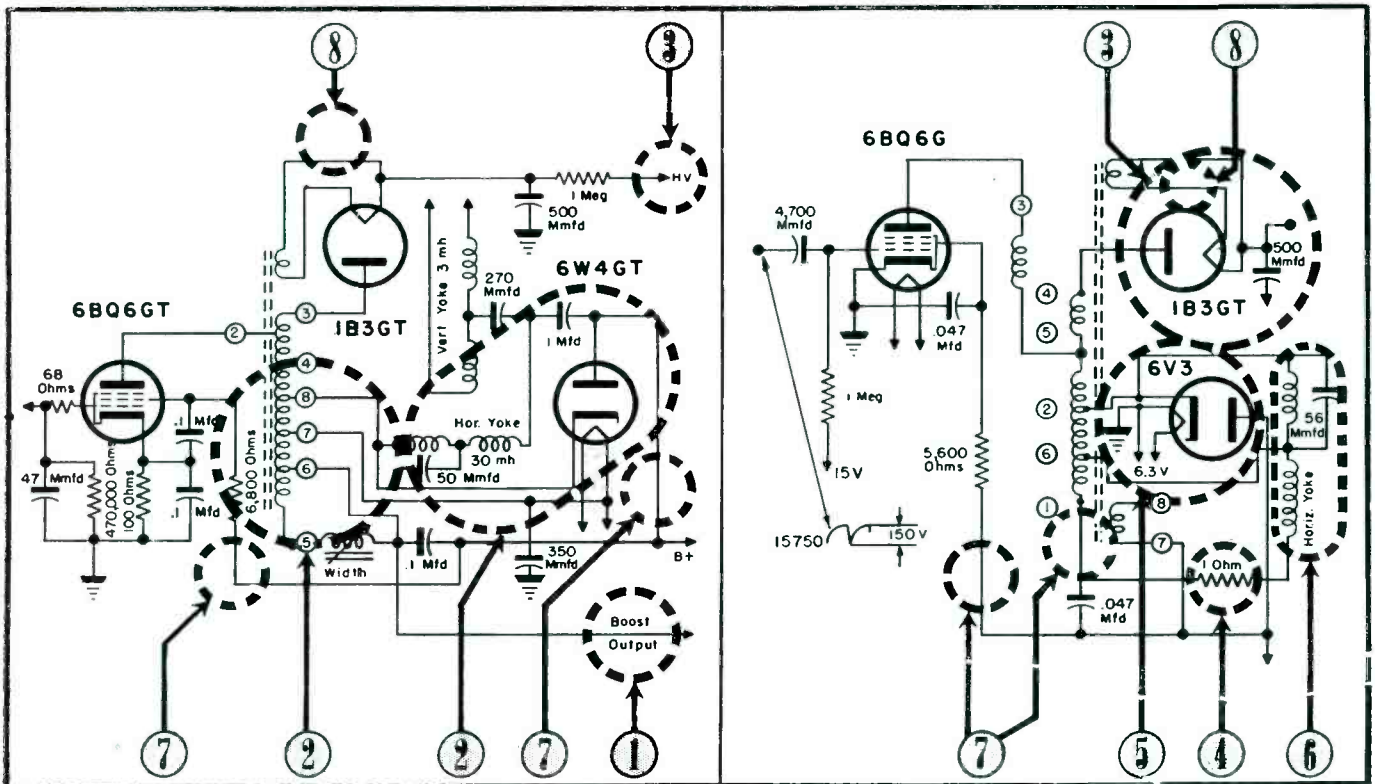
Condition	Cause	Control Method
Dark screen.  (1)	Low voltage at plate of horizontal-oscillator tube.	The B+ return lead from horizontal-oscillator circuit should be connected temporarily to an auxiliary B+ supply. If the horizontal oscillator then resumes operation, attention may be turned to the sweep circuit; otherwise, troubleshooting of the horizontal-oscillator circuit must be undertaken: <b>See diagrams at right; circle 1.</b>
Sweep circuit operates at reduced efficiency.  (2)	Reduction of plate voltage to horizontal output tube, or loss of feedback peaking pulse from damper to grid of horizontal-output tube.	Circuit patching serves to pinpoint the faulty section. For example, the yoke and damper circuit can be opened, and reconnected to the transformer in a receiver which is in good operating condition. Likewise, the transformer can be reconnected to the yoke and damper in another receiver. Or, the booster-damper section can be patched into another receiver with test leads: <b>See diagrams at right; circle 2.</b>
Horizontal oscillator inoperative; sweep-circuit condition unknown.  (2a)	Loss of drive to horizontal-output tube makes it impossible to determine whether fault is present also in sweep circuit.	One should apply drive to horizontal-output tube from horizontal oscillator of another receiver. If sweep circuit is okeh, picture will appear on screen. Test leads can be used for patching. TV station signal must be applied to both receivers.
Sweep circuit operative, as shown by 'scope check, but high voltage is subnormal or zero.  (3)	Fault in high-voltage section of receiver, or gassy picture tube; sometimes an interelectrode short in picture tube.	High-voltage from another receiver can be applied to pix-tube for check. One must not forget to provide ground path between both chassis: <b>See diagrams at right; circle 3.</b>
Sweep linearity in need of adjustment; cross-hatch generator not available.  (4)	Difficulty encountered in setting up linearity accurately on program material.	A 1-ohm resistor should be inserted in return lead of horizontal coils. 'Scope should be connected across resistor to obtain current sawtooth and circuits adjusted for greatest linearity of sawtooth: <b>See diagrams and waveform at right; circle 4 and a.</b>
Vertical barber-pole interference appears near left-hand edge of picture.  (5)	Spook interference caused by sharp transition of damper waveform at beginning of current sawtooth; high-frequency harmonics are picked up by front end, and cross-beat with the TV signal.	To eliminate the spook bar, it is usually sufficient to isolate the heater of the damper tube with conventional heater chokes connected in series with each of the damper leads directly at the socket terminals. Small bypass capacitors may also be required, from damper socket terminals to chassis: <b>See diagrams and waveform at right; circle 5 and b.</b>
Voltage waveform across horizontal-deflection coils appears distorted on 'scope screen, although circuit operation is normal.  (6)	Vertical amplifier of 'scope is often overloaded when 'scope is applied directly across coils.	A properly compensated 10-to-1 or 100-to-1 probe should be used: <b>See diagrams and waveform at right; circle 6 and c.</b>
Circuit operation satisfactory, but horizontal-output tube is short-lived.  (7)	Excessive plate current, or screen current, or both, is being drawn.	Currents should be measured and compared with tube ratings. Circuit should be checked for leaks or out-of-tolerance components with excessive current demand: <b>See diagrams at right; circle 7.</b>
Circuit operation satisfactory, but high-voltage rectifier tube is short-lived.  (8)	Excessive filament voltage applied to tube.	One should insert a small resistor to bring filament down to normal brilliance: <b>See diagrams at right; circle 8.</b>



(Above and Below)

Schematics and block diagrams of horizontal sweep systems. As noted, both dc and ac interacting circuits often exist within the horizontal sweep system. It is absolutely essential to refer to the circuit diagram of the receiver before troubleshooting and select the interacting circuits.

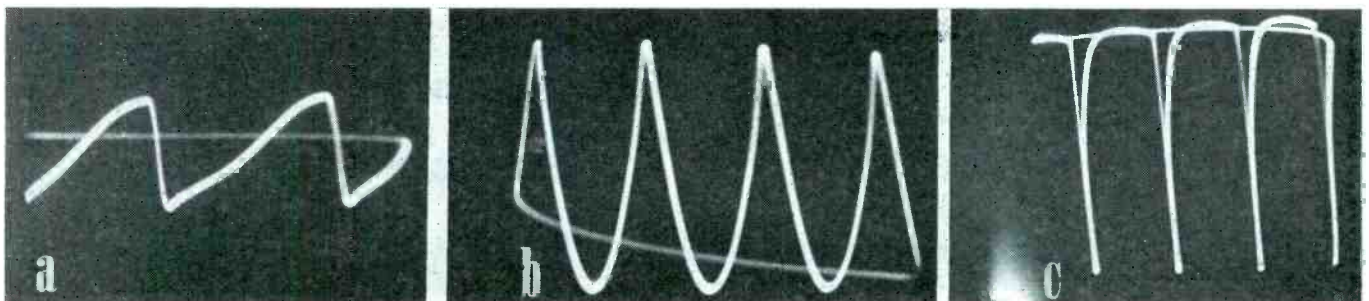
(Circuits, courtesy Ram Electronics)



The current sawtooth rise must be perfectly straight to realize complete linearity of sweep. If a cross-hatch generator is not available, a 'scope check, as shown below, will be found both accurate and convenient. Pattern illustrated shows appreciable non-linearity, requiring correction.

A damper waveform, with sharp transition at positive peak, which causes generation of strong harmonics, and can result in development of a spook bar. Chokes and possible bypass capacitors, also, in the damper leads will suppress the harmonics.

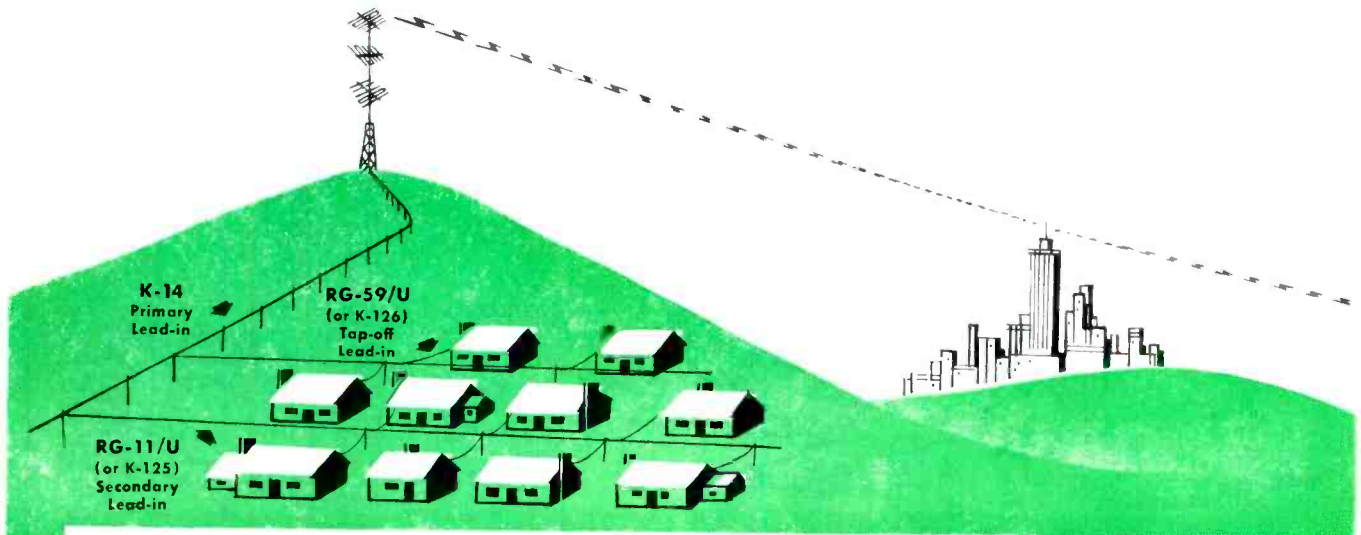
Tops of deflection waveform, as shown, are rounded by overload (grid-current flow) in vertical amplifier of 'scope. Peak-to-peak voltage will also measure subnormal when 'scope is overloaded; compensated attenuating probe will correct the condition.



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**K-14**—71-ohm shielded primary transmission line for community distribution systems. Famous for lowest line loss, long cable runs and fewer amplifiers required. Capacitance: 21.5 mmf/ft. Attenuation DB 100/ft: .57–50 Mc; .90–100 Mc; 1.42–200 Mc; 2.3–400 Mc.



**RG-11/U**—75-ohm shielded low-loss coaxial. One of the best small-diameter cables. Tops as a community TV secondary lead-in. Seven strands #26 tinned copper. Capacitance: 20.5 mmf/ft. Attenuation DB 100/ft: 1.5–50 Mc; 2.15–100 Mc; 3.2–200 Mc; 4.7–400 Mc.



**RG-59/U**—73-ohm coaxial TV lead-in cable. Highly efficient as a community system pole-to-house tap-off. Meets all needs wherever a high-grade installation is a must. Capacitance: 21 mmf/ft. Attenuation DB 100/ft: 2.7–50 Mc; 4.0–100 Mc; 5.7–200 Mc; 8.5–400 Mc.

**Use these 2 for Community TV radiation:**

## FOR URBAN CENTERS



**K-111**—300-ohm shielded, balanced TV lead-in developed by FTR. Minimizes noise, snow, ghosts due to transmission line pick-ups. Ideal for many areas where good TV was impossible before. Capacitance: 4.2 mmf/ft. Attenuation DB 100/ft: 3.4–100 Mc; 6.6–400 Mc.



**TV-1184**—300-ohm dumbbell-shaped TV lead-in. A standard low-cost lead-in for areas without unusual conditions. Cinnamon-brown color is highly resistant to ultraviolet. Two conductors: 7/#28. Capacitance: 4 mmf/ft. Attenuation DB 100/ft: 1.28–100 Mc; 3.0–400 Mc.



**TV-1182**—300-ohm deluxe type heavy-duty TV lead-in with 90 mil. web. Insulated with "silver" polyethylene, Federal development that provides maximum weather protection and long life. Capacitance: 4 mmf/ft. Attenuation DB 100/ft: 1.22–100 Mc; 2.85–400 Mc.

## Non-Radiating Lead-ins for MULTIPLEX TV SYSTEMS



**K-125**—75-ohm coaxial TV lead-in cable. Double-shielded and jacketed. Formerly listed as SP-75.



**K-126**—73-ohm coaxial TV lead-in cable. Double-shielded and jacketed. Formerly listed as SP-76.

**K-125** alternates for RG-11/U as secondary lead-in  
**K-126** alternates for RG-59/U as tap-off lead-in



Wherever there are **TV** customers...

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Federal's **TV-1185**

...**"PIPELINE"** of the Air!

**300-OHM  
ALL-CHANNEL  
TWIN-LEAD  
THAT LAUGHS  
AT WEATHER**

**FOR FRINGE AREAS**

**TV-1182**—Provides remarkably low line loss in fringe areas. Outstanding for resistance to weather and sunlight. Silver-colored insulation blends with any color scheme in home decoration.

**K-200 (RG-86/U)**—200-ohm heavy-duty ultra low-loss lead-in. Particularly adaptable to remote-area installations—especially long runs and multi-stack antennas. Also used with rombics.

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**NOW BETTER THAN EVER!**

FEDERAL'S TV-1185—the famous "Pipeline" of the Air—has been greatly improved. It's *more* durable, *more* flexible and *more* efficient... a better cable to work with!

This *new* TV-1185 is smaller in O.D. . . . with conductors consisting of seven strands of #28 stranded copper. It fits all stand-off brackets and lightning arresters . . . holds its shape while going around sharp-angle edges. And there's greater protection against oxidization in damp, salty areas. TV-1185 leads in Weatherometer tests, due to its Federal-developed "silver" polyethylene insulation.

TV-1185 keeps the energy field inside the weather-proof sheath . . . providing exceptionally low loss . . . more constant impedance. It's absolutely tops in tubular lead-ins!

Capacitance: 4 mmf/ft. Attenuation DB 100/ft:  
0.5–10 Mc; 0.95–50 Mc; 1.25–100 Mc; 1.7–200 Mc;  
2.6–400 Mc; 3.0–500 Mc; 4.5–1000 Mc.

Product of America's leading producer of solid dielectric coaxial cables



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by

THOMAS K. BEAMER

# Service Engineering

field and shop notes

## Report on A Fixed Tuned Mobile Receiver Designed for Use With Converters

IT IS OFTEN DESIRABLE to extend the efficiency of ham-band converters for mobile work. In Fig. 1 appears the circuit of a fixed tuned receiver<sup>1</sup> designed for this purpose. When used with a converter it becomes a double conversion superhet.

The unit has a stable oscillator that can be adjusted for any input frequency between 1,400 and 1,600 kc. No crystal is required; thus the frequency can be shifted when necessary to avoid beats with local broadcast stations with resultant heterodynes.

Featured is a built-in power supply that can be used on either 6 or 12 v by changing 3 wires and plugging in the correct vibrator. In addition regulated voltage can be furnished to the

converter by plugging a VR tube into the wired socket provided.

As shipped, the receiver is aligned for an input frequency of 1,440 kc. When used with a converter having an output frequency other than 1,440 kc, it is necessary to change the input transformer and oscillator tuning adjustments.

All adjustments must be made with the *bfo* off, the *ant* off, the *rf* gain full on and the selectivity at *sharp*. The actual oscillator frequency is 175 kc lower than the input frequency.

To connect a converter to the receiver, the shielded converter power cable should be soldered into a plug furnished, and plugged into the socket on the back of the set. The shield on

the power cable should be soldered to the plug shell.

A shielded coax cable from the converter should be plugged into the set's input socket.

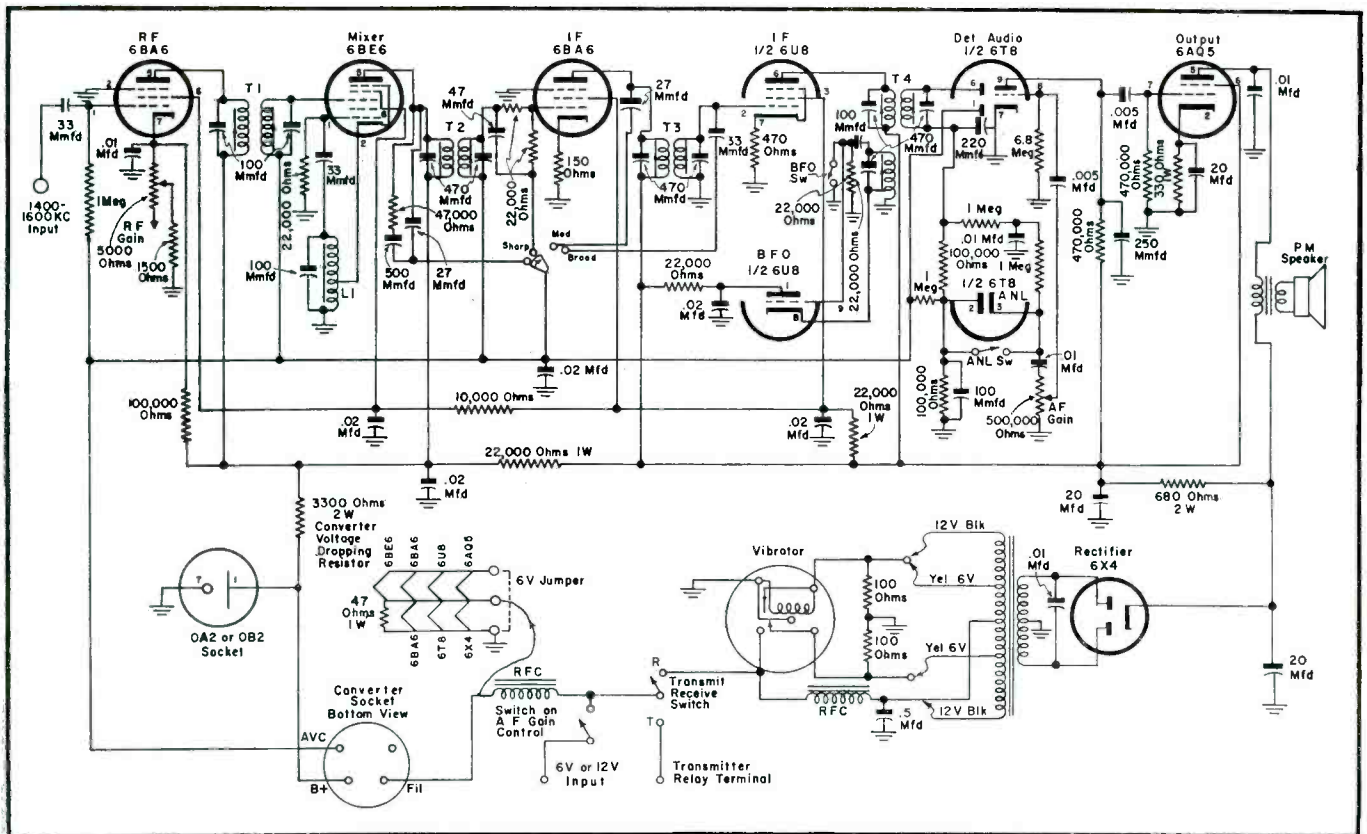
The voltage dropping resistor used in this model has been chosen for average converters, to give a plate voltage between 120 and 180 volts depending on the converter. The converter plate voltage can be raised or lowered by replacing this resistor with a lower or higher value two-watt resistor.

Regulated plate voltage of 108 or 150 can be supplied to the converter by plugging an OA2 for 150 volts or an OB2 for 108 volts into the socket

(Continued on page 55)

Fig. 1. Schematic of Mobil-ciever designed to serve as the rear-end for ham-band converters having an output frequency of between 1400 and 1600 kc.

<sup>1</sup>Mobil-ciever; S and W Electronics.



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**AND HERE'S GOOD NEWS!**

\*Survey conducted January, 1954

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HERE IS MY 3-LINE IMPRINT FOR TAGS  
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Signed . . . . .

# SER-CUITS

## Design and Application of a Crystal Marker Generator with 1-Mc Markers Over Complete IF and VHF Ranges\*

IN ALIGNING TV chassis, particularly the tuner section, it is usually very difficult to obtain a strong and distinct marker. Even if a strong marker is obtained there then appears the problem of the frequency accuracy of that marker. In an effort to find a solution to these bottlenecks, a marker generator and calibrator, consisting of a single 6J6 stage and a pair of crystals, which produce markers over the entire *if* and *vhf* range, was developed.<sup>1</sup>

Basically the circuit features two crystal oscillators operating at 5 and 6 mc, with the output removed from the cathode circuit. Inasmuch as cathode current flows in pulses in an oscillator circuit, the cathode output is rich in harmonics. In fact, with 5 and 6-mc cycle crystal frequencies, strong harmonics are still available on channel 13. The two crystal oscillator circuits, Fig. 1, can be turned completely off or they can be marker-amplitude controlled with the plate circuit potentiometers associated with each oscillator. The use of a 5 and a 6-mc cycle crystal was found to permit

the formation of at least three markers on each TV channel; *if* range (*lo*)—20-24-25-30 mc . . . *if* range (*hi*)—40-42-45-48 mc; Channel 2, 54-55-60 mc; 3, 60-65-66 mc; 4, 66-70-72 mc; 5, 76-80-82 mc; 6, 82-85-88 mc; 7, 174-175-180 mc; 8, 180-185-186 mc; 9, 186-190-192 mc; 10, 192-195-198 mc; 11, 198-200-204 mc; 12, 204-205-210 mc, and 13, 210-215-216 mc.

These are all harmonics of the 5 and 6-mc crystals. In addition, four markers are apparent in the 25 and 45-mc *if* ranges. These marker points are available continuously and if another variable marker is used in the alignment setup they offer accurate calibration points along the response curve. However, for most work, the only marker necessary can be derived from this single unit.

The foregoing markers can be operated and controlled separately so

\*From an exclusive report prepared for SERVICE by Edward M. Noll and Earl C. Gross.

<sup>1</sup>The One-Meg.

that each marker can be identified accurately on the response curve. For example, if we are using the marker generator on channel 3, the 6-mc crystal will produce markers at 60 and 66 mc. When the generator is turned off and the 5-mc marker turned up it will produce markers at 60 and 65 mc. With both crystals turned up simultaneously all three major markers will be present.

### Secondary Markers

Both crystals can be operated simultaneously and because there is a 1-mc difference frequency, secondary markers are produced every mc over the entire *if* and *vhf* range. These secondary markers have been found to be almost as strong as the primary ones, and with proper insertion permit a fine calibration of each response curve. Inasmuch as the markers are very accurate it was found that they were more reliable and less troublesome to operate than a continuously tunable marker signal. However, if the Service Man prefers to use a continuous marker as well, these crystal-controlled points can serve as fine accurate calibrations for the variable marker in locating any frequencies with an accuracy that is just a small fraction of 1 mc.

The presence of 1-mc markers adds to the accuracy of alignment, and the presence of the key markers (when any one of the markers is turned down) locates the calibration of the response curve quickly. For example, if an *if* response curve is under observation, the 6-mc crystal will locate a 24-mc position; Fig. 3. When the 6-mc position is turned down and the 5-mc point turned up, the 25-mc marker is immediately apparent. With both crystals in operation simultaneously there are *one-meg* markers over the entire response, with the 24 and 25-mc points dominating in terms of amplitude.

An accurate marker calibrator and generator is a necessity in the alignment of the TV receiver and will also become increasingly important in the

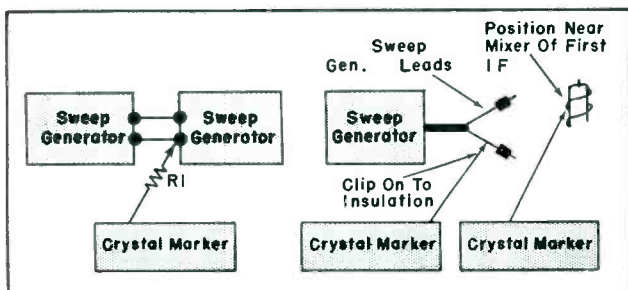
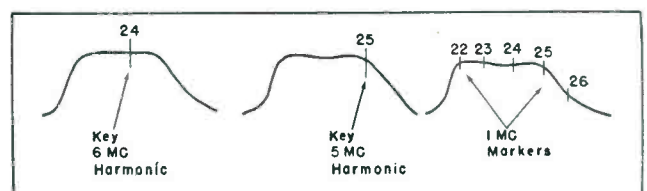


Fig. 2 (left). Insertion of the marker signal.

Fig. 3. Crystal markers on the response curve.



more critical alignment of a color chassis. An inaccuracy of 1-mc or a fraction of that frequency in the alignment of a tuner on a given channel can cause a substantially poorer signal-to-noise ratio in the reception of a fringe area signal or, where adjacent channel interference is prevalent, can cause a decided increase in adjacent channel spill-over into the desired picture. It is well known that the proper alignment of the video *if* strip is necessary to minimize intercarrier buzz. Thus the ability to place a clear and accurate marker on the response curve is a comforting advantage in alignment work.

### Marker Generator Operation

The calibrator can be connected at the same point as a sweep generator, through a suitable isolating resistor (to minimize loading and distortion of response curve) or at some convenient position before or after the point of sweep generator attachment. A calibrator lead is clipped to the insulated section of sweep generator cable or, in case of *if* alignment, the lead from calibrator is looped around the mixer or first *if* tube, Fig. 2. This method of injection permits minimum loading of sweep generator output or circuits under alignment.

The calibrator must always be connected in such a manner that markers are discernible without causing any distortion of response curve. When a direct connection is used the size of the isolating resistor should be chosen to produce a discernible marker without distorting shape of response curve.

It is also advisable to shunt a capacitor across the 'scope input at a point where it is connected to the output of the unit being aligned; one should experiment with a value between .001 and .02 mfd to clarify the markers. This step will sharpen the markers, improving accuracy and serve to keep the response curve presentation on the 'scope clean and free of beat patterns.

In calibrating an *if* section, first the sweep generator and 'scope would be connected in a normal manner, and test equipment would be adjusted to obtain *if* response curve. Then the calibrator can be hooked up by clip-

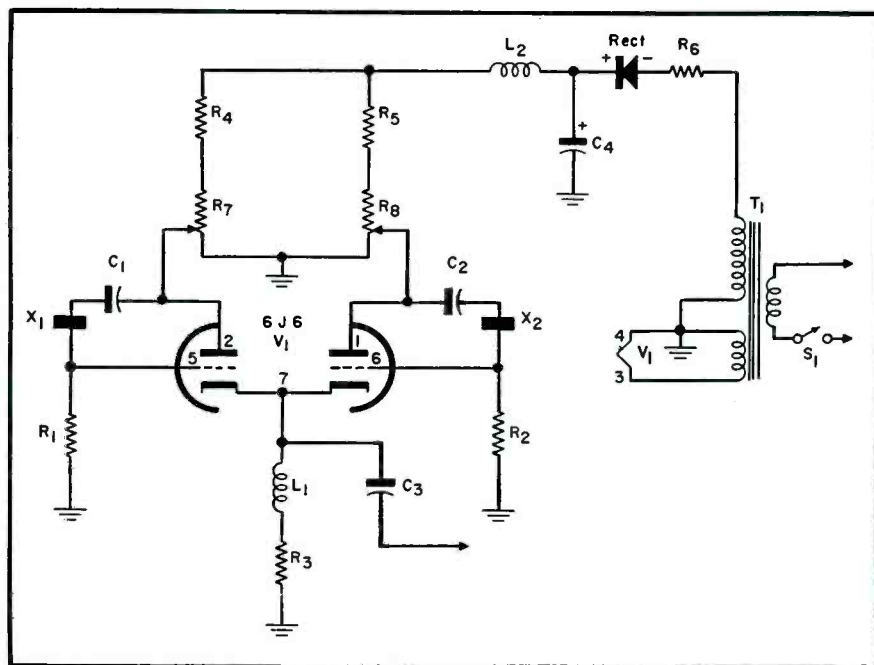


Fig. 1. Circuit of the 1-meg marker generator.

ping on to insulation of the sweep generator signal lead. One must be certain that the presence of calibrator lead has not distorted shape of response curve. Now the 6-mc marker can be turned up and the 5-mc marker turned down. A 24-mc marker will appear on the response curve; Fig. 3. This will be the fourth harmonic of the 6-mc crystal. In the next step, the 6-mc marker is turned down and the 5-mc marker turned up. A 25-mc marker will now appear on the curve (fifth harmonic of 5-mc crystal). This will locate the two key calibration points on the curve; operation of each crystal alone. In the final step both markers can be turned up. It will be noted that there will be markers every megacycle with the 24 and 25-mc markers dominating the secondary ones located at 22, 23 and 26-mc points.

The marker generator also has several applications for both *vhf* and *if* service. In using the calibrator for tuner alignment, the sweep generator and 'scope should be connected in the normal manner. Test equipment should be adjusted to obtain *rf* response curve. Now the calibrator can be connected by clipping on to insulation of

the sweep generator signal lead. Once again, one must be certain that the presence of the calibrator lead has not distorted the shape of response curve. Marker injection can be controlled with individual marker amplitude controls of calibration. The 6-mc marker should be turned up, and if the tuner is set on channel 3, markers will appear at the 60 and 66-mc points on the response curve; Fig. 4. When the 6-mc marker is turned down and the 5-mc marker up, markers will appear at 60 and 65-mc frequencies. With both markers turned up there will be a marker each megacycle over the response curve. If markers are not discernible with loose coupling of marker, a direct connection (through an isolating resistor) can be made. Degree of coupling should be regulated with the value of the isolating resistor and marker amplitude control. Markers will be more discernible and alignment better when the minimum output from the sweep generator is used; 'scope vertical gain controls set for least attenuation. The size of capacitor also has an influence on marker clarity. A definite capacitor size cannot be always recommended because its value also

(Continued on page 59)

Fig. 4. Markers on the tuner response of channel 3.

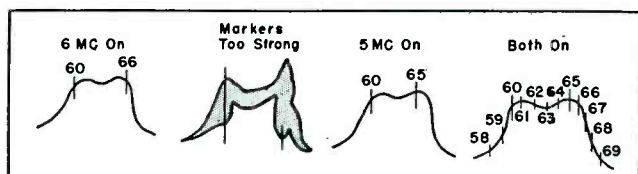
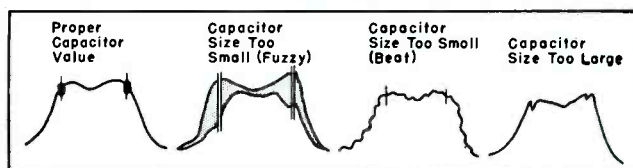


Fig. 5. Influence of the 'scope capacitor value of the marker response.



# Converting B-W Video Generator for White Dot-Bar Use in Color TV\* . . .

by D. J. MARISEN

Single-Gun Color Picture Tube Design Factors

## COLOR TV developments

DURING THE INSTALLATION of color-TV chassis using three-gun picture tubes, one of the most important steps is gun alignment registration. A dot-bar generator can be used for such alignment, provided white dots and bars are available.

With white dots the convergence control can be thrown off and there should be three colored dots visible in form of a triangle; one red, one green and one blue. If the deflection magnets are not properly adjusted, the three colors will not appear as a triangle, but may be superimposed on each other or may appear in some other shape.

Once the deflection magnets are properly aligned so that the three dots appear and the convergence control is properly readjusted, then the three dots will converge on a point and will appear white.

By the addition of a phase inversion tube (Fig. 1) in a standard b-w video generator<sup>1</sup> it was found possible to convert the instrument so that it would provide the required white dots and bars.

The additional tube inverts the 900-cycle and 315-kc signals before applying them to the modulator. This results in the reverse of the dot pattern which is normally in negative phase and applies it as positive phase.

The video generator, in which the conversion was made, features use of a timer which is crystal controlled. The crystal frequency, 315 kc, is divided down by relaxation oscillators to the desired frequencies which are then shaped and mixed together to form the composite video and sync outputs.

These oscillators serve to divide down the crystal controlled frequency of 315 kc to 15,750 cycles, 900 cycles and 60 cycles.

Four shaping circuits are employed.

The various frequencies taken from the timer are shaped and fed to the mixers in proper polarity and amplitude.

The output of the mixers is then fed into a plate-cathode phase inverter providing outputs of either positive or negative polarity. These are fed to the amplifier and cathode follower, and are available at the *video output*, and are also used to modulate *rf* channel oscillators.

A video amplifier is utilized in the instrument. The output of the phase inverter is connected to this amplifier (wideband) and amplified without appreciable loss to the higher-frequency components. The video amplifier is also utilized as a modulator for *rf* channel oscillators.

One duo-triode tube, tied in parallel, is utilized as both a cathode-follower and discharge tube. With the *waveform selector* in the *video output on* position, the plate is heavily bypassed and the tube operates as a cathode follower with the output taken from the cathode. With the *waveform selector* set to either 60 or 15,750 cps *sawtooth output*, the cathode is grounded and a resistor and discharge capacitor are switched into the plate circuit. The sawtooth output is formed and taken from the plate, and the tube acts as a discharge device.

Two independent *rf* oscillators of the Colpitts type are employed in the generator; one is for low channels (50-90 mc), and the other for high channels (170-220 mc). The *rf* oscillators are plate-modulated through an

*rc* and *l* network from the plate of the modulator. Both oscillators are calibrated in terms of channel numbers.

Video output is taken directly from the video attenuator of the cathode follower and fed into a peak-to-peak duo-diode. The *dc* from this peak-to-peak duo-diode is fed into the meter which is calibrated in peak-to-peak volts, range 0-30 volts.

In the *rf int* position of the *meter circuit selector* switch, *rf* is taken from the cathode of the *rf* channel oscillator and applied to a crystal detector. The detector converts the *rf* to *dc*. The *dc* is filtered and fed to the meter to provide setting of the *rf* level.

With this converted instrument, it has been found possible to provide for the adjustment of the focus, convergence, purity yoke and centering of the individual beams of the tricolor tube.

### Single-Gun Picture Tubes‡

The main advantage of single-gun picture tubes developed for color TV with the color-control electrode near the face of the tube is the absence of the registration problem. Several variations of these tubes fall within this classification.

In all these types, the beam excites one of the three phosphors depending on the instantaneous voltage on the control electrode. This voltage is changed periodically by a wave, the ideal shape of which is a *stairstep*, and the three color phosphors are excited sequentially.

In dot-sequential systems, the switching wave can only contain few frequencies, as it is essential to tune

(Continued on page 58)

\*From notes submitted by W. A. Weiss, vice-president, charge of engineering, Hickok Electrical Instrument Co.

<sup>1</sup>Hickok 650 C.

‡Based on paper presented by S. K. Ates and A. P. Stern, G.E., during recent IRE national convention.

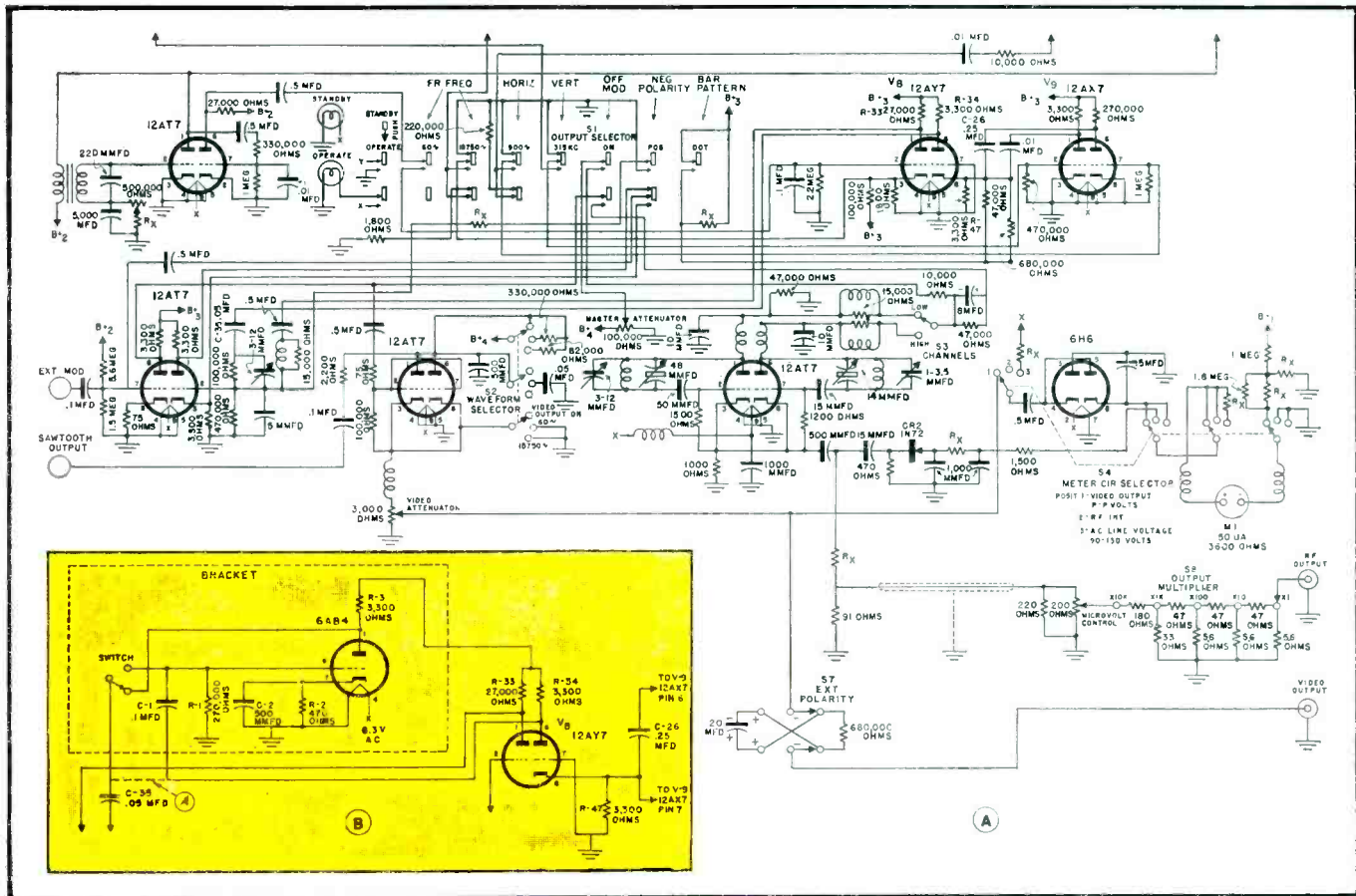
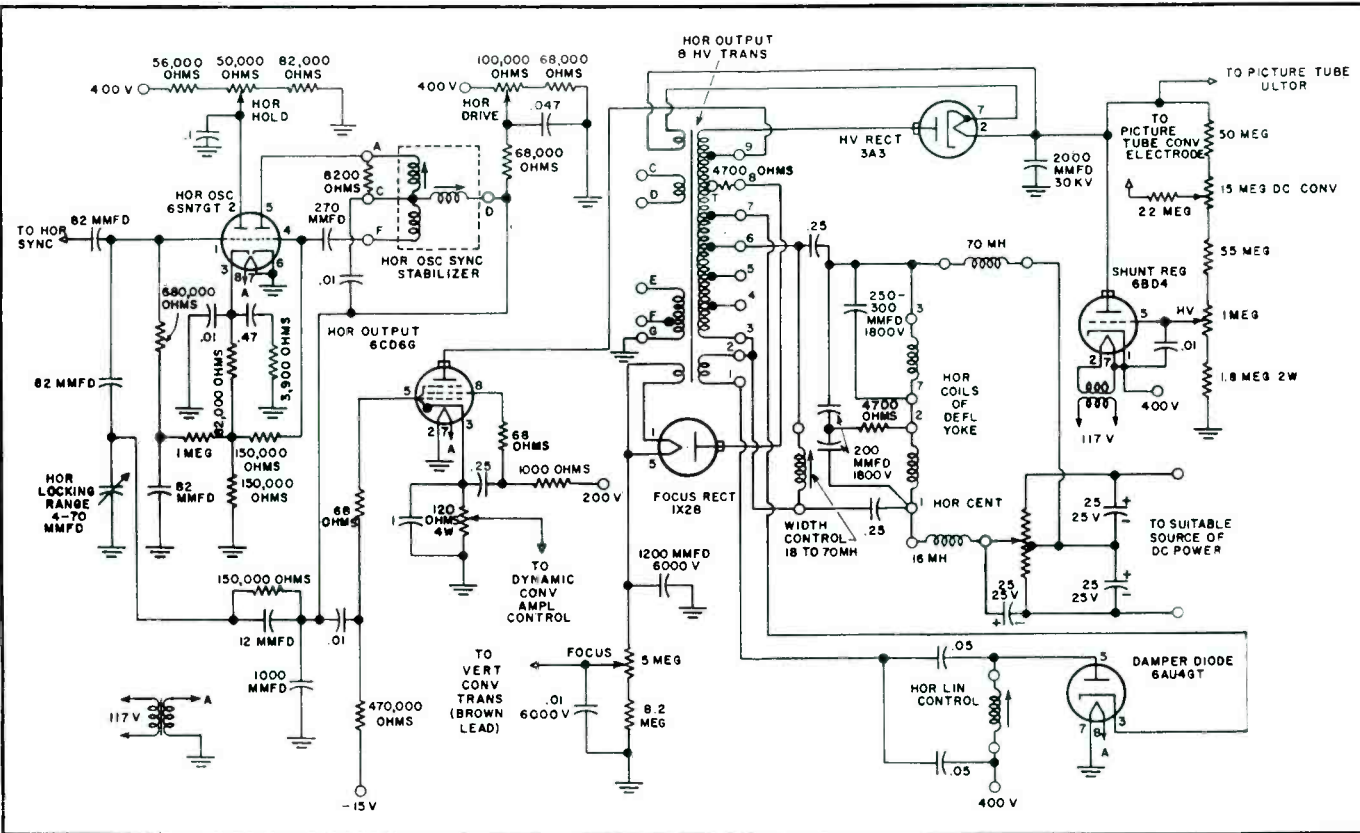
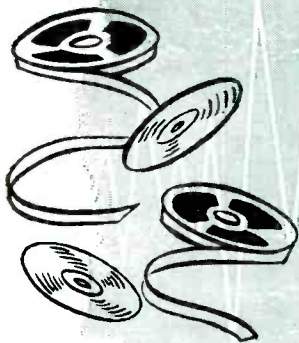


Fig 1. Partial schematic of the Hickok 650 video generator (a) and color adapter (b) developed to provide white dots and bars for color TV gun alignment registration. R<sub>x</sub> represents a calibration resistor, whose exact value is determined in production. Dashed lines in plate terminal 6 (A) of the 12AY7 represent break made in original circuit. If greater intensity of white bars and dots is desirable, a 100,000-ohm 1/2-watt resistor can be soldered from pin 2 of the 12AX7 to chassis ground.

Fig. 2. Improved horizontal-deflection and hv circuit for 15GP22 tricolor picture tube. (RCA)





# AUDIO

## INSTALLATION AND SERVICE

### Hi-Fi - Phono - Tape - P A Amplifiers - Speakers

by **KEN STEWART**

and **PAUL EDWARDS**

## Amplifier Conversion and Component Substitution

THROUGH THE SUBSTITUTION of *pm* speakers and suitably-matched output transformers, plus the proper use of negative feedback, it is possible to improve substantially the efficiency of many audio amplifiers.

An interesting illustration of a converted amp with the foregoing modifications appears in Fig. 1.

Since the main choke in the power supply is the speaker field coil, this

field coil must be replaced by a filter choke; one with an inductance of about 15 henries and a 50-mil current rating can be used, unless the speaker frame and field coil is allowed to remain in the circuit as a choke. The latter procedure has been found to be particularly advantageous when used with an amp of the Fig. 1 type, as the 1,680-ohm *dc* resistance of the speaker field coil determines the voltage drop across

the bleeder resistor, from which fixed bias voltages are tapped. If a choke is substituted, a 5-watt resistor should be inserted in series with the choke, of such value that the total resistance remains approximately 1,680 ohms.

The original output transformer used in the amp was designed to match a low-impedance voice-coil of 3 to 4 ohms; therefore the substitute output transformer should have a secondary winding matched to the new speaker impedance. The correct plate-to-plate primary impedance of the output transformer for either 6F6's or 6V6's is 10,000 ohms.

### Insertion of Negative Voltage Feedback

A 220-ohm resistor should be inserted between cathode and ground of the first 6SF5, as shown. The low value of cathode resistor was selected so as not to upset the fixed bias arrangement already provided. One end of the voice-coil winding should then be connected to this cathode through a feedback resistor, while the other end of the voice-coil winding should be grounded. (The polarity of the voice-coil connections must be determined experimentally; if the leads are reversed the amplifier will increase its gain or oscillate instead of suffering a decrease of gain.) The value of the feedback resistor must also be determined experimentally, starting with, say, 20,000 ohms and using resistors of smaller and smaller value until the

(Continued on page 68)

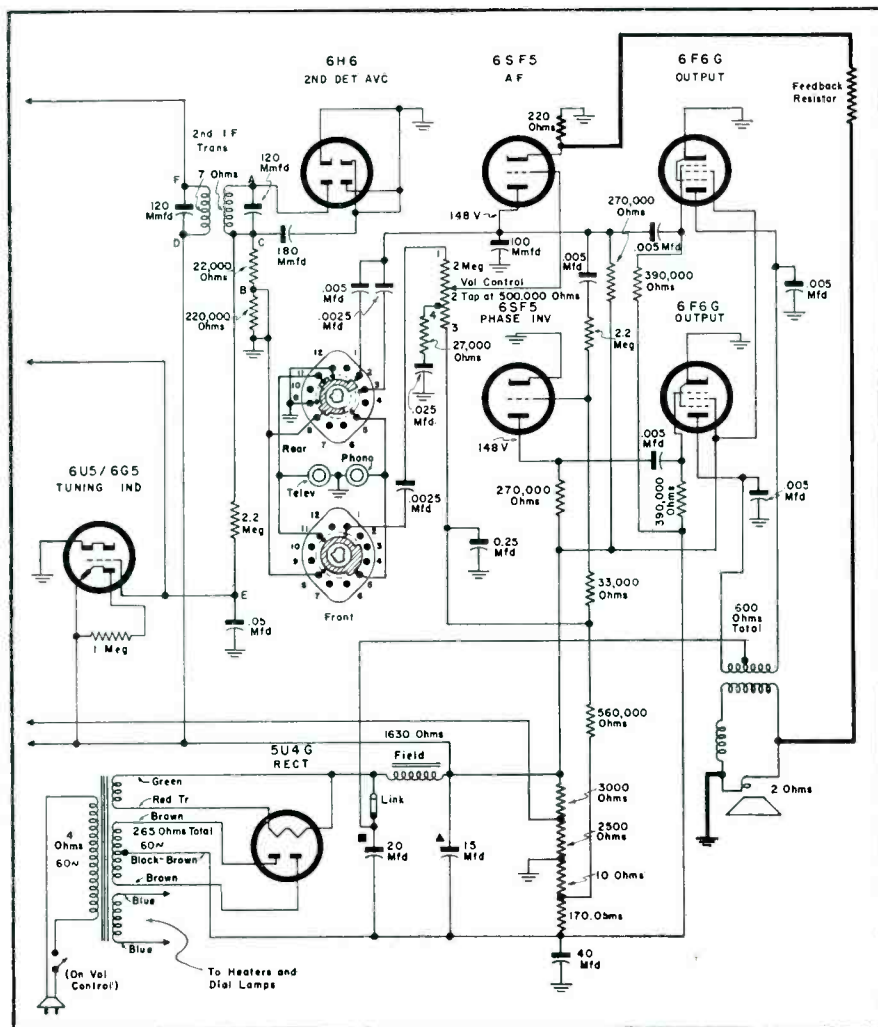


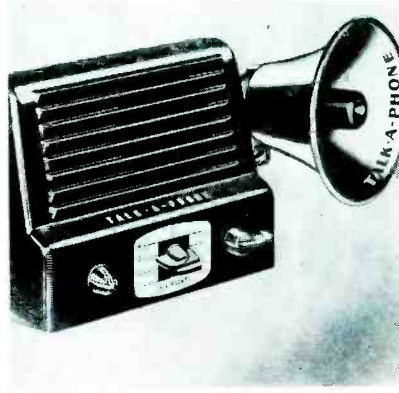
Fig. 1. Schematic of audio amp converted for *em*-speaker, replacing a *pm*, and the use of negative feedback. Amplifier, included in RCA AM broadcast/shortwave chassis, is used in this instance with a Meissner FM tuner, a Garrard record player and a G.E. preamp. See detailed negative-feedback circuitry on page 68.



## Pictorial Report on New Developments in Audio



Miniature plastic pillow speaker weighing 2.6 ounces and with a thickness of  $\frac{5}{8}$ ". Can be attached to radio or pa system. Constructed of melamine resin housing and assembly molded in one integral unit. Coil assembly consists of a molded polystyrene bobbin wound with Formex insulated wire. Has a sealed diaphragm punched of alloy steel, plated with corrosion-resistant copper nickel and hermetically sealed against dust and moisture. Single jacket, flexible, thermoplastic covered cord is detachable. (Telex Radio Pillow Speaker; Telex, Inc., Telex Park, St. Paul, Minn.)



Intercom master selective system designed for use in large areas to overcome high noise levels. Selective systems consist of one master station and five or ten substations. Master station can talk and listen to any one substation or all simultaneously. Only the master station plugs into an electrical outlet. Both systems have an optional feature whereby substations can be connected privately or non-privately and still originate calls to the master station under either application. (Shown in the illustration is model AC-5406, with C-20 nine-inch reentrant horn; Talk-A-Phone Co., Chicago, Ill.)



Dynamic noise suppressor, designed as an accessory for transcription amplifier (model 99) or with remote control amplifier (model 214). Noise suppressor features dynamic, rather than fixed, bass and treble gate tubes, said to eliminate both rumble and scratch without losing audible music. This is done by restricting bandwidth during soft passages when the human ear is relatively insensitive to extremes of treble and bass, and then by opening the bandwidth to the full range. Derives its power by connection of an octal adaptor plug placed beneath the output stage of an amplifier using 6V5, 6L6, 6F6, 6K6, or other tubes beam-power tetrode connected. Tubes used are three 12AU7, and one 6AL5. (Type 114-A; Herman Hosmer Scott, Inc., 385 Putnam Ave., Cambridge 39, Mass.)



(Right)  
Portable, pocket size sound-level meter which can be used to check frequency response and dynamic range of hi-fi sound systems. Other applications include checking of individual speakers, record-players, recorders, and complete overall checks including the response of the room or auditorium. Acoustical level can be checked for recording, and noise level can be checked in buildings, homes, factories, streets, subways, etc. (IT-140M; Industrial Television, Inc., 369 Lexington Ave., Clifton, N. J.)

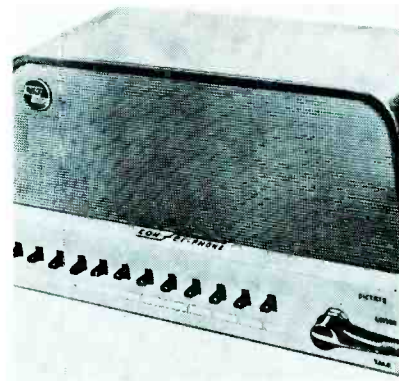


(Left)  
Kitty Kallen recording the voice of her son on portable tape recorder. (Teleelectronic Corp., 35-18 37th St., Long Island City 1, N. Y.)

Electronic megaphone said to have an acoustic output of 112 to 115 db at 5', permitting effective speech transmission up to 3,000', depending on atmospheric and surrounding noise conditions, claimed to feature virtual elimination of acoustic feedback. Self-contained with batteries and 3-stage amplifier in main housing. Weighs slightly over five pounds. (Audio Hailer; Audio Equipment Co., Inc., 805 Middle Neck Road, Great Neck, N. Y.)

Intercom which can be used with up to 24 remote stations. System of up to 25 units can be used in private intercom system or base intercoms and remotes can be intermixed. Telephone-type handset can be plugged in for privacy in communication with other base units. (Deluxe 12 and 24-station President series; Mark Simpson Mfg. Co., Inc.)

AM/FM tuner featuring a/c circuitry. Has crossover control permitting playing of any type record. Spare inputs are available for TV, tape recording, etc. (Model 303C; Altec Lansing Corp., 161 Sixth Ave., N. Y. 13, N. Y.)



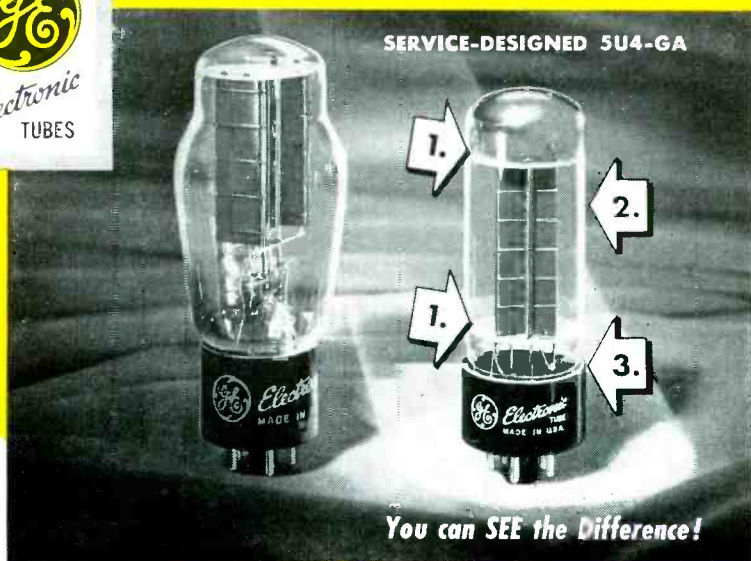
# NEW!

# G-E SERVICE OUT-PERFORM

Here's what G.E.'s new **SERVICE-DESIGNED Tubes** mean to you:



- ✓ They cut callbacks on TV repairwork, by doing a far more dependable job than their prototypes.
- ✓ Your tube-inventory requirements are lower. SERVICE-DESIGNED Tubes give top performance in all chassis.
- ✓ Your customers get more hours of trouble-free TV enjoyment . . . because SERVICE-DESIGNED Tubes have longer average life.
- ✓ They cost the same as their prototypes, despite improved performance and long life. You get higher tube value than ever before!



SERVICE-DESIGNED 5U4-GA

You can SEE the Difference!

Here, for the first time, is a line of tubes developed specially for television servicing! These 6 new G-E SERVICE-DESIGNED Tubes soon will be followed by others designed from the ground up to meet the practical requirements of your work.

- Where greater sturdiness or higher voltage capacity were found desirable, these qualities have been *designed into* the new types. You can install G-E SERVICE-DESIGNED Tubes in any circuit with confidence, knowing they have the safety margin to stand up!
- See your G-E tube distributor today! He will be glad to show you the new SERVICE-DESIGNED Tubes—explain how they will save you time, trouble, and costs, and increase your list of satisfied TV customers. *Tube Department, General Electric Company, Schenectady 5, New York.*

The 5U4-G prototype (left) was a tube that did a good electrical job, but was subject to damage from shocks and vibration. In the new SERVICE-DESIGNED 5U4-GA, you have a rectifier that can withstand hard usage. Note the arrowed reasons why:

- (1) Substantial mica supports brace the tube structure at both top and bottom, instead of at the top only. Also, double-fin plate construction gives better heat dissipation.
- (2) Glass bulb now is straight-side, compact, and strong. It is

specially "necked down" at bottom, so the base can be the same diameter as the 5U4-G—enabling the same ring-clamps to be used when installing the tube.

(3) Base construction has been changed to button-stem, with the leads passing through widely spaced individual seals at the bottom of the glass envelope, the same as with miniature tubes. This gives greater strength, also shorter leads and better lead separation. Another advantage is improved heat conduction. This, in turn, materially reduces electrolysis and air-leakage.

## READY NOW: 3 MORE G-E SERVICE-DESIGNED TUBES THAT DO OUTSTANDING JOBS . . . AND WHY!

### SERVICE-DESIGNED 5Y3-GT

A sturdier tube, with longer life! Mica supports now brace the tube structure both top and bottom . . . new button-stem base adds strength, separates the leads . . . double-fin plate construction gives the SERVICE-DESIGNED 5Y3-GT much improved heat dissipation.

### SERVICE-DESIGNED 25BQ6-GA

Cut callbacks with this new tube that runs cooler than its prototype! All the improved features of the 6BQ6-GA. Larger bulb gives ample cooling. Tube handles higher pulse plate voltages. High-melting-point solder protects plate cap-terminal.

### SERVICE-DESIGNED 1B3-GT

Install and forget! This new tube does a superior job far longer! Special lead glass wards off electrolysis and air-leakage. There is a new ring around the filament which stops "bowing" and the filament burn-outs that frequently result.

# -DESIGNED TUBES ALL OTHERS!

Specially developed for the TV service industry.  
Cost the same as types they replace.



"Running hot" shortened the life of many prototype 6BQ6-GT's (left). G-E designers went to the heart of the problem, and, retaining the same basic layout for interchangeability, gave this tube a king-size bulb that means cooler operation under all normal conditions.

Also, because of special mica design and new processing techniques, the new SERVICE-DESIGNED 6BQ6-GA will handle higher pulse plate voltages. Internal

tube arcing is cut 'way down.

In many TV chassis, Type 6BQ6-GT now is pushed to the limit. Replacing with 6BQ6-GA's means far fewer service callbacks due to early tube failures.

A further important improvement in the SERVICE-DESIGNED 6BQ6-GA, is use of a special high-melting-point solder for the plate cap-terminal. This prevents loosening of the terminal when the tube is removed for testing.

● Type 6SN7-GTA has been redesigned to give top performance in all synchro-guide and other TV circuits. Among measures taken to assure this result, is a special factory "chopper" pulse test. The test is made at voltages equal to the lowest line voltages that will be encountered in TV chassis of any make.

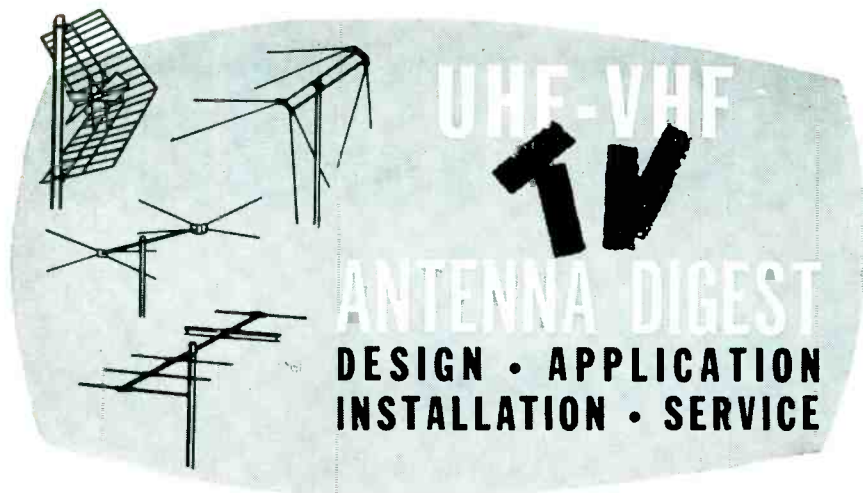
In all respects and in all circuits, the SERVICE-DESIGNED 6SN7-GTA now will replace Type 6SN7-GT. Capacity of the new tube is much superior to the old, as proved by this cross-tabulation of ratings:

	Old 6SN7-GT	New 6SN7-GTA
Max plate voltage	300 v	500 v
Max plate dissip, per plate	2½ w	5 w
Max heater-cathode voltage	90 v	200 v



GENERAL  ELECTRIC

161-1A3



by **RALPH G. PETERS**

## Rotators and High-Gain Antennas ‡ . . . Survey of New Antennas . . . Accessories

IN LANCASTER, Pa., there now exists a TV receiving problem, which mirrors a growing condition in many areas. A number of stations surround the city, but they are from 28 to 150 miles away.

### High-Gain Array Approach

Maximum reception at such distances demands the use of high gain antennas. Normally, such high gain arrays possess extremely sharp forward lobe patterns which make them very critical even when they are properly oriented. This design has been found necessary to obtain high

gain. On the other hand, an antenna must have a comparatively broad directional pattern if it is to pick up a number of channels located in different directions.

### Antenna-Rotator Combination

The use of high gain antennas and rotators have been found, in many instances, to offer a very effective solution. Two broad-band yagi antennas can be mounted to a common mast (one covering low channels, one covering the highs) and placed so that interaction and the umbrella effect can be avoided. Tests have shown best

results are usually available when the antennas are beamed a minimum of 45° apart, with the high band antenna on top. With the use of such arrays, the antenna rotator becomes all-important. Using the rotator, the major forward lobe pattern of either of these arrays can be placed in direct line with the incoming signal and provide maximum transfer of the signal to the receiver.

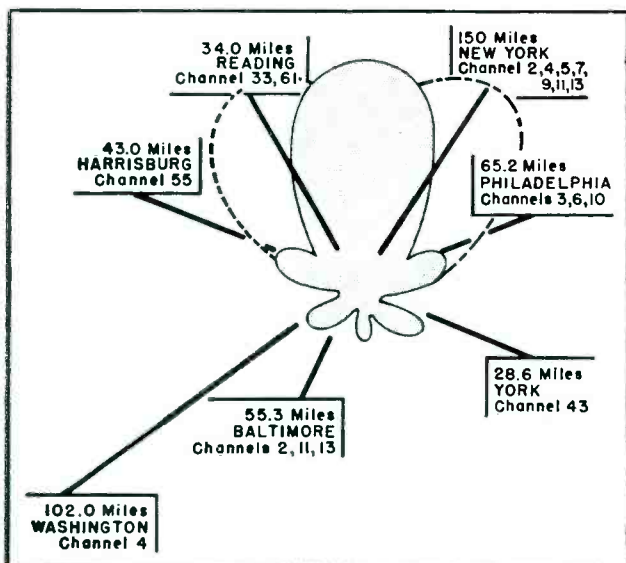
It has also been found that the rotator permits compensation for day to day variations in the directivity of the signal transmitted from the transmitting antenna. Such variations can, and often do occur as the result of atmospheric conditions; they might cause slight bending of the signal from the transmitting antenna.

### Other Needs for Rotators

As new stations come on the air, the rotator will also be found to be a satisfactory answer because the antenna array can be turned until the major lobe is in the direction of the new station. This arrangement has been found to be more effective than pickup of the new station off the side lobes of broad-band antennas; of course, there is always the probability that there will be no lobe of any kind facing the new channel.

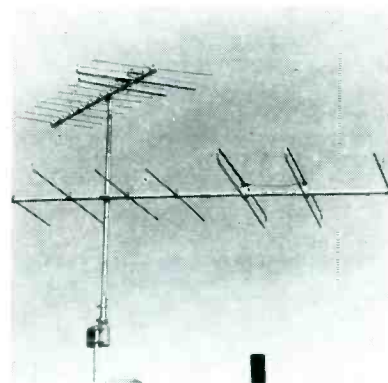
In *uhf* areas, where signal radiation is somewhat critical, signal variation during a single evening of televiewing is frequently noticeable. Antenna rotators permit the setowner to compensate for these slight signal variations, by making a slight adjustment of the antenna position.

Rotator application has become more vital than ever before. Used with high gain antenna arrays, their use opens a profitable present and future business for the Service Man.

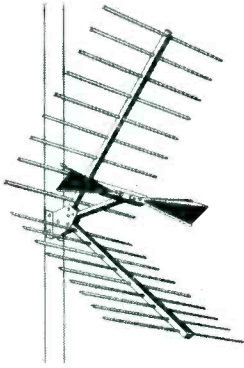


‡From a report prepared by *Martin Bettan, RMS, and Harold Merson, Jeb Sales.*

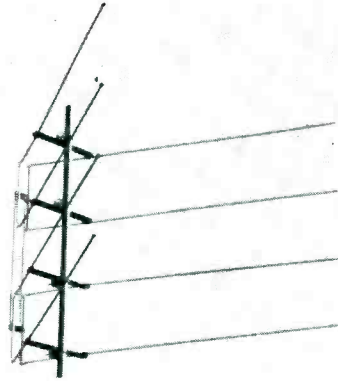
Left: Receiving situation in Lancaster, Pa. (at left), that is rapidly becoming typical in many areas throughout the country. City is surrounded by stations, but most are substantially distant from pickup point.



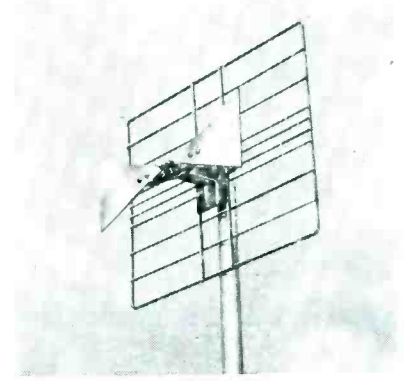
Pair of broad-band yagis, mounted on common mast to cover high and low bands, which can be oriented by a rotator. Antennas have been placed so that interaction and umbrella effect are avoided. Models shown are RMS Panoramic with a Jeb 10 rotator.



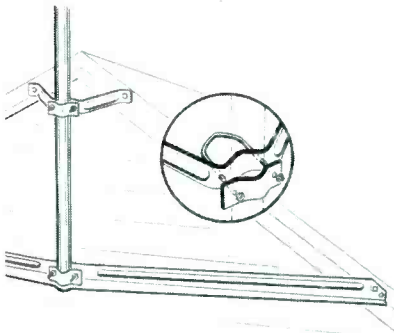
Reverse V dipole corner reflector antenna with two reflector screens produced by molding series of U-shaped aluminum reflectors into a glass fibre spine. Molded fibre glass T is used to mount and separate the drawn aluminum dipoles. Reflectors swing open to 90° angle and can be locked in place with a screw. (Actotenna; Acme Tool and Specialties Co., 224 N. Loomis St., Chicago 7, Ill.)



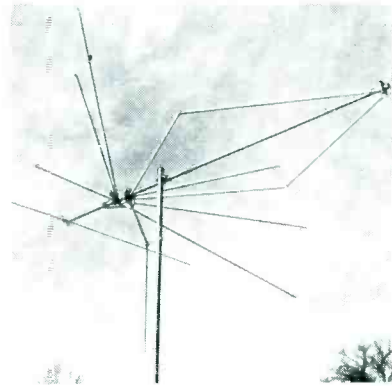
Preassembled antenna for secondary and fringe uhf, as well as primary vhf areas. Has mid-element bracing and plastic dielectric insulators. On uhf, model has narrow major lobe. (Econo-Vee; Channel Master, Ellenville, N. Y.)



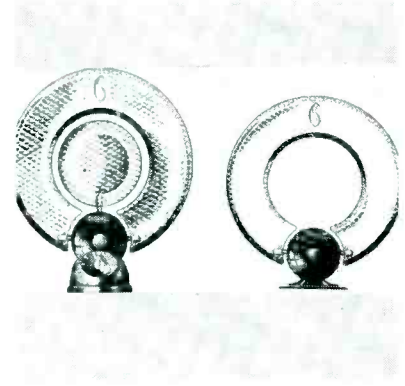
Bowtie-reflector which features a rigid wire grid reflector and aluminum bowtie dipole. Reflector is plated with cadmium. (Model uhf 615; JFD Manufacturing Co., Inc., 6101 Sixteenth Ave., Brooklyn 4, N. Y.)



Eave mounting made of embossed steel and hot dip galvanized. Lower member is of one-piece construction and has a 48" spread. Spread is said to permit mounting the antenna mast on the eaves of varied pitched roofs far enough down from the peak to insure secure installation. Has 3" embossed steel upper bracket. Features reversed U bolt and clamp arrangement which permits use of a spittle nut driver to tighten up the mast clamp. (EM-48; South River Metal Products Co., Inc., 377 Turnpike, South River, N. J.)



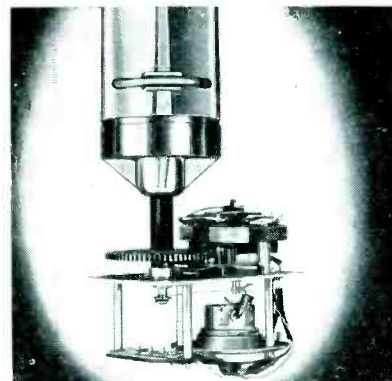
Antenna for channels 2 to 83. The uhf section is said to take advantage of high gain and sharp directivity of the rhombic, while the vhf section is a conical type. Also has adjustable peaking construction. Fed by a single leadin. Available in single bay and double stack models. (Model 98; Falcon Electronics Co., 2003 Cedar St., Quincy, Ill.)



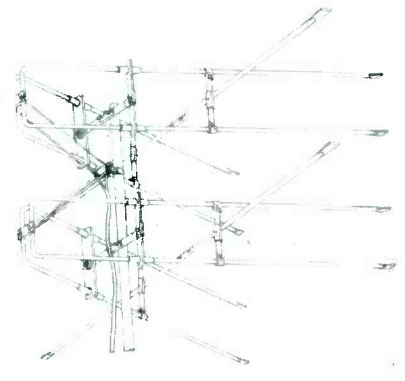
Left: Portable indoor TV antenna, designed for vhf and uhf in metropolitan areas. Has an embossed halo element and phasing disc; also 6-position electronic beam-selector switch. Right: Another vhf/uhf portable indoor antenna, which features a diamond embossed element mounted on a molded bakelite ball housing. (Models 4D and PT-H; Snyder Manufacturing Co., 22nd & Ontario Sts., Philadelphia 40, Pa.)



Drawing of Falcon ADSQLP contest. Winner was Peerless Electronic Equipment Co., Louisville, Ky. Left to right: Roy J. Wade, general manager of Falcon Electronics and Joe Bonansinga, general manager, WGEM-TV, Quincy, Ill., who drew lucky name. On desk is the Falcon 88 and in background, a Falcon Vari-Con.



Antenna rotator, which it is said, will accommodate masts from 3/4" to 2" and up to 175 pounds. Has automatic braking and lubricated capacitor motor. (Crown Controls Co., Inc., New Bremen, O.)



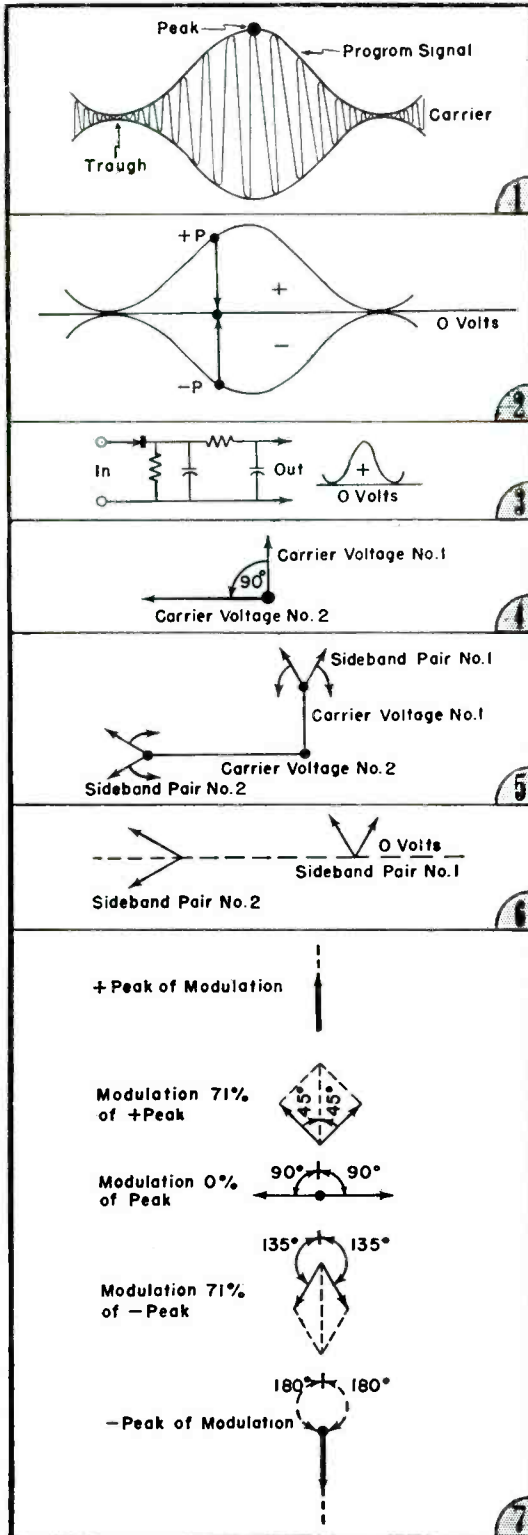
Stacked Delta V beam antenna, said to permit use of a common transmission line for uhf and vhf. (Model 556; Brach Manufacturing Corp., 200 Central Avenue, Newark, N. J.)

# COLOUR

## TELEVISION

### Synchronous Detection: What It Is . . . What It Does . . . How It Works

by **ANDREW R. ELWOOD**



(1)

IN FAMILIAR AM broadcasting, one carrier wave is modulated by the program signal, as shown at left.

(2)

THE MODULATED wave will not affect a loudspeaker directly, because its average value is zero, as shown here. For every positive voltage (+P) in the envelope, there is a corresponding negative voltage (-P). Positive and negative envelope voltages cancel.

(3)

HOWEVER, the program signal can be recovered by a simple detection process, which rectifies and filters the modulated carrier, as shown at left.

(4)

WHEN IT BECOMES necessary, as in color TV transmission, to squeeze two program signals into the same channel, two carrier waves can be used. The two carriers have exactly the same frequency, but are timed one-quarter cycle apart; or, the two carriers are 90° out of phase. This relationship is shown in the drawing at left.

(5)

EACH OF THESE two carriers can be independently amplitude modulated, as indicated here. The modulating process is best represented as a pair of oppositely rotating vectors. One vector in the sideband pair is the upper sideband, while the other vector in the sideband pair is the lower sideband.

(6)

THE TWO MODULATED signals cannot be separated by conventional detectors, because each signal would interfere severely with the other, and neither program signal would be intelligible. Hence, the carriers are suppressed at the transmitter, and only the sidebands are transmitted, as shown.

(7)

THE SIDEBANDS can be illustrated via a graphical representation of vectors, which rotate in opposite directions, and which will progressively add and cancel to form the peaks and troughs of the modulated wave. At left appears the sideband vectors as they progressively pass through 0°, 45°, 90°, 135°, and 180°. During this time, the modulation passes from the peak to the trough, and the process repeats in the same manner from trough to peak, as long as the modulation is present. . . . In a, sideband pair 1 is in phase, and both sidebands add up to full + peak voltage (phase = 0°). In b, sideband pair 1 is now 45° out of phase, and sidebands add up to 71% of the + peak voltage. At c sideband pair 1 has proceeded 90° out of phase, and the sidebands now add up to 0% of the peak. In d, the sideband pair 1 is 135° out of phase, and sidebands add up to 71% of the trough (- peak). Sideband pair 1 in c is now 180° out of phase, and the sidebands add up to full trough voltage (- peak voltage).

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No. 43-2 2 oz. List \$0.65



**G-C ELECTRONIC CONTACT CLEANER**  
No. 210-2 2 oz. List \$0.55



**G-C RUBBER-TO-METAL & PHONO DRIVE CEMENT**  
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## 90 CHEMICALS FOR... BETTER TV-RADIO SERVICING

With the largest, most complete line of quality chemicals in the industry, G-C is the name you should remember whenever you need cement, solvent, cleaners, lubricants and all the rest. Yes, with close to a hundred different G-C Chemicals now available—everything you need—the next move's up to you!



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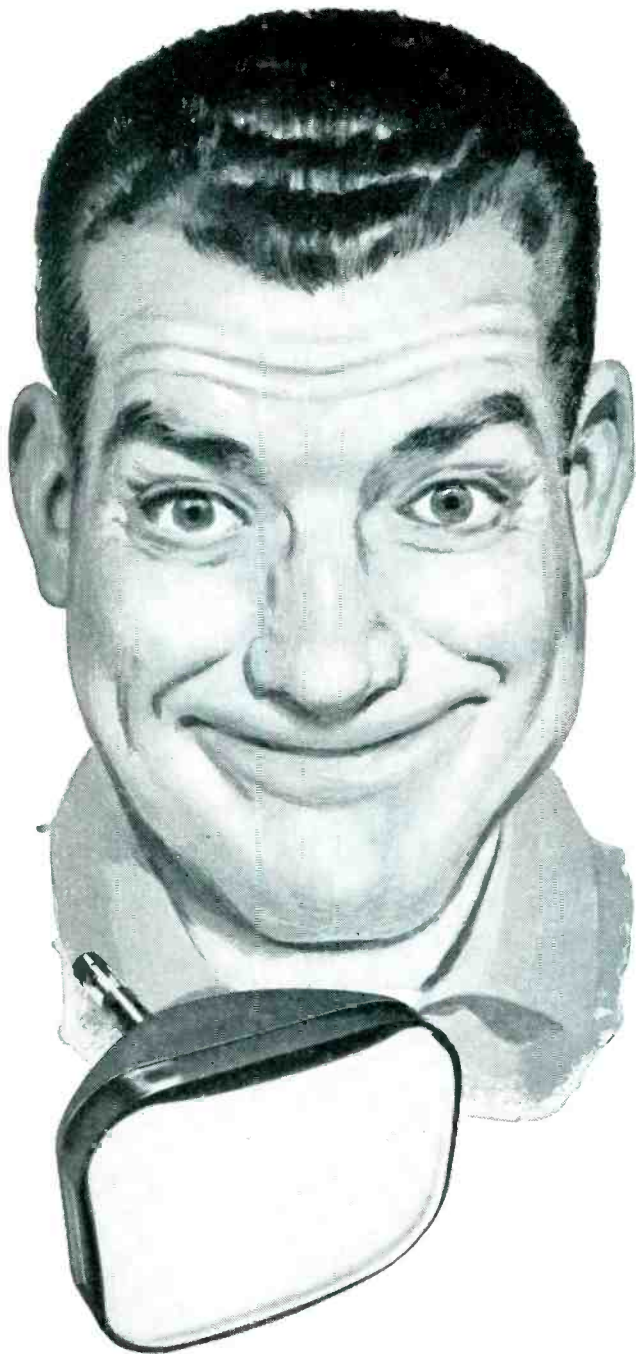


**GENERAL CEMENT MFG. CO.**

901 Taylor Avenue

Rockford, Illinois

## SERVICE MEN LIKE TO USE TUNG-SOL TUBES



Tung-Sol business practices are on the same high level with Tung-Sol Tube quality—and service men have always profited from both. It pays to use Tung-Sol Tubes.

**TUNG-SOL®**  
dependable  
**PICTURE TUBES**



TUNG-SOL ELECTRIC INC., Newark 4, N. J.  
Sales Offices: Atlanta, Chicago, Columbus,  
Culver City (Los Angeles), Dallas, Denver,  
Detroit, Newark, Seattle.

## Catalogs and Bulletins

THE HERMAN CATALOG SERVICE, 200 E. 37th St., New York 16, N. Y., has prepared a syndicated *hi-fi* catalog, with simplified explanations of *hi-fi* systems and descriptive copy on *hi-fi* equipment chosen for distribution in a particular area. Available up to 100-page formats.

\* \* \*

CLUM MANUFACTURING Co., Electronics Division, 601 W. National Ave., Milwaukee 4, Wis., has released an 8-page parts catalog, detailing ferrite cores, TV replacement coils, TVI filters, *rf* chokes, lock switches, terminal strips, and oscillator coils.

\* \* \*

THORDARSON-MEISSNER, Mt. Carmel, Ill., have issued a catalog, 54-A, which includes 83 schematics covering approximately 300 coils. Appearing also are cross-references to other manufacturers and information on 62 new TV coils and an *rf* heater supply, plus listings of *hi-fi* components and kits.

\* \* \*

ALPHA WIRE CORP., 430 Broadway, New York 13, N. Y., has issued an 8-page catalog, 153-S, featuring wire and cable for sound. Wire and cable illustrations detail conductors and insulation.

\* \* \*

RADIO MERCHANDISE SALES, INC., 2016 Brouxdale Ave., New York 62, N. Y., has prepared a 6-page folder, covering a *uhf V* antenna, lightning arrester, standoffs, window feed-thru, and tube puller.

\* \* \*

CLAROSTAT MANUFACTURING Co., INC., Dover, N. H., has released catalog 54, featuring standard controls and resistors for radio and electronic equipment, as well as a C-line and other industrial controls.

\* \* \*

VACO PRODUCTS Co., 317 E. Ontario St., Chicago 11, Ill., has issued a 4-page monthly edition of *Vaco News*, which details a new plier line. Also described are *vari-boards*, merchandising displays for pliers.

\* \* \*

ALEN B. DUMONT LABS, INC., 760 Bloomfield Ave., Clifton, N. J., has prepared a 12-page bulletin, describing wide-band cathode-ray oscillograph, 323. Booklet provides specifications and illustrations of the instrument, and circuit diagrams.

\* \* \*

ROGERS ELECTRONIC CORP., 43-49 Bleecker St., New York, N. Y., has issued a 16-page replacement catalog, listing TV set models with deflection yoke and flyback transformer replacements.

\* \* \*

ELECTRO-TECH EQUIPMENT Co., 308 Canal St., New York 13, N. Y., and 690 Murphy Ave., SW, Atlanta, Ga., has published a 189-page catalog, 54, describing a line of instruments and controls. Detailed are lab and portable test instruments, bridges, decodes and recording devices, panel and switchboards, service instruments, transformers, voltage regulators, rectifiers, timers, photoelectric controls relays, solenoids and miscellaneous equipment.

\* \* \*

AEROLITE ELECTRONICS CORP., 507 26th St., Union City, N. J., has released a 32-page catalog describing banana plugs and jacks, needle chucks, phone tipjacks, test leads, contact strips, connector plugs, etc.



## On Book Row

TELEVISION SERVICING, SECOND EDITION. . . BY WALTER H. BUCHSBAUM: A revised version, with a comprehensive review of installation and maintenance techniques that can be used for practically all TV receivers. Design and construction features of *uhf* and *vhf* receivers are also described. Recent improvements, such as automatically-focused and large-screen picture tubes, transistors, industrial-TV, theatre-TV, and projection systems are detailed, too. Also described is the compatible color-TV system, with an explanation of the color signal, color picture-tube operation, methods of encoding and decoding. Six chapters on troubleshooting techniques, as well as alignment data, are also incorporated into this edition.—367 pages, priced at \$5.95; Prentice-Hall Inc., 70 Fifth Ave., New York 11, N. Y.

\* \* \*

HOW TO USE METERS. . . BY JOHN F. RIDER: Devoted to the application of all kinds of panel meters, volt-ohm-milliammeters and *vtvms* for TV and radio servicing and industrial applications, this book provides special emphasis on where to measure, how to measure and with what instrument to do the job. Differences between meter-type measuring equipment of all kinds, stating what they can and can not do, are offered. Also discussed is electronic-component testing.—160 pages, 5½" x 8¼", paper bound, priced at \$2.40; John F. Rider Publisher, Inc., 180 Canal St., New York 13, N. Y.

\* \* \*

AUTOMATIC RECORD CHANGER MANUAL: Fifth of a continuing series on record changers and tape recorders covering 22 different basic units. Features exploded-view diagrams and parts lists. Also included are data on adjustments, change-cycle descriptions and service hints, as well as information on record support, record selection, pickup arm handling, needle set-down adjustments, trip cycles, recording head adjustments, cleaning and operational details. Index, covering five manuals of the series, is also included with list of receivers by manufacturer's make and model, showing what changer was used in a specific set.—288 pages, 8½" x 11", paper bound, priced at \$3.00; Howard W. Sams and Co., Inc., 2201 E. 46th St., Indianapolis 5, Ind.

\* \* \*

RADIO RECEIVER DESIGN, PART I. . . BY K. R. STURLEY: The second edition of a two-volume book, with revised chapter on fundamentals of transmission and reception. Other chapters, rewritten to include up-to-date material, now contain additional or new information on the calculation and measurement of tube noise, wave-traps, signal-to-noise ratio, and balance-to-unbalance antenna feeder connections. Material has also been added on self-capacitance and mutual inductance of coils, the diode frequency changer, noise and the *synchrodyne*, effect of component tolerance, and crystal-coupled *if* transformers.—667 pages, priced at \$10.00; John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y.

\* \* \*

RADIO TROUBLESHOOTING GUIDEBOOK. . . BY R. RICHARD JOHNSON AND JOHN F. RIDER: A reference text, and the first volume of a series covering radio-receiver repair, detailing treatment of defects which may develop in chassis. Several chapters describe troubleshooting and repair procedures by listing symptoms, causes and remedies for virtually every kind of fault.—150 pages, 5½" x 8½" paper bound, priced at \$2.40; John F. Rider Publisher, Inc.

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Tung-Sol hi-performance tube quality is a dependable safeguard against call-backs that cut into service work profits. Keep that in mind and remember—it pays to use Tung-Sol Tubes.

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SERVICE, APRIL, 1954 • 47

8 vertical outputs  
 3 deflection yoke  
 1 filter choke  
 5 width and linearity controls  
 17 exact replacement flybacks  
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# ASSOCIATIONS



## ARTSNY, N. Y.

THE FIRST OF A series of sessions on color TV, planned by the Associated Radio-Television Servicemen of New York, featured a demonstration of a Westinghouse color set and a Hickok video generator, converted for use as a white dot-bar generator. *Gordon Jolly*, field engineer at Westinghouse, detailed the operation of the chassis and explained its installation and techniques that should be applied in alignment, adjustment and general troubleshooting.

Second color meeting, which *ye editor* will moderate, will feature a demonstration-talk on a Sylvania tricolor receiver. Equipment required for testing and installation will also be on display and described.



Left: Plaque presented to *ye editor* by ARTSNY at a special award ceremony which preceded group's initial session on color TV at which *ye editor* served as moderator. Above: Officers and directors of ARTSNY, who were at meeting. Standing, left to right: Henry Levine, Benjamin Cohn, Henry Kaye, George Kimmel, Joe Forman (association attorney), Joseph Whittin, Phil Goldfarb, Molly Goldfarb, Max Liebowitz, Edward Eisen, Jack Spiegel, Paul Abraham, Harry Oxer, Joseph Guanivi, Robert Olson, Harold Landfield. Seated, left to right: Sidney Perlin, Jacob Allen, Arthur Rhine, Gordon Jolly (Westinghouse field engineer who delivered talk), *ye editor*, O. Capitelli, Marty Boxer and Harry Temler.



Above, right: At concluding meeting of Eastern Conference and Color-TV Symposium committee, who formulated plans for recent three-day session at the Bellevue-Stratford, Philadelphia, Pa. Standing, left to right: Sam Brenner, Paul Smith, Max Liebowitz, Roger Haines, *ye editor*, Howard G. Delaney and Ed Wise. Seated, left to right: Bert Bregenzler, Aaron Edelman, Harold Rhodes, Al Haas, Bill Morrow and Dave Krantz.

## SPRTA, YORK, PA.

AT A RECENT meeting of the board of directors of the Southern Pennsylvania Radio and TV Technicians Association, *Eugene Klinedint* was appointed chairman of the educational program committee, and *Willard Stroyer* was named corresponding secretary.

Board of directors voted to meet the first and third Monday of each month.

## CR TSA, PHILADELPHIA, PA.

THE COUNCIL of Radio and Television Service Associations, Philadelphia, has arranged with WFIL-TV, for the presentation of a series of public-relation fifteen-minute programs, over a thirteen-week period, featuring outstanding personalities in industry.

During the initial program, Al Haas, council chairman and James Daley, PRSMA member, were interviewed by Allan Prescott, popular master of ceremonies of headline program at the station.

Activities of the council are also being promoted over the radio facilities of WFIL, with spot announcements, made five times each day. Announcements direct consumers to call council telephone number for name of reliable service shop.

## TEN YEARS AGO

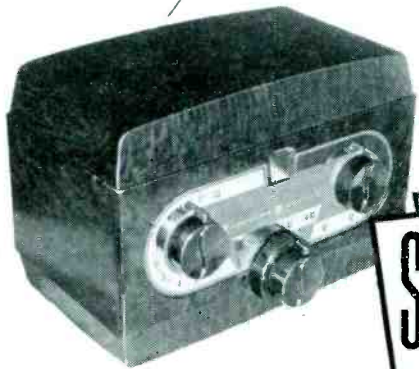
GUESSTIMATES on the size of the FM and TV postwar market were made by *J. E. Brown*, Zenith chief engineer, *J. D. McLean*, G. E., and *Dr. Allen B. DuMont*. Brown predicted that there would be 20-million FM receivers and 2,000 transmitters in operation within five years after the war. McLean, in his forecast, felt that 18 months after construction begins there would be 40 active TV stations covering a service area of 30-million people, and within five years, there'd be 100 active stations. Dr. DuMont, in a talk titled *TNT (Television Now and Tomorrow)*, stated that TV would set new standards in marketing, fully in keeping with the coming age of super-marketing. . . . *Ray Pentecost*, Chicago, Ill., was named winner of \$100 War Bond in SERVICE contest on wartime servicing and maintenance. Other winning contestants who re-

ceived war bonds were: *Nat Bader*, Brooklyn, N. Y.; *Paul Gramucci*, Wallingford, Conn.; *Chester W. Sharp*, Pryor, Okla., and *E. M. Dewar*, St. Hyacinthe, Que., Canada. . . . Distribution lines of the sound system, antenna coupling and switching methods, and electronic voltage and speed regulators, were analyzed. . . . Front cover illustrated portion of an analyzer-tube tester (*Supreme 385*) which provided 6 *dc ma* ranges, 6-range capacity measurements and 6-range control on *ac* or *dc* voltmeter or ohmmeter. . . . *Joseph K. Fabel* was elected president in charge of sales of the Allen D. Cardwell Mfg. Corp., Brooklyn, N. Y. . . . *Ben Kievit*, supervisor of customer services of Sylvania, was named a field engineer in the equipment sales department for New York and New England areas. . . . *W. A. Ellmore*

was appointed vice president in charge of sales and engineering of Utah Radio Products, Chicago, Ill. *Chester L. Walker*, formerly chief engineer, was named sales manager in charge of manufacturing and equipment divisions; *Marion S. Danisch* became chief engineer, and *Gordon S. Carbonneau*, engineer in charge of quality control. . . . *Leon Golder* resigned as secretary and sales manager of The Rola Co., Inc., Cleveland, Ohio. . . . *A. H. Hardwick*, formerly president of Hardwick, Hindle, Inc., was appointed to the executive sales staff of International Resistance Co., Philadelphia, Pa. . . . *Ralph P. Glover* opened consulting engineering offices in Oak Park, Ill. . . . *George T. Bryant* was named hearing-aid salesman by Graybar Electric. . . . *Oden F. Jester* was appointed vice-prexy of Meissner Mfg. Co., Mt. Carmel, Ill.

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## Community TV

(Continued from page 21)

a life expectancy of at least eight years. There is also evidence suggesting that the loss in polyvinyl jacketed cable will increase some 8% during its first year of use because of the migration of the plasticizer, and that no larger change need be expected.

Tests have proved that the outer sheath of black polyvinyl is almost impervious to water, but will, after sun and weather aging, become brittle and allow moisture and oxygen to pene-

trate the jacket and corrode the stranded copper conductor. It is anticipated that this corrosive action will increase the normal loss characteristics so much that the cable will have to be replaced.

These two factors, aging and plasticizer migration, plus a third important cause for variation in cable attenuation, temperature fluctuation, make it necessary to install automatic gain control units at key distribution points throughout the system.

At the initial in-town distribution point the signal must be split into several sub-trunks, permitting the servic-

ing of the community by areas; and the sub-trunks are, in turn, split into several feeder lines. One signal splitter being used is an *ac* powered cathode follower distribution unit that provides from 3 to 10 feeder lines. One advantage enjoyed by this method of signal division is that very little or no loss occurs, thereby permitting its placement at a considerable distance from the amplifier.

Another distributive unit widely used is a passive-line splitting network that can provide from two to eight feeder lines. Losses of from 3 to 8 db across all frequencies are common to this signal splitter. However, since it requires no *ac* power and little or no maintenance, it, too, has certain advantages.

A very important appliance used in community TV systems is the device designed for tapping the main feeder line to provide signal for the subscriber's receiver through the coax service loop. Tapoffs are of two basic types. One is inserted directly into the main feeder line after the line is cut, and the other clamps onto the main cable and pierces it to the center conductor without cutting. Isolation between the main distribution line and the subscriber's service loop is accomplished by either a series resistor or a series capacitor in the tapoff. To equalize the signal and control line-loading, the isolating resistor decreases in value as the distance from the amplifier increases. Resistance values are effective from 220 to 3,300 ohms; capacitance values are effective from 3.3 to 5 mufd.

The 59/U service loop most often terminates behind the receiver at an impedance matching transformer. At this point the system's 75-ohm impedance is matched to the receiver's 300-ohm impedance through an elevator coil network.

Fundamentally, a CT system is very similar to an overhead power distribution system and uses many of the basic construction techniques employed by the telephone company. The coax cable, because of its low tensile strength, is lashed with stainless steel lashing wire to a No. 6000 tensile steel messenger. The messenger, in turn, is suspended from three bolt clamps affixed to each utility pole by a through-bolt penetrating the pole 40" below the electrical facilities and a minimum of 12" above the telephone equipment. Amplifiers are protected by adequately ventilated, insect-proof, weather-resistant cabinets mounted on crossarms on selected poles. Installed with each amplifier are a fused safety switch, a voltage regulator, and several convenience outlets. *AC* power is taken from a nearby secondary service and metered on the pole. Some electric utilities

apply a non-metered flat rate for this type of constant service.

Adequate grounding is always accomplished at the tower, at each amplifier, at every tenth pole, and at the last pole on each distribution line. Periodic bonding between the telephone and TV messenger, where they parallel each other, is also a necessary safety precaution. The design, construction, operation, and maintenance of a community TV system should always, and generally do, conform to the rules and regulations of the National Electrical Safety Code.

System construction costs vary enormously. They depend on the distance from tower site to the community, whether phone or power poles are available for the run into town, availability of space to accommodate the TV cable on existing poles, size and layout of the community, type of cable and equipment used, and other variables. Accordingly, transmission line costs may vary from \$3,000 to \$7,000 per mile. The in-town system expenditures can vary from \$3,000 to \$4,500 per mile plus the cost of installing individual service loops.

Initial charges for the service vary from \$100 to \$150, and monthly service and maintenance charges vary from \$3.00 to \$5.00.

Today there are close to 300 systems in the United States and Canada, serving an estimated 165,000 homes in communities ranging in population from 3,000 to 100,000. After the FCC's allocation plan has been fully implemented, there are indications that a large number of communities will be without any TV coverage; many other communities may receive the limited reception provided by a single nearby station; however, they may be unable to enjoy TV programs originating in the metropolitan areas. Community TV could supply the answer.

#### PORTABLE BATTERY DRIVE



Portable radio-battery sales kit which contains battery selection chart, window streamers, replacement guide, door decal, cross reference chart, battery replacement stickers, and retail price chart. (Burgess Battery Co., Freeport, Ill.)



W 42 BH

78

This "Dual Voltage" cartridge is an excellent all-around replacement for old-style 78 r.p.m. cartridges. It guarantees improved performance in many cases. A unique "Slip-On" condenser harness provides choice of output voltage—1.5 with condenser harness installed and 3.75 without condenser. For fine quality at low cost your best bet is the Model W42BH at only \$5.50 list.



W 31 AR

WC 31 AR

33 1/3

45

This high output (2.1 volts!) "Direct Drive" cartridge was specifically designed for use with all fine-groove records. Universal mounting bracket provides quick, easy installation in RCA-type 45 r.p.m. changers. (Fits 1/2" and 5/8" mounting centers.) Has easy-to-replace needle. For maximum quality, highest output, and low cost, specify Model W31AR at the low list price of only \$6.50

33 1/3

45

Also available as ceramic cartridge (same price)—Model WC31AR. Highly recommended in areas where heat and humidity make use of conventional crystal cartridges impractical. List price \$6.50



W 26 B

33 1/3

45

78

This "Vertical Drive" "all-purpose" cartridge provides superlative reproduction for all types of records. Low tracking pressure (only 6 grams) and high needle compliance guarantee faithful tracking and longer record life. Uses exclusive Shure "Unipoint" needle, scientifically designed for maximum performance and long life. List price \$7.50



W 22 AB

33 1/3

45

78

This "Vertical Drive" "turnover-type" cartridge provides extended frequency response (50 to 10,000 c.p.s.) at extremely low needle point pressure—only 8 grams. One of the most popular, widely used cartridges in original equipment. Highly recommended as replacement in phonographs equipped with turnover mechanism. Individual needles—one for fine-groove and the other for standard records—guarantee maximum results. List price \$9.50



W 22 AB-T

33 1/3

45

78

Offers all the advantages provided by the Model W22AB, plus a long-life turnover mechanism. Furnishes replacement of old, worn-out turnover mechanisms as well as cartridges. Also an excellent replacement for converting all-purpose phonographs into turnover type. List price \$10.00

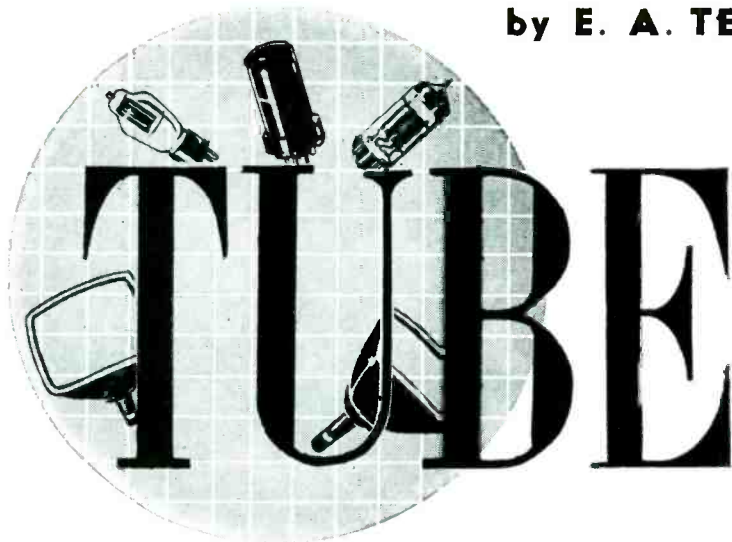
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**Latest Transistor-Application  
Developments in Audio,  
Intercom, Receivers, Oscillators**  
*News*

THE TRANSISTOR, a pure laboratory item for years, is now, slowly but surely, emerging into the practical world and with some striking results.

During the past year\* germanium junction transistors, averaging less than 10-db noise level, have been developed and used in the first *af* stages of various types of *af* amplifiers found in tape recorders, line broadcast amplifiers, motion picture sound amplifiers, geophysical equipment, sound meters, and elsewhere where hum and microphonics of tubes have always been a problem.

Transistors have also been included in low-noise, high intelligibility microphones, replacing carbon types in aircraft, mobile intercom, and radio systems.

A portable transistorized *af* oscillator for making tests in telephone and broadcasting fields has also been developed. It uses small hearing aid batteries.

The transistor has also been installed in a small oscillator, crystal

controlled, for use as secondary frequency standard. Single, small, self-contained batteries will, it is claimed, operate the oscillator for about 2 years continuously; so no on-off switch or other controls were included in the device.

A tiny transistorized, battery-operated receiver for hospital and factory paging has also been designed. The unit is worn by those subject to call; the receivers pick up messages from a single loop of wire extending throughout the plant.

**Transistorized HV Supply**

A flashlight battery-powered, transistor *hv* supply for operating portable radioactivity measuring instruments has also been produced. This device converts voltage from a couple of ordinary flashlight batteries; the transistor replaces the more conventional vibrator. The finished device weighs

7½ ounces and is in a package 2¾" by 1¾" by 1⅞".

To control motors and other industrial devices, rated up to 500 watts, engineers have designed a transistorized preamp and magnetic amp.

A sound pickup head for the amplifier of a film projector using a transistor has also been announced. The transistor is said to provide low noise, non-microphonic, full sound-range amplification, and eliminate a tube and transformer combination which requires a separate housing.

At the IRE annual meeting, representatives<sup>1</sup> of one company reported that it is likely that one of the first large-scale applications of transistors will be in the field of portable AM broadcast chassis.

Discussing circuitry for receivers, they said that a common problem of all high-frequency circuits resides in the fact that the gain of transistors decreases with increasing frequency.

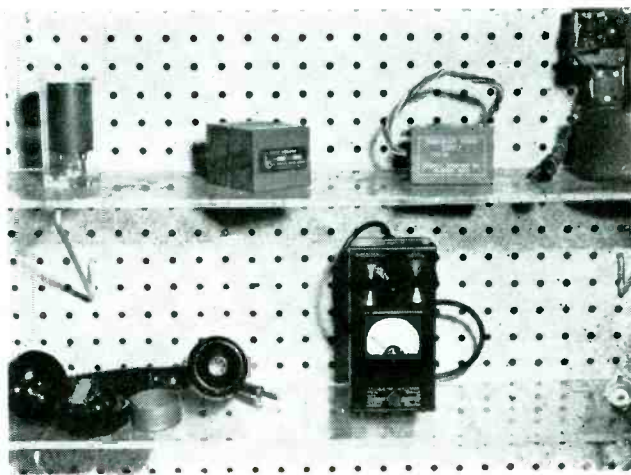
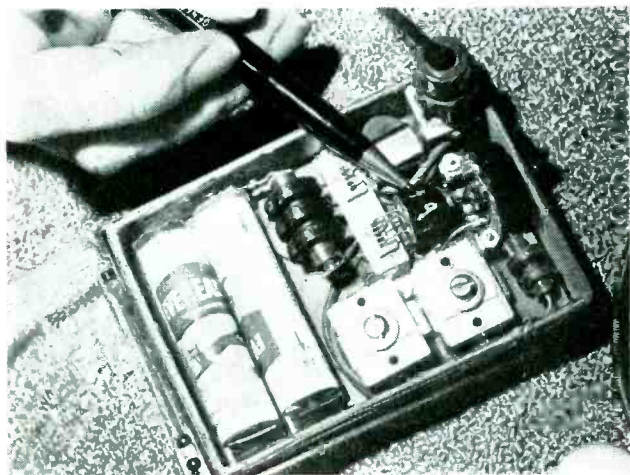
To make use of the maximum avail-  
(Continued on page 54)

\*From data supplied by Raytheon.

<sup>1</sup>A. P. Stern and J. A. A. Raper, G. E.

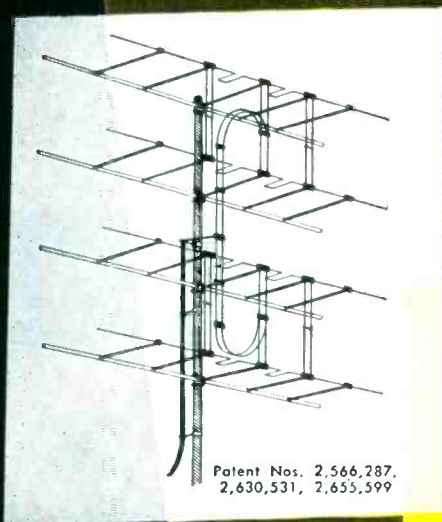
Experimental vest pocket civil defense (1260 kc) radio powered by two pen-size flashlight batteries, which uses a transistor and double-based diode for detection and amplification. (G. E.)

Assortment of recently-developed transistorized equipment. Top row, left to right: Crystal-controlled oscillator, preamp designed to control motors, hv flashlight-operated power supply, sound pickup head of film projector with amplifier. Bottom row, left to right: telephone headset with miniaturized amplifier and *af* oscillator. (Equipment by Vectron, Industrial Control, Technical Operations, Ampro, Remler and General-Radio, respectively. Photo from Raytheon.)



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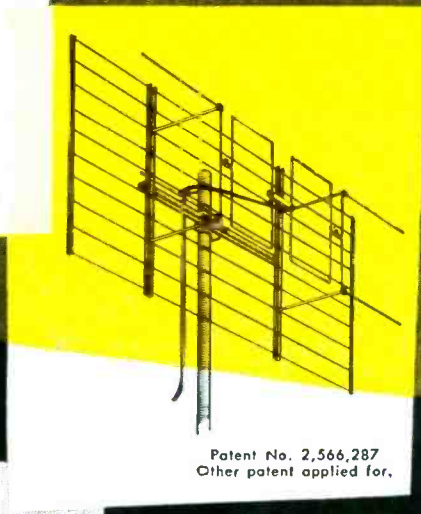
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Patent Nos. 2,566,287, 2,630,531, 2,655,599

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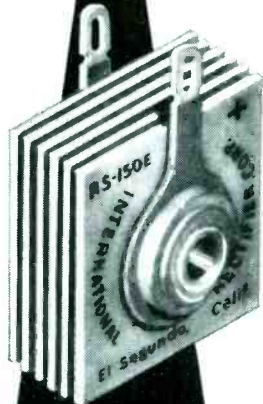
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**Tube News**

(Continued from page 52)

able gain, impedance matching becomes imperative.

The nature of the local-oscillator circuit depends on whether inductive or capacitive tuning is used. The requirements (uniform oscillation in the 1 to 2 mc range, frequency stability, output power), it was noted, can be satisfied with both junction and point-contact transistors. Point-contact transistors have the advantage of circuit simplicity; junction transistors are more frequency stable and need less battery voltage.

In the *rf* amplifier, loop or wire antennas can be applied, depending on whether capacitive or inductive tuning is used. The stage must have high and uniform gain over the broadcast band. Impedance matching of the series or parallel type should be used, depending on the nature of the tuning device to obtain constant *rf* bandwidth and image rejection. The transistor experts declared that gains of 15 to 20 db are usual with grounded emitter junction transistors.

As converters, junction transistor diodes have been used. It has been found that conversion gain improves with increasing power output of the oscillator and reaches an optimum.

Analyzing *if* amplifiers using junction transistors, the specialists said that such transistors in a grounded emitter configuration have a maximum available gain of 20 to 30 db at 455 kc. Maximum gain and adequate selectivity were called contradictory conditions and, therefore, the coupling network presents problems. *AGC* must be applied to one or more *if* stages, possibly the *rf* stage, converter or local oscillator.

**Transistors as Detectors**

Diodes or transistors can be used as detectors. Transistors were said to be superior; less *if* power needed for linear detection, considerable gain instead of loss, delivers more *agc* power.

The gain of a transistor *lif* amplifier depends on the operating point; the necessary *agc* power can be derived in various ways.

In audio considerable power can be obtained with experimental power transistors. With ordinary units, it has not been possible, generally, to obtain more than 400 mw.

Single-ended class *A* or *B* push-pull output circuits can be used. Class *B* operation has been found superior because of smaller standby power, increased efficiency and power output.

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## Service Engineering

(Continued from page 32)

provided. It may be necessary in some cases to decrease the value of the voltage dropping resistor to prevent the voltage regulator tube from extinguishing when the battery voltage is low.

*AVC* voltage is available at the converter power socket for use on those converters designed to use *avc*. Any shunting resistance imposed should be at least 10 megohms.

Battery power (6 or 12 volts) is fed to the chassis through a single externally fused lead. Where it is necessary to extend this lead, 14 gauge wire (or larger) must be used to prevent excessive voltage drop. The fuse should be type AGC 15 amp for 6 volts or 7½ amp for 12 volts.

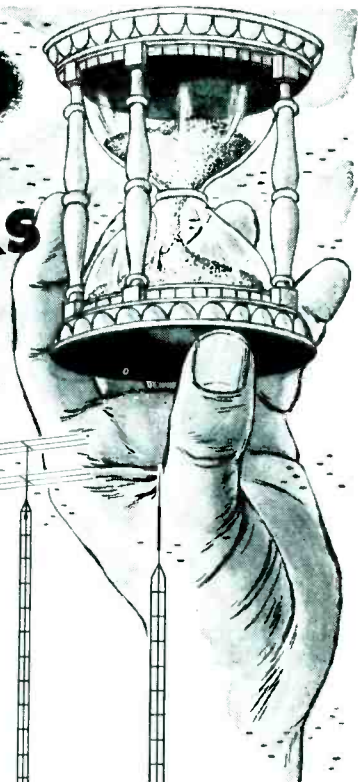
The transmit-receive switch is wired to disconnect the vibrator supply in the transmit position and supply 6 or 12 volts to the transmitter relay terminal at the rear of the chassis. This terminal must be used only for the transmitter control relay or the antenna change-over relay. The maximum current which may be drawn from this terminal is 5 amperes.

To permit spotting the transmitter frequency, a separate switch may be used to turn on the transmitter when the set's switch is in the receive position.

To avoid feedback when switching from transmit to receive it may be necessary to employ a resistor (about 200-ohm 2-watt) so connected that it shorts the transmitter high voltage to ground when the transmitter relay is in the receive position.

If a signal generator is available it should be set at the input frequency desired and loosely coupled to the input terminal of the receiver. The oscillator coil tuning slug should be adjusted for maximum *avc* voltage (measured with a vacuum-tube voltmeter at pin 1 of the 6T8) or tuned for maximum audio output. The top and bottom tuning slugs on the input transformer should then be adjusted for maximum *avc* voltage or maximum audio output. The converter should then be connected to the chassis and its output circuit peaked according to the converter instructions.

If no signal generator is available, the set's frequency can be adjusted by using a regular broadcast receiver with a calibrated dial. About 3' of insulated wire should be soldered to pin 2 of the 6BE6 socket. The wire should be run near the antenna or antenna terminal of the broadcast receiver. The broadcast receiver should



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be set at the frequency desired for the receiver's *oscillator*, and the oscillator tuning slug adjusted until a signal is heard of the *bc* receiver. The wire should now be removed and the converter connected to the mobile receiver. With the antenna connected and the converter tuned between stations the top and bottom tuning slugs of the input transformer should be adjusted for maximum noise. The converter output circuit should also be peaked if necessary. The accuracy of this method of adjustment will depend on the accuracy of the broadcast receiver dial. The converter calibration

may be affected slightly, however operation will not be affected.

After the mobile receiver is in operation it may be found that a beat note occurs with each station tuned in, even with the *bjo* off. This will be especially noticeable with converters which have poor rejection to broadcast frequencies; it is caused by a broadcast station operating on or near the input frequency of the mobile receiver. This *bc* signal comes through the converter and acts like a *bfo*. Since the receiver's oscillator is not crystal controlled it may be shifted in frequency to correct this trouble.

# Eliminating Community TV Cochannel Interference . Cures for Noise in Auto Radios . Auto-Radio Power Supply Tests . Improved Brightness Circuitry



by T. L. GILFORD

THE ELIMINATION of cochannel interference in community TV systems is extremely difficult in most cases. To solve the problem several approaches can be tried. First, one should move the antenna off the top of the mound, hill or mountain so that these natural obstacles act as a barrier and the antenna cannot pick up the offending signal.

A second method of solving the problem would be to use either of the two arrangements shown in Fig. 1. A third alternative, and the one found to be least efficient, is to merely construct a chicken-wire screen to block out the offending signal.

### Improved Brightness Circuitry

IN THE G. E. series 21C and 21T models, the brightness circuit has been revised to provide greater consistency of the raster size, with respect to the brightness level, as shown in Fig. 2. Sets incorporating this circuit use a single unit brightness-control pot rather than dual type employed earlier.

### Noisy Auto Radio Cures<sup>1</sup>

IT HAS BEEN noticed that *dead* dial light bulbs can produce noise in auto

radios. Filaments may be broken, and the loose ends may make enough contact with each other and with the elements which held the filament to cause *pops*.

### Auto-Radio Supply Tests<sup>2</sup>

THE VOLTAGE delivered to an auto radio from an auto-radio 6-v system varies normally between 5.5 and 7.5 and in a 12-v system between 11 and 15. At extreme low-temperature conditions the voltage may be as high as 8 and 16 volts, respectively, for short periods of time. Variable output from a power supply is desirable to simulate the voltage conditions under which the auto radio operates. The power supply can be set at low voltage to show up components such as tubes, oscillator circuits and vibrators, which may not function satisfactorily at low input voltages, and it can be set at high volt-

age to detect parts which fail to operate at high input voltage. If a power supply does not have a variable output a *variac* can be used in conjunction with the supply to obtain this feature. The *variac* should be connected to 110 *v ac*; it is variable from 0 to 130 volts. This unit will vary the output of the power supply from 0 volts to a voltage higher than it would normally supply.

### Overload Protection

A power supply should have overload protection in the form of a fuse or a circuit breaker to protect equipment when excessive current is drawn. Some supplies have both a fuse in the primary circuit and a circuit breaker, usually the thermal type, in the secondary circuit.

Ripple voltage which is present in the output is difficult to measure in the average service station; however, if objectionable hum is not heard from the radio with the volume turned well up, it can be assumed that excessive ripple voltage is not present in the output of the power supply. If there is objectionable hum, a battery floated across the power supply terminals will (Continued on page 58)

<sup>1</sup>From notes supplied by Gene Clark, Spencer-Kennedy Labs.

<sup>2</sup>From TESTING TIPS, prepared by the DELCO RADIO DIVISION, and submitted by S. W. ARCHER, Delco Radio Service manager.

Fig. 1. Antenna and filter arrangements found effective in minimizing or eliminating TV cochannel interference at antenna site. Attenuating networks are indicated at  $\alpha$  and phasing networks at  $\phi$ .

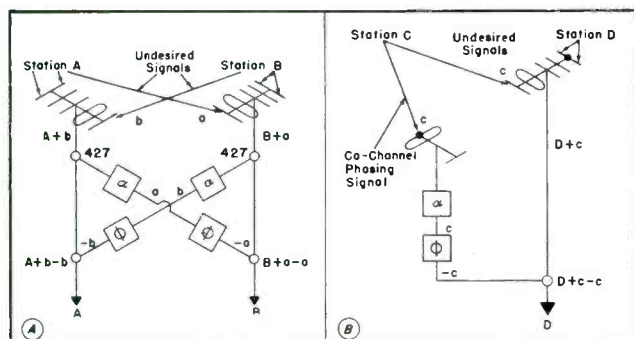
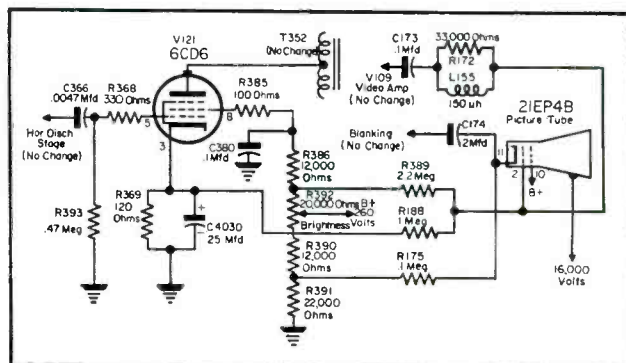


Fig. 2. Revised brightness control circuit in G.E. 21C and 21T models.



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### \$2000 - 1st prize

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To win one of these 503 prizes all you have to do is complete in 25 words or less "I like Pyramid capacitors because\_\_\_\_\_." You fill in this statement on a Pyramid contest entry blank which can be obtained from any electronic parts jobber selling Pyramid capacitors. You have this entry blank countersigned by your jobber or one of his salesmen and forward it to us attached to a Pyramid Dry Electrolytic Capacitor box top—the top being the part which carries the description of the item. There is no limit to the number of entries which you may make in this contest but each entry must be accompanied by a box top. Full rules for the contest appear on the entry blank.

It's so easy. Here is the kind of statement that might win:

*"I like Pyramid capacitors because they always check out perfectly and don't deteriorate and so I know I won't have to call back at my expense."*

*"I like Pyramid capacitors because the line is so complete that I can always get what I need and don't have to worry about an off-brand capacitor."*

## PYRAMID



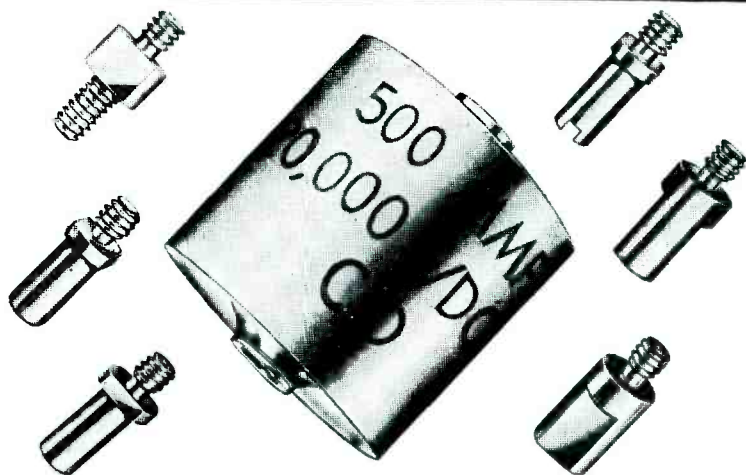
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- 1 Only one quality—the best at no premium. All Pyramid capacitors are made of materials commanded by rigid military specifications.
- 2 All Pyramid capacitors are non-hygroscopic.
- 3 Highest quality insulator material used in all production results in low leakage factor.
- 4 Exclusive non-contamination technique guarantees close tolerances and no deterioration. Peak performances for life.
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- 6 Designed by service technicians across the country for their requirements.
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## Servicing Helps

(Continued from page 56)

act as a filter and remove any objectionable hum which is present in the supply.

One should not connect an auto radio to a power supply with leads smaller than No. 12 or No. 10 wire size. If a smaller size wire is used a voltage drop will occur in the leads, making the voltage at the auto set lower than that indicated by the supply voltmeter. This condition will be aggravated as the current drain is increased. Probably the most convenient

leads are the stranded wire type which are more flexible and less likely to break after continued use.

### Buffer Circuits for 12-V Sets<sup>1</sup>

THE NEW 12-volt power supply circuits use a buffer resistor in series with the buffer capacitor across the secondary of the power transformer.

The junction of the buffer resistor and capacitor, if not properly dressed, may short to ground; chassis or hash cover.

In case a 12-volt radio blows fuses and substitution of a vibrator does not

correct the condition, it is possible that the trouble may be under the hash cover. If the buffer resistor is shorted to ground it will be necessary to replace the resistor, as the resistance value will probably have dropped to a low value. It will not be necessary to replace the buffer capacitor and vibrator; tests have indicated that after a fuse does blow as a result of such a short, neither the vibrator nor the buffer are any the worse for wear.

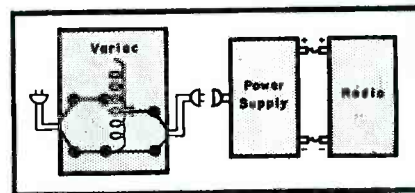


Fig. 2. Use of a variac in auto-radio power-supply line to simulate voltage conditions under which an auto radio operates.

## Color TV

(Continued from page 36)

the necessarily large capacitance of the control electrode at the high frequencies involved; only in dot-sequential systems can a waveform other than a stairstep be used. In line or field sequential systems, these waveforms would cause shading.

In the case of a three-gun picture tube, luminance and chrominance signals are separated and the latter sampled at proper angles. The resulting four channels are provided with proper amplification, and  $E_v$  is added to the color-difference signals so that quantities proportional to  $E_R$ ,  $E_G$ , and  $E_B$  are displayed.

### Translation Technique

This procedure is not appropriate for single-gun tubes; the tube input requires one signal carrying the entire color information sequentially. The NTSC signal is a sequential signal, but at no instant does it represent  $E_R$ ,  $E_G$ , and  $E_B$  or quantities proportional to them. Therefore, a signal transformation in the receiver is necessary.

The transformation must be such that the resulting modified signal represents at three instants quantities proportional to  $E_R$ ,  $E_G$ , and  $E_B$ , preferable in a symmetrical system.

It has been found possible to create a signal satisfying the foregoing requirements, so that single-gun tubes can be used effectively. Various methods permitting the required signal modification have been evolved and will, it is expected, be included in single-gun color TV receivers now being developed.

## Ser-Cuits

(Continued from page 35)

depends on the circuit to which the scope is attached.

The influence of the scope capacitor value on the marker response is illustrated in Fig. 5 (p. 35). When the capacitor is not large enough, as in any alignment setup, the response pattern will be fuzzy, and when markers are inserted they appear broad and indefinite.

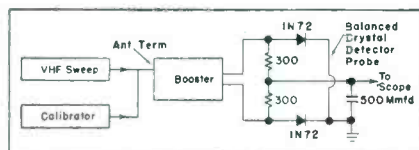
When the capacitor value is too large the markers become broad and lower in amplitude.

### Booster Alignment

The calibrator will be found helpful in the alignment of boosters. Booster alignment often drifts because of age or a change in component part. Also it is often desirable to peak the booster on a specific channel. Boosters are designed for optimum gain over a wide span of channels. Often it is possible to favor a desired channel or group of channels by alignment touch-up or sacrificing gain on some channels not used.

In booster alignment, the *vlf* sweep is connected to antenna terminals of the booster while the scope is attached to booster output via a detector probe; Fig. 6. The crystal detector must be used to demodulate *rf* output of the booster and recover 60-cycle sweep modulation.

Fig. 6. Booster alignment setup.



### CONTEST WINNERS



Winners in CBS-Hytron nationwide Certified Quality Service contest: (left) Norman Gertz, Warwick, R. I., and Jack Campbell (third from left), distributor salesman. Gertz won \$500 in savings bonds and Campbell won \$250 for helping Gertz with his entry. Awarding prizes are Herbert Pope (second from left), CBS-Hytron salesman in New England, and Ernest Gervais (right), electronic parts wholesaler.

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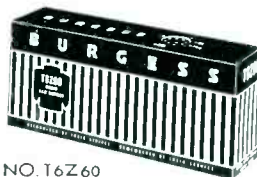
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you. Provides space for  
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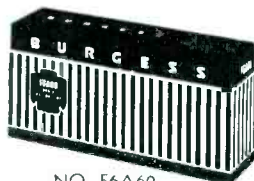
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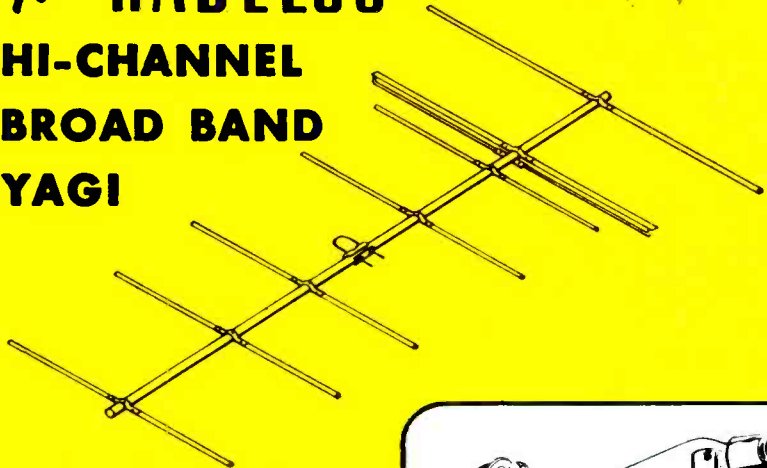
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LIST

\$ 995

Model  
BBH-11



7580 GARFIELD BLVD.  
CLEVELAND 25, OHIO

UHF TV Generator

(Continued from page 25)

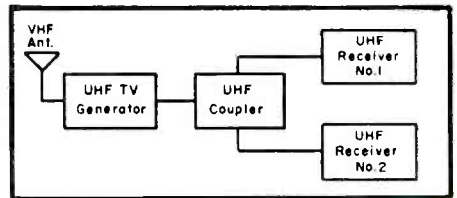
uhf/vhf coupler<sup>3</sup>. For feeding several receivers vhf couplers<sup>4</sup> can be used to multiply the signals to the desired number.

VHF to UHF Conversion

A vhf signal generator can be converted to uhf operation as shown in Fig. 7. The generator can be used in the conventional manner with the output level being controlled by the gain control.

Veryhigh sweep generators can also be adapted to uhf operation, as shown in Fig. 8. Marker injection can be made at vhf or uhf as shown.

<sup>3</sup>ITI model T-126A uhf/vhf Tenna Coupler.  
<sup>4</sup>ITI model IT-127A vhf AutoCoupler.

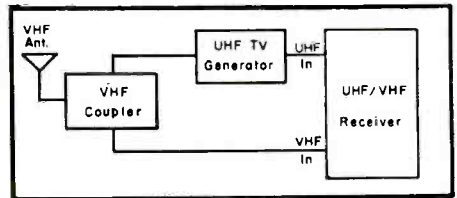


(Above)

Fig. 5. Layout of uhf TV generator to demonstrate uhf receiving equipment.

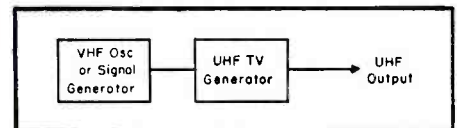
(Below)

Fig. 6. Black drawing of uhf TV generator used to demonstrate uhf/vhf receiving equipment.



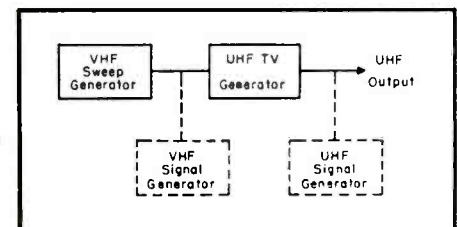
(Below)

Fig. 7. Use of uhf TV generator to adapt a vhf signal generator or oscillator to uhf.



(Below)

Fig. 8. Use of uhf TV generator to adapt a vhf sweep generator to uhf.



## Williamson Amplifier

(Continued from page 27)

cathode, as illustrated in Fig. 5. Twenty db or more of feedback is applied; therefore the voltage gain of the amplifier is reduced at least 90%. If the polarity of the feedback leads is reversed, the amplifier will oscillate instead of suffering a reduction of gain; this means that the wrong side of the voice coil has been grounded. The large amount of feedback can only be used in conjunction with a high quality output transformer, and when a compromise is made in the choice of the output transformer the amount of feedback may have to be reduced by increasing the value of the feedback resistor,  $R_f$ .

Another possible source of phase shift within the feedback loop is insufficient capacitance for the coupling capacitors. If the latter are replaced, substitute values cannot be chosen at random from the shelf. The replace-

(Continued on page 62)

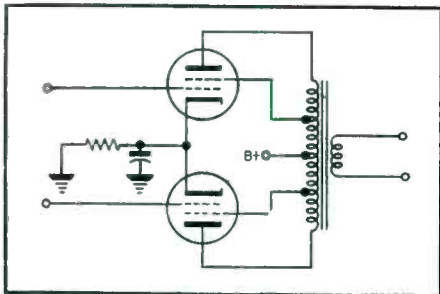


Fig. 3. Ultra-linear output circuit, in which the screen grids are connected to neither the center-tap nor plate end of the output transformer, but to a point intermediate between the two. The output tubes operate with characteristics which are in-between those of triodes and those of pentodes.

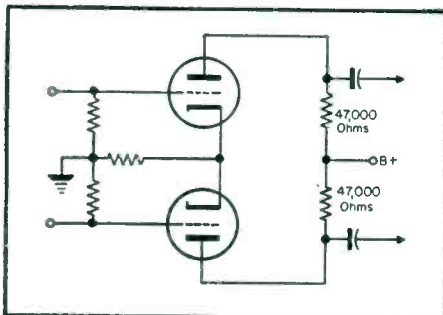
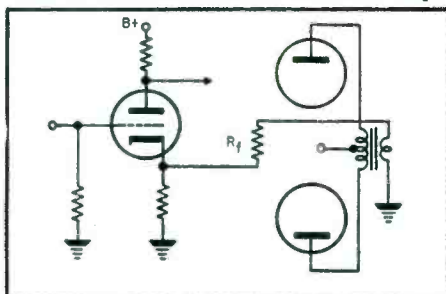


Fig. 4. Driver circuit, with potentiometer of Fig. 2 eliminated.

Fig. 5. Feedback circuit of Williamson amp.



# Sangamo Dry Electrolytics

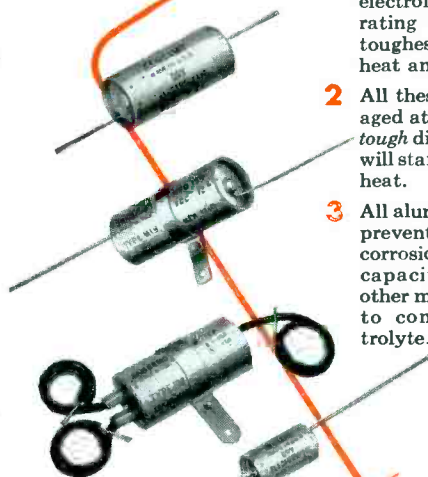
Live many seasons  
for heap good  
reasons



these wire lead  
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with age

Use Sangamo dry tubular electrolytics for trouble-free replacements. You don't have to worry about premature failure. Long life is really built into these capacitors. They have exceptional staying power because:

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## SANGAMO ELECTRIC COMPANY

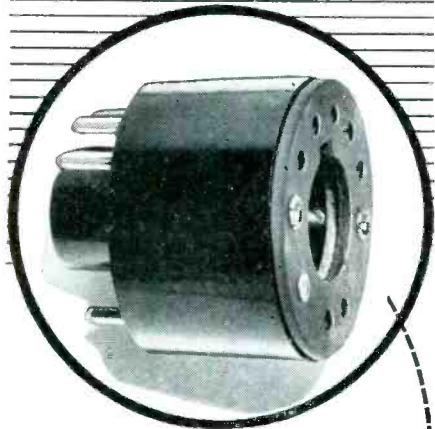
MARION, ILLINOIS

SC54-4

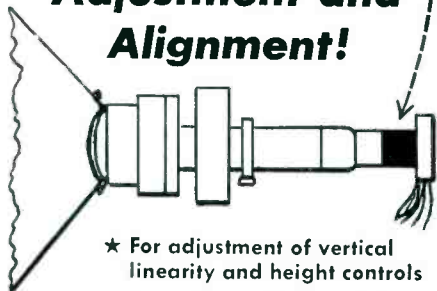
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## Williamson Amplifier

(Continued from page 61)

ment must have as high a capacitance as the original, because insufficient capacitance may introduce motor-boating.

### The Power Supply

The Williamson power supply is conventional, and in the original uses two chokes, one high current unit for the output stage, and one low current unit for the voltage amplifiers. The  $B+$  voltage of the original amplifier, with KT66 output tubes, is 450.

### Performance

The complete amplifier should perform so well that it does not influence the character of the reproduced sound to any audible degree. The quality of the system should be entirely dependent upon the associated loud-speaker pickup, and other components.

There is no special characteristic of this amplifier that requires special matching characteristics of the components with which it works; a good speaker system connected to the correct impedance voice-coil terminals, and a good preamp and control amplifier with standard high-impedance or cathode-follower output, is all that is required. There is often a certain advantage to having the high-level power amplifier as a separate fixed gain unit; the heavy chassis can be mounted on the cabinet floor, away from the control panel.

<sup>1</sup>Vino, Mark. *The Maintenance of Hi-Fi Audio Systems, Service*, Oct., 1953.

### AD CAMPAIGN REVIEW



At an ad-campaign session in office of Ray L. Triplett, proxy of Triplett Electrical Instrument Co., where new program for '54 was discussed. Kneeling, left to right: Burton Browne, head of agency handling account; Lynn C. Wimmer, BBA public relations department; Cleon Triplett, manager of plant 2; Norman A. Triplett, sales manager; Ray L. Triplett, and (back to camera) Robert E. Abbott, BBA creative chief. Standing, left to right: Arden R. Baker, Triplett ad manager; James P. Cody, assistant to Browne; W. Ropp Triplett, vice president and assistant to president and M. Morris Triplett, chief engineer.



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**KENWOOD ENGINEERING CO., INC.**  
Kenilworth, New Jersey



## Annunciator TVI

(Continued from page 23)

interference. If no change is noted, the interference is not being received by the power line to the receiver. If a marked reduction in interference is noted, some sort of a line filter is necessary. Comparison of the reductions produced with the filter at the annunciator system power input and at the receiver power input will indicate the best location of the line filter. In a few instances, trouble can be completely eliminated by tightening the core bolts of the transformer, or by grounding some point in the secondary circuit.

Line filters are devices which either short out or block out unwanted currents in a power line. Simplest form is a shunt capacitor, as in Fig. 3, *A* and *C* (p. 23), capacitor value being determined by experiment, and its voltage rating being about ten times the supply voltage. Capacities useful in the primary circuit are usually from .1 to .5 mfd, and paper capacitors of the sealed type, rated at 600 volts, are substantially immortal in this type of service. Some additional interference reduction can be brought about by use of a pair of capacitors, with the common terminal grounded, shunted across the transformer, as in *B* and *D*. Very severe power line infeed of interference can be reduced by an *l-c* balanced filter, as in *E*. This filter must be shielded, and the shield, as well as the transformer core, grounded.

### Two-Section Balanced Filter

A two-section balanced *l-c* filter which effectively eliminated line pickup troubles in a busy airport communications room is shown in Fig. 4 (p. 64). This is more involved than is normally needed in residence QRM elimination, but is quite useful when the customer lives next door to the police radio station, or over a taxicab dispatching office. Line filters are only useful in eliminating interference carried, radiated, or picked up by the power lines, and the best line filter in the world will be useless if the interference reaches the receiver by some other channel.

Several cases of severe noise pickup have been cured by disconnecting the receiver ground wire at the receiver. This is effective in some instances because, even though the receiver is at ground potential with respect to *dc*, it is at some other *rf* potential, due to *l*, *c*, and *r* of the ground wire. *DC* grounding without *ground lead noise injection* has been obtained by use of a shielded ground wire, with the shield



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insulated from the wire at all points except at the ground rod connector, as in Fig. 4 (lower left). This procedure is not effective when a good low resistance ground is unobtainable, as is often the case in arid regions, or where the ground rod is driven to a *hanging water table*, of small dimensions, with a high resistance path to *universal* ground.

### Reduction of Annunciator Interference AC Systems

Annunciator interference produced by *ac*-operated systems can be reduced,

in most instances, by grounding some part of the secondary circuit, such as points *A* and *B* in Fig. 1. One must be sure that there is only one ground on the system, as extra grounds introduce sneak circuits which may be most difficult to locate.

Interference from vibratory annunciators, such as bells and buzzers, will be at a minimum when the oscillation period of the armature is an integral power of two multiples of the line frequency, such as 1, 2, 4, 8, or 16 times line frequency; and when the resonant frequency of the bell is a low-num-

(Continued on page 64)



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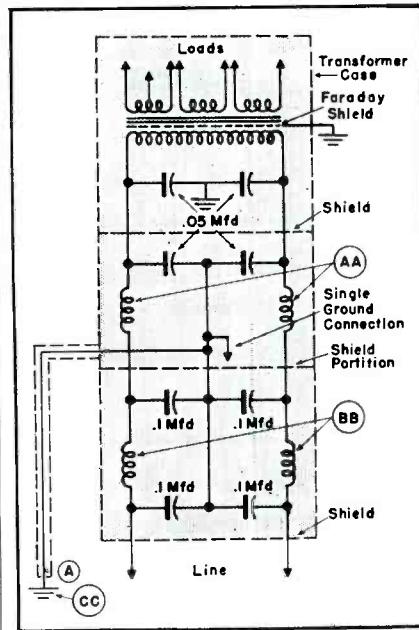
manufactured by  
**QUIETROLE  
 COMPANY**  
 Spartanburg, South Carolina

(Continued from page 63)

bered harmonic of the armature oscillation frequency, such as 1, 2, 3, or 4 times. With equipment commonly available today, optimum operation is usually obtained with an armature frequency of 120 or 240 cps, and a bell frequency of 480 or 720 cps. This adjustment can be rather easily done by ear, and no exact frequency measurements are necessary, as the bell or buzzer has a *clean* (agreeable) tone when the foregoing conditions are met, and a very ragged tone, sometimes accompanied by pulsing, when relations of line frequency, armature frequency, and bell frequency are incorrect. Contact sparking will also be found to be at a minimum when frequency and phase relations of the various annunciator components are correct, and radio interference, consequently, is also at a minimum under these conditions.

Further reduction in interference radiated by vibrating annunciators can usually be brought about by shunting the bell coil, the transformer, or both, by a small capacitor, to depeak or absorb the flybacks occurring when the contacts open (Fig. 2). Capacitor values commonly useful are from .05 to .5 mfd, with voltage ratings at least 10 times supply voltage. Connection across the coil (from *D* to *B* in Fig. 1) is usually most effective, but a capacitor shunted across the transformer (from *A* to *B* in Fig. 1) can also be helpful. Occasionally, capacitors across both bell coil and trans-

Fig. 4. Filter for very severe line interference. Coils at AA have 20 turns of No. 18 enameled wire on a 3/4" diameter tubing, while at BB are 30-turn coils, with windings of No. 18 enamel on 3/4" diameter form. A shielded ground cable must be used, with the shield grounded at point A only. The ground (CC) should go to a water base.



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**CRYSTAL MARKER GENERATOR**  
**NEVER SUCH AN ACCURATE AND**  
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**IF AND VHF TELEVISION RANGE**

A new compact and single-tube unit displays *One Megacycle Markers* over entire I.F. and VHF Ranges, along with key calibration markers. All markers are crystal controlled. (Refer to article in this issue.)

Unit is now available in kit form with easy-to-follow construction and operation instructions. Kit is now available at an introductory price of \$29.50 and includes tube and properly-matched and accurate crystals.

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Send crystal calibrator kit to:

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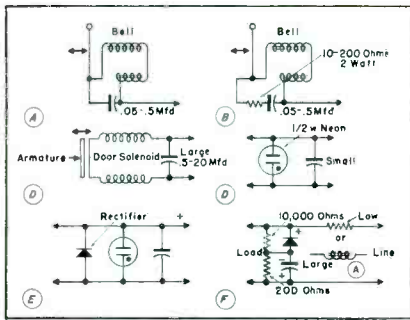


Fig. 5. Flyback absorbers. Filter at A can reduce interference by factor of 10 to 100; coil is shunted with medium value capacitor (.05 to 5 mfd). System shown at B will provide greater reduction of damped oscillations. In C the filter should be large enough to reduce flybacks and oscillations. The neon shown in the D circuit serves to depeak flybacks. Reversed diode shown in E provides further dissipation of flyback energy. A surge-harbor circuit is shown in F; this is the most effective flyback absorber. Choke A is a 10-turn winding with No. 12 wire on a 1/2" bolt.

former are useful and rarely (but not never) a capacitor shunting outer ends of transformer and bell coil (from A to D in Fig. 1) is helpful.

When line filters and shunt capacitors fail to reduce interference from an ac annunciator system to a reasonable value, the trouble-making annunciators can be replaced by components of better design, the vibrating bells can be replaced by solenoid-operated chimes, or the system can be converted to dc operation.

Reduction of interference from dc-operated annunciator systems is fairly simple and straightforward, although it may be somewhat costly and time-consuming. Preliminary steps are adjustment of the bells to optimum operation, so that the tone is clean and contact sparking is at a minimum. This occurs when the armature frequency is an integral fraction (1/2, 1/3, 1/4, etc., not 11/23, 13/37, etc.) of the resonant frequency of the bell. This adjustment can be made easily by ear, and is considerably simpler in a dc system than in one operated from a transformer, because line frequency is not present to complicate matters.

One part of the system (and only one) should be grounded. Unless there is a good reason for some other connection, supply minus should be grounded. When the bells, buzzers, and other components are being adjusted, any other devices connected to the system should be checked, and minor defects, such as loose connections and frayed insulation, remedied as preventive maintenance.

Interference from dc-operated vibratory annunciators, such as bells and buzzers, can usually be reduced by a factor of more than 10, and often more than 100, by shunting the coil with a capacitor of medium capacity, as in Fig. 5A. This capacitor is most effective when it is mounted directly across

there is  
a correct

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the coil terminals, inside the bell case. Useful capacities, in most instances, are from .05 to .5 mfd; voltage ratings should be 200 or more for a 6-volt system. This capacitor should be large enough to absorb the flyback produced when the magnetic field of the coil collapses. Its value is best found by experiment, and the value is not critical. Use of a very large capacitor (several thousand mfd) is inadvisable, as this may tune the bell, converting it into a relay oscillator, a most useful timing device in some applications, but only a costly *electrical do-jummy* in this appli-

cation. Use of a shunt capacitor alone causes a great depeaking of the flybacks from the annunciator coil, and a moderate reduction of the damped oscillations following the flyback; Fig. 2.

When greater reduction of the damped oscillations (greater decrement) is desired, a small resistor in series with the capacitor is effective, as in Fig. 5 B. This increases over-all resistance of oscillatory system (coil, capacitor, resistor), and dissipates flyback and oscillatory currents as heat.

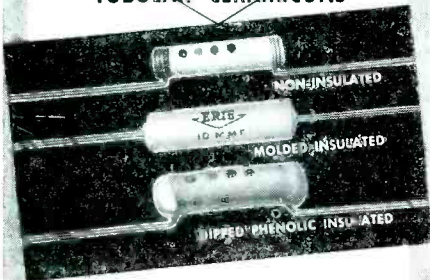
[To Be Continued]

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TEMPERATURE COMPENSATING  
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- Three Temperature Coefficients: NPO, N330, N750: Close tolerance on all temperature coefficients.
- Non-insulated, Molded insulated, Dipped Phenolic insulated.
- Wide range of capacity values, close tolerance on all capacity values.
- Provide commercial equivalents of many often used JAN types.

One purpose of the three temperature coefficients is to provide the means of combining in parallel, various combinations of NPO and N330; and NPO and N750 to obtain intermediate temperature coefficients. Formulae for computing these values as well as a simple nomograph for quick computations will be afforded in service information.

The range of capacity values is the most complete offered as *standard stock* by any ceramic capacitor manufacturer. Servicemen and engineers . . . your distributor has these capacitors to meet your requirements for TV replacements, laboratory work, and prototype development.

Write for complete list of capacity values available JAN equivalent table, and nomograph.

ERIE components are stocked at leading electronic distributors everywhere.

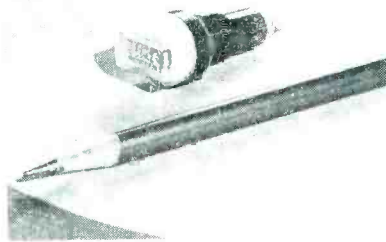


# Tools . . . Instruments Parts . . .

### LITTELFUSE INDICATING FUSE POST

An indicating fuse post, 344010, designed for 3 AG and 3 AB fuses in ratings up to 15 amperes and 250 volts maximum, has been announced by Littelfuse, Inc., Des Plaines, Ill.

Fuse post measures 2 3/8" overall, 3/4" above panel, 1 5/8" below panel, including the solder terminals. Mounts on 11/16" minimum center to center dimension knob 15/16" od; body mounts in 5/8" diameter D non-turning hole; 5/8"-18 thread of body.



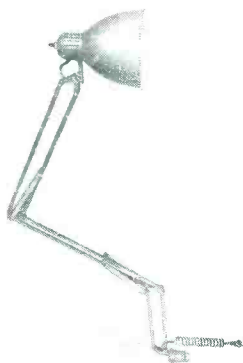
Littelfuse Indicating Fuse Post

\* \* \*

### LUXO TRIPLE EXTENSION LAMP

A triple-extension lamp, L-3, with a 60" radius, has been introduced by the Luxo Lamp Corp., 102 Columbus Ave., Tuckahoe, N. Y.

Flexing arrangement provides a fixed, free-swinging horizontal member (out from wall) joined to twin medium length extension arms. Available with bracket for attachment to table, desk or horizontal surface, and for wall mounting.



Luxo L-3 Lamp



FOR EVERY  
SERVICE MAN!

HUSH Jr.  
KIT  
SERVICER

The Amazing, New  
TV-Tuner Cleaner  
That Sprays On!

The new, "handy" size for TV and Radio Service Men to pack right along in their tube kits. So convenient on home service calls.

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2-ounce bottle, complete with 24 karat gold plate spray attachment.  
8-ounce refill bottle only \$1.95

HUSH is made by the manufacturers of EVER QUIET—for volume controls—contact restorer.

EVER KLEER—for cleaning and keeping TV tubes clean.

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### ADMIRAL ANTENNA KITS

A line of nine outdoor TV antenna kits has been introduced by the Admiral Corp., 3800 Cortland St., Chicago 47, Ill.

Nine kits, each with a choice of four different mounts, cover *uhf*, *vhf* and combined *uhf-vhf*. Each outfit contains antenna, mast, mast mount, guy wires, insulators and lead-in and hardware.

\* \* \*

### KAPNER TESTER

An all-electric continuity tester, *170-A*, said to eliminate need for zero adjustments and battery replacement, that indicates resistance from a fraction of an ohm to 5 megohms, has been developed by Kapner Hardware, Inc., 2248 Second Ave., New York 29, N. Y. A safe-guard resistor limits the output to 1 ma.

In the testing procedure, one lead is clipped to one side of the circuit or resistance under test; then when touching prod lead to other side, an indicator light tells whether resistance is *low*, *high* or *open*. Has an extremely low output that is said to make it impossible to damage battery or hearing-aid tubes.



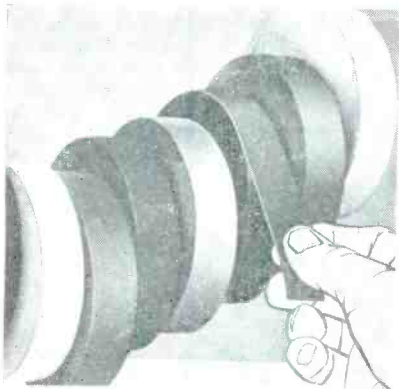
Kapner Tester

\* \* \*

### VINYL COLOR TAPE

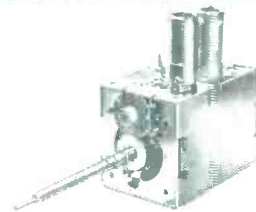
Vinyl plastic tapes, *Dutch Brand*, in red, yellow, green, blue, gold, silver, black and white, are now available from Van Cleef Bros., Inc., Division of Johns-Manville, 7800 Woodlawn Ave., Chicago 19, Ill.

Available in four widths,  $\frac{3}{8}$ ",  $\frac{1}{2}$ ",  $\frac{3}{4}$ " and 1"; tapes are said to have a breaking strength of 15 pounds per inch width, and a dielectric strength of 1,000 *v* per mil.



Dutch Brand Color Tapes

The  
TARZIAN  
TUNER  
is known  
for its  
perfection



Yes, perfection in design . . . craftsmanship . . .  
and perfection in performance.

That's why you'll find most manufacturers of the best known receivers today are placing their confidence in the Tarzian Tuner. Leading manufacturers are specifying the Tarzian Tuner to be used in the sets they make because they can be sure of customer satisfaction with the trouble-free Tarzian Tuner.

You just can't beat the Tarzian Tuner for selectivity, stability and reception . . . especially in fringe areas.

And, the Tarzian approach to UHF is recognized as the sensible . . . all-channel . . . approach. Remember, Tarzian was first with UHF engineered into a VHF Tuner.



**SARKES TARZIAN, Inc.**

**Tuner Division • Bloomington, Indiana**

### SUPEREX VARI-TENNA AND LOOPSTICK

A ferrite core coil, *Vari-Tenna*, with a high *Q* winding designed to replace antenna coils, has been announced by Superex Electronics Corp., 23 Atherton St., Yonkers, N. Y.

A miniaturized bar loop, *Energized Ferri-Loopstick*, for use where space is a factor, has also been announced. Unit, which has a core length of  $2\frac{3}{4}$ ", employs a ferrite rod with a high *Q* (said to be up to 400). A vinyl collar holds the core in position.

(Right)

Superex Vari-Tenna and Loopstick



[Additional New Part news on pages 69, 70]

# RADIO TV SERVICE MEN—



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• We don't have to tell you what past due accounts can do! Avoid slow collections . . . use the systematically prepared Collection Rubber Stamps!

ANY STAMP only <b>\$1.00</b> Order by Number	10 STAMPS only <b>\$7.50</b> Order by Number
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That your account is past due.
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At least a part payment at this time.
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Your account is long past due and we must ask for settlement promptly.
- 5 **PAST DUE!**  
If inaccurate or for any reason why payment cannot be made now please advise us.
- 6 **PAST DUE!**  
You have no doubt overlooked this account. We would appreciate your check within the next few days.
- 7 **SECOND NOTICE!**  
We again remind you that your account is much overdue and must ask for settlement promptly.
- 8 **YOUR REQUEST**  
For credit was not ignored—this request for payment should not be.
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Unless this account is paid within 10 days it will be given to our attorneys for such legal action as may be necessary.
- 10

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## Audio

(Continued from page 38)

maximum volume which the receiver is capable of delivering has been reduced as much as can be afforded.

The reduction ratio of output signal voltage, in *db*, represents the amount of feedback that has been introduced, and also indicates, under proper conditions, the reduction ratio of harmonic distortion for the same power output.

### Substitution of 6V6s for 6F6s

In some instances, output tubes have been switched to secure greater gain and better frequency coverage. In this chassis, the slight increase of power available from changing over to 6V6s would not warrant a substitution, as the output stage bias circuit would have to be radically altered. However, if the 6V6s are used, the output stage grid returns from the bleeder resistor must be disconnected and connected directly to ground. Then a 270-ohm, 10-watt resistor should be inserted between the connected cathodes of the 6V6s and ground, and this 270-ohm resistor should be bypassed with a 50-mfd, 50 *wv* electrolytic. The output transformer ratings and the tube socket connections remain the same.

### Plastics in Audio

Two members of the plastic group, an oldtimer polyethylene, and a newcomer, styrofoam, joined the audio family recently. The polyethylene is now being used as a soft plastic sleeve for the protection of record surfaces.<sup>1</sup>

The sleeve was developed to protect records, particularly *lps*, from the

<sup>1</sup>Walco Discover.

## GET THIS NEW SPRAGUE T-C RULE



Save time . . . avoid mistakes . . . in finding the values of stock N750 and NPO type ceramic capacitors to connect in parallel to equal a capacitor of desired intermediate temperature coefficient of the required capacitance. Just slide this handy, pocket-size rule to the proper values and you'll come up with the right answer quick as a wink every time. On back are complete color codes on all types of ceramic capacitors. Ask your Sprague Distributor for one, or write to Sprague Products Co., 61 Marshall Street, North Adams, Mass. It's only 15c.

### SPRAGUE PRODUCTS COMPANY

Distributors' Division of the Sprague Electric Co.  
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### THE NEW TV DYNATRACER

- Traces TV Signals and Voltages
- Locates Defective Components
- Requires No Additional Equipment

This sensationally new piece of test equipment is ideal for troubleshooting television sets in the home or in the shop. The "DYNATRACER" will outperform more expensive testers and should pay for itself on first repair.

A Must For Every TV Technician  
**SPECIFICATIONS:** The "DYNATRACER" is a self-powered quality test instrument designed to trace TV signals through any Video, Sound, Sync, AFC, Horizontal or Vertical Sweep Circuit—will isolate trouble to a stage or component.

**ADDED FEATURE:** The "DYNATRACER" will also trace voltages (50/500 V. AC/DC) and instantly locate open, shorted, intermittent or leaky (up to 20 megohms) condensers, resistors, coils, transformers, etc.

Instruction and Trouble-Shooting Book Enclosed  
**10-DAY MONEY-BACK GUARANTEE**

Cut out ad, attach name and address, with \$5 bill, check or money order, and mail to

**Century ELECTRONICS CO.**

211-04 99th Ave., Dept. 307, Queens Village, N. Y.

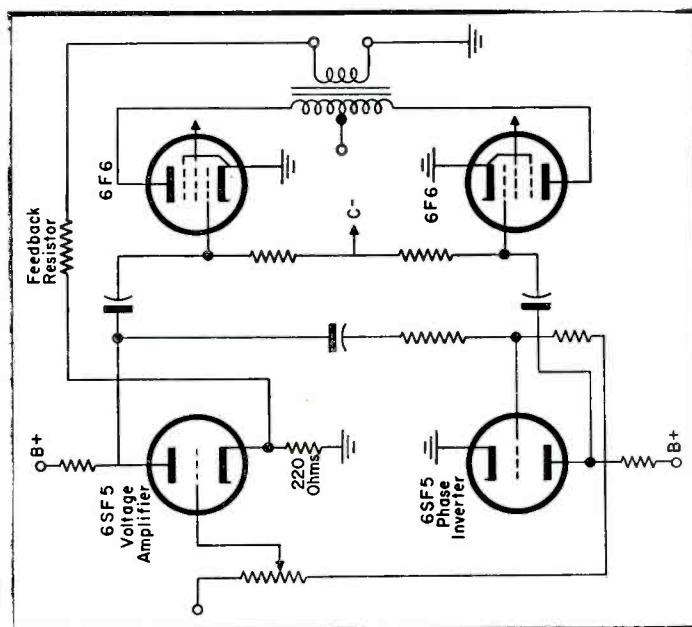


Fig. 2. Detailed circuitry illustrating introduction of negative feedback in modified amplifier. The 220-ohm resistor should be inserted between the cathode and the ground.

scratches suffered in sliding them in and out of record jackets, also from the injurious effects of moisture, dust and finger marking.

Sleeves are being made in standard sizes to accommodate both 10" and 12" discs.

The second plastic, *styrofoam*, has been included in the cone area of a new type of *hi-fi* speaker. A thin panel of the plastic 20" square, set in motion in the speaker, is claimed to produce bass tones five times as strong, for the same motion, as those produced in the usual 12" cone speaker.

<sup>2</sup>Developed by Paul A. deMars.

## Tools. Instruments. Parts

(Continued from page 67)

### FEDERAL FOLDING TRUCKS

Folding trucks, that can be collapsed for storing or for carrying in a car or truck, have been introduced by the Federal Cash Register Co., P. O. Box 2265, Kansas City 6, Mo.

Trucks can be fitted with a 2-way outlet and a 10' extension cord. One model, *Regular*, is said to be for loads of from 25 to 300 pounds. Another model, *Self-Balanced-2 Wheeler*, it is claimed, will carry a load normally handled on a two-wheel truck.

\* \* \*

### TRIO PANEL-MOUNTING VTVM

A miniaturized panel-mounting *type A* vacuum-tube voltmeter, requiring the same panel area as a standard 3½" meter, and having a depth of 4¼", has been developed by Trio Laboratories, P. O. Box 143, Wantagh, N. Y.

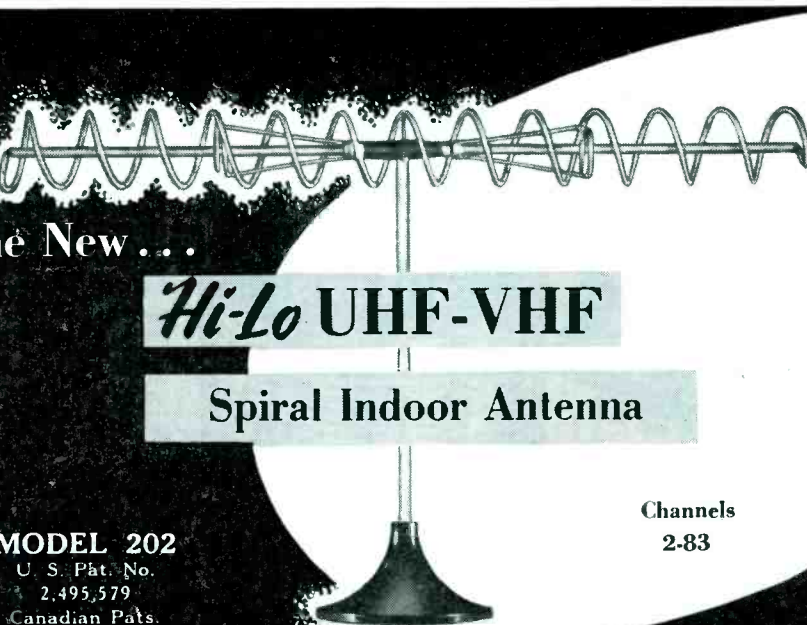
Unit is available with full-scale sensitivities ranging from 10 millivolts to 300 volts *rms*. Input impedance of 1 megohm meter can be used for measurements from 20 cps to 50,000 cps. Utilizes a feedback amplifier circuit, and four germanium diodes in a meter bridge circuit.

\* \* \*

### MUELLER COLORED TEST CLIPS

Colored, vinylite insulators, designed for test clips for identification, have been announced by the Mueller Electric Co., 1571C E. 31st St., Cleveland 14, Ohio.

Colors available include electric blue and canary yellow, in clip sizes 26, 29, 47, 49, 62, 87 and 90. Free samples are available by writing on letterhead to company.



The New . . .

**Hi-Lo UHF-VHF**

**Spiral Indoor Antenna**

MODEL 202

U. S. Pat. No.

2,495,579

Canadian Pats.

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Channels

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Peak Performance for Indoor  
UHF and VHF TV Reception.

Takes only seconds to install . . . receives clear pictures immediately, tuned to high or low TV channels. No switches or rods to adjust. 20 inches high, 32 inches wide. Gleaming gold tone appearance with smart bakelite base and aluminum bars. Modern design blends with any furniture.

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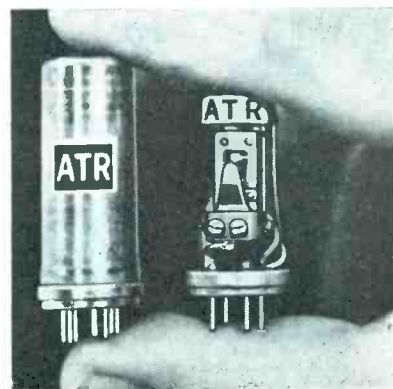
### ATR SUBMINIATURE VIBRATORS

A subminiature vibrator, designed for miniature flashlight-cell-operated power supplies, has been developed by the American Television and Radio Corp., 300 E. 4th St., St. Paul 1, Minn.

Vibrator, which will fit a 7-pin miniature tube base, has a driving coil voltage of 1.5, 3 or 6 *dc*, and operates on coil power of less than 45 milliwatts. Unit is of a full-wave non-sync driver type construction, having a frequency of 100 cycles and total time efficiency of 80%.

Right: ATR Subminiature Vibrator

Left: Mueller Colored Clips



# KESTER

Since the most important single step in Radio-Television Servicing is soldering . . . it's just plain good sense to use the best — **KESTER SOLDER** . . . Key Name in Solder for More Than 50 Years.

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# SOLDER

## SPRAGUE YOKE CAPACITOR KIT

A service kit, *CK-1*, for capacitor replacements on TV yokes, has been announced by the Sprague Products Co., 61 Marshall St., North Adams, Mass. Capacitors included in the kit provide coverage of fractional values between 33 and 82 mmfd.,  $\pm 10\%$  tolerance. Capacitors fit inside yoke assembly and are replacements for the mica capacitors which sometimes appear in original equipment. Kit includes 36 capacitors: two-33, five-39, five-47, ten-56, two-62, five-68, two-75, and five-82 mmfd *Ceramites*.



Sprague Capacitor Kit

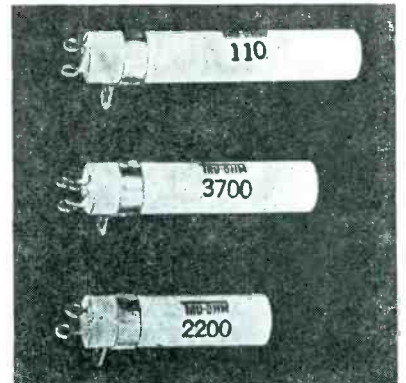
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## TRU-OHM CERAMIC CORE RESISTORS

Resistance units, *Stand-Ohm* made for top-of-chassis mounting which, it is said, remove a high heat source from the area of critical components which might possibly be affected by heat, are now available from Tru-Ohm Products, Division of Model Engineering and Manufacturing Inc., 2800 N. Milwaukee Ave., Chicago 18, Ill.

Resistors are wound with resistance wire on a flat ceramic core, which is coated with silicone cement and inserted into a ceramic tube which is then filled with silica and sealed with silicone cement. Units are supplied in ratings of 10, 15, 20 and 25 watts, in heights of 1½", 2", 2½" and 3", respectively; all are 19/32" diameter to fit in 5/8" chassis cut out. Can be supplied in straight resistance values or with up to two taps.

Also available are non-hygroscopic ceramic-core resistors, *Econ-ohm series S*, that can be operated at full watt rating and at a temperature not exceeding 275° C. Standard ratings supplied are 3, 5, 7, 10, 15 and 20 watts, and sizes 1 3/16" x 1/2", 1 5/8" x 9/16", 2" x 9/16", 2" x 3/4", 2 1/2" x 3/4" and 3" x 3/4", respectively.



Tru-Ohm Ceramic Core Resistors

## STOP TV TUNER NOISE... QUICKLY—SAFELY! with

# SPRA-KLEEN

Pressure-Applied CLEANER-LUBRICANT

**A NEW MUST FOR EVERY SERVICEMAN**

- No Harmful Ingredients
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- Reaches Everywhere — No Need To Pull a TV Chassis!

G-C's new SPRA-KLEEN Electrical Contact Cleaner and Lubricant is just what you need for fast, easy, safe servicing of TV tuners and other parts like relays, switches and controls. No need to pull that chassis; just "poof" and SPRA-KLEEN's directional nozzle reaches any remote corner. See your favorite jobber today!

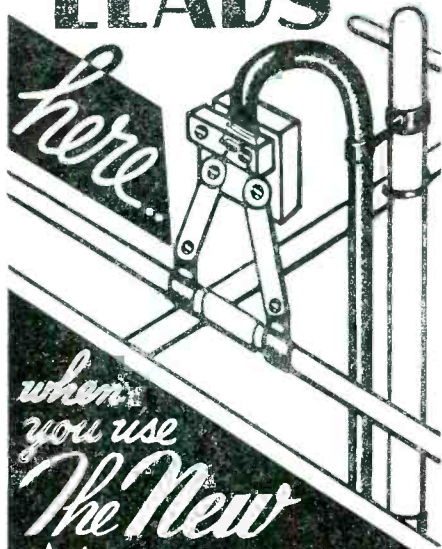
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 301 Taylor Avenue, Rockford, Illinois

WRITE TODAY for your free copy of the big new G-C Catalog 156.

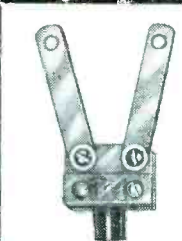
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 LIST \$1.67 (6 full ounces)



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**The New MOSLEY "Y-TY"**



LIST PRICE \$ .80

PATENT APPLIED FOR

- Low Loss, Permanent Connections Of Transmission Line and Phasing Strips To TV Antenna Elements!
- For UHF and VHF Antennas!
- For All Types Transmission Line!
- Eliminates Roof-top Soldering Jobs!
- Quick — Easy to Install!
- Available In Two Sizes To Fit All Antennas!

**CATALOG 263-S** For all UHF Antennas and most VHF Yagis, Conicals, Inline, and other type antennas where distances between terminals is 4" or less.

**CATALOG 263-L** For TRIO Zig-Zag, and other antennas where distance between terminals is 6" or less.

Your reputation hangs on fine threads of copper. Use the MOSLEY "Y-TY" on Every Installation Job To Stop Antenna Call-backs!

The NEW MOSLEY "Y-TY" now available at Radio and Television Parts Distributors — Coast-to-Coast!

WRITE FOR FREE COPY OF THIS CATALOG



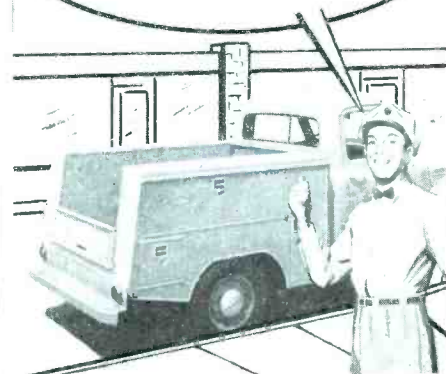
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ST. LOUIS 14, MISSOURI

## Rep Talk

SIX TRADE ASSOCIATIONS have established a conference coordinating committee, and *Russ Diethert*, national president of The Reps, has been named chairman. Committee, organized for the purpose of coordinating regional conferences run by sales reps, to eliminate duplication of time, effort and expense, includes the National Electronic Distributors Association (NEDA); the West Coast Electronic Manufacturers Association (WCEMA); the Radio-Electronic-Television Manufacturers Association (RETMA); the Sales Managers Club, Eastern Group (SMC); the Association of Electronic Parts and Equipment Manufacturers (EP & EM), and The Reps. The industry relations committees of the various associations organized a task group to work out a program of coordinating and staggering conferences. Members of the committee are: *G. Yarbrough, E. Berlant, WCEMA; J. A. Milling, Norman A. Triplett, RETMA; S. L. Baraf, Robert D. Ferree, SMC; Ted Rossmann, A. N. Haas, Jr., EP & EM; Mose Brannum, R. W. Farris, Russ Diethert, Leroy W. Beier and R. M. Campion, Sr., The Reps; and W. J. Jenkins, Charles Goebel and S. Tonahill, NEDA.* . . . The Reps will manage the hospitality suite and message service at the May Parts Show, May 17-20, at the Conrad Hilton Hotel. . . . N. Y. chapter has voted to discontinue the annual stag party. . . . The '54 Directory of The Los Angeles Chapter, with a 36-page chapter roster, list of manufacturers represented by members and a product index, has been published. Directory was compiled by a special committee of chapter officers including *George Davis*, president. *Al J. Rissi*, vice president, and *Frank A. Emmett*, secretary-treasurer. . . . *William C. Lynch*, formerly a special accounts executive for Remington Rand, has been added to the sales staff of Henry Lavin Associates. . . . *S. I. Neiman*, head of Public Relations Affiliates, Chicago, has acquired an interest in the Oren H. Smith Co., Chicago rep firm. . . . *LeRoy McGuire*, 29 Bancroft Dr., Rochester, N. Y., has been appointed rep for Astron Sales Corp., for the state of New York, excluding metropolitan New York City. . . . *Charles V. Kettering*, Denver, Colo., will serve as rep in Colorado, New Mexico, Utah, southern Idaho, and Wyoming, for the Thorens Co. . . . *John J. Koppie Associates* have been named eastern rep for the Sightmaster Corp., electronic fuse line. . . . *W. J. Doyle Co.*, Chicago, Ill., has been appointed rep for American Screen Products Co. in Illinois, Wisconsin and Lake County, Indiana. . . . *Clark R. Gibb*, 1409 Hennepin Ave., Minneapolis, Minn., is now rep for Ram Electronics Sales Co., in Minnesota and North and South Dakota. . . . *Ben Joseph*, 521 Fifth Ave., New York 17, N. Y., has been named sales rep for Kleer-Vue in the metropolitan New York territory. . . . Xcelite, Inc., Orchard Park, N. Y., has announced the appointment of two new Southeastern Tier reps: *Frank C. Nickerson*, 1133 Ponce de Leon Avenue, Atlanta 6, Georgia, (North Carolina, South Carolina, Georgia and Florida, except for Northwest Florida), and *A. S. Engleman*, 3205 Crump Av., Memphis, Tenn. (Tennessee, Alabama, Mississippi and Northwest Florida.)

"Service-Master saves me up to one hour of service time every day"



## Service-Master THE IDEAL RADIO AND TELEVISION SERVICE BODY

Here's the body that takes a completely equipped shop to the job, and saves up to 75 minutes per day. Using the latest average service base rate of 6 cents a minute and an average saving of 30 minutes a day . . . Service-Master saves \$478.00 worth of time a year. Available in sizes for 1/2, 3/4, 1, and 1 1/2 ton chassis — regardless of age or make. The coupon below will bring complete details, with no obligation to you.

## MAKE YOUR PICK-UP TRUCK A SERVICE TRUCK, TOO!

### SERVICE-TWINS

for 1/2 and 3/4 ton pick-up trucks



These easy-to-install tool and material compartments are finished in baked-on, medium-dark green enamel. Parts bins are built-in. Doors have slam-action catches, with locks keyed alike. Available with overhead rack.

**McCABE-POWERS AUTO BODY CO.**  
5900 No. Broadway • St. Louis 15, Mo.

Please send me complete details on:  
SERVICE-MASTER  SERVICE-TWINS

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City & State \_\_\_\_\_

# PERFORMANCE

*Guaranteed*

**TO LAST  
A LIFETIME!**

**UNIVERSITY COBREFLEX-2  
WIDE-ANGLE TRUMPET**

Lifetime Performance has been built into each Cobreflex-2. Nothing yet produced compares in construction and design efficiency. Once installed, the Cobreflex-2 can be forgotten. The Cobreflex-2 is Breakdown-Proof . . . truly performance guaranteed to last a lifetime.

**Compared! Tested! Proven Superior!**

Write for  
technical  
literature



When used with University Driver Units

Meets Any  
Frequency Response  
Power Capacity  
Impedance Requirement  
Mounting  
Application



Model T-30 Driver Unit  
Cont. Power: 20 Watts over 250 CPS  
Response: 250-15,000 CPS  
Impedance: 8 Ohms

Model SA-HF Driver Unit  
Cont. Power: 25 Watts  
Response: 90-10,000 CPS  
Impedance: 16 Ohms

Model MA-25 Driver Unit  
Cont. Power: 25 Watts  
Response: 90-6000 CPS  
Impedance: 16 Ohms

Model PA-30 Driver Unit  
Cont. Power: 30 Watts  
Response: 80-10,000 CPS  
Impedance: 16/165/250/500  
1000/2000 ohms  
Power Taps (70V):  
30/20/10/5/2.5 Watts

Model SA-30 Driver Unit  
Cont. Power: 30 Watts  
Response: 90-10,000 CPS  
Impedance: 15/65/165/250  
500/1000/2000 ohms  
Power Taps (70V):  
30/20/10/5/2.5 Watts

UNIVERSITY LOUDSPEAKERS • INC., 80 So. Kensico Ave., White Plains, N. Y.

# PERSONNEL

CHARLES A. HANSEN, former sales manager of Jensen Mfg. Co., has been appointed manager of the distributor division of Gramer Transformer Corp., Chicago, Ill.



Charles A. Hansen      George J. Desposito

GEORGE J. DESPOSITO, formerly government contract administrator for Emerson, has been named administrative assistant to the executive vice president of the Pyramid Electric Co., North Bergen, N. J.

\* \* \*

WALTER R. WOLFGRAM is now factory superintendent for the Jensen Manufacturing Co., Chicago, Ill. Wolfram was formerly plant manager for the Standard Transformer Corp.



Walter R. Wolfram      Herman J. Schorle

HERMAN J. SCHORLE has been appointed works manager of the new Manchester, N. H., plant of the Insuline Corp. of America.

\* \* \*

HARRIS O. WOOD has been appointed chief engineer of the television division of the Philco Corp., Philadelphia, Pa. Wood was recently appointed chairman of the TV receiver committee of RETMA.

\* \* \*

C. RUSSEL FELDMANN has been elected president of the National Union Radio Corp., Hatboro, Pa. Feldmann succeeds former president KENNETH C. MEINKEN, who has resigned.

\* \* \*

JOHN E. NELSON is now central regional manager of equipment tube sales for G.E., and will headquarter at the tube warehouse at 3800 N. Milwaukee Ave., Chicago, Ill. . . . C. BYRON FARMER has been named regional sales manager of the newly-created replacement-tube southeastern sales area, covering North and South Carolina, Tennessee, Georgia, Alabama and Florida. . . . ALBERT C. BOURGER replaces Farmer as sales manager for the southern district in the region.

\* \* \*

ALFRED A. MEDICA, former assistant ad manager, is now sales manager of national accounts for the Admiral Corp., Chicago, Ill.

\* \* \*

SEYMOUR MINTZ, formerly a vice president of Admiral Corp., has been appointed president of CBS-Columbia.

# AMPHENOL

Dealers, servicemen, distributors and the public have learned to rely upon any product stamped with this Trade Mark. To all it signifies highest quality, dependable performance.

AMERICAN PHENOLIC CORPORATION • CHICAGO

## CARBON-TET

Finest Cleaner for Electrical Parts



1. Quickly removes oil, grease, tar and other soils from electrical parts!
  2. Safe, Won't burn! Won't explode!
  3. Won't harm finest surface or finish!
  4. Dries instantly—no odor or residue!
  5. Economical for cleaning sliding contacts, condenser plates and chassis. Also as a wash for carbon deposits.
- In gal. cans, qt. cans, 8-oz. bottles.  
Order from your jobber.

**THE KERDEN CHEMICAL CO.**

BOX 1076, STATION "A" • CLEVELAND 2, OHIO

At the 1954  
Electronic Parts Show

May 17, 18, 19, 20

**SERVICE**

Will be in Display Room

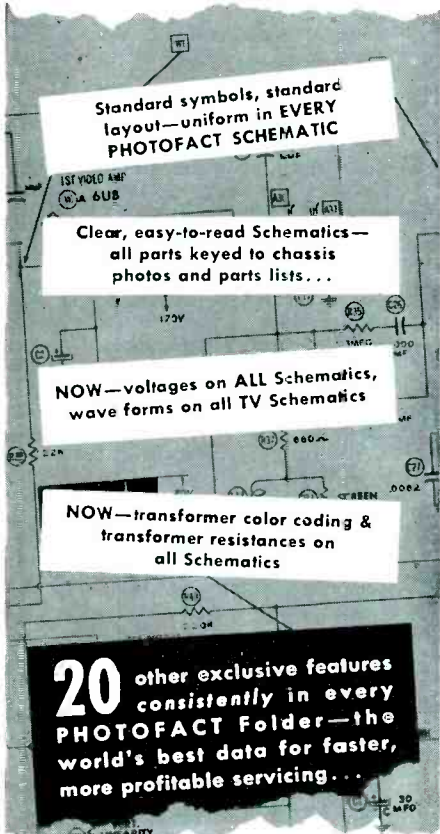
**609A**

Conrad Hilton Hotel

Chicago



you're on **easy street**  
with **PHOTOFACT**  
**SCHEMATICS**



Standard symbols, standard layout—uniform in EVERY PHOTOFACT SCHEMATIC

Clear, easy-to-read Schematics—all parts keyed to chassis photos and parts lists...

NOW—voltages on ALL Schematics, wave forms on all TV Schematics

NOW—transformer color coding & transformer resistances on all Schematics

**20** other exclusive features consistently in every PHOTOFACT Folder—the world's best data for faster, more profitable servicing...

**NOW! GET THE PROOF FOR YOURSELF!**

**FREE** We'll send you a Free Photofact TV Folder—just ask us for it!

Learn for yourself how PHOTOFACT pays for itself by earning bigger profits for you! We'll send you the proof—a FREE specimen PHOTOFACT TV Folder that shows all the features found consistently and exclusively ONLY in PHOTOFACT. Send for your FREE specimen TV Folder now. Examine it. Compare it. You'll see why PHOTOFACT belongs in your shop! And you'll want to ask your parts distributor about the pay-as-you-earn-plan. Only \$25 down brings you the entire PHOTOFACT Library. Write for FREE specimen TV Folder—learn now how to earn more!

HOWARD W. SAMS & CO., INC.  
2207 E. 46th St., Indianapolis 5, Ind.

**HOWARD W. SAMS & CO., INC.**

B. F. VALLIERE has been named vice president and general manager of the F. W. Sickles Division, General Instrument Corp., Elizabeth, N. J. Valliere will head-quarter at the Chicopee, Mass., plant.



B. F. Valliere

H. J. TUTWILER has been appointed national sales manager for Miller Television Co., Burbank, Calif. . . . THOMAS A. MARSHALL has been named development engineer.

CHARLES T. CARROLL, former chief of government engineering, is now director of engineering for the Hallicrafters Co., Chicago, Ill. Carroll replaces HAROLD ADLER, who has joined Guthman as vice president in charge of engineering.

ROBERT PAULSON has joined the New York district office of Ampex Corp. Paulsen was formerly with the Tele Q Corp. and Special Effects and Equipment, Inc.

WILLIAM E. STOHLRIER has been appointed director of public relations of Federal Telecommunications Laboratories, Nutley, N. J., a division of I. T. and T.

LEO G. SANDS, former president of the railway equipment division of Bogue Electric Manufacturing Co., has been named administrator of railroad communications sales, a new activity within the communications marketing department of the RCA engineering products division, Camden, N. J.

THOMAS C. FLYNN has been appointed account supervisor at David O. Alber Associates, Inc., New York, N. Y., for the Allen B. DuMont Laboratories, Inc., account.

**ILLUMINATED CLOCK-SIGN**

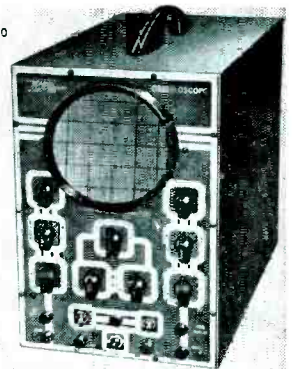


Illuminated clock-sign featured in G. E. tube department Service Shop identification program. Sign has colors and design which match three store-front outdoor signs also included in program. Other signs included in program are a 36" by 48" metal outdoor projecting sign and a 20" by 28" self-standing metal curb sign. All three, besides a 12" by 16" metal outdoor flange sign, include G. E. authorized dealer decal design.

536K Multimeter Kit \$12.90  
Wired \$14.90  
1000 ohms/volt



425K 5" Scope Kit \$44.95  
Wired \$79.95



**YOU BUILD**  
**EICO**

**KITS**  
**IN ONE**  
**EVENING-**

**but they**  
**last a lifetime...**  
**and you**  
**save 50%**

38 Kits and 42 Instruments—the industry's most complete line of **MATCHED**

**TEST INSTRUMENTS!**

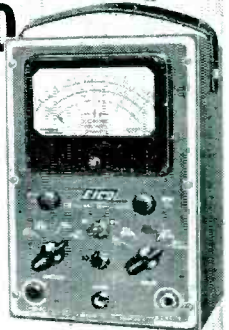
Over 1/4-million EICO Instruments are now in use the world over! That's the proof of EICO's leadership in Value to the Serviceman!

For latest precision engineering, finest components, smart professional appearance, lifetime performance and rock-bottom economy—see and compare the EICO line at your jobber's today before you buy any higher-priced equipment! You'll agree with over 100,000 others that only EICO Kits and Instruments give you the industry's greatest values at lowest cost.

Write NOW for FREE latest Catalog S-4



625K Tube Tester Kit \$34.95  
Wired \$49.95



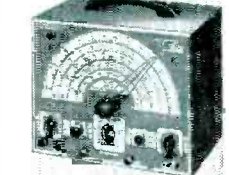
227K VTVM Kit \$25.95  
Wired \$39.95



565K Multimeter Kit \$24.95  
Wired \$29.95  
20,000 ohms/volt



NEW 377K Sine & Square Wave Audio Gen. Kit \$31.95. Wired \$49.95



360K Sweep Gen. Kit \$34.95. Wired \$49.95



1040K Battery Elin. Kit \$25.95. Wired \$34.95

**Laboratory Precision at Lowest Cost**

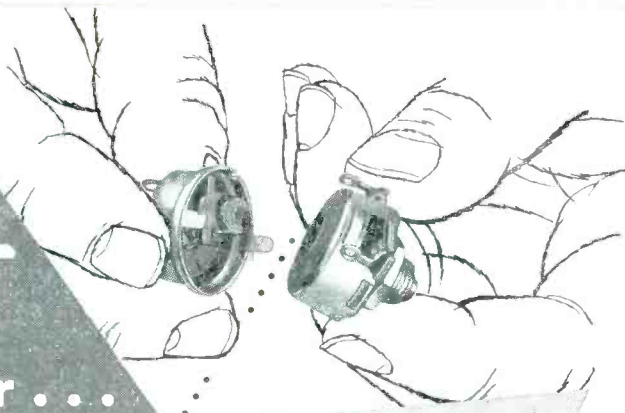
Prices 50% higher on West Coast.



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**ELECTRONIC INSTRUMENT CO., Inc.**  
84 Withers Street, Brooklyn 11, N. Y.

# SLIP

them  
together . . .



Nearest thing to universal replacement control! Clarostat's new 15/16" control (Series A47) fits anywhere. 1/2 watt rating. Values of 500 ohms to 10 megohms maximum.

Then take the new Series SWE "Ad-A-Switch" switch (S. P. S. T. 5 amps; D. P. S. T. 3 amps.). Pry off cover tab of control . . . slip on "Ad-A-Switch" switch . . . bend locking lugs.

Finally, select any one of 12 different "Pick-A-Shaft" shafts. Insert keyed end in slot. Tap slightly. Presto! You now have the right shaft.

It pays to keep an assortment of these universal replacement items on hand for quick, satisfactory, profitable servicing.

Ask your distributor for Clarostat Series A47 controls, "Ad-A-Switch" switches and "Pick-A-Shaft" shafts. Ask for latest catalog No. 54 — or write us.

## 15/16 CONTROL

### AD-A-SWITCH\*

### PICK-A-SHAFT\*

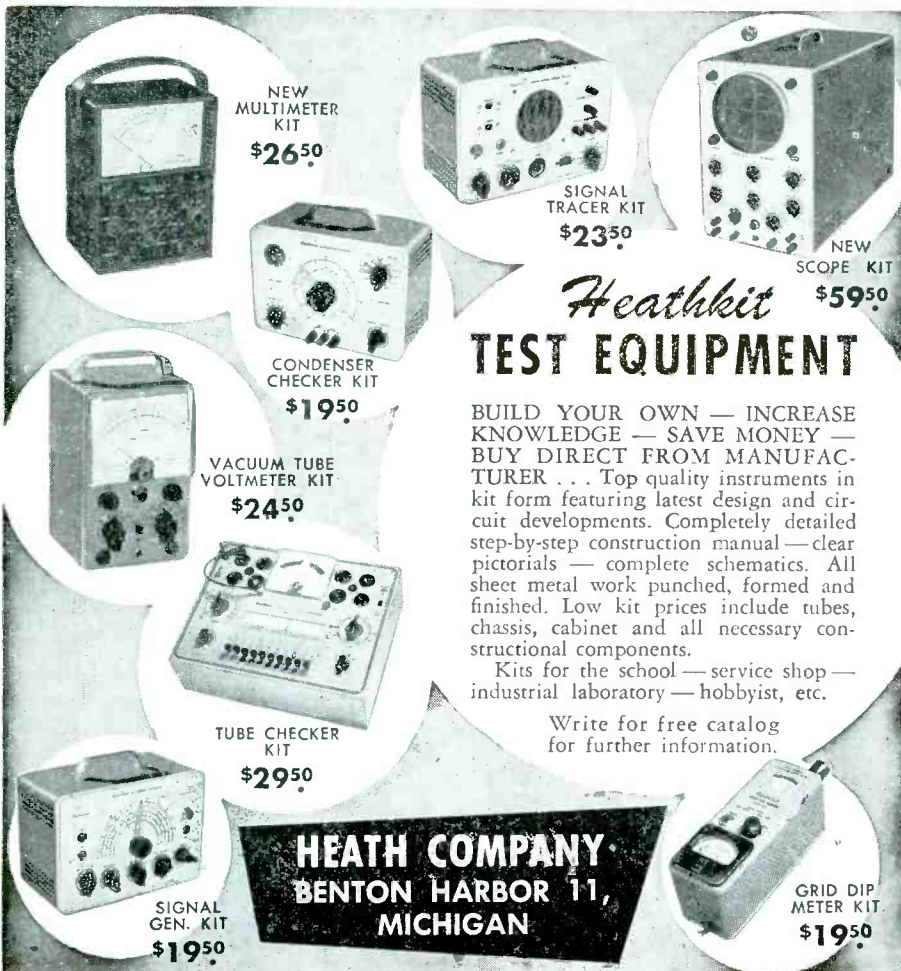
\*Trade-Mark

CLAROSTAT

## CONTROLS and RESISTORS

CLAROSTAT MFG. CO., INC. DOVER, N. H.

In Canada: CANADIAN MARCONI CO., LTD., Toronto, Ont.



**NEW MULTIMETER KIT**  
\$26.50

**SIGNAL TRACER KIT**  
\$23.50

**NEW SCOPE KIT**  
\$59.50

**CONDENSER CHECKER KIT**  
\$19.50

**VACUUM TUBE VOLTMETER KIT**  
\$24.50

**TUBE CHECKER KIT**  
\$29.50

**SIGNAL GEN. KIT**  
\$19.50

**GRID DIP METER KIT**  
\$19.50

## Heathkit TEST EQUIPMENT

BUILD YOUR OWN — INCREASE KNOWLEDGE — SAVE MONEY — BUY DIRECT FROM MANUFACTURER . . . Top quality instruments in kit form featuring latest design and circuit developments. Completely detailed step-by-step construction manual — clear pictorials — complete schematics. All sheet metal work punched, formed and finished. Low kit prices include tubes, chassis, cabinet and all necessary constructional components.

Kits for the school — service shop — industrial laboratory — hobbyist, etc.

Write for free catalog for further information.

**HEATH COMPANY**  
BENTON HARBOR 11,  
MICHIGAN

### RCA BATTERY DRIVE

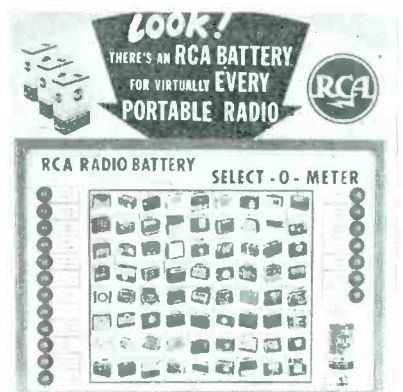
A campaign to revitalize portable radios, now inoperative or half alive for want of fresh batteries, has been announced by the RCA Tube Department, RCA Victor, Harrison, N. J.

National magazine, radio and TV advertising; in-store displays; and merchandising aids for neighborhood shops will be coordinated to remind portable set owners of the importance of fresh batteries to good radio performance.

Designed to increase store traffic and battery purchases is a battery *Select-O-Meter*, a game-like counter display which features photographs of 72 of the most popular models of portable radios. Insertion of a selector probe in socket beneath photo of portable lights up the correct RCA battery replacement for that particular instrument.

Other point-of-purchase material available to dealers through RCA battery distributors include continuous-roll sales slip register, complete with an initial supply of sales slips in triplicate form; identification kit, containing a lithographed metal sign for wall or outdoor display, and a decal for use on windows or truck panels; window streamer kit; and a pocket-sized spiral-bound battery counter index, tabbed for quick reference to RCA battery replacements for eight leading battery brands and the correct battery complement for the nearly 1,000 different portable radio models produced since '45.

A service-aid feature of the program is a wood and metal 24" x 48" service workbench which may be obtained by the Service Man at a special price, depending upon his purchases of RCA batteries from his distributor. Workbench features metal test equipment rack and lower storage shelf.



**LOOK!**  
THERE'S AN RCA BATTERY FOR VIRTUALLY EVERY PORTABLE RADIO

RCA

RCA RADIO BATTERY SELECT-O-METER

### ERIE 20-KV TV-FILTER PACKAGE

An individual display carton, for the 413 20-kv TV filter ceramicon, has been announced by the Erie Resistor Corp., Erie, Pa.

Package includes the ceramicon and an assortment of seven terminals of five different types, which are said to provide the Service Man with the means to meet any combination required for any TV receiver.

**TACO SCHEDULES FULL ANTENNA PRODUCTION**

Full TV antenna production schedules, at the present time, have been announced by the Technical Appliance Corp., Sherburne, N. Y.

Commenting on this activity, *Tore Lundahl*, sales manager, said: "Our policy of thoroughly field-testing every new antenna design has paid dividends. Twenty-three years of antenna manufacturing has taught us that the Service Man is the fellow we have to please. We must provide him with the product that will perform up to specifications and at the same time incorporate the dependability upon which he can stake his reputation."

"We feel that as long as we produce the best antennas we know how, and as long as we reinvest in expansion of engineering and production facilities here at Taco, we can keep our plant humming," Lundahl added.

\* \* \*

**BURGESS BATTERY PATENT AWARD**

*J. J. Coleman* and *Sam Kurlandsky*, engineers for Burgess Battery Co., Freeport, Ill., have been awarded a patent for the development of conductive wax intercell connections in dry batteries.

Previously, solder, carbon impregnated varnishes, silver paints and similar materials were used to connect the electrodes in cells to one another and to the terminals. Invention provides an electrically-conductive wax connection, having a relatively high specific conductance. It is solid at room temperature, but melts to a fluid, easily-applied body of relatively low viscosity at a moderately warm temperature and cools and sets almost immediately. A particularly desirable feature of this connection is said to be the low level of the electrical resistance, achieved without extending the areas of the cell terminals covered by the connecting composition.

\* \* \*

**FEDERAL MIDWEST REGIONAL OFFICE AND WAREHOUSE**

A regional sales office and warehouse, to serve the distributor market in the midwest, has been established at 4056 West Armitage Ave., Chicago 39, Ill., by the Federal Electric Corp., Clifton, N. J.

Other Federal Electric Corp. warehouses and regional sales offices are located at Cambridge, Mass., for the New England area, and Los Angeles, Calif., for the West Coast. Midwestern states to be covered by the new facility include: Minnesota, Wisconsin, North Dakota, South Dakota, Iowa, Kansas, Missouri, Nebraska, Illinois, Michigan, Indiana and Kentucky.

*E. G. Parker* has been appointed regional sales manager for the midwest outlet, with *James T. Kane*, formerly with the distributor sales department, as his assistant.

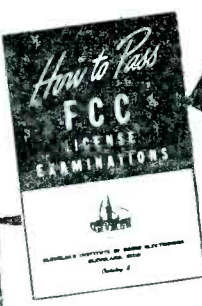
\* \* \*

**NEW ANTENNA CO. SET UP BY J. R. WELLS**

*John R. Wells*, recently affiliated as a partner in Wells & Wingard, has established his own operation, the Welco Manufacturing Co., 802 Washington St., Burlington, Iowa.

Welco, it is said, is now manufacturing a line of TV antennas, featuring an all-channel *wif* antenna, the *Welco Challenger*.

**FREE How To Pass FCC COMMERCIAL RADIO License Exams**



Tells where to apply and take FCC examinations, location of examining office, scope of knowledge required, approved way to prepare for FCC examinations, positive method of checking your knowledge before taking the examination.

Get your FCC ticket in a minimum of time!

GET THIS AMAZING Booklet FREE too

TV ENGINEERING INCLUDED IN OUR COACHING AND TRAINING and GET CATALOGUE C WHICH TELLS HOW



**1. WE GUARANTEE Your FCC LICENSE**

If you have had any practical experience—Amateur, Army, Navy, Radio repair, or experimenting.

**2. Employers make job offers to our graduates every month!**

**3. Our amazingly effective Job Finding Service helps OUR students get better jobs!**



Get All 3 FREE

**---MAIL COUPON NOW---**

Cleveland Institute of Radio Electronics  
4900 Euclid Bldg., Cleveland 3, Ohio Desk RS-7 E  
(Address to Desk No. to avoid delay)

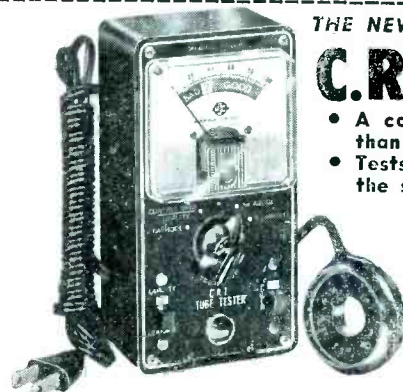
I want to know how I can get my FCC Commercial License in a minimum of time. Send me your FREE booklets, "How to Pass FCC License Examinations" (does not cover exams for Amateur License), as well as "There's Money For You In 2-Way Mobile Radio Services," and the amazing new booklet, "Money-Making FCC License Information."

Also tell me how I can get a TV Engineering Course without additional charge.

NAME .....  
ADDRESS .....  
CITY ..... ZONE ..... STATE .....  
Paste on 2-cent post card or send air-mail.

**IF** You have never ordered by mail because you did not want to buy anything "sight unseen" or—  
You have ordered by mail but with disappointing results or—  
You have never purchased anything on time payments because of excessive finance charges, then—

**HERE** is your opportunity to examine what you want under our "Seller not Buyer, takes all the risk" plan. We invite you to order this instrument and examine it in the privacy of your own home. If you decide to keep it, you can then pay the balance in easy monthly payments with no interest or finance charges added. Otherwise, you may return the merchandise for prompt refund of your down-payment.



**THE NEW MODEL TV-40**

**C.R.T. TUBE TESTER**

- A complete picture tube tester for little more than the price of a "make-shift" adapter!!!
- Tests all magnetically deflected tubes . . . in the set . . . out of the set . . . in the carton!!

**SPECIFICATIONS:**

- Tests all magnetically deflected picture tubes from 7 inch to 30 inch types. • Tests for quality by the well established emission method. All readings on "Good-Bad" scale. • Tests for inter-element shorts and leakages up to 5 megohms. • Tests for open elements.

**EASY TO USE:**

Simply insert line cord into any 110 volt A.C. outlet, then attach tester socket to tube base (*Ion trap need not be on tube*). Throw switch up for quality test . . . read direct on Good-Bad scale. Throw switch down for all leakage tests.

Model TV-40 C.R.T. Tube Tester comes absolutely complete—nothing else to buy. Housed in round cornered molded bakelite case. **\$15.85**

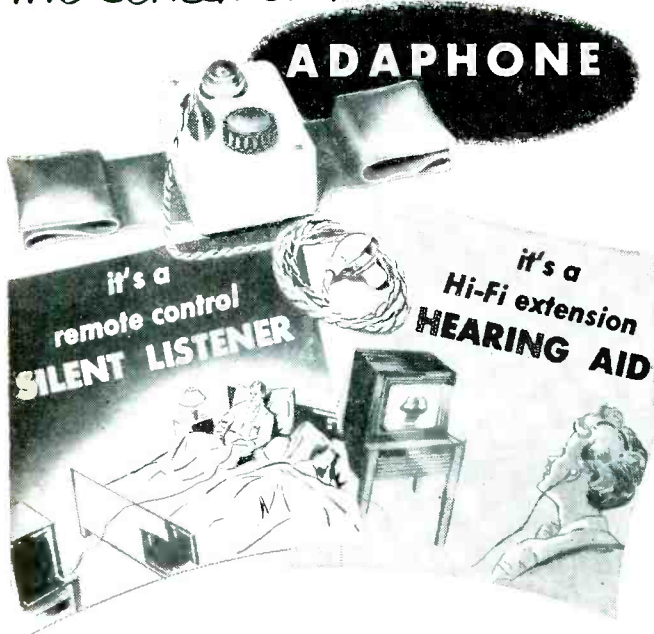
**SOLD ON EASY PAYMENTS AT THE NET CASH PRICE**

**NO INTEREST OR CARRYING CHARGES ADDED!**

MOSS ELECTRONIC DISTRIBUTING CO., INC.  
Dept. B-100, 3849 Tenth Ave., New York 34, N. Y.  
Please rush one Model TV-40. I am enclosing down payment of \$3.85 and agree to pay balance \$4.00 monthly for 3 months.  
Name .....  
Address .....  
City ..... Zone ..... State .....

the sensational

# ADAPHONE



At last... a precision instrument that brings radio and TV listening pleasure to the hard of hearing without raising the normal loudspeaker volume. And perfect for normal hearing folks who want to watch TV or listen to radio without any sound to disturb others.

ADAPHONE is easily attached to any TV or radio set. List Price is \$19.95 complete. Literature and counter displays available. Sold through jobbers only. Write Dept. S-4 today for details.

**FENTON COMPANY, 15 Moore St., New York 4, N. Y.**

## NEW LINDGREN "PORTASCREEN"

**TRUE DOUBLE SHIELDED  
PORTABLE SCREEN ROOM**

NOW! Here's the screen room you've been hoping for. An entirely NEW Lindgren Portable Screen Room, completely pre-fabricated... fully assembled... measuring only 35 1/2" x 35 1/2" x 35 1/2" for table or work bench. This True Double Shielded Screen Room has an attenuation of over 100 DB from 5 MC up to 10,000 MC. Ideal for testing smaller equipment, using test instruments, meters, etc., outside the enclosure. Low in price... high in performance.



\$175.00  
and up

FOR TABLE OR  
WORK BENCH

EST. 1939  
Minimum RF Interference

Write today for complete information about the "PORTASCREEN."

**ERIK A. Lindgren & ASSOCIATES**

4515-17 N. Ravenswood Ave., Chicago 40, Ill., Phone SUNnyside 4-0710

new Bogen UHF Design  
traditional Bogen efficiency

## NEW 'UCT-1' UHF CONVERTER



- better than competitive converters by a 6 db signal-to-noise ratio
- 6 db reduction in noise level means corresponding 6 db increase in signal level from antenna—clearer viewing
- maximum performance in *all* signal areas—often permits simpler antenna
- connects to any VHF set
- single-knob tuning runs entire UHF range, channels 14 to 83 inclusive
- complete with tubes, 4' of 300-ohm twin lead, instruction sheet... list \$42.50



"G-Line," UHF Transmission line, list \$43.75 (kit includes: 2 launchers, 150 feet of special insulated wire, 2 stand-off brackets)

"UHB,"

UHF

Booster,

list \$41.00



# Bogen

See your distributor or write  
DAVID BOGEN CO., INC.  
29 Ninth Avenue, New York 14, N. Y.

## WHEN YOU CHANGE 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

### INSL-X SPRAY

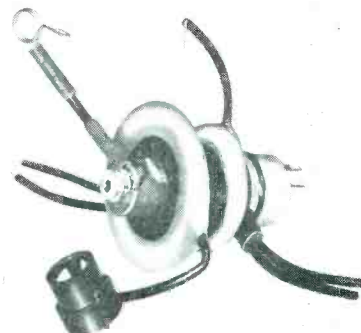
A protective spray, *Insl-X*, packaged in a 12-ounce aerosol container, has been announced by Insl-X Sales Co., 26 Rittenhouse Place, Ardmore, Pa.

Available in clear, aluminum and black. Spray is said to have good hardness qualities; adheres to all conventional assembly surfaces including ceramic, anodized aluminum and phenolic.

### STANCOR FLYBACKS FOR RCA

Three exact replacement flybacks, A-8233, A-8234, A-8235, for, it is said, 91% of the RCA TV chassis, excluding 5" and 27" sets, are now available from the Chicago Standard Transformer Corp., Addison and Elston, Chicago 18, Ill.

Bulletin 482 lists over 40 chassis and more than 100 models that use these flybacks. Right: Stancor A-8234



### DUMONT WIDE-BAND 'SCOPE

A wide-band 'scope, model 323, designed to measure both time and amplitude over the entire range of general lab applications, has been announced by the Instrument Division, Allen B. DuMont Laboratories, Inc., 760 Bloomfield Ave., Clifton, N. J.

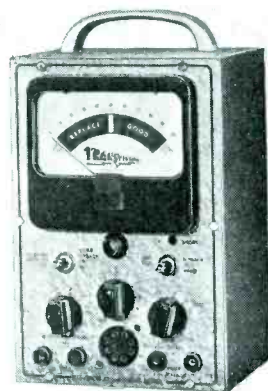
Direct coupled, 10-mc (3 db down) vertical amplifier of the instrument enables display of very-low-frequency phenomena, and high-speed pulses, together with their *dc* level. Sweeps, directly calibrated by means of a front-panel dial, extend from 1 second to 1 microsecond-per-inch. Calibrated sweep expansion and delay enables speeding by a predetermined factor any 2" portion of the 4" trace. Scale is calibrated to read directly in volts by means of internally generated voltage standards; eleven ranges, extending from 2 to 400 volts full-scale, are available.



### TRANSVISION TV COMPONENT TESTER

A 4-in-1 TV component tester, that tests flyback transformers and yokes, selenium rectifiers, picture tubes, and is also to serve as a picture tube reactivator, has been developed by Transvision, Inc., New Rochelle, N. Y.

As a flyback transformer and yoke tester, it checks these units for shorted turns; as a selenium rectifier tester, it checks rectifiers in half-wave circuits; as a picture tube tester, it provides for checking picture tube without removing it from the set (measures cathode emission, locates shorts between elements, locates high resistance shorts or leakage as high as 3 megohms).



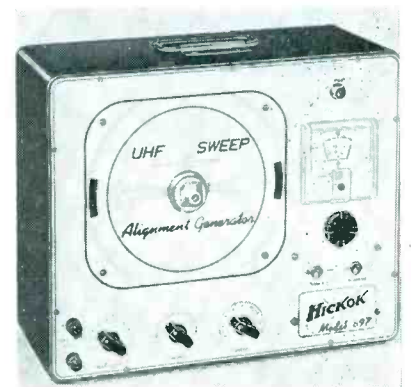
### HICKOK UHF SWEEP ALIGNMENT AND VHF SWEEP GENERATORS

A *uhf* sweep alignment generator, 697, that provides fundamental output on channels 14 to 83, has been announced by the Hickok Electrical Instrument Co., 10521 Dupont Ave., Cleveland 8, Ohio.

Unit is claimed to offer a constant amplitude over the entire sweep range. Has a piston-type attenuator. Output impedance is 50 or 300 ohms sweep width of 0-25 mc at low end of band and 0-75 mc at high end.

A *vhf* sweep generator, 695, featuring three *rf* oscillators that provide frequencies on fundamentals (channels 2-13) with a .3-volt output and heterodyned output *if* of 0-50 mc, is also available.

Instrument has a bias voltage, variable from 0-12 volts, metered directly by a voltmeter on the front panel; internal method of retrace blanking to provide a reference base line.



## Replace with Seleton



### SELETRON RECTIFIERS

and  
be  
safe!

No arc-over, short circuits or excessive heating when you replace with SELETRON. Proof? Millions are giving top performance as original equipment in many famous make radio and TV sets right now!

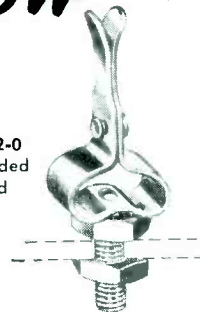
See Howard W. Sams PHOTOFACT Folders listing SELETRON selenium rectifier replacements. Write us for the name of our nearest dealer.



Seleton and Germanium Division  
**RADIO RECEPTOR COMPANY, INC.**  
Since 1922 in Radio & Electronics  
Sales Dept.: 251 West 19th Street, New York 11  
Factories in Brooklyn, N. Y.

## NOW TWO TYPES

No. 2-0  
Threaded  
Stud



No. 2-1  
Banana  
Plug



Clips  
Shown  
Actual  
Size

## GRAYHILL Panel Mount Test Clips

IDEAL FOR RAPID TESTING  
OF PIGTAIL TYPE COMPONENTS.  
SPRING-ACTION HOLDS WIRE  
FIRMLY — NO OPENING OF JAWS NECESSARY.  
TENSION IS PARTIALLY ADJUSTED BY TIGHTENING  
HEX NUT CLOSEST TO CLIP ON THE No. 2-0  
AND THE BANANA PLUG HEX  
ON THE No. 2-1.



*Grayhill*

533 Hillgrove Avenue, La Grange, Illinois  
Phone: Fleetwood 4-1040

**your customers  
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give  
higher fidelity**



Displaying the "Webcor" sign in and around your store means only one thing . . . PROFIT!

That's because growing thousands of hi-fi customers are turning to Webcor for Diskchangers. Through word of mouth, national advertising and past experience, your customers *know* that Webcor changers give the best service and the truest fidelity. You'll profit, too, because Webcor changers are much easier to install and require less upkeep. If you are not presently carrying Webcor, call your nearest Webcor distributor today.



Webcor template  
**FREE**



Webcor Mounting  
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Webcor Hi-Fi 3-speed changers are world famous for quality. With Webcor you have:

- A choice of TWO different sizes
- A choice of THREE different colors
- A choice of TWO pickups (magnetic or ceramic)

**PLUS . . .** exclusive Velocity Trip, Step Drive, powerful motor super-thick Flocking, Balanced Tone Arm. From \$49.50.

A Webcor Diskchanger is the heart of every High-Fidelity installation.

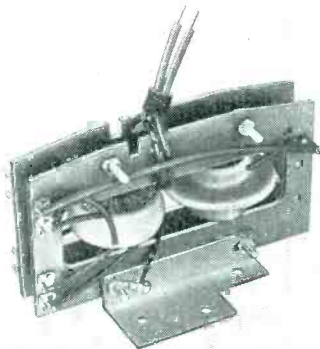
**Webcor**<sup>®</sup>

Webcor is the trade name of Webster Chicago Corp.  
Chicago 39, Illinois

© W.C. 1954

**RAM-MOTOROLA FLYBACKS**

Flyback replacements, X103-4-5-6, for Motorola TV chassis TS-14 to TS-505, have been announced by Ram Electronics Sales Co., South Buckhout St., Irvington-on-Hudson, N. Y.



Ram-Motorola Flybacks

**TELONIC UHF MARKER OSCILLATOR**

A *uhf* marker oscillator, which tunes from 400-930 mc with, it is said, an accuracy of  $\pm .25\%$ , is now available from Telonic Industries, 444 South Rural St., Indianapolis, Ind.

Unit has a built-in, regulated power supply. Features a 50-ohm output attenuated by 0, 20 and 40 db. Uses a 6AF4 oscillator, inductively tuned, operating at the fundamental frequency.

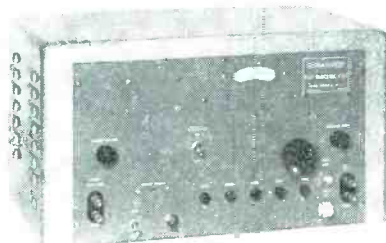


Telonic UHF Marker Oscillator

**KAY UHF SWEEP GENERATOR**

A *uhf* sweep generator, *Ultra-Sweep*, featuring continuously variable sweep width, a built-in detector, and zero level baseline, has been introduced by the Kay Electric Co., 14 Maple Ave., Pine Brook, N. J.

Unit has front panel dial calibrated in both channel number and 10-mc steps within the 450 to 900-mc range.



**I JUST WANT THE FACTS—"Paul!"  
NOTHING PAYS OFF LIKE THE FACTS**



**PERMO'S CATALOGS,  
REPLACEMENT GUIDES AND SALES AIDS  
HAVE ALWAYS BEEN LOADED WITH FACTS**

**NOW!** *in addition*

**PERMO  
PHONO NEEDLES**

WILL BE LISTED IN  
**SAMS' PHOTOFACTS**

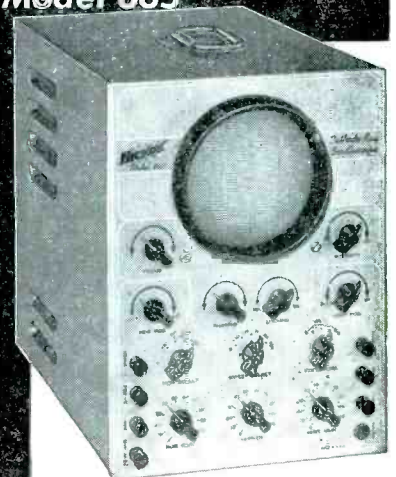


**PERMO, INC.**



CHICAGO 26

**HICKOK**  
Model 665



**TV TECHNICIANS'  
5" SCOPE**

- Frequency: 0.5 cycles to 700 KC.
- Push-Pull Amplifier
- Sensitivity: 20 M.V. per inch.
- Excellent Square Wave Response.
- Stable, dependable, built-in trace.
- Write for technical details . . .

**THE HICKOK ELECTRICAL INSTRUMENT CO.**

10521 DUPONT AVE. CLEVELAND 8. O.



# JOTS AND FLASHES

COLOR TV clinics have become the headline attraction across the nation. . . . Over 27,000 Service Men attended the first 35 nationwide sessions on installation and maintenance of color TV sponsored by RCA. Commenting on this enthusiastic reception, RCA Service Company prexy Ed Cahill said that this keen interest shows that Service Men are aware of the necessity for advance preparation to meet future public demand for color TV service. . . . *Wells and Winegard*, Burlington, Iowa, is now under the sole ownership of *John R. Winegard* who purchased the partnership interest of *John Wells*. . . . FINCO 400-A fringe area antennas were rewarded to winning contestants on TV quiz shows over WAVE-TV, Louisville, Kentucky, and WHIO-TV, Dayton, Ohio. . . . *A. C. Elles* has become assistant industrial sales manager of Industrial Development Engineering Associates, Inc. (I.D.E.A.). . . . Dage Electronics Corp., Beach Grove, Indiana, producer of Vidicon TV cameras and related equipment, has been purchased by Thompson Products, Inc., 23555 Euclid Ave., Cleveland 17, Ohio. *George Fathauer* will remain as Dage chairman, and *James Lahey*, president. . . . *Edmund I. Eger* has been appointed vice president-advertising of Admiral Corp. . . . *James O. Johnson* has been named general sales manager of Buchanan Electrical Products

Corp. . . . *Joseph M. Coleman* is now merchandising assistant for Sylvania's radio tube and TV picture tube division. . . . *Lester Klein*, formerly manager of the 212 Fulton Street store of Hudson Radio and Television Corp., New York, has been appointed manager of the firm's main store at 48 West 48th St. . . . The N. C. Rorabaugh 4th quarterly report showed Alliance among the top 26 national TV spot advertiser. *John Bentia*, Alliance vice prexy, noted that Alliance was 14th from the top in a tie position with R. J. Reynolds. . . . *Graeme W. Stewart* has been appointed ad and sales promotion manager of Stewart-Warner Electric, division of Stewart-Warner Corp. . . . *E. Dudley Bell* is now general manager of Solar Manufacturing Corp. . . . Hub Electronics Corp. is now located at 249 Tarrytown Road, White Plains. . . . *Albert Lederman* has been named engineering specialist in a new mechanized circuits department at the parts division of Sylvania Electric Products, Inc. . . . *Frank H. Russell* has become director of sales training at Philco. He succeeds *Edward M. Bland*, recently named ad manager for Philco television division. . . . *Correction*: The operating temperature range of the C-D subminiature tantalum-foil electrolytics, described in the March issue of SERVICE, should have been noted as from  $-55^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , and the illustration of the capacitors should have been reversed.

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VIDAIRE • VIDAIRE • VIDAIRE



## ELIM-A-TRACE



### VERTICAL RETRACE LINE ELIMINATOR

- Eliminates vertical retrace lines in picture when brightness control is turned up.
- Makes picture viewable on weak picture tubes.
- View picture without strain in fringe areas.

## VIDAIRE TEL-ATTEN

- Eliminates overloading due to strong signals.
- Reduces buzz in intercarrier sets.
- 1000 to 1 change in signal reaching antenna posts.
- Vernier adjustment for all signal areas.



### SIGNAL ATTENUATOR

## VIDAIRE KINE-LITE



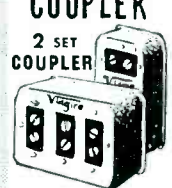
### C.R.T. REJUVENATOR

## VIDAIRE

- Renews brilliance and contrast of picture.
- Prolongs life of old picture tubes.
- Two connecting plugs.
- No soldering necessary.

## VIDAIRE TELE-COUPLER

- Permits use of one antenna with two TV sets.
- Reduces effects of local oscillator radiation from one TV set to another.
- Filter action reduces interference at IF frequencies.



## VIDAIRE Electronics MFG. CO.

EXECUTIVE OFFICES AND PLANT  
576 WEST MERRICK RD. LYNBROOK, N.Y.

FREE MAIL THIS COUPON

Please Send FREE  
 Latest catalog  
 "TV INTERFERENCE AND ITS REMEDIES"

NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_

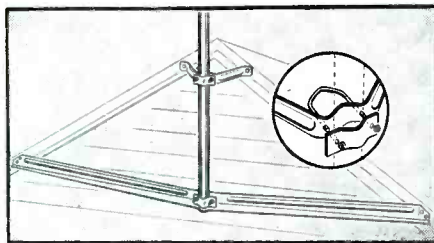
# NOW ... IT'S THAT EASY TO INSTALL TELEVISION ANTENNAS



With SOUTH RIVER'S three NEW Antenna Mountings designed for faster, easier television antenna installations!

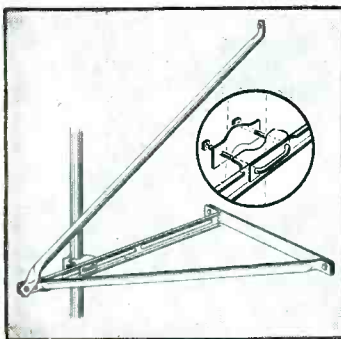
Oh for the life of a serviceman with SOUTH RIVER'S brilliant new antenna mountings, YOU just name the kind of installation you're working with ... SOUTH RIVER has the mounting to solve your problem!

**EAVE MOUNT**  
Model EM-48



Heavy-gauge embossed steel lower bracket with generous 48" spread permits secure, rugged installation of mast on homes with varied pitched roofs. Embossed 3" steel upper bracket permits ample clearance of roof edging. Hot-dip galvanized to prevent corrosion and for lasting rust-proof finish. Accommodates masts up to 1½" O.D. Complete with lag screws and mounting hardware.

Also available with 60" lower bracket—EM-60.

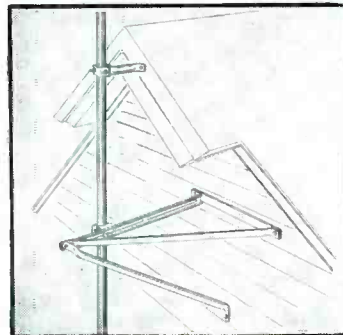


**ALL STEEL ADJUSTABLE WALL BRACKET**

Model ST-18A

2 heavy-gauge embossed steel, fully adjustable, rugged braced brackets permit an 18" clearance under eave. Bottom bracket includes steel bracing leg.

Features unique "U" bolt and plate sliding-type mast clamp. Hot-dip galvanized to prevent corrosion and rust-streaking. Hardware includes lag screws for mounting.



**COMBINATION STEEL ADJUSTABLE WALL BRACKET**

Model ST3-18A

Same lower bracket as Model ST-18A. Utilizes a rugged 3" embossed steel upper bracket. Useful in

many applications where mounting is required under peak of a house. Complete with necessary hardware and lag screws.

*South River*

**METAL PRODUCTS CO., INC.**

South River, New Jersey

In Canada — A.T.R. Armstrong Ltd., Toronto

Write for your copy of South River's complete 1954 catalog.

PIONEER AND OUTSTANDING PRODUCER OF THE FINEST LINE OF ANTENNA MOUNTINGS

NOW FROM P. R. MALLORY & CO. Inc. **MALLORY...**



the **1**st . . . All-Channel  
UHF Converter  
Designed to fit  
*Inside ANY VHF Set*

Here's another first from Mallory . . . The Mallory Model '188' Concealed UHF Converter. It fits inside any VHF set to make it an all-channel receiver. And it's a sure-fire salesbuilder for you.

**Look at these features of the Mallory '188'.**

**OUT OF SIGHT . . .** The entire unit is mounted inside the cabinet. All that shows is a clear plastic selector dial and switch lever.

**EASY TO INSTALL . . .** No alteration in the set chassis is required and the '188' has its own power supply. Can be mounted inside the cabinet on either side or at the top. A bracket and four screws do the job on wood cabinets. On plastic or metal cabinets, the converter may be mounted on the fiber-board rear enclosure.

**PROVED PERFORMANCE . . .** The '188' offers you the same proved performance . . . the same high quality reception . . . as the Mallory '88' Cabinet Converter which has given outstanding performance in UHF areas across the Nation.



*Mallory Concealed Converter  
—first on the market*



*Mallory Cabinet Converter  
—first on the market*

*Give Yourself Greater Converter Sales . . .  
By Giving Your Customers Their Choice  
of Mallory Converter Styles.*

.....  
**NO RADIATION PROBLEM!**

Both Mallory Converters contain specially designed components to prevent troublesome interference from radiation—a problem common to low quality converters which ruin TV reception over a wide area.

P. R. MALLORY & CO. Inc.  
**MALLORY**

CAPACITORS • CONTROLS • VIBRATORS • SWITCHES • RESISTORS  
RECTIFIERS • POWER SUPPLIES • CONVERTERS • MERCURY BATTERIES

**APPROVED PRECISION PRODUCTS**

**P. R. MALLORY & CO. Inc., INDIANAPOLIS 6, INDIANA**

# "RCA sure took the 'mystery' out of selling radio batteries"



says **MRS. ANNA MAE WATTS** of the **Melody Shop,**  
**205 N. Ervay Street, Dallas, Texas**

**Battery Selling Help** was what Mrs. Watts needed when she began to concentrate on selling RCA Radio Batteries. "Finger-tip selling control is what I like about RCA Batteries," Mrs. Watts reports, "the handy RCA Fact-Finder saves lots of time. What's more, RCA prints the competitive numbers their types replace right on the side of the battery carton itself."

**Y**OU, TOO, can get the useful selling aids which took the "mystery" out of radio batteries for our Texas friend, Mrs. Watts. Just phone your RCA Battery Distributor today. Have him show you how the RCA Battery shelf strips simplify inventory control. Ask him about the RCA list price card which helps customers sell themselves. Get the facts about the extremely popular RCA Battery Repeat Business Stamp and Pad which is offered to dealers and service tech-

nicians with their RCA Battery purchases. Stamp your store name and address in imprint space on side of RCA battery carton, to help build repeat business.

When you hear all the profit opportunities RCA Batteries offer, you'll want a good stock to sell at your store. For complete details ask your RCA Distributor salesman for a copy of the useful new radio battery merchandising booklet, "The 1954 RCA Battery Sales Planner."

## Here's how RCA helps you sell more Radio Batteries



● NATIONAL TV and RADIO ADVERTISING



● POWERFUL SALES PROMOTION



● COMPLETE LINE



● GREATEST NAME IN RADIO



● RADIO TRADE DISTRIBUTION



**RADIO CORPORATION of AMERICA**  
**RADIO BATTERIES**

**HARRISON, N. J.**