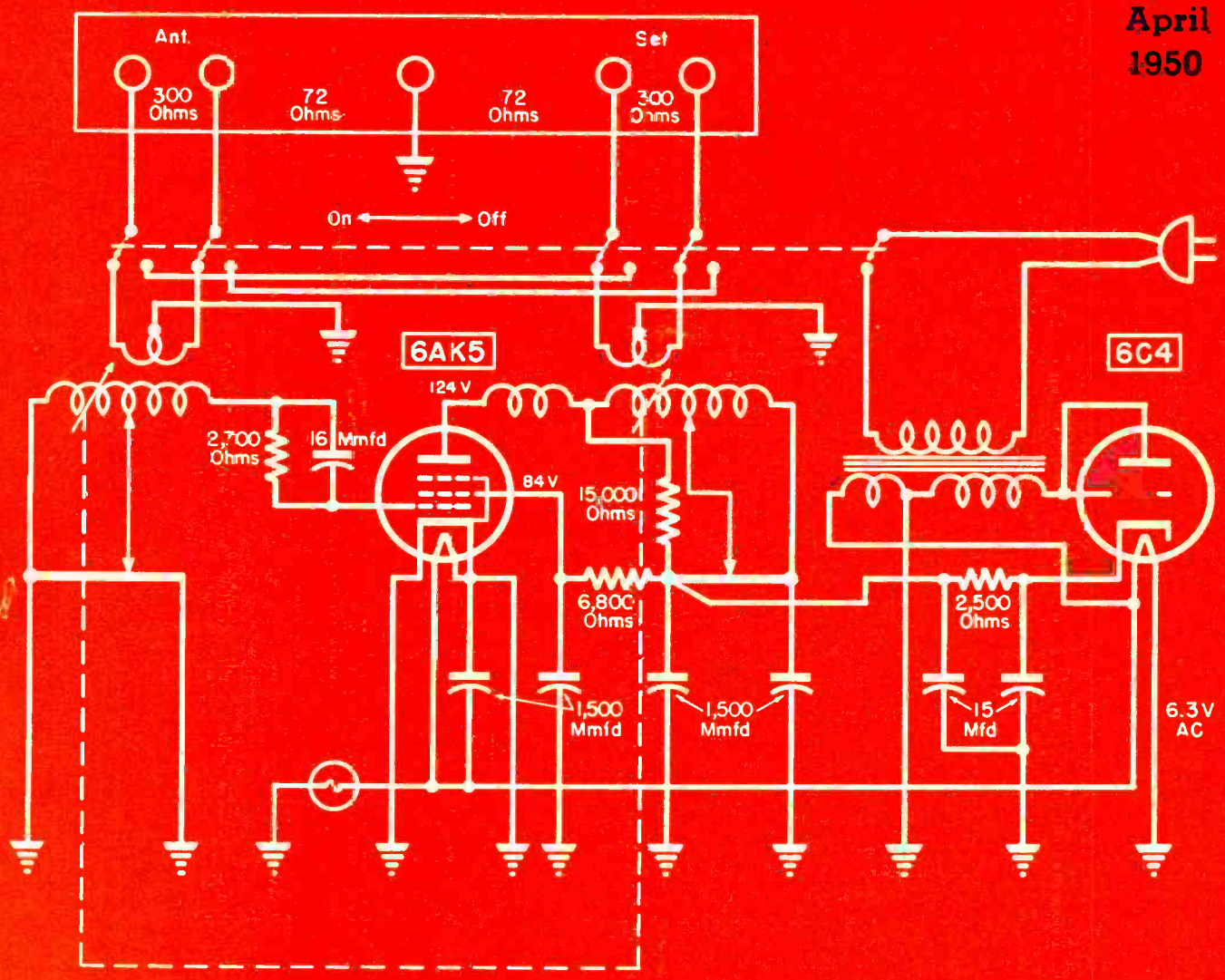
RADIO · TELEVISION · ELECTRONIC

SERVICE

April
1950

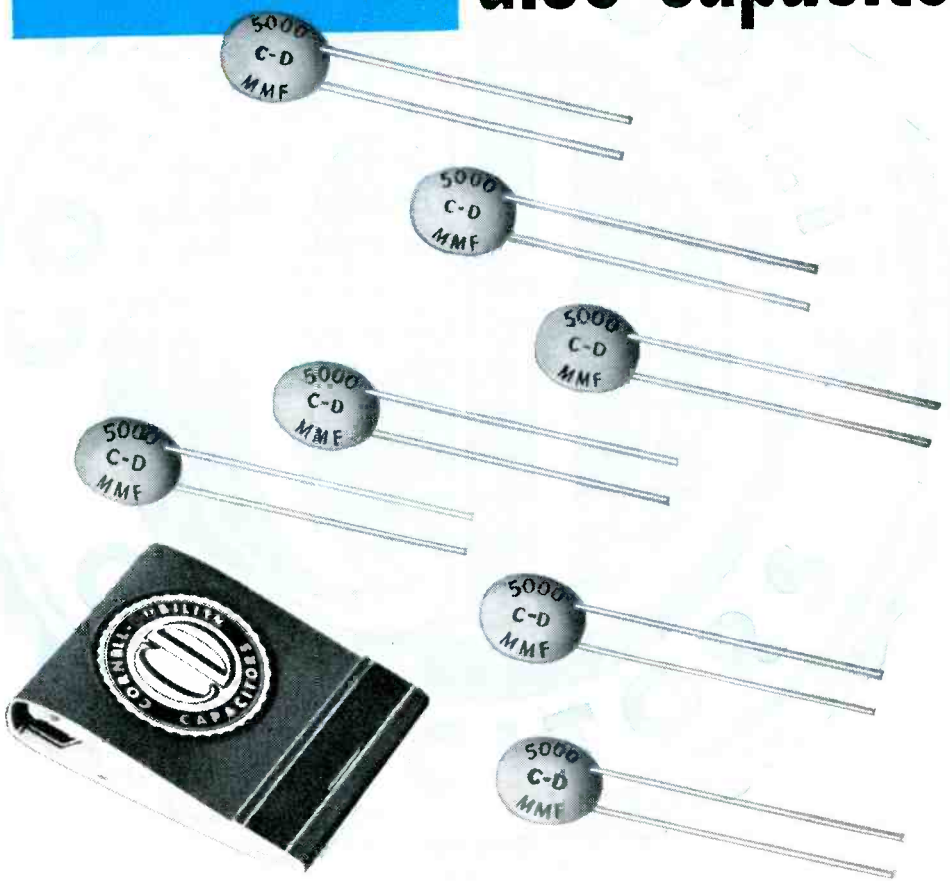


Continuously-tuning single-dial TV-FM amplifier with balanced input maintained by center-tapping arrangement in the output link.

[See page 2]

THE TECHNICAL JOURNAL OF THE RADIO TRADE

new TINY MIKE® miniature ceramic disc capacitors



NOW—take advantage of these new, space-saving, miniature ceramic disc capacitors, designed for bypass and coupling in ultra-compact assemblies. These ceramics incorporate the same dependable performance built into the highly specialized C-D ceramic capacitors, used for years by the world's largest manufacturers of instruments and transmitter equipment.

C-D TINYMIKES OFFER YOU DISTINCT ADVANTAGES IN CAPACITOR DESIGN:

- Ideal for cramped chassis layouts: only 19/32" in diameter, only 5/32" thick.
- TINYMIKES are lighter than other types of same capacity and voltage rating.
- Short current path and parallel leads reduce inductance to lowest possible level.
- Resistance is fixed at a low level by solder-connected leads directly to the high-purity silver electrodes.
- Use of two electrodes accurately positioned in relation to each other reduce eddy current losses to a minimum and increases the Q.
- High dielectric strength of C-D ceramic, high insulation resistance and low power factor assure constant and dependable service.
- Protected against the effects of humidity by a special phenolic coating and high-temperature wax impregnation.
- Presently available in capacities of 50 to 150 mmfd. at ± 20% and 500 to 5,000 mmfd. guaranteed minimum capacity over a temperature range of + 10°C to + 65°C, at 500 volts DC working.
- All C-D ceramics for servicemen are stamped with capacity ratings in micro-microfarads.
- C-D ceramics for servicemen packed 10 to convenient carton.

If your jobber doesn't have the new C-D TINYMIKE ceramic capacitor yet, write direct to the factory. We'll supply you promptly through the nearest C-D jobber stocking them. Bulletin on request. Address: CORNELL-DUBILIER ELECTRIC CORPORATION, Dept. S40, South Plainfield, New Jersey. Other plants in New Bedford, Brookline and Worcester, Massachusetts; Providence, Rhode Island; Indianapolis, Indiana and subsidiary, The Radiart Corporation, Cleveland, Ohio.

C-D Best by Field Test!

40TH ANNIVERSARY CORNELL-DUBILIER CAPACITORS 1910-1950

CONSISTENTLY DEPENDABLE

CORNELL-DUBILIER

CAPACITORS — AUTO VIBRATORS

TV AND FM ANTENNAS — ROTATORS — CONVERTERS

RADIART

IF IT'S NEW...

KEN-RAD DEALERS HAVE IT!

IN RAPID radio-TV progress, your neighborhood reflects a national trend. Receivers of brand-new design, with new circuits—*new tubes*—are being installed daily. Here is potential service business you want! With Ken-Rad tubes, you can get it—by having the new types ahead of time, in order to meet new socket requirements as they arise . . . 6CB6 is one of many Ken-Rad tubes geared to 1950 servicing needs. You'll come on this 7-pin pentode soon in both the video-i-f and r-f-amplifier stages of TV receivers. Have the 6CB6 and other new tubes *available when you need them* . . . by stocking the Ken-Rad brand! Widen your market—increase your income—by drawing profitably on the big fund of research and engineering which General Electric offers you in the form of up-to-the-minute Ken-Rad types, TV-picture, metal, glass, and miniature! Your Ken-Rad distributor will be glad to help. Phone or write him today!

★ ★ ★

A sharp-cutoff r-f-amplifier miniature pentode, Type 6CB6 differs from the 6AG5 (among existing similar tubes) by having the suppressor brought out to a separate pin connection, instead of connected internally to the cathode. This improves performance—particularly in the new 40-mc i-f applications—by enabling the TV designer to reduce inter-action effects between input and output circuits. Transconductance of the 6CB6 is higher than the 6AG5 by approximately 1,100 micromhos. Grid-plate capacitance is lower —an especially desirable feature in h-f work.

182-JA3

KEN-RAD *Radio Tubes*

PRODUCT OF GENERAL ELECTRIC COMPANY

Schenectady 5, New York

HOT THIS MONTH!

New Ken-Rad tube display and storage cabinet jumps up sales, speeds selection of tubes . . . saves space! You'll want this jimdandy accessory once you set eyes on its stunning dark blue crinkle finish, test its heavy 24-gage welded steel construction, glimpse the good-looking Ken-Rad *electric sign* at the top. Cabinet is 28" high, 21" wide, 8" deep. The six shelves hold over 150 tubes. Additional shelf units can be added, if desired, for still greater storage. Here's a real sales winner that comes in first every time! It's ready now! Ask your Ken-Rad tube distributor how you can get one.

Vol. 19, No. 4

RADIO · TELEVISION · ELECTRONIC
SERVICE

April, 1950

LEWIS WINNER
Editorial Director

F. WALEN
Assistant Editor

ALFRED A. GHIRARDI
Advisory Editor

ABC

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Wins 30% more business with SYLVANIA DEALER CAMPAIGN

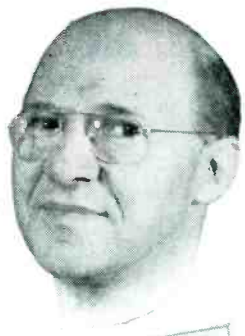
"Last summer we obtained your coordinated campaign and mailed the postal cards to just certain sections. Then we kept track of service business, and found we received 30% more from the sections which got the cards.

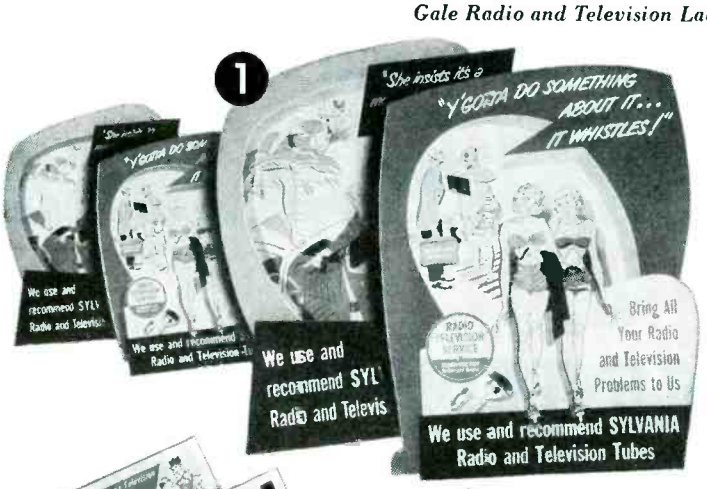
"We're convinced . . . your campaign is the best insurance against a summer slump in service business.

"This year, May, June, July, and August are going to be our big profit months."

Albert Gale

Gale Radio and Television Lab., New Rochelle, N. Y.





1—Displays
2—Window Streamers
3—Post Cards
4—Ad Mats
5—Radio Spots

You, too, will cash in BIG with this powerful, new summer campaign

Right now is the time to send for the new, complete advertising campaign that's bound to bring *you* extra business . . . all through May, June, July, and August.

Look at all the colorful, sales-making material you get! Everything from large 3-dimensional window- and counter-displays, to complete newspaper ad mats and postal cards. Even radio spot announcements to be broadcast over your local station. It's all yours...and it's all FREE...you pay only the postage on the postal cards, 1¢ for each card.

Written and designed to tie in with Sylvania's big national magazine advertising which your customers will see in the Saturday Evening Post, Collier's, Look, Life and other publications.

So, don't delay! Mail the coupon for full details TODAY!

RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES; FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES, SIGN TUBING; LIGHT BULBS; PHOTOLAMPS

SYLVANIA ELECTRIC

Sylvania Electric Products Inc.
Advertising Dept. R-1704-A, Emporium, Pa.

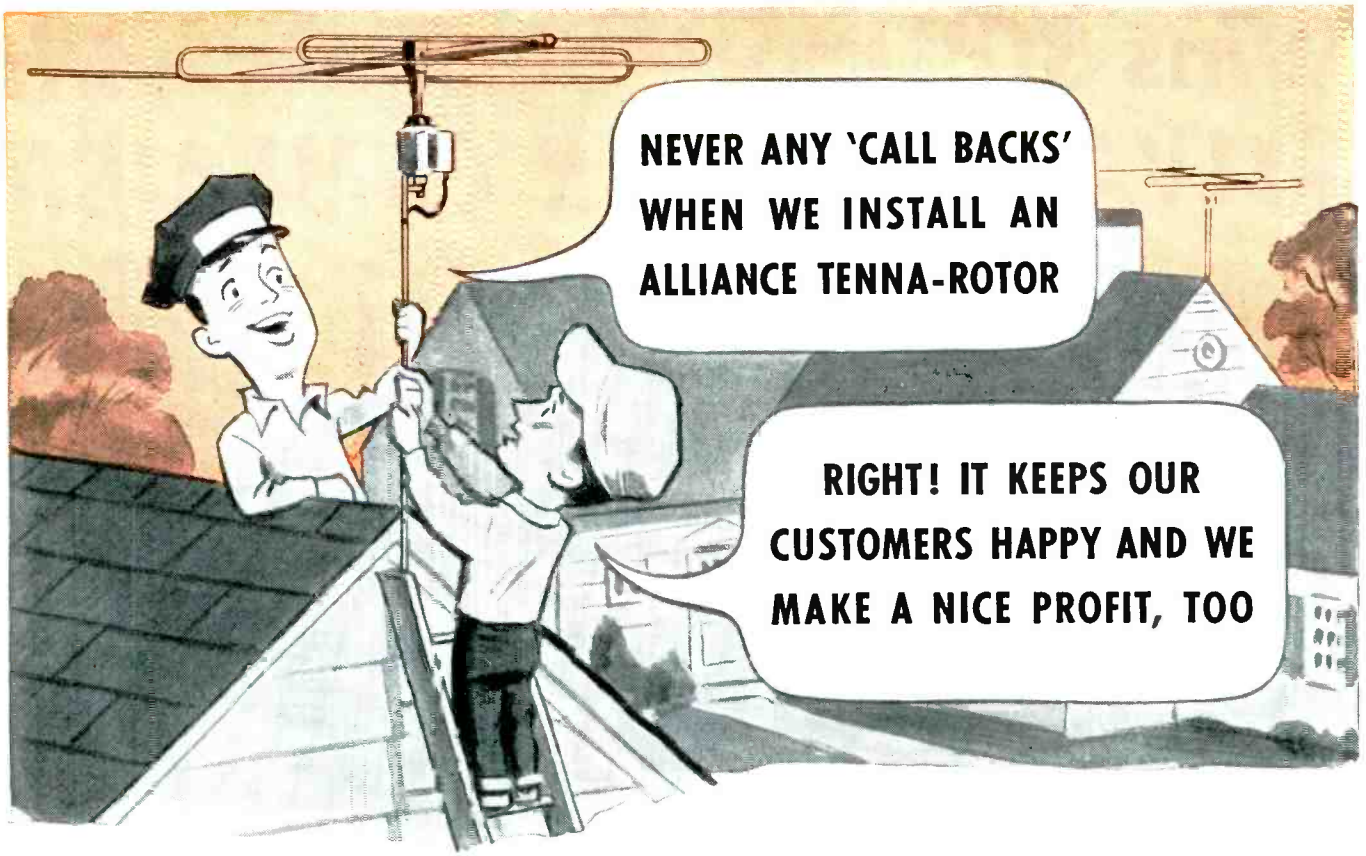
Please send me full information about the May-June-July-August Service Dealer Campaign.

Name _____

Company _____

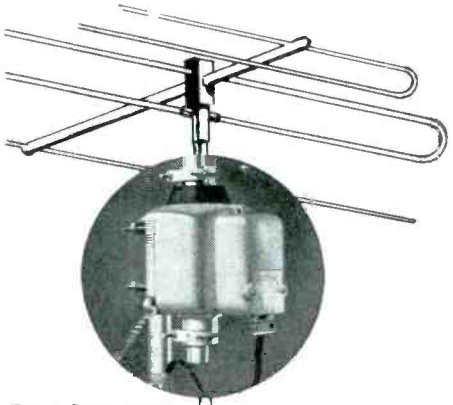
Street _____

City _____ *Zone* ____ *State* _____



. . . and only ALLIANCE TENNA-ROTOR

'puts it on the line'...with a real TV campaign—that clicks!



Tenna-Rator comes complete in one package!
Both standard Model ATR and Deluxe Model DIR available!

New Model DIR as illustrated has indicator control case to show compass direction!

...60 stations...3,700,000 TV viewers!

Every week your customers see Tenna-Rotor demonstrations right in their homes!

- **Only Tenna-Rotor** can point to over 200,000 satisfied users from coast to coast!
- **Only Tenna-Rotor** has Underwriters' Laboratories approval and a one year guarantee!
- **Only Tenna-Rotor** has special 4-conductor cable with "ZIP" feature for faster, easier installations!

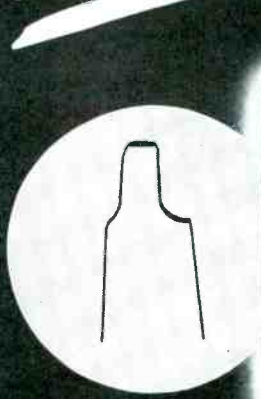
E. T. L. Laboratory tests prove operation in sub-zero, rain and icy weather!

alliance
TENNA · ROTOR

Trade Mark Reg. U. S. Pat. Off.

ALLIANCE MANUFACTURING COMPANY • ALLIANCE, OHIO
Makers of Alliance Phonomotors and Powr-Pakt Motors

Announcing... a revolutionary new oscilloscope



Horizontal sync-pulse as displayed on WO-57A screen

Check these important features!

- ✓ **Sensitivity**—25 millivolts per inch deflection.
- ✓ **Frequency Response** of vertical amplifier—flat within 3 db from zero to 500 kc; down only 55% at 1 Mc; useful beyond 2 Mc.
- ✓ **Transient Response**—tilt and overshoot less than 2%.
- ✓ **Utility**—provided with frequency-compensated and calibrated step attenuator. Also has vernier control and calibrated voltage source.
- ✓ **60-Cycle Sweep**—with phasing control.
- ✓ **Input Capacitance**—less than 15 uuf with WG-214 accessory probe.

Plus these outstanding extras

- \+ **Trace Expansion**—two times screen diameter for sweep-alignment applications.
- \+ **Direct Coupled Vertical Amplifier**—separate jacks for DC and AC signal measurements.
- \+ **Linear Sweep**—range 15 to 30,000 cps, with preset fixed positions for viewing vertical and horizontal TV sync pulses and oscillator waveforms.
- \+ **Exclusive**—sweep direction reversing switch—positive or negative syncing.
- \+ **Push-Pull Amplifiers**—produce sharper trace and reduces astigmatism.
- \+ **Standardized case** fits test racks WS-17A and WS-18A.

Power supply . . . 105/125 volts, 50/60 cycles.

$137.50 Suggested User Price

The RCA WO-57A

High Gain—Wide Band—DC and AC Input.

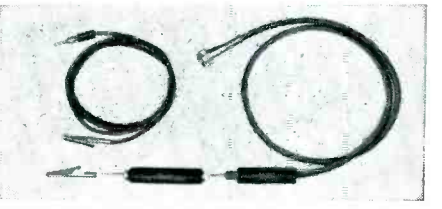
The WO-57A is an outstanding innovation in portable oscilloscope design. Especially suited for television, this new scope is excellent for laboratory, factory, or shop use . . . for viewing and measuring square waves, pulses, TV sync signals, and sine waves.

Unusually versatile . . . newly designed from stem to stern . . . the RCA WO-57A Oscilloscope is a triumph of engineering.

Incorporating the features of far more expensive instruments . . . and with a sensitivity and response equal to that of many laboratory units . . . the WO-57A is the first inexpensive oscilloscope wholly equipped to handle every TV and radio service job.

Direct-coupled amplifiers are used to provide low frequency response flat down to dc. Excellent low-frequency square-wave reproduction, essential for correct sweep alignment, is thus assured. High-frequency square-wave response up to 100 kc enables the WO-57A to reproduce blanking and sync pulse wave shapes with fidelity heretofore unobtainable in moderately priced service-type oscilloscopes.

For complete technical details, ask your RCA Test Equipment Distributor for the bulletin on the new WO-57A, or write RCA, Commercial Engineering, Section D-56X, Harrison, New Jersey.



Probe Kit (WG-214)—$7.50. Includes input cable with direct probe, slip on low-capacitance probe, and ground lead for observation of sync pulses, oscillator wave-forms and video signals without undue circuit loading.

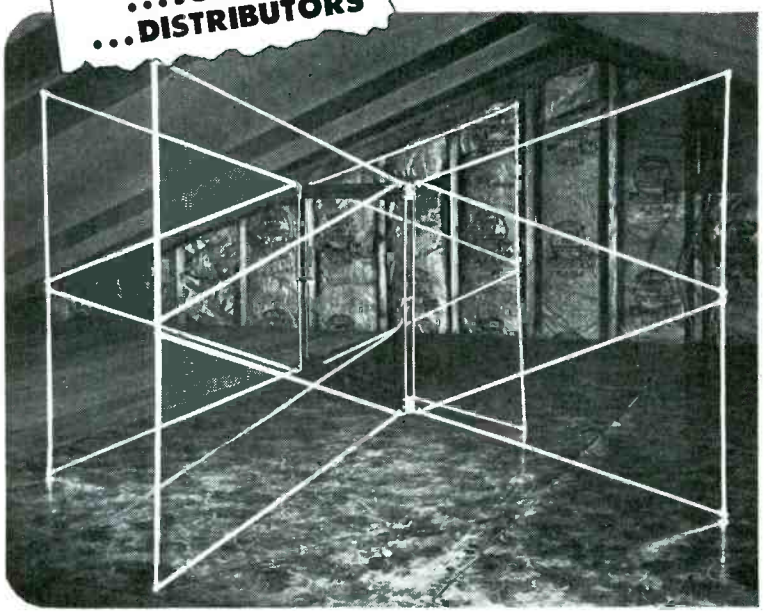
Available from your RCA Test Equipment Distributor

RADIO CORPORATION of AMERICA
TEST EQUIPMENT **HARRISON, N.J.**

Attention:
...DEALERS
...SERVICEMEN
...JOBBERS
...DISTRIBUTORS

telrex

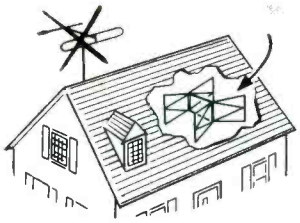
initiative and originality is your short-cut to greater profits



REVOLUTIONARY INDOOR ANTENNA

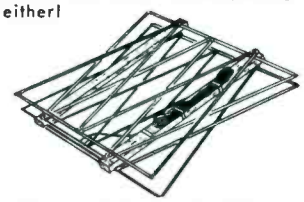
— outperforms most outdoor installations

the new telrex ATTIC-V-BEAM*



LOOKS BETTER— AND IS BETTER!

Homeowners and landlords everywhere are enthused about this antenna. Best of all, once installed you don't worry about call backs because of damage from snow, sleet or wind. No gradual loss of efficiency because of chemical and soot deposits. No more steeplejacking either!



NOT A KIT OF PARTS — COMPLETELY ASSEMBLED!

That's right, it's complete with TL already attached. Comes folded into compact package. To install, just unfold and place in position. That means quick, easy installation in any weather —winter or summer. Order today.

SOLVES TV INSTALLATION PROBLEMS IN ALL PRIMARY AND MANY SECONDARY AREAS — Makes outdoor installations unnecessary in most locations within a radius of 30 miles from transmitters without sacrificing pic or sound quality on any channel. (Reports of good reception at 80 miles have been received.)

SAME WELL-KNOWN TELREX SUPERIORITY IN SENSITIVITY, DIRECTIVITY BAND PASS AND CONSTRUCTION — Famous Telrex Conical-V-Beam design eliminates spurious lobes to increase forward gain and insure full band pass on all TV channels. It's a Telrex from start to finish, mechanically too.

OVERCOMES LANDLORD AND HOME OWNER OPPOSITION TO ROOF ANTENNAS FOR TV OR FM INSTALLATIONS — The first really practical indoor antenna. Ideally suited wherever space permits, in attic, garage, air spaces, or even utility rooms. Compact design, light in weight. Self-supporting on floor, beams, rafters or can be suspended.

EVERY SET OWNER — OLD OR NEW — IS A SALES PROSPECT FOR THIS ANTENNA — Every TV set owner would be happy to discard his roof antenna. That means that right now he's your prospect for this antenna. Why not stock up today and start selling this market. Wherever you see a rooftop antenna and an attic, you have a live prospect. Don't delay.

OTHER MODELS FOR RECEPTION CLOSER TO THE TRANSMITTER

Be sure it's a "CONICAL-V-BEAM" —Look for the TELREX* Trademark

* REGISTERED TRADE MARK

telrex INC.
CONICAL-V-BEAMS*
ASBURY PARK 4, N. J.
AMERICA'S STANDARD OF COMPARISON

MR. DEALER:
Sell the Line that Builds CUSTOMER CONFIDENCE KEEPS

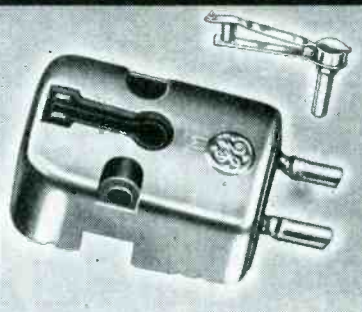
VARIABLE RELUCTANCE CARTRIDGES

★ FOR QUALITY ★ FOR PRICE ★ FOR TURNOVER

Compare These General Electric Variable Reluctance Cartridges With Anything On The Market!

NEW "BATON" STYLUS

provides unexcelled delicacy of tone for critical ears. Dual-twist stylus assembly (inset) permits higher lateral compliance and improved tracking. Double damping blocks filter out needle talk and mechanical resonance. This new assembly now included in all types of G-E Cartridges. RPX-040 and RPX-041.

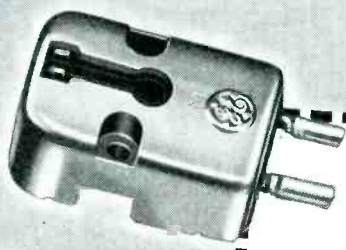


TRIPLE PLAY CARTRIDGE

Ride the sales boom of this sensational new G-E model! Plays *all* three types of records without a change of position in the tone arm! A flick of the knob selects stylus. Requires no adjustment of tone arm weight. *Costs 25% less than the 2 cartridges it replaces!* A hit with manufacturers and listeners alike! Model RPX-050.

PROFESSIONAL VARIABLE RELUCTANCE CARTRIDGE—

One of the most popular cartridges of the G-E Line. Preferred by broadcast station engineers for its smooth, wide-range frequency response designed to match broadcast equalizers. Operates with any G-E stylus. Model RPX-046.



YOU can't beat these General Electric Variable Reluctance Cartridges for superb reproduction, sturdy construction, and low cost. That's why manufacturers, radio stations, and the listening public everywhere continue to select the G-E Cartridge that fits their needs best.

You can get a bigger share of the valuable replacement business by stocking the models shown here. Don't delay—place your orders today!

PLENTY OF PROMOTION!

Ask your distributor for complete 1950 G-E Parts Promotion Kit! Counter displays, ad reprints, full line sheets and folders, everything you need to sell more G-E speakers, cartridges, parts and accessories! Get it today!

You can put your confidence in—

GENERAL ELECTRIC

General Electric Company
Section 340
Electronics Park
Syracuse, N. Y.

Send me latest information on stylus wear plus FREE folder on the new G-E Baton stylus.

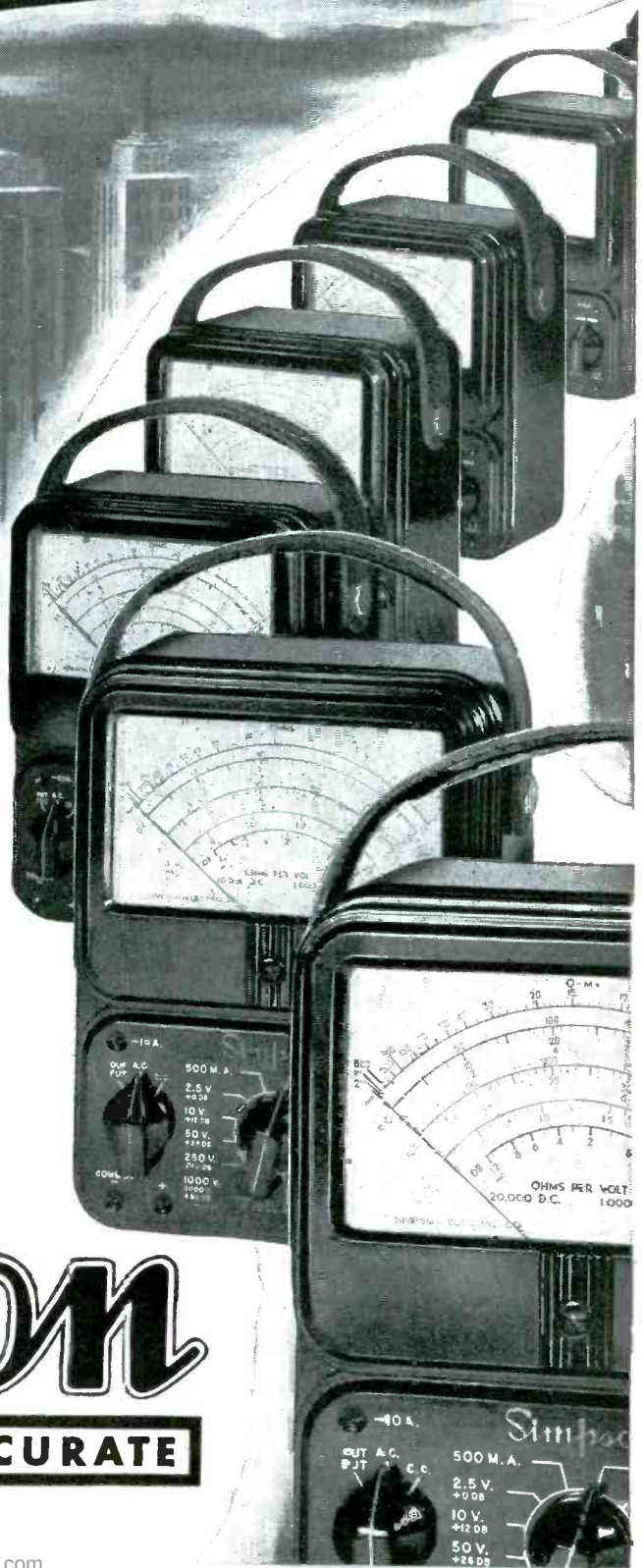
NAME.....

ADDRESS.....

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

Just imagine!

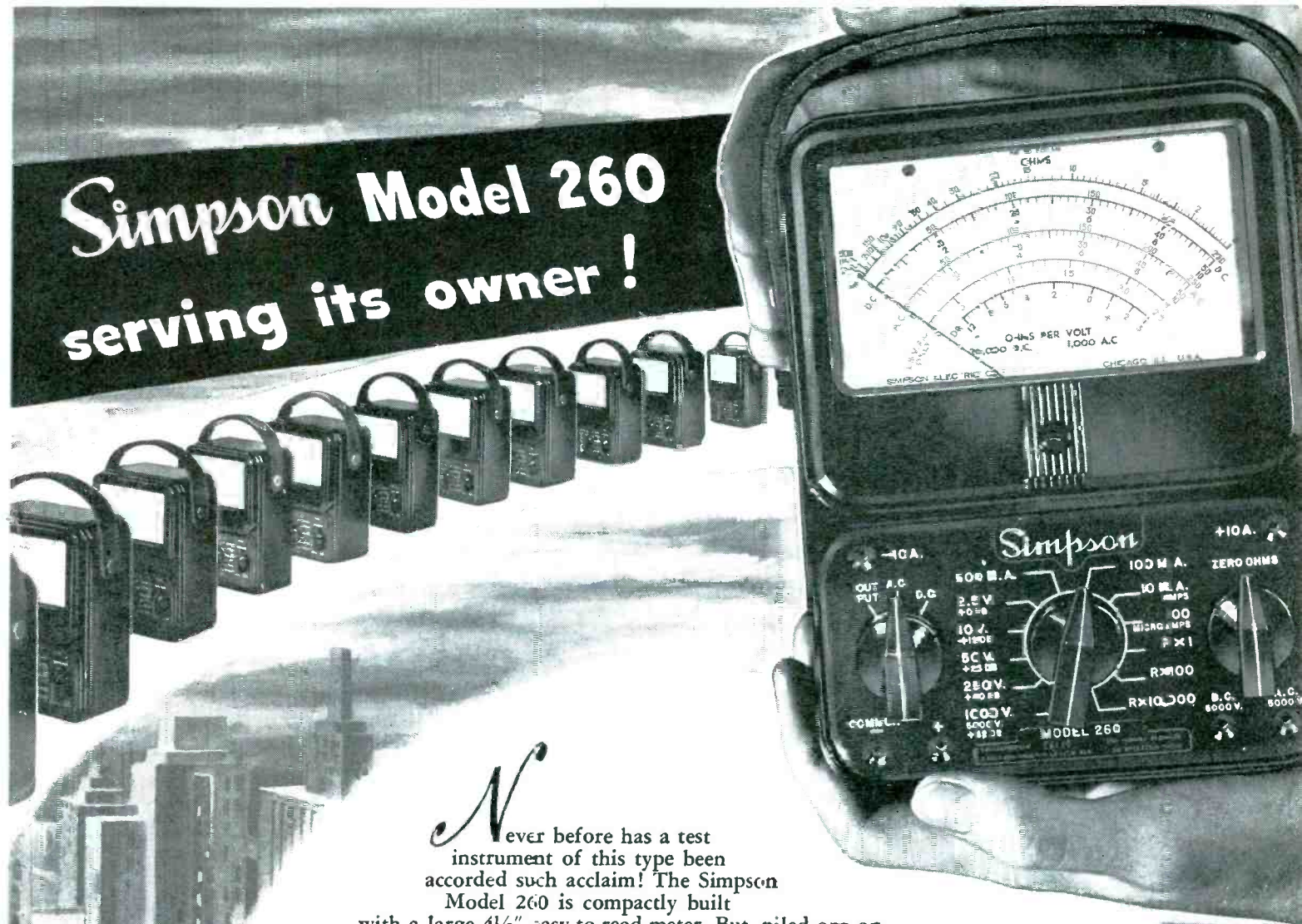
the 260,000th World Famous Volt-Ohm-Milliammeter is now



Simpson

INSTRUMENTS THAT STAY ACCURATE

Simpson Model 260 serving its owner!



Never before has a test instrument of this type been accorded such acclaim! The Simpson Model 260 is compactly built with a large 4½" easy-to-read meter. But, piled one on top of another, 260,000 Model 260's would equal the height of 121 Empire State Buildings*, with a few floors left over!

More impressive is this fact: *There are more Simpson Model 260 Volt-Ohm-Milliammeters in use today than all others combined!*

The Model 260 also is available in the famous patented Roll Top safety case with built-in lead compartment. This sturdy, molded, bakelite case provides maximum protection for your 260 when used for servicing in the field or shop.

SIMPSON ELECTRIC COMPANY

5200 W. Kinzie St., Chicago 44, Illinois • *In Canada:* Bach-Simpson, Ltd. London, Ont.

Phone: COlumbus 1-1221

Reaching 102 floors toward the sky, the 1,250 foot high Empire State Building is the tallest structure in the world.

RANGES

20,000 Ohms per Volt DC, 1,000 Ohms per Volt AC

VOLTS: AC & DC: 2.5, 10, 50, 250, 1,000, 5,000

OUTPUT: 2.5, 10, 50, 250, 1,000

MILLIAMPERES, DC: 10, 100, 500

MICROAMPERES, DC: 100

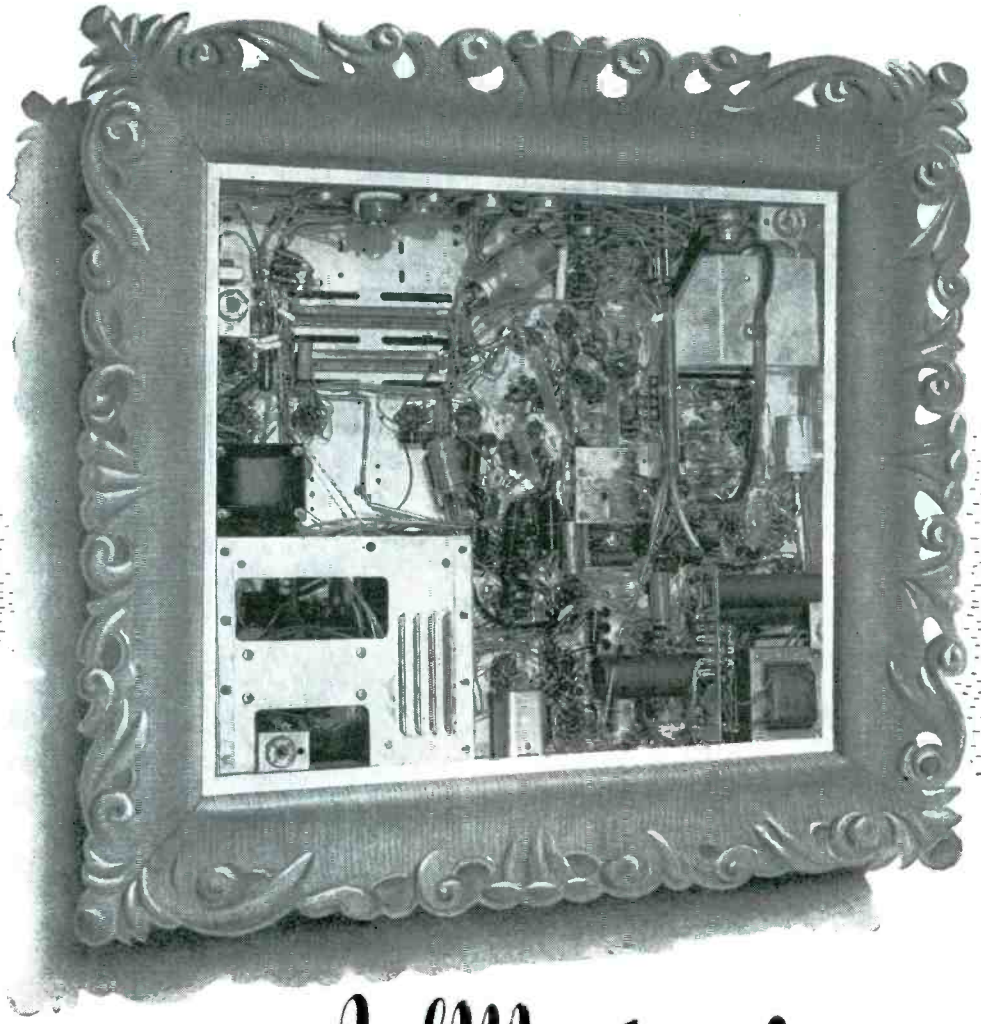
AMPERES, DC: 10

DECIBELS: (5 ranges) —12 to +55 DB

OHMS: 0-2,000 (12 ohms center), 0-200,000 (1,200 ohms center), 0-20 megohms (120,000 ohms center).

Prices: $38.95 dealer's net; Roll Top $45.95 dealers net. Complete with operator's manual.

25,000 volt DC Probe for television servicing, complete, for use with 260, $12.35



A Masterpiece

COMPLEX, EFFICIENT . . . KESTER SOLDER MAKES IT POSSIBLE

Good fast work can only be done with the best materials. Kester Plastic Rosin-Core Solder and the more active Kester "Resin-Five" Core Solder, made only from newly mined grade A Tin and Virgin Lead, are formulated especially for TV, radio, and electrical work. Kester Solders flow better . . . handle easier . . . faster to use.

Free Technical Manual—Send for your copy of "SOLDER and Soldering Technique."

DEPENDABLE

EASIER TO USE

FASTER

SAVES TIME

KESTER SOLDER COMPANY
4248 Wrightwood Ave., Chicago 39, Ill.
Newark, N. J. • Brantford, Canada

KESTER SOLDER

FREE

with purchase of 100 Sylvania Receiving Tubes... or 3 Sylvania TV Picture Tubes

Here are 2 sample pages from "Servicing Television Receivers." Note the easy-to-read type arrangement and the simplified photographic instructions.

HERE at last is a guidebook to help simplify TV set service for you. You'll be amazed how it will enable you to quickly identify trouble . . . solve tricky problems.

Contains more than 100 pages with scores of actual photographs and easy-to-read diagrams, to help you increase and improve your TV set repair business.

Not for sale . . . it's FREE!

This valuable book is yours absolutely free, from your regular Sylvania distributor, with your order of 100 Sylvania receiving tubes . . . or just 3 TV Sylvania picture tubes. Spirally bound with a sturdy board cover to stay open and lie flat on your bench.

NOTE: This important booklet offer is open for a limited time only. So don't delay. Send your order for the tubes you need today to your Sylvania distributor and he'll mail this free, helpful guidebook to you immediately.

Quickly answers scores of questions

- **Shows more than 80 actual photos of screen test patterns. Shows how to identify trouble by pattern behavior.**
- **Gives simple, concise instructions for making repairs, proper adjustments.**
- **Contains complete circuit diagrams of typical television receiver.**
- **Explains latest television developments such as "Intercarrier sound."**
- **Tells about television test equipment and what each instrument will do.**
- **Provides a practical dictionary of television set trouble.**

SYLVANIA ELECTRIC

RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES; FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES, SIGN TUBING; LIGHT BULBS; PHOTOLAMPS

ANCHOR

Ahead Again

New 2-Stage Pre-Amplifier Increases Original TV Signal Strength 5 TIMES

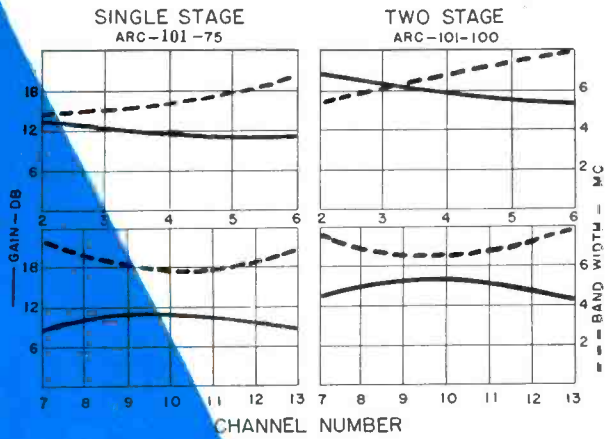
LIST PRICE **$44.95**

You'll be Ahead Too . . . With Greater Profits Than Ever!

ANCHOR'S NEW 2-STAGE BOOSTER NOW Enlarges Your TV Market for Sales to Thousands of New Suburban and Fringe Area Residents

In 1949 the ANCHOR Single Stage BOOSTER improved television reception for 1 out of every 4 TV Set Owners. Thousands of apartment dwellers, suburban and fringe area residents the nation over demonstrated their preference by making ANCHOR the Number One BOOSTER in sets sold. ANCHOR developed this recognition only through its own top-notch performance by being able to deliver sharp snow-free pictures in most difficult conditions. Now ANCHOR has added the new Two Stage BOOSTER to their line to bring television, and the finest television reception, to everyone. The New ANCHOR Pre-Amplifier Will Out-perform Any Two Stage BOOSTER on the market.

ANCHOR'S performance curves have never been challenged. Undisputed laboratory tests prove that the ANCHOR Two Stage BOOSTER increases the original TV signal strength 5 TIMES.



- *Single Knob Construction allows switching and tuning with a flick of the wrist.*
- *Radically new switching of tube and circuit components.*
- *Modernly styled with streamlined plastic escutcheon. Soft mahogany leatherette finish.*
- *Most stable non-regenerative unit available. The unit that is not returned.*

ANCHOR ENGINEERING ALWAYS A YEAR AHEAD!

ANCHOR RADIO CORP.
2215 SOUTH ST. LOUIS AVENUE CHICAGO 23, ILLINOIS

Foolhardy Promises

THOSE RECKLESS RECEIVER and Service claims, which bounced around with such abandon in the DX days of radio, have begun to splash around again causing headaches and heartaches on many, many fronts, particularly in TV. The trouble, which appears to have been smoldering for about a year, began to flame a few months ago, with some set makers and dealers pouring quite a bit of oil into the fire.

Hammering away on the air and via the printed word, the chassis builders have bannered features, truly startling, and practically impossible to justify except perhaps in the choicest of locations. With Service Men unable to provide such exciting results, as advertised, the consumers have begun to roar, and justly so, demanding the clear, *extra-large,* pictures they were told they would have, regardless of the location and *balky* receiving conditions which might prevail.

In one area the complaint problem became so acute that a Better Business Bureau was called in on the scene to see what it could do to remedy the situation. The *BBB* entry did serve to help, with printed and oral claims from the manufacturer and dealer becoming substantially subdued, and the consumers receiving a more careful explanation of what they might have to contend with, if their location wasn't just right.

Fortunately, most manufacturers are aware of the fact that it is absolutely pointless to issue claims, unless there is sound laboratory and field-tested support. Such manufacturers are enjoying an unparalleled acceptance in the home, in the sales room and particularly in the Service Shop with the Service Men, who really have to live with the product.

On many occasions, we regret to report, Service Men have made brazen claims, too, reminiscent of the breadboard days of the twenties. There have been those advertised golden promises of round-the-clock service, no charge for inspection or even initial repairs, and the gem of all, their miracle antenna *guaranteed* to provide *perfect* results on all channels in *any* location. Fully aware that these claims could not be met, and simply spreading these gilded words about as bait, the boys have caused quite a furore. The practice has become so bold in some communities that calls for help have gone out to the *BBB* groups, with the result that policing methods have had to be suggested, a procedure disturbing to everyone. In one area, where the complaints ran into the hundreds in one month, the *BBB* set up an extremely stringent code, which Service Men were expected to follow or else perhaps face curbs on their activities.

We know that *most* Service Men do not subscribe to these disastrous practices. We'd like to say *all* are in that category, and we hope that it will be that way, promptly, with everyone following their own code of ethics, a code which will outlaw all foolhardy promises.

Advertising and the Service Man

IN ADVERTISING, the Service Man has one of his most effective sales-building tools. And, strange as it may seem, all advertising doesn't necessarily demand a direct outpouring of dollars. Actually, advertising starts with a satisfied customer.

Commenting on this aspect, Austin Lescarboura said recently: "Every job handled is a continuing advertisement. Every person pleased can be quite an advertisement, with word being passed around among friends and neighbors that good work is performed at your shop and that the charges are fair and square. The more people a shop can get to spread this word-of-mouth advertising, the quicker and better the business will grow. . . . And don't hesitate to label the good work done in the shop. If I were a Service Man, I'd put my hallmark on every job I turned out. In other words, I'd put a sticker on the back of that cabinet or chassis, proudly stating that this set had been serviced by me and restored to satisfactory operating condition on such and such a date. . . . Another thing I'd like to do would be to return the defective parts to the set owner in a bag printed with a comment which might read: 'Defective parts which have been replaced with new and guaranteed parts.' . . . The average set owner is always suspicious about charges anyway. If you state on the bill, that you have replaced a tube, capacitor, transformer, or resistor, why not return the replaced parts as proof? . . . This is good advertising. It sells the customer on your honesty. It justifies your bill, and it advertises you for your next call for service."

When an advertising budget is to be established, for perhaps some classified directory space, or a neon light, or a box in the local paper, or some direct-mail activity, a percentage of the estimated income for the year must be used as a basis of planning. Said Lescarboura on this point: "Anywhere from 1% to 5% of the estimated income is well in line. The 1% rate is somewhat low, but if there is a substantial volume of business, it may be adequate. The 5% figure may be necessary at the start in getting a flow of business."

Lescarboura also noted that it is wise to be sure that you or your men make a good impression when calling on your customers. Being brought into the living room is a privilege which everyone should respect.

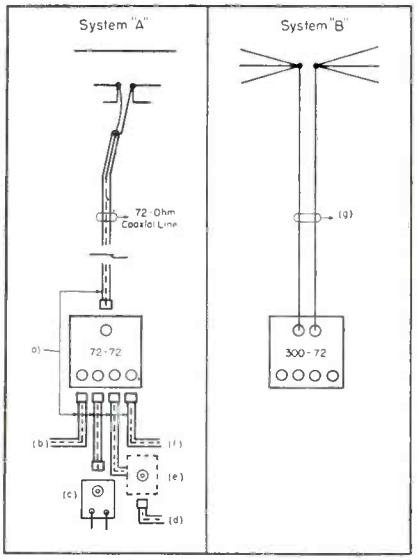
Commenting on the importance of follow-up, he said: "You might phone to ask whether the set is performing satisfactorily, say a week after delivering the set. . . . You might also send out a form letter, with some suitable enclosure like a blotter or folder, occasionally both to customers and prospects, reminding them that you are available whenever something goes wrong with their radio or TV model."

Reviewing these plans, you'll probably say that there is quite a bit of work involved. You're right, there is plenty of hard work required to put these ideas into action. However, anything worth working for, and that outstanding success to which you aspire is certainly worthy of all the effort you can put forth. . . a concluding bit of sage advice for which we are also indebted to Austin Lescarboura.—L. W.

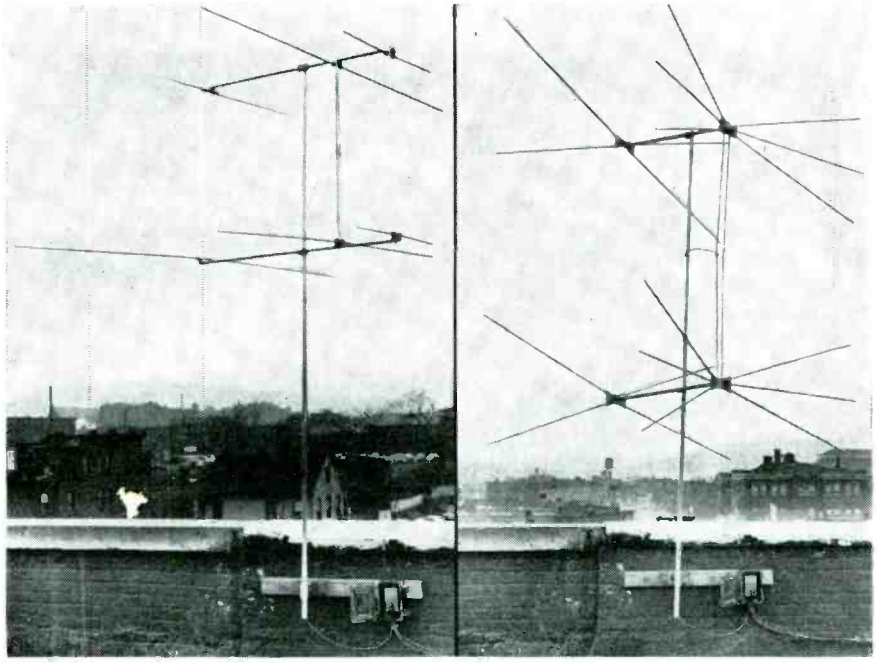
Simplified TV

Fig. 1. Master-antenna system setups for 72- and 300-ohm leads. In the 72-ohm arrangement, RG type of coax cable (*a*) is used for the internal and external installations. At point (*b*) the direct connection to the 72-ohm receiver input is made. At (*c*) the 300-ohm contact is completed. At (*d*) we have a lead for the 72-ohm input of an RCA type of front end, and at (*e*) is the outlet plate contact, where desired for a more permanent installation. The (*f*) terminal is for a connection to a 72-ohm input of a TV model. In the 300-ohm arrangement, the leadin (*g*) should be an open balanced line for external use, but of a coax type[1] for internal conduit and noisy-area installations.

[1]Anaconda ATV-225.



Figs. 2 (left) and 3 (right). In Fig. 2 appears a directional dipole assembly designed to match a coax line. The Fig. 3 view illustrates a directional V antenna assembly developed to match a 300-ohm balanced line. This antenna, when stacked as shown, provides a satisfactory match to a 72-ohm coaxial cable and has been found to have more gain than a single antenna array, of the type shown in Fig. 2. *(Courtesy Brach Mfg. Co.)*



WITH TV RECEIVER design and construction showing considerable improvement, transmission better than ever, and programming on a new high in entertainment level, sight and sound interest has begun to shatter all types of records, particularly in the rural and suburban areas, where this new medium has really solved that leisure-hour problem.

The accelerated TV enthusiasm in the smaller communities has proved to be quite a boom for the smaller local dealer, whom many are inclined to patronize not only because of convenience, but because of pride in the town's business center. The dealers have also seen the possibilities of their service zooming as a result of increased population due to the construction of many of the rambling garden-type apartment houses, as well as the one and two-family homes.

In streamlining TV installation for this new audience, it has been necessary to give prime consideration to the antenna systems which would provide best service. Since the areas are, in the main, somewhat removed from metropolitan centers, a well-installed antenna system is a must item. And with the garden-like countryside to consider, the installation must be neat, with a minimum of equipment in the way of poles, wires and leadins, on the rooftops. In probing the problem, it was found that the master-antenna system technique would afford an effective solution, such a system to meet the requirements of both the dealer, and tenant and landlord.

The dealer problem was found to require a system that would . . .

(*1*) Supply a common quality of television signal on all channels so that customers can make a fair comparison between all receivers connected to the system.

(*2*) Match all types of television receivers.

(*3*) Surpress local-oscillator interference between television receivers, which conform to the RMA radiation rating of not more than 25 microvolts per meter on channels 2 to 13, inclusive.[2]

The tenant and landlord problem was also found to be a three-point case, in which . . .

(*1*) The system must provide each user with reception comparable to that he would obtain from an individual antenna of his own on the roof.

(*2*) A defective set in any apartment connected to the system must not seriously affect the performance of any other television receiver operating on the system.

(*3*) The cost of installing and maintaining the system should not exceed the cost of installing and maintaining individual antennas.

With the foregoing requirements in mind, the systems shown in Fig. I were evolved.

The source of signals, for systems *A* and *B* in Fig. 1, which differ only in the impedance of the downlead, is the antenna. Therefore, a good broadband antenna is essential in the system. In Fig. 2 and 3 appear two types of antennas whose gain was found to be far in excess of a straight dipole for each channel. In areas within 15 miles of a metropolitan station, a single array is usually satisfactory and may also be employed in some high locations which are approximately 30 miles from the TV stations, but better results are a certainty, in secondary signal areas, when these arrays are stacked.

In noisy areas or areas plagued by

[2]As outlined in the RMA bulletin, REC-129-B.

Master-Antenna Systems

Multiple-Outlet Systems, Developed for Smaller Shops and Garden-Type Apartment Dwellings, as Well as One and Two-Family Homes, Provide Effective Link of Receivers for Comparative Tests, Signal Quality for Each Set Equivalent to That Which Might Be Available from Separate Antenna Lines, Suppression of Local Oscillator Interference and Matching to 72 or 300-Ohm Models.

by JEROME BERGER

Manager, Devices Division
Brach Manufacturing Corp.

interference transmissions, system *A* was found to be most effective, providing a system which is completely shielded from antenna to the television receiver.

The distribution-system device, used with system *A*, is illustrated in Fig. 4. With this arrangement, the antenna signal, which feeds the device through a single lower coaxial fitting, is divided into four equal parts for distribution to four television receivers. The same device with a 300-ohm input is shown in Fig. 5.

In operation, the distribution arrangement provides a division of the signals into four equal parts with approximately the same attenuation and standing-wave ratio on all channels. Therefore, all sets connected have a common quality of TV signal.

In addition, a reradiated signal from the local oscillator of any television receiver, connected to the system, will be reduced to approximately one-sixteenth of its power, because of the distribution devices.

While nearly all of the current television receivers can be matched to a 72-ohm coaxial transmission line, there are many receivers around which do not have such provision. Accordingly a unit was developed to provide a match to the earlier types of TV receivers with 300-ohm inputs to the 72-ohm systems. This is illustrated in Fig. 6.

Incidentally, a short or open at the TV receiver end of the system has little effect on any other receiver, since the reflected signals, due to the condition of the end of the line, are absorbed by the action of the device and have

(*Continued on page* 60)

Fig. 4. Distribution device for dividing the antenna signal into four equal parts. Single coax fitting (below) accepts signals from a 72-ohm coax antenna downlead.

Fig. 5. View of distribution device with balanced terminals provided to accept signals from 300-ohm downleads.

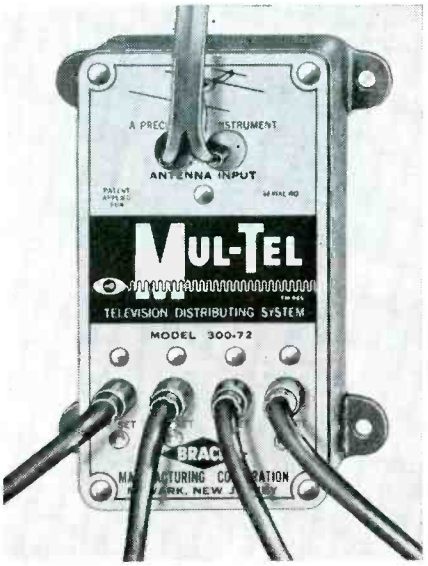


Fig. 6. Unit for matching 72-ohm output of distribution device to 300-ohm input of television receiver.

PHONO installation and service

Curing Toy Record-Player Motor Sluggishness . . . Remedies for Inoperative LP Changers . . . Current Record-Thickness Problems and Cures . . . Bridging Amplifier Design . . . Three-Speed Changer Features.

by KENNETH STEWART

MANY TOY RECORD PLAYER phono motors such as used in G. E. models 186-3A, 4SJ2A1 and 4SJ3A1, have been changed because the player may take several minutes to reach correct operating speed or in some cases may never reach the correct speed. This motor change has been found to be unnecessary in practically all cases, if the following service procedure is applied:

(*1*) The *C* clip must be removed from the bottom of the spindle and then the turntable and spindle removed. The motor should then be turned on and off, and observations made if it *coasts* or stops rather abruptly. If it stops abruptly it may be due to two reasons: the shaft not seated properly in the self-centering bearings, or grease in motor may be gummed up.

To correct *gummy* grease, some carbon-tet should be squirted into the motor bearings and the shaft rotated with your fingers to work it in. Then use a couple of drops of fine oil in each bearing. If after doing this the rotor still does not feel *free,* it is probably due to the rotor shaft not being centered. To correct this, the rotor shaft should be grasped firmly and *worked* around in the same manner, as when trying to enlarge a hole with a rat-tail file. This will center the shaft in the bearings.

(*2*) The spindle and spindle bearings should be cleaned thoroughly, applying a *light* coat of Lubriplate or some similar light lubricant.

(*3*) While several methods are used to hold the idler wheel on its shaft, in all cases a paper washer will be found on each side of the idler wheel. This paper washer must not be *bunched up,* causing a drag on the idler wheel.

Inoperative LP Record Changers

Improper operation of the Philco record changers, models M-09C and M-12C, has been found to be a frequent cause of an inoperative condition.

The long-play tone arm of these changers has an automatic shut-off feature, which turns off the motor at the end of a long-playing record. This feature consists of a mercury switch and latch, which is operated through the tone arm by the eccentric grooves at the end of the record. After the mercury switch has been tripped *off,* the long-play tone arm must be pushed firmly to the extreme right against the tone-arm rest, to latch the mercury switch *on.* Since this switch is in series with the motor circuit at all times, the long-play tone arm must be on the tone-arm rest to enable the changer to operate on standard records.

Failure to Cut Off After Last Record

If the changer on the Westinghouse models V-7126/7127 fails to cut off after the last record, one or more fiber washers should be added under the lift lever at the pivot.

A type V-7110 lift lever should always be used as a complete assembly,

(*Continued on page* 44)

Pocket-size superhet, featuring a speaker whose diameter is about the size of a silver dollar. When the lid of the case is raised, a tapered horn approximately 5"x3½" is formed. Novel speaker and receiver, developed at RCA Labs, was described by Dr. Harry F. Olson, director of the RCA Accoustical Research Lab at the recent IRE Convention in N. Y. City.

Three-speed record changer, which features a pusher-type platform, two interchangeable spindles, jewel-mounted tone arm, interchangeable plug-in heads, muting switch and a weighted turntable. (*Garrard Model RC-80.*)

Cabinet designed to house assortment of sapphire or osmium-tip needles to simplify selection and inventory. To assist in the selection, there has been produced a wall chart or cross-reference chart, illustrating the size and shape of needles, and identifying them with key numbers, which appear on the needle containers, stored in the cabinet. Cabinets are supplied to jobbers and charts are available to Service Men. (*Jensen Industries, Inc., 329 S. Wood St., Chicago 12, Ill.*)

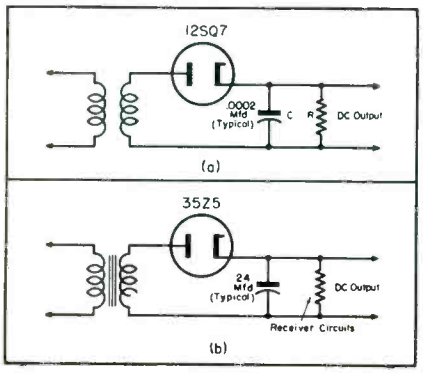


Fig. 1. Typical half-wave diode detector (*a*), and typical half-wave rectifier (*b*) circuits.

Application of Diodes in AM, FM and TV

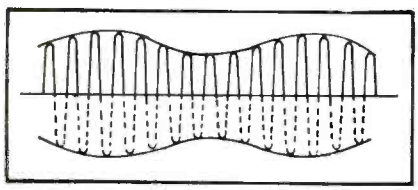


Fig. 2. The *dc* output from a half-wave rectifier. The dotted-half cycles indicate where the plate is negative with respect to the cathode and current does not flow.

Fig. 3. When the gaps between pulses are filled in, the output across the load resistor appears as shown above.

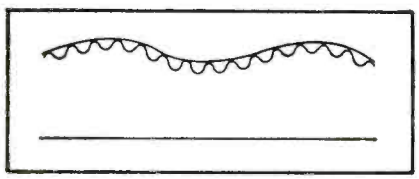
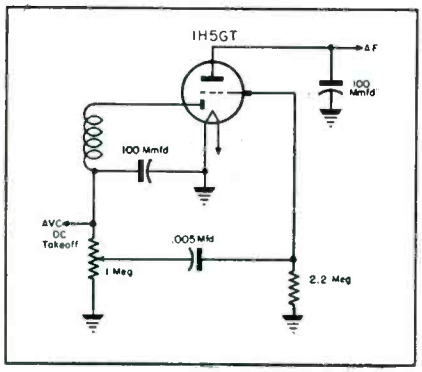


Fig. 4. A typical AM diode-detector circuit.



A DETECTOR in reality is a rectifier in disguise. Stripped to its essentials, it stands revealed as the twin brother of the *ac* rectifier in any power supply circuit. Each is a device which conducts current in one direction only. A diode, or two-element vacuum tube, may be used as either a detector or an *ac* rectifier. Circuit-wise, the two applications are essentially identical. To illustrate this point, we can compare circuits such as shown in Fig. 1 (*a* and *b*), where we find identical circuit connections, the two diagrams differing only in component values and the addition of an iron core in the transformer.

The half-wave circuit is used in detectors because it has less loss than the full-wave type. The full-wave circuit requires less output filter, but delivers less output voltage for a given input.

Reviewing vacuum-tube theory to probe the problem further, we find that the electrons emitted by the cathode are attracted to the plate *when the plate is positive with respect to the cathode*. In other words, with an *ac* or *if* input to the diode circuit, such as that of Fig. 1*a*, current will flow during the period when the plate is positive with respect to the cathode. Since the polarity of the *ac* input reverses every half cycle, the current flows only on every other half cycle, as shown in Fig. 2. The dotted half cycles are those where the plate is *negative* with respect to the cathode and current does not flow.

To improve the efficiency of the arrangement, a capacitor is connected across the output, as shown in Fig. 1. This capacitor charges up and tends to discharge slowly so that the *dc* pulsations do not have time to fall to zero potential between half cycles. The gaps between pulses are filled in, then, and the output across the load resistor *R* appears more like that of Fig. 3. With a properly selected value of capacity, the efficiency can be increased as much as three times. If the capacity is too small the efficiency suffers and if too large, it reduces the response of the circuit to amplitude variations which represent high-frequency audio signals.

Both *ac*, in the form of *if* signal, and *dc* are present in the output of the diode detector. Another function of the capacitor is to bypass or short circuit the *if* signal so that it does not get into the succeeding circuits and cause degeneration or regeneration. Frequently, the *dc* output is also used to bias the *rf* or *if* tubes in proportion to the signal strength to form automatic gain control; *agc* or *avc*. It is important that this circuit be filtered to prevent feeding back *if* signal to earlier stages. A simple circuit showing the *agc* takeoff and the audio takeoff of a diode detector appears in Fig. 4. To prevent further the *if* signal from entering the succeeding circuits, the audio plate circuit is bypassed with 100 mmfd of capacity. Where it is desirable to accent filtering of the *agc* leads, the circuit of Fig. 5 is sometimes used. The circuit features use of another section of filter comprised of the 47,000-ohm resistor and the lower 100-mmfd capacitor. Incidentally, the unusual volume control connection via several apparently superfluous parts, is really a tone-compensated volume-control circuit, providing high-frequency attenuation with reduced volume control settings, thus simulating bass-boost.

While the poor efficiency of the diode (less than unity) can be materially improved at ordinary broadcast frequencies by the proper selection of the output reservoir capacitor, this is not true in diode detector circuits at FM or TV frequencies. At these frequencies, other factors limit the selection of the capacity value. The diode itself must be especially designed for low plate-to-cathode capacity and

Basic Circuit and Component Factors Which Must Be Considered in the Application of Diodes, Particularly at the Very High Frequencies Used in FM and TV... Features of Typical Circuits Using 6AL5s in Video Detectors and Sound-Channel Detectors (Balanced Discriminators and Ratio Detectors).

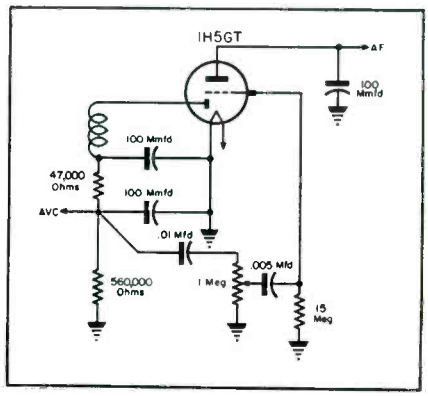


Fig. 5. Detector circuit of G. E. 254, illustrating use of filtering in *age* leads.

by A. T. PARKER

low resistance during the period of conduction. Both the load resistance and the output capacitor must be kept small to prevent loss of the higher frequencies (up to 4 or 5 mc) present in TV video channel detectors.

The type 6AL5 diode is commonly used in video detectors as illustrated in the typical applications of Figs. 6 and 7. It will be noted that the connections to the diode are reversed in these two diagrams. This is determined by the number of video stages between the detector and the picture tube. That is, for an odd number of stages (in this case just one) the diode polarity shown in Fig. 6 must be used, and for an even number of video stages (2, 4, etc.) the diode connections shown in Fig. 7 apply.

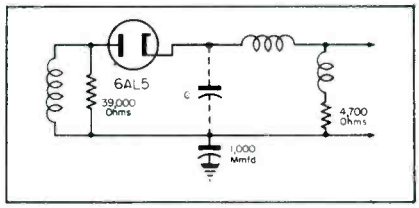
The output of these detectors include low-pass filters which are intended to provide uniform frequency response over the video pass band, up to 4 or 5 mc. The shunt capacity *C* in Fig. 6 is composed up of the stray circuit capacities. In the case of the circuit in Fig. 7, the shunt capacity is also quite small, 10 mmfd. It is important to note that this shunt capacitor, forming part of the output low-pass filter is also the reservoir capacitor previously mentioned. The terminating resistance at the output of the filter is kept as large as practicable, determined by the values of the series inductance and shunt capacitor. This resistance must be high to obtain the best efficiency from the diode circuit, though at best the efficiency of video detectors is seldom as good as 70%.

The use of diodes in FM and TV sound channel detectors presents a more complex problem to the designers of modern receivers. Two basic types of detectors are commonly found. These are known as the *balanced discriminator* and the *ratio detector*. Each of these circuits serves to convert the constant level *varying frequency* output of the FM *if* to a *varying amplitude* or AM signal before detection by the diode. The diode then performs exactly as described for AM detection. In practice, the amplitude variations present in the input of each type must be stabilized for proper performance.

The discriminator used for detection embodies the same principles as the discriminator used for automatic-frequency-control circuits which first gained prominence in the mid-'30s.

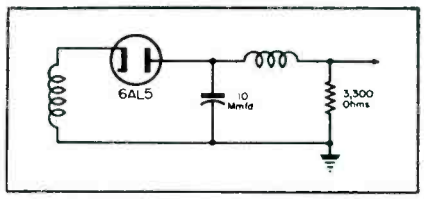
Amplitude changes in the *if* signal are eliminated before the signal is applied to the balanced discriminator by using one or two limiter stages ahead of it. The limiter stage shown in Fig. 8 utilizes degeneration to provide constant amplitude signal to the discriminator. The omission of a cathode bypass causes cancellation of portions of input and output voltages appearing across the cathode resistor. This tends to maintain a constant output level.

In Fig. 9 appears a simplified version of Fig. 8, in which the tertiary winding is connected to the mid-tap of the secondary. The induced voltages in these coils will be in phase since they are both inductively coupled to the same primary. The voltage across the tertiary winding will be in



(Above)

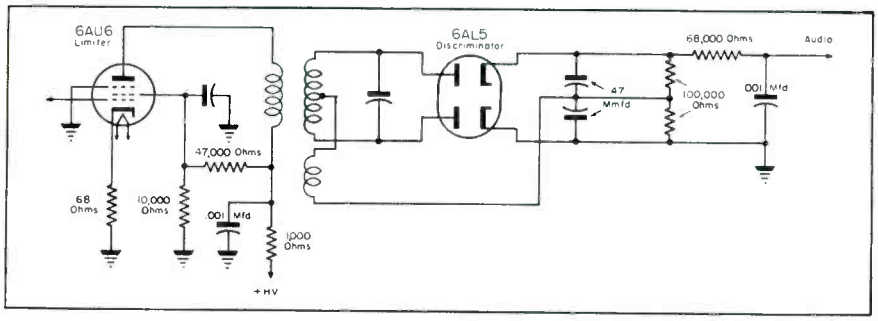
Fig. 6. Video detector used in Stromberg Carlson TV-125.



(Above)

Fig. 7. The Philco 48-700 video detector.

Fig. 8. Stromberg-Carlson TV-125 sound detector stage. Limiter stage employs degeneration to provide a constant-amplitude signal to the discriminator.



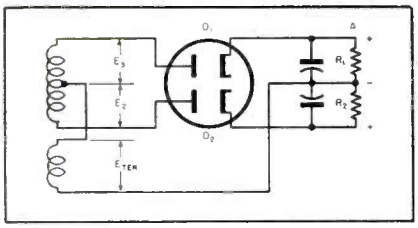


Fig. 9. Operational schematic of Fig. 8.

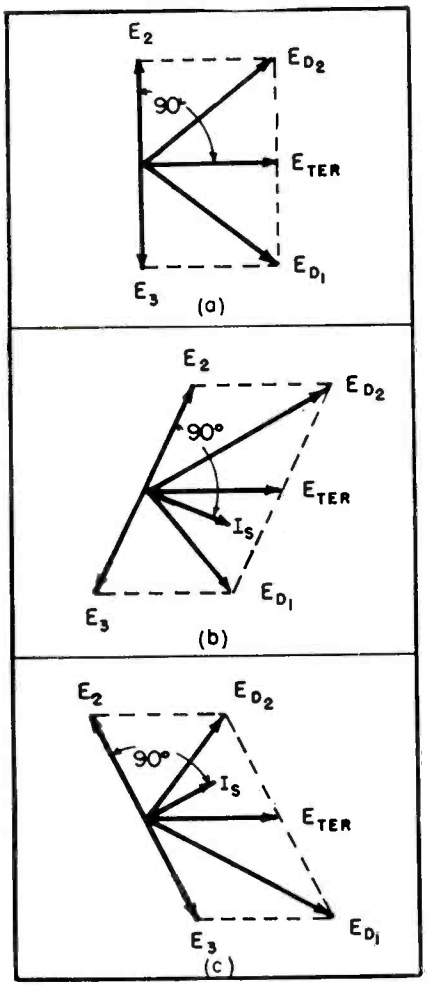


Fig. 10. Vector plots. The diagram in (*a*) illustrates the phase relationship of three voltages as applied to the diodes. Vector in (*b*) shows the phase relationship when the voltage across the coil is 90° ahead of the current. In the (*c*) vector we have the phase relationship which results when the tuned circuit has capacitive reactance and the circulating current leads the induced voltage.

phase with the induced voltage because it has no current and therefore no IZ. The secondary, however, is a part of a tuned circuit and the phase of the voltage across the coil will depend on the relation between the frequency of the applied voltage and the resonant frequency of the tuned circuit. *At resonance* the current circulating in the tuned circuit will be in phase with the induced voltage. The voltage across the coil is always 90° ahead of the current through the coil. For this reason, the voltage across the secondary is 90° ahead of the induced voltage and also 90° ahead of the voltage across the tertiary winding.

The voltages E_2 and E_3 are measured from the mid-tap and since the two ends of a coil have opposite polarity, they are 180° out of phase. The phase relations of the three voltages can be best illustrated by a vector diagram, as in Fig. 10*a*.

When the frequency applied to the primary is above the resonant frequency of the secondary, the current circulating in the tuned circuit is no longer in phase with the induced voltage because the tuned circuit then has inductive reactance and the current lags the induced voltage. The voltage across the coil, however, is always 90° ahead of the current. These phase relations are shown in Fig. 10*b*.

When the frequency applied to the primary is lower than the resonant frequency of the secondary, the tuned circuit has capacitive reactance and the circulating current leads the induced voltage. The phase relations are then as indicated in Fig. 10*c*.

Reviewing Fig. 9 we find that the voltage applied to D_1 is E_{ter} plus E_2. The load resistors R_1 and R_2 are connected so that the voltages appearing across them have the polarities shown in Fig. 9. It will be noticed that the voltages across the two resistors are in opposition.

In Fig. 10*a* the voltages applied to the two diodes are equal. The voltages across R_1 and R_2 will then be equal and will cancel, and the point A in Fig. 9 will be at ground potential.

In Fig. 10*b* the voltage applied to D_2 is greater than that applied to D_1; therefore the voltage across R_2 will exceed that across R_1 and point A will be negative with respect to ground.

In Fig. 10*c* the situation is reversed and point A will be positive with respect to ground.

At the transmitter, one cycle of audio frequency produces one upward and one downward swing in frequency. These frequency changes, applied to the discriminator, produce one positive and one negative voltage or one cycle of audio frequency. In this manner the original audio wave is reproduced.

In Fig. 11 appears a ratio-detector arrangement which features a circuit innovation. That is, the connections to one of the diodes seem to be reversed. This is not an error, but intentional.

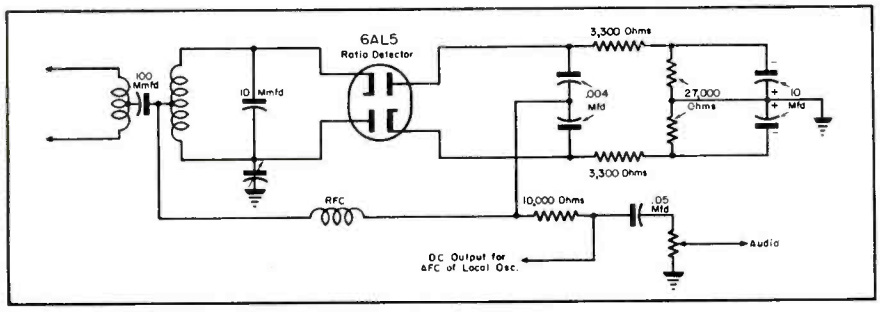
The problem of eliminating amplitude variations from the FM signal applied to the ratio detector has been accomplished in this circuit without resorting to the limiter stage with its many disadvantages. The amplitude variations are smoothed out after detection by the diode.

In the circuit, an *rf* choke has been substituted for the tertiary winding. The method of providing an *rf* voltage across the choke in step with the phase of the primary voltage is slightly different. Either method provides the same result. Some circuits take the *rf* signal from the top of the primary coil, but this one achieves a better impedance match by using a tap on the primary. So we see that, as before, the phase of the current through the secondary, with respect to the *rf* choke, determines the current through each diode. The output connections cause the resultant voltages developed across the load resistors to add together. The total voltage measured from cathode to cathode remains substantially constant, but the voltage measured from the mid-tap of the two reservoir capacitors and the mid-tap of the two load resistors fluctuates in accordance with the phase difference, which in turn is a function of the variation in frequency (due to modulation) applied to the input. The large value of capacitor across each load resistor serves as a filter which charges up and discharges so slowly that it tends to maintain a constant voltage across the load. This action replaces the work accomplished by the limiter in the discriminator-type circuit.

Another function of the sound channel detector is the use of its developed

(*Continued on page* 63)

Fig. 11. Sound detector in the Philco 48-700 TV receiver, where the connection to one of the diodes has been reversed to eliminate amplitude variation from the FM signal applied to the ratio detector. An *rf* choke has been inserted in place of the tertiary winding in this arrangement.



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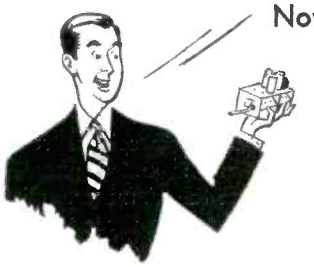

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Streamlining Trends in

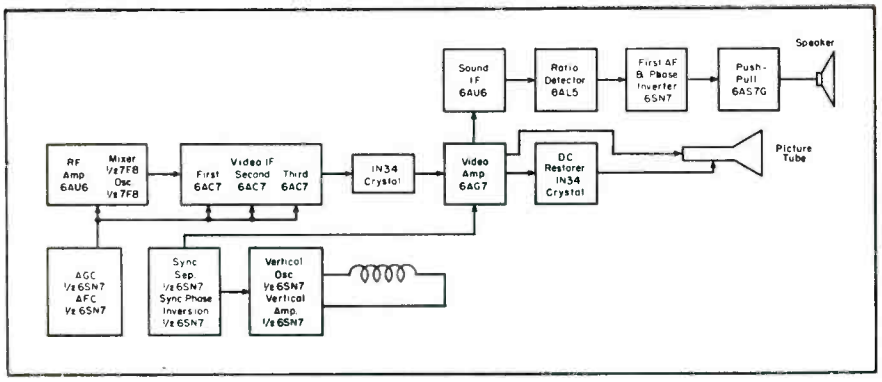


Fig. 1. Block diagram of a streamlined TV chassis, which has fewer tubes, but nevertheless has highly efficient reception possibilities.

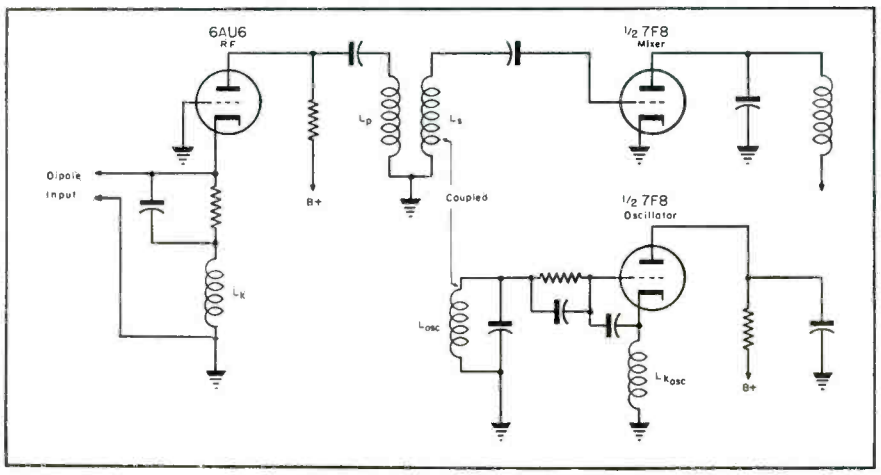
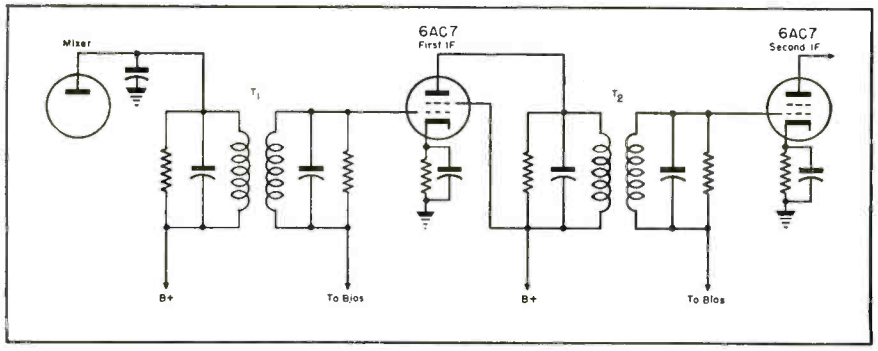


Fig. 2. Simplified schematic of a two-tube front end, showing hookup for one channel; *G. E.* 910.

Fig. 3. A three-stage bandpass *if* amplifier with a minimum of circuitry.



RECENT MONTHS have witnessed the arrival of the long-expected trend to TV receiver simplification, with emphasis on the use of multi-purpose tubes, crystals to eliminate some types of tubes and new circuitry involving more compact and in some instances fewer components.

The TV receiver today features nine basic sections, each of which must provide a specific service. These sections include:

(*1*) The *rf* or front end, which must select and tune in twelve channels.

(*2*) The *if* picture strip, which must provide a full 4-mc bandwidth, with good sensitivity.

(*3*) The video amplifier, which must supply sufficient amplification to raise the video signal to a proper amplitude to modulate fully the electron beam of the picture tube.

(*4*) The sound *if* and audio output, the FM circuit which provides the sound.

(*5*) The automatic gain control, required to compensate for the difference in strong and weak signals from station to station.

(*6*) The sync amplifier, which must provide the sync pulses for properly timing the vertical and horizontal deflections of the electron beam.

(*7*) The horizontal and vertical magnetic type deflection circuits, supplemented by effective automatic frequency control, and good damping.

(*8*) Low-voltage power supply.

(*9*) High-voltage power supply.

The RF or Front End

In the early days of superhet circuits separate tubes were used for the *rf* amplifier, separate mixer, and separate oscillator. Eventually this setup was simplified so that a single tube, like the 6A8 pentagrid converter, could be used. The signal grid of this tube accepted an *rf* voltage, performed the dual functions of mixer and oscillator, and passed an *if* signal on to the succeeding stages in these circuits.

The evolution of FM receivers revealed a similar problem and eventual solution. First came the *rf*, mixer, and oscillator sections involving three tubes for the front end. Then came mixer tubes of the pentagrid converter type, like the 6SB7Y, which could perform precisely the same function in an FM receiver as the 6A8 or the 6SA7 in the broadcast-band receiver. It was found

TV Circuitry

Techniques Recently Adopted to Simplify Circuitry Provide for the Modification of the Front Ends, IF Picture Amplifiers, IF Sound Amplifiers, Oscillator Systems and the Increased Use of Multi-Purpose Tubes.

by DAVID T. ARMSTRONG

advantageous to use an *rf* tube before the 6SB7Y for FM, which was not always necessary, though desirable, for the broadcast band.

Experience with television is following a similar pattern. Until quite recently it has been common practice to have three separate tubes, one for *rf*, one for the mixer, and one for the oscillator stages of the front end.

Research and intense experimental activity disclosed that it was possible to build front ends with only two tubes, featuring reasonably good signal-to-noise ratio, and excellent image rejection.[1]

The circuit of a two-tube front end which was found to work quite well with an *rf* section is shown in Fig. 2. In this system the *rf* amplifier uses a 6AU6 connected as a triode in a grounded-grid amplifier. A dipole is connected to the cathode circuit to provide a substantially constant input impedance of 300 ohms to the antenna at all frequencies tuned.

A choke, L_k, is in series with the cathode resistor of the 6AU6 to prevent the input impedance from being lowered by the shunting effect of the total stray capacity to ground. The value of the choke is changed according to the frequency of the channel being tuned.

The *rf* amplifier is coupled to the converter tube by a wide-band transformer consisting of the windings L_p and L_s. These primaries and secondaries are self-tuned by the distributed and tube capacities to provide optimum gain. The triode converter is one section of a 7F8 dual-triode-type tube.

The oscillator, which makes use of the remaining half of the 7F8, is inductively coupled to the converter grid by locating the oscillator coil on the same coil form as the converter grid coil, L_s. This oscillator is a modified Colpitts, which operates on the high frequency side of the *rf* signal. The choke, L_k, provides a *dc* path to ground from the cathode of the oscillator, but it maintains the cathode off-ground at the *rf* frequencies.

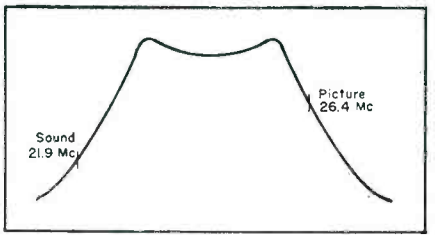
The IF Picture Amplifier

In streamlining the *if* picture amplifier, the intercarrier system has been found very appropriate because it is an excellent means of simplifying a circuit without a sacrifice of quality of response. A modified bandpass-filter-coupled amplifier in three stages can afford sufficient overall gain to provide a good video *if* output signal for a direct view receiver; for projection four stages of *if* amplification may be necessary.

The bandpass response, which refers to the response characteristic, in which a definite band of frequencies is transmitted uniformly, is normally obtained in *if* transformers by tuning the primary and secondary resonant circuits to slightly different frequencies. The filter-coupling is a selective circuit network designed to pass currents at frequencies within a continuous band limited by an upper and a lower critical or cutoff frequency, while substantially reducing the amplitude of currents of all frequencies outside that band.

[1]Wallman, Henry; Macnee, Alan B.; and Gadsden, C. P., *A Low Noise Amplifier*, Proceedings of IRE; June 1948.

Fig. 4. Plot illustrating broad band-pass required in *if*; this is *if* response achieved without traps.



A simplified schematic of a three-stage bandpass amplifier using three 6AC7s is shown in Fig. 3. The transformers, T_1, T_2, and T_3, are overcoupled and then loaded with resistance to provide adequate band-pass frequency characteristics. In the intercarrier system there are two signals present in the *if* stages at all times and simultaneously. One signal contains the audio information and the other the video information. The FM sound signal is removed from the plate of the final video amplifier.

In the system illustrated the *if* transformers must pass a broad band of frequencies, similar to those shown in Fig. 4. To obtain this type of bandpass it is necessary to overcouple the primary and secondary coils of each *if* transformer. It is also usually necessary to load both the primary and secondary coils by connecting a resistor across the winding, as shown in the grid and plate circuits of the *if* stages in Fig. 3.

The bandwidth or the pass band may vary from about 2 mc to the full 4 mc in different types of receivers. The better type receiver will have a wider pass band than the less expensive type receivers. Receivers with 7-inch tubes do not require fine detail, since it is usually impossible to see detail at the normal viewing distance because of the small image. But, for the larger size tubes and especially for projection, it is necessary to have the full 4 mc pass band. Every increase in bandwidth is achieved at a sacrifice in gain. Therefore, to have sufficient gain with

(*Continued on page* 46)

One Antenna Operates Low-Cost BRACH

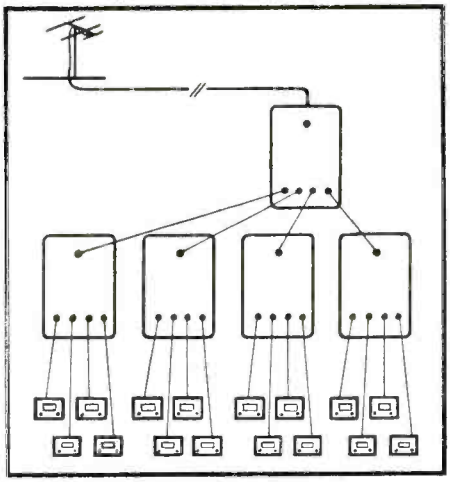
Perfect for 2-Set Owners & Garden Apartments

The Brach Mul-Tel System has already proven a boon to a number of real estate management firms and garden apartment owners many of whom had previously denied installation to their tenants. Dealers and jobbers report a ready market even among homeowners who are contemplating a second television set for their homes. One dealer noted a sharp increase in set sales as soon as homeowners learned that a second antenna was unnecessary. Each type of Mul-Tel Box is priced at $10.66 to dealers (suggested retail price is $19.75).

No Tubes; No Current; No Switches; No Maintenance Costs

The Mul-Tel System is miraculously inexpensive and requires absolutely no maintenance costs, because it contains no tubes, uses no current and has no moving parts. Nothing can go wrong.

HOW IT WORKS



THE BRACH MUL-TEL SYSTEM is a model of simplicity. The heart of the entire installation is an aluminum outlet box, 5 inches long x 2¾ inches wide x 1¾ inches deep, weighing only 18 ounces. This unit is attached to your antenna by either a 72-ohm coaxial cable or a 300-ohm wire. When 16 sets are to be demonstrated, another Mul-Tel unit is connected to each of its four receptacles. The sets are in turn connected to each of the 16 receptacles.

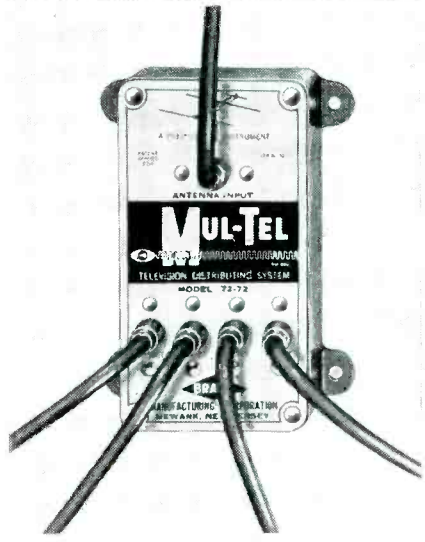
4-Set System Costs $19.75 List Rapidly Installed

The Brach Mul-Tel System installs quickly and easily with just a screwdriver. It doesn't clutter the walls like other systems. Brach Mul-Tel System will operate from any antenna but to insure best results, the Brach T-Bar Antenna is recommended.

"It's Low in Cost . . . and Does A Great Job"

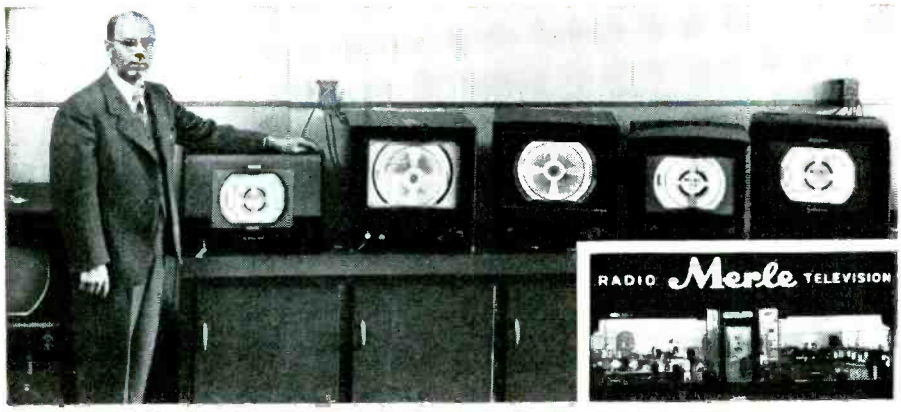
"I've tried several so-called multiple systems in my store", says Charles D. Minogue, General Manager of Hunter's in Union, N. J., (a fringe area location) "and they cost up to $500 each for installation. The Brach Mul-Tel System costs a small fraction as much—and best of all—delivers the finest picture."

SIMPLE DESIGN



One of three types of distribution units available in the Brach Mul-Tel System. For a 4-set system the cables on the bottom connect directly to TV sets; in a 16-set system each wire feeds into another distribution unit which in turn supplies 4 sets. Cable on the top is 72-ohm coax from the antenna. Provision is made for use of 72 or 300 ohm downlead to any input.
(Pat. applied for)

Increases Sales and Store Traffic—Says Busy Dealer



Mr. L. MERLE of Merle Radio, Plainfield, N. J. (30 air miles from New York City) one of the first dealers to install the Brach Mul-Tel System, demonstrates a group of TV sets operating from one Antenna. "Since I installed the Mul-Tel," says Merle, "I can show my sets to better advantage—to more people—and I'm making numerous TV set sales, I could never make before as a result of Mul-Tel installations in garden apartments. With Mul-Tel I don't expect slow TV sales this summer".

Up to 16 TV Sets with MUL-TEL System

Revolutionary Multiple TV Distribution System Uses No Boosters. Is Non-Amplified

Jobber Installation Sells Dealers

WILLIAM WRIGHT, Service Manager of Teldisco Inc., Dumont distributors for the Northern New Jersey area, reports excellent results from his own installation of the Brach Mul-Tel System. "Dealers who have viewed the system in operation", says Mr. Wright, "are sold on sight. We can't install them fast enough. Furthermore, we're tickled for another reason. Our sets move faster off the dealer's floor when demonstrated on the Mul-Tel".

MUL-TEL®

PATENT PENDING

OLDEST AND LARGEST MANUFACTURERS BRACH OF ANTENNAS AND ACCESSORIES

multiple television system

BRACH MFG. CORP. 200 Central Ave. Newark, N. J.

Div. of General Bronze Corp.

Demonstrates More Sets at a Time Using Only One Antenna

IT'S HERE! A good, fool-proof multiple television distribution system for very little money. Spurred on by the obvious need of thousands of television dealers, the Brach engineers made "MUL-TEL" possible. Already in use by hundreds of retailers, jobbers and home-owners, it has been met with enthusiastic response both in high signal areas and fringe areas.

Only Minutes to Install

No splicing, cutting or taping is necessary. The entire installation can be completed in a few minutes with nothing more than a screwdriver. In strong signal areas the Brach Mul-Tel provides the same quality picture and sound to as many as 16 receivers from one antenna. Now dealers can demonstrate more sets, increase store traffic, increase profits. Most important is the fact that thousands of apartment house occupants who have been deprived of TV by landlord restrictions on roof antennas are now converted into fat TV prospects by The Brach Mul-Tel System.

Order from your jobber now. If he hasn't stocked the Brach Mul-Tel System yet, send us the coupon below. The Mul-Tel is available for immediate deliveries.

Guaranteed

An unconditional 100% money-back 60-day guarantee accompanies each Brach Kit, consisting of a Brach Superview Antenna, 72-ohm coax down-lead, in addition to the Mul-Tel Units.

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Dealer ☐ or Jobber ☐

If Dealer, give your Jobber's name and address.....

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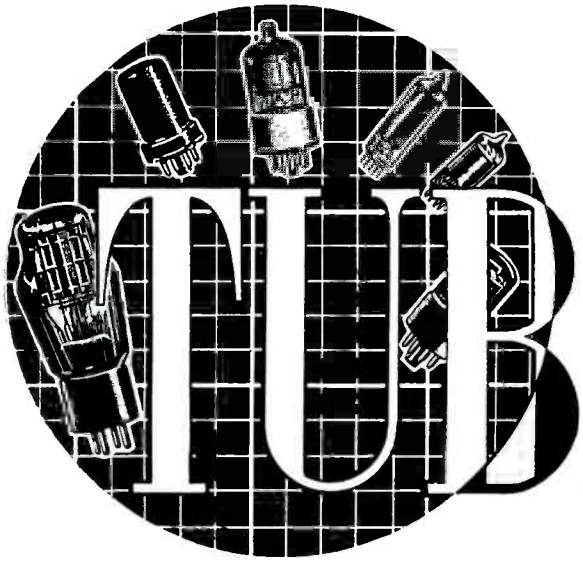


TUBE News

Picture Tube Interchangeability Data . . . Ion Trap Adjustment Procedures . . . Indicator Gun Picture Tube Design and Application.

by L. M. ALLEN

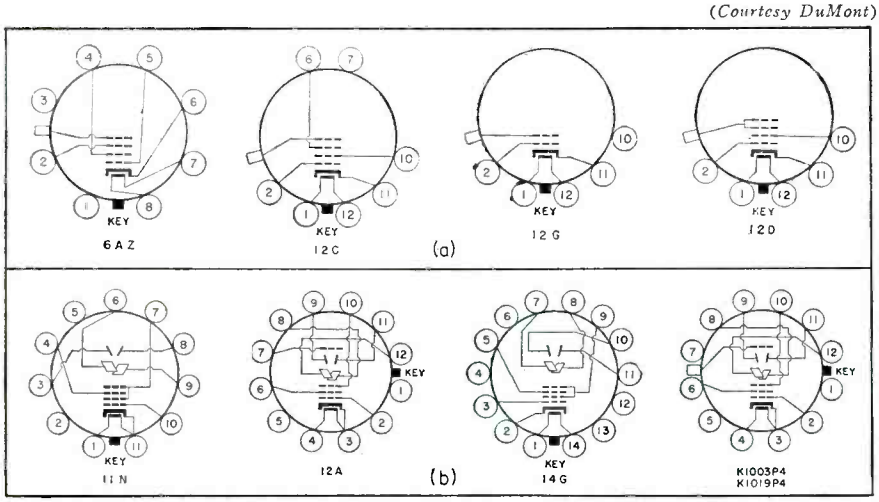
THE VARIETY of picture tubes now being processed in 7", 10", 12", 12½", 14", 15", 16", 19" and 20" sizes, requiring many circuit variables to accommodate the different element structures, has emphasized the need for a particularly close study of the tubes' characteristics to accelerate service work.

The basing arrangements are very important in such a review providing the key to the tube's design and corresponding application possibilities. The multiplicity of basing setups now in existence appear in Fig. 1.* Two types are shown: basing for magnetic and electrostatic tubes.

The *AZ* identity is usually associated with the 7CP4, an electrostatic tube with a 6½" face-plate area.[1] In the *12C* category are the 7DP4 and the 10DP4, both of which are also electrostatic types, the 7DP4 having a face area of 6", and the 10DP4 a face area of 9" and a metal backing. In the *12G* category are quite a few models: the 8AP4, a 7¾" face-plate tube; the 10MP4 and 10MP4A, both having a 9⅛" face-plate area, the *A* type having a gray filter face; and the 12VP4 and 12VP4A, with 11" face-plate areas, and a gray filter in the *A* model.

Fig. 1. Basing employed in magnetic type (*a*), and electrostatic type (*b*) picture tubes.

(Courtesy DuMont)



The majority of the picture tubes fall in the *12D* classification and involve the following types: 7HP4 (5$\frac{15}{16}$" face-plate area); 10PB4 and 10PB4A (9" face areas, with a gray filter for the *A* type); 10EP4 and 10EP4A (9" face-plate areas, with *A* type using a gray filter); 12JP4 (11" face); 12KP4 and 12KP4A (11¼" face, the former with a metal back, the latter with a gray filter); 12QP4, 12QP4A, 12LP4, 12LP4A, 12RP4, 12TP4, 12UP4 and 12UP4A (all with 11" face-plates, except the latter which has a 11⅜" area front face, the *A* types also having a gray filter); 14BP4 (gray face rectangular type with a 12¾" diagonal area); 15AP4, 15CP4, 15DP4 (14" face-plate areas); 16AP4 and 16AP4A (14⅜" face areas, the *A* type having a gray filter); 16CP4 (15" face area); 16DP4 and 16DP4A (15" face areas, with a gray filter for *A* type); 16EP4 and 16EP4A (14⅜" face area, the *A* type having a gray filter); 16FP4 (15" face area); 16GP4 (14⅜" gray filter face); 16HP4 and 16HP4A (14½" face areas, with a gray filter in the *A* type); 16JP4 and 16JP4A (15" face areas, with gray filter in the *A* type); 16LP4 and 16LP4A (14½" face areas, with gray filter in *A* type); 16MP4 and 16MP4A (14¾" face-plate, with gray filter in *A* type); 16QP4 (15" diagonal rectangular type with gray filter face); 16RP4 (rectangular tube with 14⅞" diagonal gray filter face); 16SP4 and 16SP4A (14½" face areas, with gray filter in *A* type); 16TP4 (rectangular type

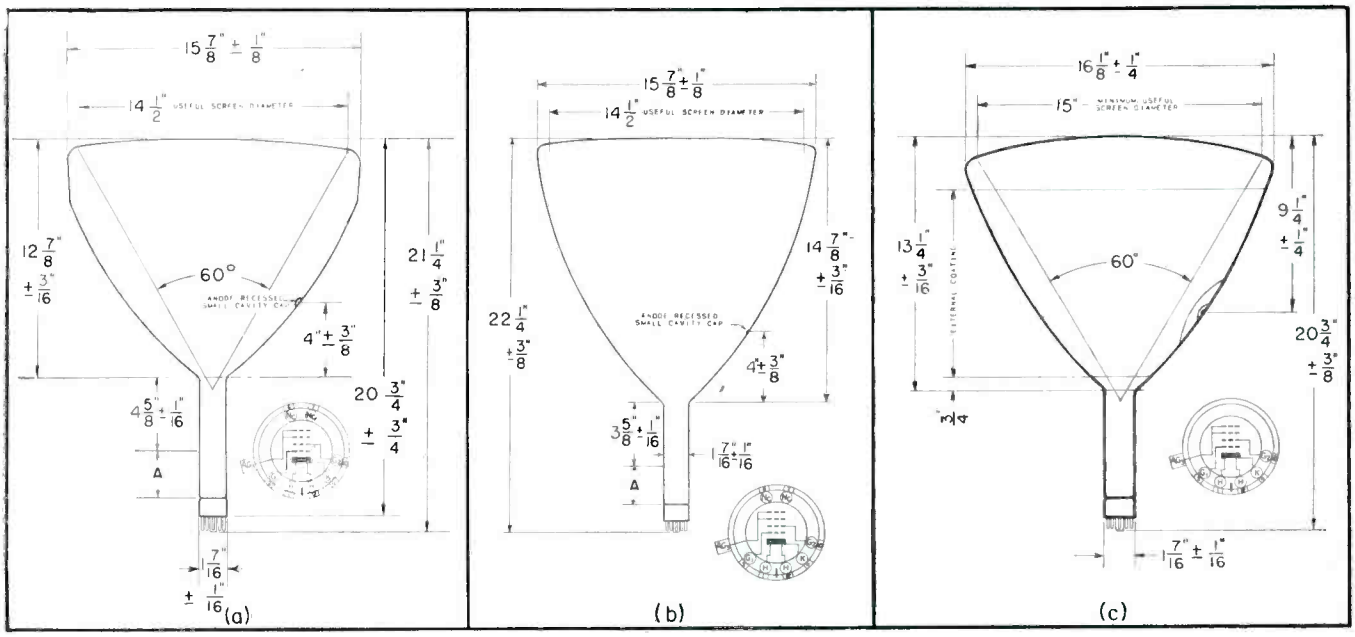


Fig. 2. Envelope and base measurements of 16HP4A, 16LP4A, and 16JP4A (*a*, *b* and *c*, respectively) 16″ picture tubes. Ion trap is used at point *A*. (*Courtesy Tung-Sol*)

with 14⅞″ diagonal gray filter face); 16YP4 (14½″ gray filter face area); 19AP4 and 19AP4A (17⅜″ face area, with gray filter in *A* type); 19DP4 and 19DP4A (17⅜″ face areas, with gray filter face for *A* type); 19EP4 (rectangular type with $17\frac{31}{32}$″ diagonal gray filter face area); 19FP4 (17⅜″ face area with gray filter face); 19GP4 (17⅜″ gray filter-face area); and 20BP4 (18¾″ face area).

In the electrostatic classification are the *11N* type in which falls the 7EP4 with a 6″ face area; the *14G* types, including the 7GP4 (6″ face area), 7JP4 (6″ face area), 8BP4 (8″ face area), 10GP4 (9″ face area, and 10HP4 (8¾″ face area); the *12A* types, which includes the 14AP4 (11″ face area) and the 20AP4 (17″ face area); and the K1003P4 and K1019P4 types with 10½″ and 18″ face areas, respectively.

16″ Tube Variations

The physical variations which exist in the 16″ picture tubes, now available, are illustrated, in part, in Fig. 2,** where appear dimensional views of the envelopes of the 16HP4A, the 16LP4A and the 16JP4A.

*Picture-Tube Interchangeability Factors**

Tube types with identical bulb outlines present no problem of interchangeability with respect to chassis layout, unless the difference in overall length is so great that the two types in question would not be compatible in the same cabinet design.

For types with different bulb outlines, the radius of face curvature, bulb diameter, and overall length, will provide some indication of bulb similarities.

When a high focus current tube is replaced for a low focus current tube, it may be necessary to increase the focus current range of the receiver; otherwise, a stronger focus coil must be employed.

It is important that the proper external magnet is used with the ion-trap of the tube, particularly when changing from a double to a single magnet. Since these components are relatively inexpensive, it would seem practical to keep them on hand.

If a tube without external coating is replaced for a tube with external coating, a 500 to 1,500-mmfd capacitor, connected between the high-voltage output lead and ground, will insure proper set operation.

In general, there are three types of connectors to the anode of picture tubes, the cavity and ball connectors in all glass types, and the clip connector for types with a metal cone envelope. When making tube changes, the appropriate connector must be used.

In practice, the same deflection yoke usually may be employed with all tube types having deflection angles of less than 66°. Types with deflection an-

(*Continued on page* 59)

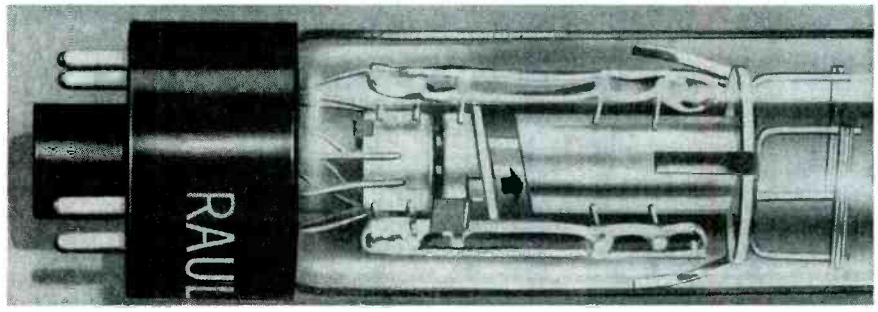
[1]Face areas indicated represent the minimum useful diameter.

*Based on data prepared by the Allen B. DuMont Laboratories.

**Courtesy Electronic Tube Division, Tung-Sol Lamp Works, Inc.

Fig. 3. The indicator-gun picture tube. Arrow indicates where glare becomes visible when ion trap is improperly adjusted.

(*Courtesy Rauland*)



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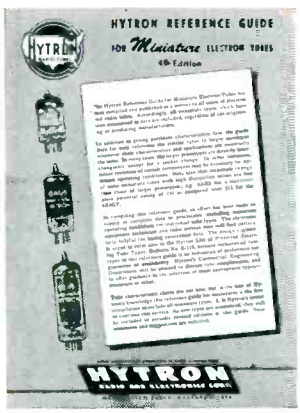
Seen these Hytron firsts in popular new TV sets? The prominent TV set makers shown are using them. And the list is growing. DuMont, for example, now uses the 1X2 and 6BQ6GT. You'll see many more of these famous tubes. And many more new Hytron types designed for low-cost TV for the mass market. When you buy these Hytron firsts, follow the leading set manufacturers. Buy the original. Buy Hytron!

choose one or more of THESE HYTRON TV FIRSTS



NEW 4th EDITION

Hytron Reference Guide for Miniature Electron Tubes

Miniature types are multiplying fast. You need this Hytron Reference Guide. Originated by Hytron, it is unique. Lists all miniatures to date, regardless of make. Six pages of pertinent data. 132 miniatures — 41 of them new. 70 basing diagrams. Lists similar larger prototypes. Free from your Hytron jobber. Get your copy of this old friend brought up to date — today.

OLDEST MANUFACTURER OF RECEIVING TUBES

HYTRON

RADIO AND ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS

A TV/FM Preamplifier

[*See Front Cover*]

TELEVISION PREAMPS, or boosters, have become important in *stretching the fringe area.*

In designing equipment for this DX TV service, it has been found that there are many operational variables to consider. For instance, there are the detuning effects of various TV receiver front ends and coupling leads, as well as the antenna and transmission-line variables. Continuous tuning has been found to be one solution, providing a means of adjusting to resonance with the desired frequency. In the model[1] diagramed on the cover and in Fig. 1, such tuning from 50 to 220 mc is provided, approximately 5½ turns of a tuning knob being required for tuning from channel 2 to 13.

Input-Output Balancing

The circuit also provides for the balancing out of noise pickup on the transmission line by center-tapping of the input link. Balanced input to the TV set is maintained by center-tapping the output link. The center-tapped input and output links simultaneously provide for a 72-ohm input and output connections, as well as 300 ohms.

Inductance Tuning

Tuning is accomplished by varying the inductance of both L_1 and L_3, which are of silver-clad wire structure. One end of L_1 is grounded directly while one end of L_3 is bypassed by a 1500-mmfd capacitor. Rotation of L_1 and L_3, the windings of which act as lead screws, causes a pair of sliders, *X* and *Y*, to run along grounded phosphor bronze silver plated bars. This action effects a change of inductance by shorting-out a number of turns and leaving the unshorted turns for tuning inductances. To eliminate absorption trap effects of the *shorted* portion of each coil, at certain frequencies, the *X* and *Y* sliders have double contacts and effectively short-out two complete turns.

Tracking Characteristics

Tracking of both grid and plate circuits, considering that L_1 and L_3 are exactly similar, is accomplished by *equalizing* the different input and output capacities of a 6AK5, in terms of frequency. The higher input capacity, in combination with a 16-mmfd series capacitor, resonates with L_1. The lower output capacitor resonates with L_3 and L_5, in series. *Equalization* is therefore realized by reducing the effective grid tuning capacity and increasing the effective plate tuning inductance.

Bandwidth Considerations

Adequate bandwidth is accomplished by closely coupling the input and output links and by shunting resistors R_1 and R_3. These resistors are most effective at the lower frequencies. At the upper frequencies the inherent circuit *Q* is reduced by resistive and capacitive losses and these losses have been found sufficient to effect proper bandwidth. Regenerative effects have been minimized by including short common ground current paths, effective inter-circuit shielding and low inductance bypass circuit elements.

Insertion-Loss Control

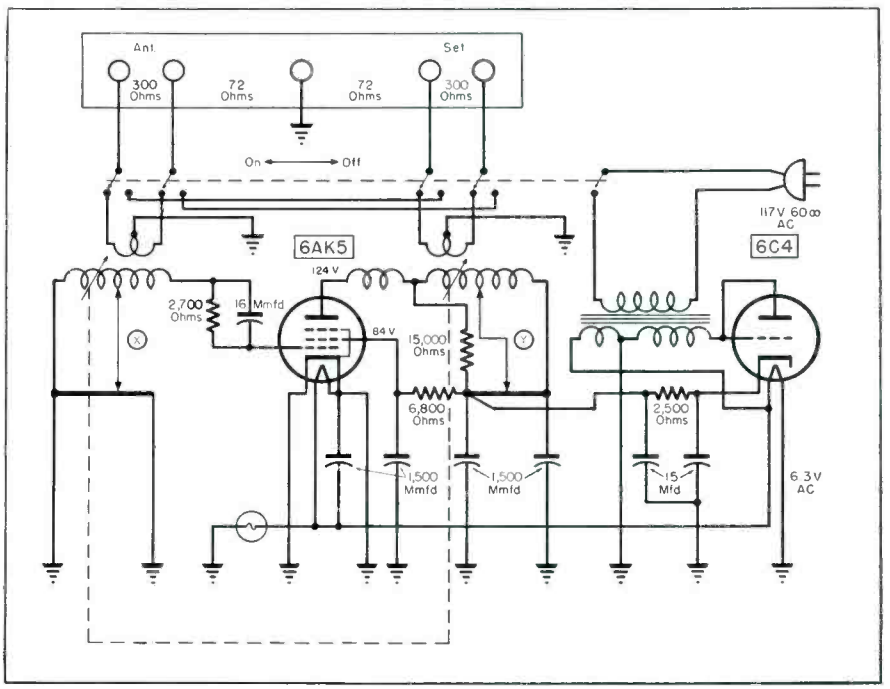
Insertion loss, noticeable when the amplifier is turned *off* and in the so-called *straight-through* condition, has been minimized by maintaining a *300-ohm spacing* and length of the connecting leads from the *ant* terminals, through the slide switch to the *Set* terminals.

Power-System Design

In the power supply system are a 2,500-ohm filter resistor and 15 mfd-input and output capacitors. All by-pass capacitors are 1,500 mmfd at 700 volts, to insure positive *rf* grounding at all frequencies.

[1] Super Sonic IT-4.

Fig. 1. Schematic of the Super Sonic IT4 preamp. The *L* symbols cited in the text refer to the primaries, L_2 and L_4; secondaries, L_1 and L_3; 6AK5 plate coil, L_5; 2700-ohm resistor, R_1, and 15,000-ohm resistor, R_3.



Analysis of the Stewart-Warner AM/FM/TV 9104 Chassis Series . . .

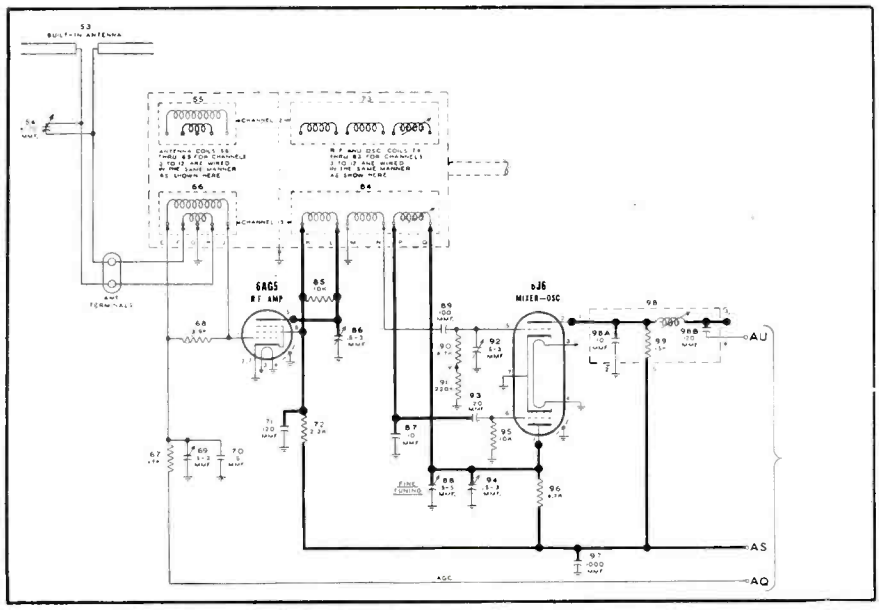


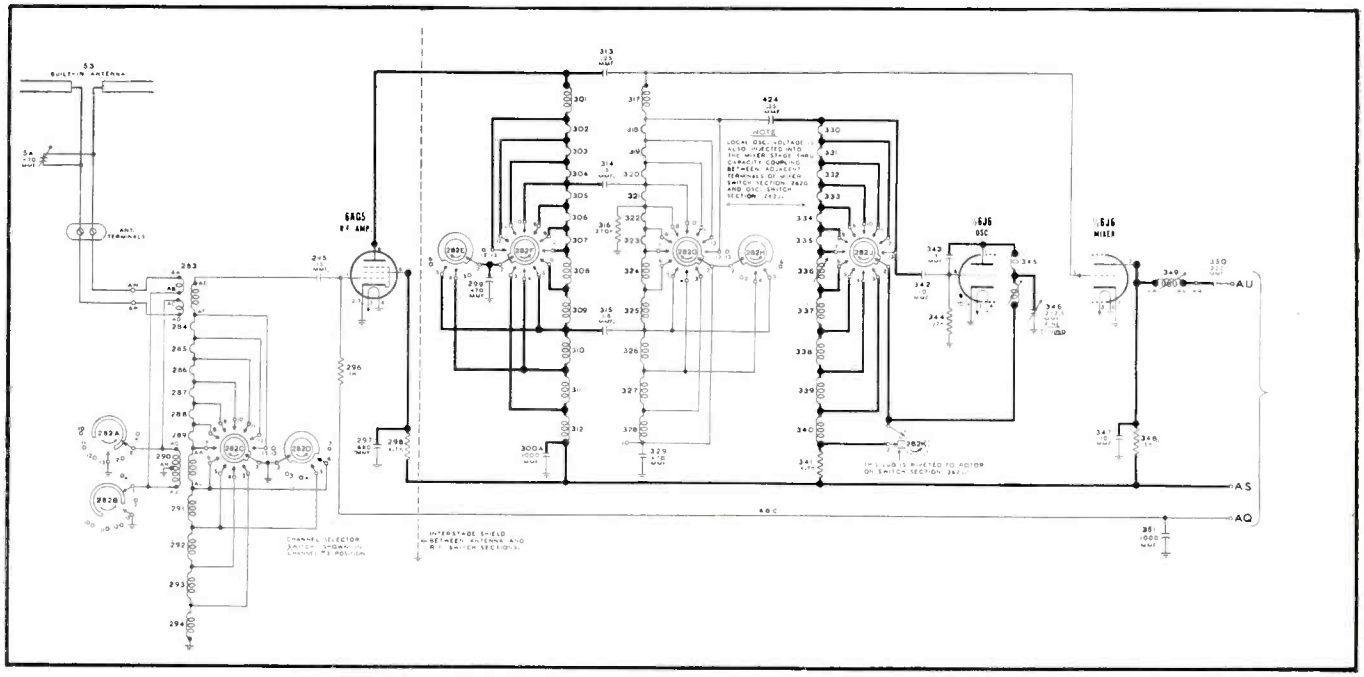
Fig. 1*a*. Turret-type *rf*-tuner assembly of Stewart-Warner TV model.

Fig. 1*b*. Fixed coil and selector-switch *rf* tuner also used in some models of the Stewart-Warner chassis.

COMPLETE RECEIVING SYSTEMS, providing AM, FM and TV services, which a short while ago appeared to have had limited appeal, have now become quite a popular item, with most of the manufacturers producing a variety of low and high-band look and listen units.

In Fig. 1, *a, b, c,* and *d,* appear an interesting example of the circuitry used in these multi-system receivers. In these chassis, Stewart-Warner models 9104-A/9105-B/9104-C, appear an AM/FM tuner, which uses five tubes for reception of FM signals and three tubes for AM.

When the band switch is set to the *FM* position in these models, the received frequency-modulated signal is fed into the cathode of one triode section of a 12AT7 which acts as a grounded grid *rf* amplifier. The other triode section of this tube is used as an FM mixer and its grid circuit is tuned by one section of a gang capacitor. The second, third, and fourth grids of a 6BE6 are tied together and this tube is utilized as a triode for the FM oscillator circuit. The FM sig-



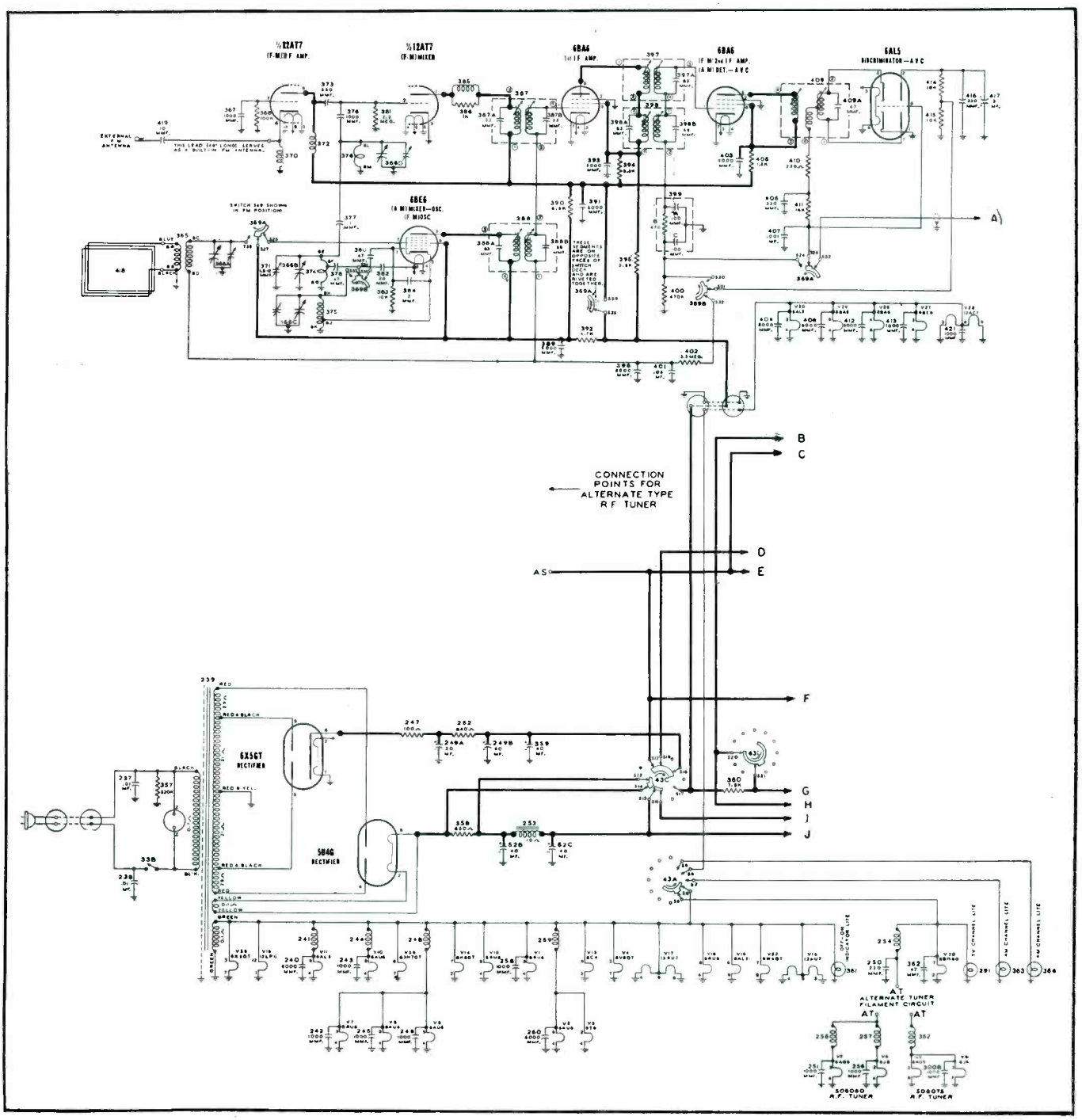


Fig. 1c. The FM tuner, AM mixer and overall power supply system used in the Stewart-Warner TV models; see p. 33 for video section of circuit.

nal is then fed through two transformer-coupled 6BA6 *if* amplifiers. A 6AL5 is used in a radio-type FM discriminator circuit. This stage also provides *avc* voltage which is applied to the grid of the first *if* amplifier stage. Audio voltage developed in the discriminator stage is fed to an audio socket on the TV chassis. A section of the band switch in the TV chassis couples the audio signal across the volume control. The triode section of a 6T8 acts as a sound amplifier and is coupled to a 6V6GT sound-output tube. This stage drives a *PM* dynamic speaker.

The AM Circuit

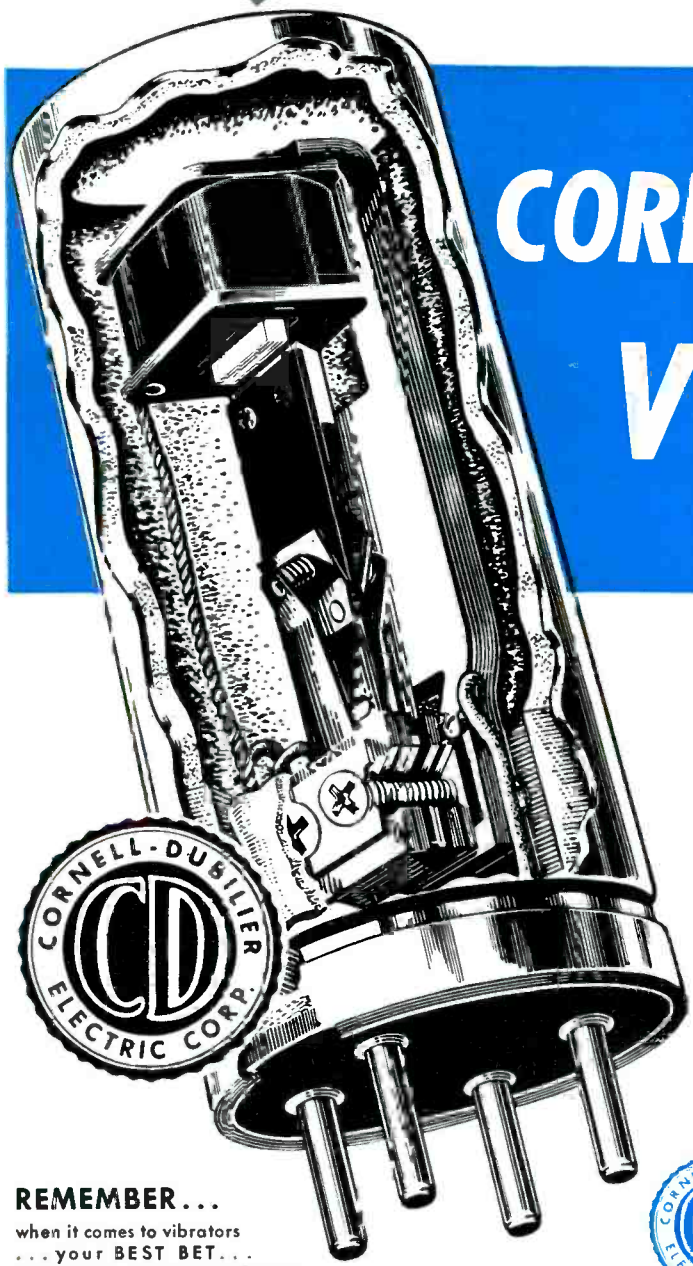
When the receiver is set for AM reception, the amplitude-modulated signal received by a built-in low-impedance loop antenna is coupled to the third grid of the 6BE6, through a tuned-antenna coupling coil. This tube acts as a mixer-oscillator for AM operation, the oscillator section being of the modified Hartley type. The *if* signal is then fed through one stage of transformer-coupled *if* amplification using a 6BA6. The grid and cathode of a second 6BA6 are used as a diode for AM detection and development of *avc* voltage, this voltage being applied to the mixer grid and the grid of the *if* amplifier stage. Audio voltage developed across a 470,000-ohm detector load resistor is fed to the audio system in the TV chassis where it is amplified in the same manner as was the detected FM signal.

TV Chassis RF Circuits

The TV section of this receiver is equipped with a built-in antenna

(*Continued on page 52*)

AS QUIET AS A



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And That's Really Saying Something!

There's a new measure of the word quiet . . . not as quiet as a pin-drop . . . not as quiet as falling snow . . . but AS QUIET AS A CORNELL-DUBILIER VIBRATOR! Built for peak performance under even the most adverse conditions, C-D vibrators are quiet beyond compare! This feature has added hours and hours of trouble-free performance because quiet vibration means less wear and resulting LONGER LIFE!

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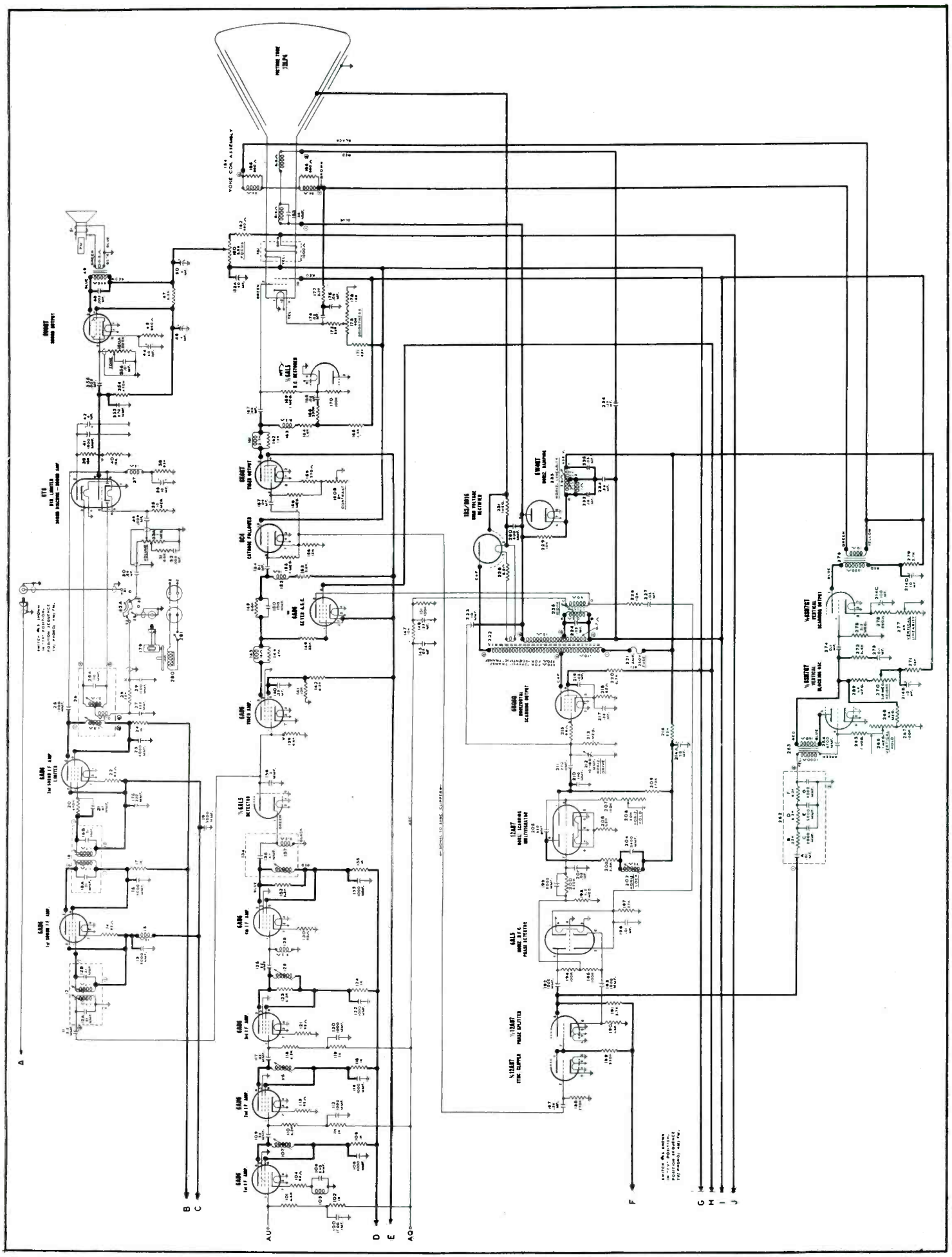

Fig. 1*a*. The sight and sound circuit of the Stewart-Warner TV sets.

NOW! Convert 10"-12½" Quickly, Profitably, Easily with

NEW! NORELCO DUO-VUE world's first dual-purpose TV offers 3′ x 4′ picture—$199.50 list*

NEW! PROTELGRAM "CONVERSION PACKAGE" makes possible huge 234 sq. in. picture for trade-in buyers

This 2½" 3NP4 is smallest projection tube on market, is lowest in cost ($19.50 retail), produces largest home picture (3′x4′).

North American Philips has really BIG PROFIT NEWS for you—and BIGGER, BETTER PROTELGRAM TV pictures for your customers, up to 3′ x 4′ in the sensational NORELCO DUO-VUE now making its world premiere at $199.50 — more television picture for less money than ever before offered!

What is there in it for you? PROFITS from PROTELGRAM's Four-Way Plan described on the right.

Philips makes it easy and profitable for you to—

1. Sell PROTELGRAM to set builders interested in bigger pictures — 13½" x 18".

2. Sell PROTELGRAM for custom-built, large-screen installation, up to 3′ x 4′ for homes, clubs, bars, hotels, etc.

3. Sell NORELCO DUO-VUE, television's newest, finest and biggest picture used with the customer's direct-view table set to produce 3′ x 4′ pictures on a home-movie screen. A flip of a switch selects either picture, and you can connect DUO-VUE to almost any table-model receiver in less than an hour.

4. Sell PROTELGRAM in a conversion cabinet to customers wanting to convert their 10 or 12½" direct-view receivers to a picture larger than a 20" tube gives. And you can make the conversion in less than one hour following the simple, straightforward instructions provided.

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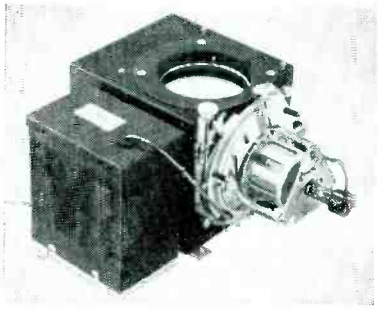
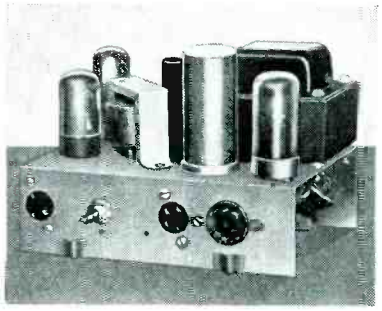


PROTELGRAM UNIT

Projection box measures only 8½" x 9" x 13", contains optical system and alignment assembly, is designed for quick easy service and adjustment. The 2½" 3NP4 projection tube is long-lived, extremely low in cost. Compact 25KV high-voltage unit is only 8½" x 4½" x 7".

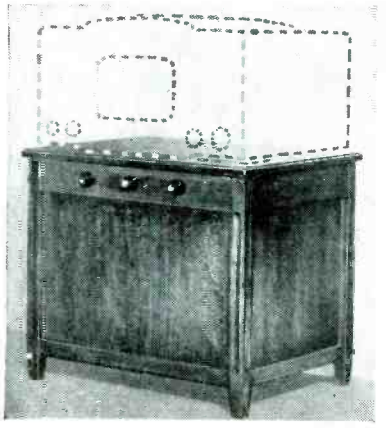


AUXILIARY CHASSIS

New auxiliary chassis fills additional electrical requirements essential to adaption of TV chassis to PROTELGRAM; makes change-over quick and easy. Measures only 8" x 12" x 4".

CONVERSION CABINET

Console cabinet measuring 22" x 27¾" x 46½" provides space for installation of customer's 630 Type TV chassis, comes equipped with complete PROTELGRAM system, auxiliary chassis, cabinet mirror and viewing screen.



NORELCO DUO-VUE

Beautiful cabinet contains PROTELGRAM unit. Only 23½" high. 20" x 26" top holds most any 10" or larger direct-view table model. Concealed ball-bearing casters make it easy to pull out from wall for 3' x 4' viewing on external screen. Offers customers choice of two picture sizes for small and large group viewing.

FOUR-WAY Profit Plan

1 Sell PROTELGRAM to the man who builds his own!

Thousands of TV kits have been sold to the man who likes to build his own equipment. These handymen are ripe for PROTELGRAM, because they can combine it with a TV chassis, get life-size TV at a reasonable cost.

2 Sell PROTELGRAM to custom set buyers

Clients who want built-in installations in walls or cabinets are perfect prospects for PROTELGRAM. Huge picture size, plus compactness and flexibility, makes it the answer for this type of user.

3 Sell PROTELGRAM to trade-in customers

PROTELGRAM sells itself to customers who want bigger pictures, but are reluctant to take a trade-in loss. You can now use their present TV chassis, connect it with PROTELGRAM in a cabinet such as shown at (3) left. They get a 234 square-inch picture, 13½" x 18"

4 Sell NORELCO DUO-VUE for largest home-TV pictures

Only with NORELCO DUO-VUE can you offer both direct-view and 3' x 4' movie-size TV . . . and at a reasonable price. This is the *newest thing in television* for your customers who want the best. Lots of sales opportunities in bars, clubs, institutions and hospitals, too.

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TV Receiver Production Changes

Modification in 1X2, 6X4 or 6BQ6 Circuit of Raytheon Sets to Avoid Streaks Across Picture Tube . . . Filament Circuit Alterations to Prevent 1X2 Failures . . . Revisions in RF Tuner, IF Amplifier and Noise Clipper in Westinghouse Chassis . . . Application of Channel Adjusters in Philco Models . . . New DC Restorer System for G. E. TV Receivers.

by DONALD PHILLIPS

WHITE LINES or streaks running diagonally across the picture tube face may later result in failure of the 1X2, 6W4, or 6BQ6 tubes or damage to the horizontal deflection transformer or blow the fuse.

If this condition is noticed, the trouble can be corrected by making the revisions shown on Fig. 1*:

(*1*) The connections from a terminal lug on the 500-mmfd 15,000-volt capacitor, C_{117}, are removed first.

(*2*) The terminal lug is then removed and replaced with a two-leg terminal strip.

(*3*) Then the capacitor is connected to pin *5* of the 6W4, and a 1.5-megohm resistor connected from the capacitor to the terminal board and pin *1* of the yoke socket.

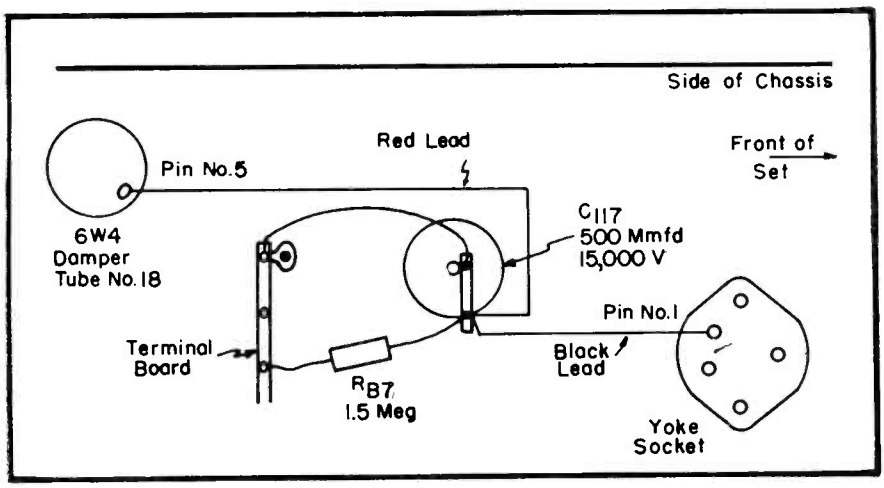
These changes are included in code 4 models of Raytheon M-1101 and C-1102, and code 2 chassis of M-701.

1X2 Tube Failures

To limit the 1X2 filament voltage and prevent tube failures on Raytheon 16AX23/25/26 chassis with group numbers below 7,500, a 10-ohm, ½-watt, 10% resistor must be added in parallel with each of the two 1X2 tube filaments. The resistor should be connected from pin *1* to *5*. Group numbers from 7,500 and up have this modification incorporated.

*Raytheon M-701, code 1; M-1101, and C-1102, code 1-2-3.

Fig. 1. Circuit revision in Raytheon TV chassis to avoid failure of 1X2, 6X4 or 6BQ6, which may introduce white lines or streaks running across picture tube.



Westinghouse V-2150-31 Chassis Changes

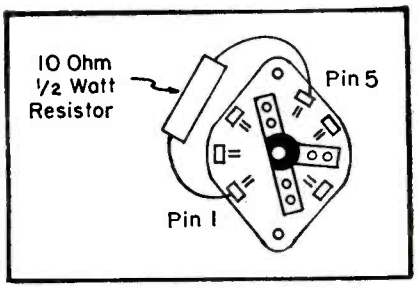
The two chassis (V-2150-1) used in the Westinghouse H-223 models, have had several modifications included in the *rf* amplifier, *if* amplifier and noise clipper.

The screen-voltage circuit in the *rf* amplifier has been altered so that it is now applied from a 125-volt line through a 1,000-ohm dropping resistor, rather than from the common tuner supply line. Improved *agc* operation has been thus obtained.

As the size of the picture tube is increased, greater high-frequency response of the video *if* system is necessary to produce the same apparent resolution as that of a smaller tube. Accordingly, the pass band of the video *if* system has been increased via the use of an additional video *if* amplifier stage. To keep the level of the audio *if* (21.6 mc) 26 db below that of the video *if* (26.1 mc), a 21.6-mc trap was added to the system. The trap is located in the cathode circuit of the 6BJ6 fourth video *if* stage.

A noise clipper, incorporated in some early production chassis, with some types of transmitting conditions, has been found to cause an objectionable buzz. The 1N34 crystal shunted by a 470,000-ohm resistor, and connected to the video test jack at one end through a .05-mfd capacitor to ground at the

Fig. 2. Modification in Raytheon TV sets which limits 1X2 filament voltage and prevents tube failure.



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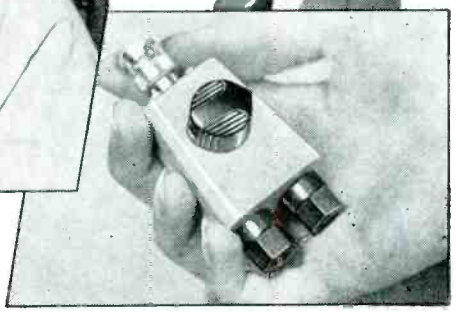

New! Balanced output adaptor (Type ST-8A) permits accurate alignment of balanced input receivers. Now G.E. offers you *both* single-ended and balanced output.

"COMPLETE alignments used to take us half a day when we used a conventional sweep. Now we do them in 15 minutes with our G-E Test Equipment Package!

"We align 60% of the sets that come into the shop—as an extra service to our customers. Result—we've been getting letters from pleased patrons who say their receivers work better than ever! *This has built our service business faster than anything we've done before.*

"We now repair most head ends right in the service shop because the G-E Variable Permeability Sweep has enough output to do the job alone. This G-E Package is the only equipment we've found that will align an inter-carrier circuit receiver quickly and accurately. With it, we get accurate marking of frequency by crystal controlled markers, plus clear visual presentation from the wide-range Cathode Ray Oscilloscope.

"It does more things *better* than any equipment we've ever used. Without it we could never service so many receivers so fast, so accurately!"

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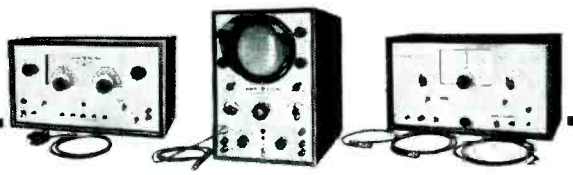

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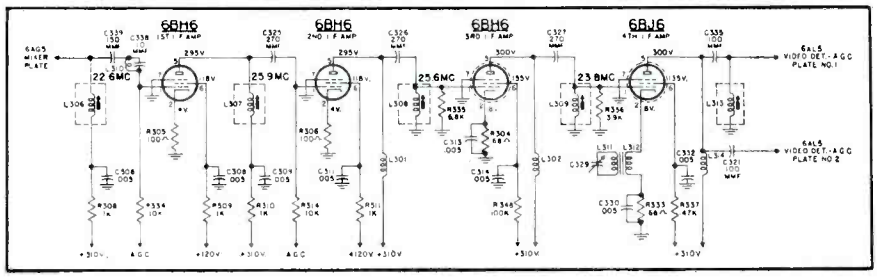


Fig. 3. Revised *if* amplifier in Westinghouse V-2150-01 chassis.

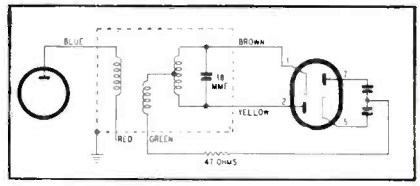


Fig. 4. Philco discriminator circuit, with new type transformer.

other should be clipped from the circuit and discarded if the buzz is encountered.

*Addition of Channel Adjuster to Philco Receivers***

In some locations, to receive sound and picture satisfactorily, it has been found that there is a need for periodic adjustment of the oscillator channel coils.

This may be due to any of four conditions: (*1*) The discriminator transformer and the heterodyne-oscillator may be drifting in such a direction and magnitude that their combined effects are too great for the *afc* system to compensate, with the signal strength available. (*2*) The receiver may be in an area where the signal strength is so low that, for all practical purposes, there is no *afc* voltage developed to operate the *afc* system. (*3*) The 6J6 may be erratic in operation causing severe tuning drift. This type of drift will usually be large, and show up in the first five minutes of operation. The drift can be corrected by replacing the 6J6 with a new tube. (*4*) The sound *if* section may not be aligned correctly. The discriminator crossover may be occurring at an incorrect frequency, or the sound *if* sensitivity may be so low that insufficient *afc* voltage is developed.

To reduce the receiver drift, a new discriminator transformer[1] must be installed. Circuit for this transformer is shown in Fig. 4.

The oscillator-grid-tank capacitor should also be replaced by a 10-mmfd negative-temperature-coefficient compensating unit[2]; the new discriminator transformer must be used when installing the special 10-mmfd capacitor.

In areas where the signal strength is very low, generally where the station produces less than 2 volts *dc* at the *align test* jack, or where new transmitters are scheduled to go on the air, an electronic fine-tuning control, known as a *channel adjuster*, may be added to the receiver.

Channel-Adjuster Features

The *channel adjuster* consists of a potentiometer, which is connected across a positive and negative voltage supply; the arm is connected to the *afc* bus of the receiver. By rotating the potentiometer, the voltage on the *afc* bus is adjusted manually from negative through zero to positive. This manually-adjusted voltage is fed to the heterodyne-oscillator control tube, thus controlling the heterodyne-oscillator frequency manually.

An off-on switch is included, and is used to turn the *channel adjuster* circuit off in areas, or for stations, that provide sufficient signal to supply adequate *afc* voltage.

The basic circuit for the *channel adjuster* is shown in Fig. 5.

The *channel adjuster* off-on switch and the contrast control are incorporated into a dual-potentiometer assembly. The inner shaft is for the *channel adjuster* and off-on switch, and the outer shaft is for the contrast control.

When the *channel adjuster* is installed, a refinement may be made to the oscillator-control circuit to increase the deviation from about .5 mc to at least .75 mc. This refinement consists of changing the 3.3-mmfd neutralizing capacitor to a 2.2-mmfd unit.

When setting up a receiver incorporating the *channel adjuster*, the *channel adjuster* circuit should be turned off and the *afc* voltage adjusted for zero on each station. A 20,000-ohms-per-volt voltmeter, connected to the *afc test* jack, must be used as an indicating device for this adjustment.

In making any adjustment on the oscillator-tuning core in the *channel adjuster* it is necessary to see that the core has sufficient tension on it to prevent it from being disturbed from its correct setting when the turret is rotated. To increase the tension on the oscillator-tuning core, the oscillator channel coil must be removed and

(*Continued on page* 54)

**Based on copyrighted data prepared by Philco.

[1]Philco 32-4317. [2]Philco 30-1224-51.

Fig. 5. Basic Philco channel-adjuster circuit. The 10,000-ohm resistor in the 6AL5 discriminator circuit was not used in the 48-1000, code 121, or early 48-1001, code 122, receivers.

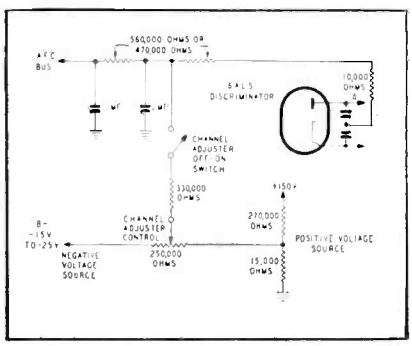
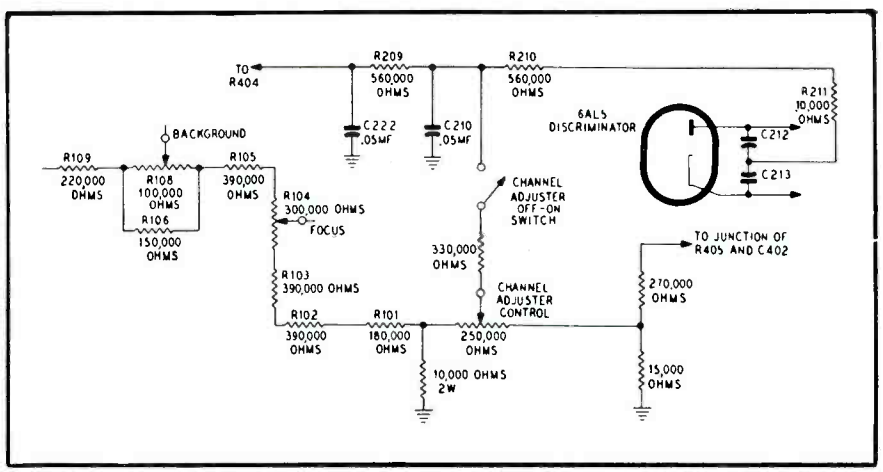
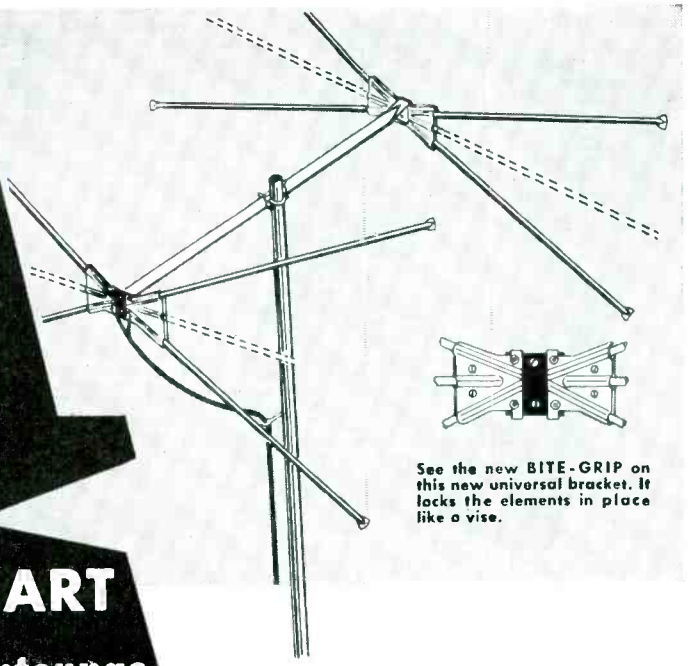


Fig. 6. Channel-adjuster circuit for Philco 48-700.



THE COMPLETE QUALITY LINE at Budget Prices



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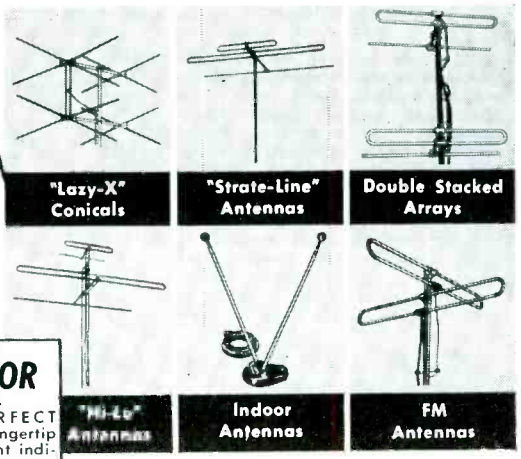

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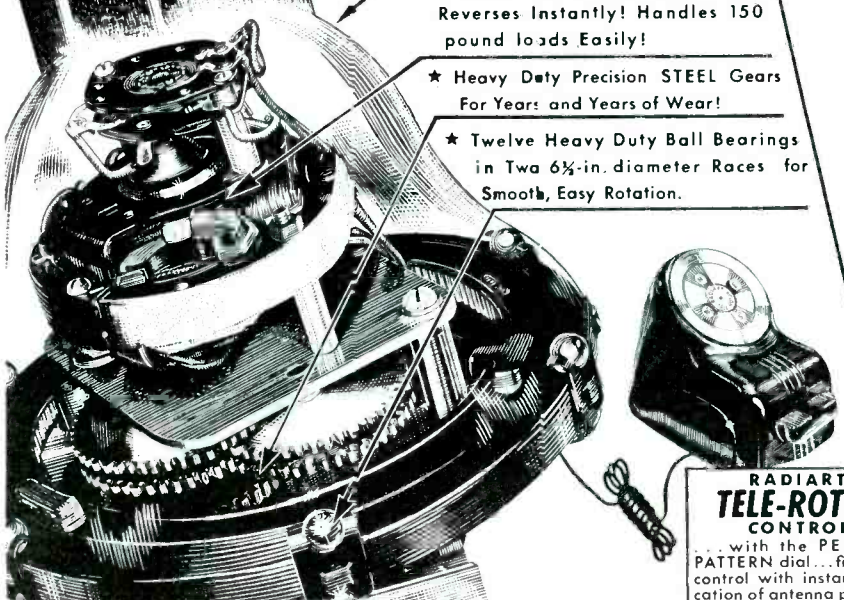
- ★ Powerful heavy duty Motor that Reverses Instantly! Handles 150 pound loads Easily!
- ★ Heavy Duty Precision STEEL Gears For Years and Years of Wear!
- ★ Twelve Heavy Duty Ball Bearings in Two 6½-in. diameter Races for Smooth, Easy Rotation.



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TV . . . FM Antenna Installation

by IRA KAMEN

Manager, Antenaplex and TV Dept., Commercial Radio Sound Corp.

and LEWIS WINNER

Editorial Director, Bryan Davis Pub. Co., Inc.; Editor, SERVICE and TELEVISION ENGINEERING

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ASSOCIATIONS

ETG

THE PHILADELPHIA Radio Service Men's Association has become heir to a new name, *Electronic Technician Guild.*

According to a memo from Richard G. Devaney, the new guild will consist of radio and TV dealers, distributors and their sales personnel, independent radio and TV service shop operators and their employees. The guild will attempt to classify shops and set wage rates and, in addition, regulate working conditions.

Committees will be set up to examine and grade all members and arbitrate grievances between employers and employees. Attendance at the meetings, as well as a proposed technical school or series of lectures, will be compulsory until a *master grade* is reached. Thereafter, attendance will only be required at meetings.

All committees will be composed of groups of three, six and nine and operate on the following basis: one employed Service Man, one service dealer and one disinterested party, probably a jobber or a teacher. It is hoped that with this type of arrangement all hearings will be on a broad impartial basis.

The metropolitan Philadelphia district will witness the inauguration of the guild. After a period of practical operation, other member groups of the Federation of Radio Service Men's Associations of Pennsylvania, and the Empire State Federation of Electronic Technicians' Associations will be invited to participate in the application of the guild principle.

The guild plans call for eventual offers of hospitalization, loan service to financially distressed members and ultimately a retirement pension plan.

ARTSNY

THE INAUGURAL CLASS of 32 Service Men attending the special 24-week training course conducted by The Associated Radio-Television Service Men of New York in cooperation with the Board of Education was graduated recently, the ceremonies occurring at the Manhattan Trade Center, in New York City, where the classes were conducted.

As a result of this training, members of the association who took the course can now be classified as *television technicians,* according to A. P. Henry, in charge of the school. Henry states that those who graduated are now . . . "competent to handle any television servicing job in the industry."

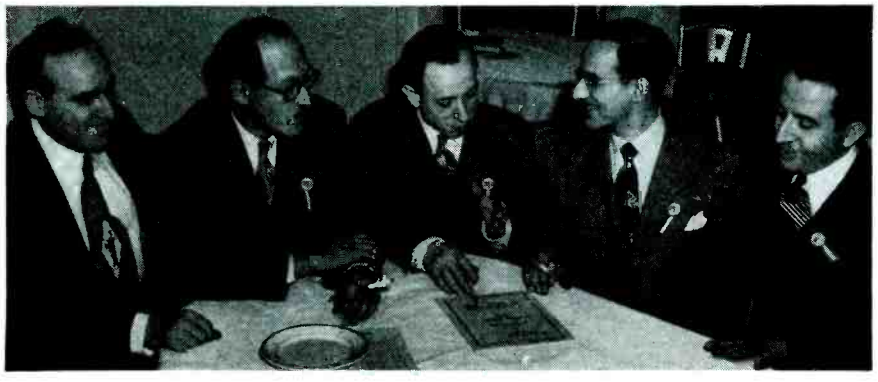
The courses have certainly demonstrated their value, Henry emphasized, and will be conducted indefinitely.

The special ARTSNY television lectures, which were begun during '49, have been extremely successful, too. Recently, members of industry appeared to discuss such topics as 'scope practices, sweep generators, alignment of TV receivers and installation problems.

The first annual entertainment and dance, sponsored by the association and held at the Hotel Diplomat a few

(*Continued on page* 63)

At the recent first annual ARTSNY entertainment-dance, left to right: Joseph Wolk, sergeant-at-arms; Arthur Silverberg, vice president; Max Leibowitz, president; Jerry Maccherone, recording secretary, and Jack Edel, treasurer.



TEN YEARS AGO

From the Association News Page of SERVICE, April, 1940

THE FIRST LESSON of a TV course was presented before the Binghamton Chapter by Wayne Shaw. . . . The third annual banquet and election of officers for the Southern New Hampshire Chapter was held at the Elms in Goffs Falls, New Hampshire. Glen Browning and Chick Evans, manager of WFEA, Manchester, appeared as guests at the banquet. An announcement was made that Arthur Sandborn was the new chairman; Thomas Swist, vice chairman; George Lefebvre, secretary-treasurer and Homer Sawtelle, chairman of the service bench. . . . A round-table discussion of frequency modulation was conducted during the regular monthly meeting of the Williamsport Chapter, held in the meeting room of the YMCA. . . . Emil Maginot, president of the Boston Chapter, appeared before a meeting of the Whaling City Chapter of the Radio Technicians Guild in Labor Temple. RCA presented a demonstration of signal tracing using their dynamic demonstrator at the New Bedford Vocational School. . . . The DeMambro Radio Supply Company of Boston presented Glenn Browning before a Salem Chapter meeting at Eagle Hall, Salem, Massachusetts. Browning discussed frequency modulation and demonstrated the newest in FM equipment. . . . J. H. Smith, Jr., was reelected president of the Institute of Radio Technicians of Hartford, Connecticut. G. Miller was named vice president; H. R. Griswold, secretary, and K. Anderson was reelected treasurer. . . . At the annual meeting of the New Jersey Radio Technicians, held in Paterson, New Jersey, and sponsored by Dale Radio Company, George C. Connor, Hygrade-Sylvania commercial engineer, presented a talk on frequency modulation.

New TV Parts . . . Accessories

PHILIPS-DUO-VUE DIRECT-VIEW/ PROJECTION SYSTEM

The Protelgram large-picture television system has become available from North American Philips Co., Inc., 100 E. 42 St., N. Y. 17, N. Y., in four *packages*: *Duo-Vue*, offering a choice of a direct-view picture or a 3' x 4' (1728 sq. in.) picture projected onto a home movie screen; a *picture booster* for converting small-screen size direct-view chassis to 13½" x 18" size pictures; big-picture projecting unit for custom installations; and as a big-picture component for amateurs building their own receivers.

The Duo-Vue unit consists of a wooden cabinet 26½" wide, 20" deep and 23½" high which houses the Protelgram system and auxiliary chassis.

Connections are provided for attaching Duo-Vue to the chassis of a table model direct-view receiver placed on top of the unit. Has three controls on the front: brightness and focus; picture tilt and change-over switch, direct-view to the 3' x 4' picture.

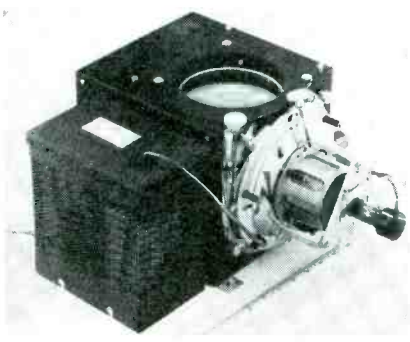
To produce a 3' x 4' picture, the unit is pulled away from the wall on concealed, ball-bearing, rubber-tired casters into a position about nine feet from a standard home-movie screen, on which the picture may be thrown. A white wall will also serve as a viewing surface. Flipping a switch changes over the unit from direct-view to projection. Focusing is accomplished by adjusting the distance from the wall as the picture is projected from the back of the unit.

The Protelgram system can also be used as a *picture booster* in conjunction with the chassis of a small picture direct-view set.

In converting such a set into a receiver the chassis is mounted in a suitable cabinet containing the Protelgram system, auxiliary chassis, screen, mask and mirror.

Almost any standard chassis required for a direct-view tube with magnetic deflection can be used with the Protelgram system. To simplify the conversion an auxiliary chassis, type PA3C, is available. Chassis incorporates: power supply for both the Protelgram high voltage unit and the 3NP4 focus coil; one stage of video amplification; a special protection circuit; brightness and focus controls.

Custom installers can use the Protelgram system which consists of a projection box assembly measuring 8½" x 8½" x 16½". Inserted into the optical box is the tube and socket, and focus, horizontal and vertical deflection coils.

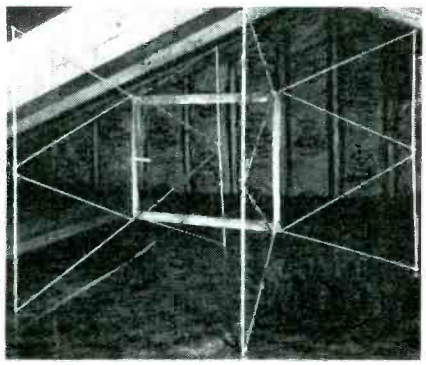


Left: Basic Norelco Protelgram equipment.

TELREX ATTIC V BEAM

An antenna, the *Attic V Beam* has been developed by Telrex, Inc., Asbury Park, N. J.

Antenna is said to require no masts, towers, guy wires, etc. Folds into a compact package for easy handling and placement. Opens up completely assembled, into a full two bay *conical V Beam* array, complete with transmission line. The array is light and entirely self-supporting. It may be suspended or rested on flooring, beams or rafters.



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G.E. TV PICTURE TUBES

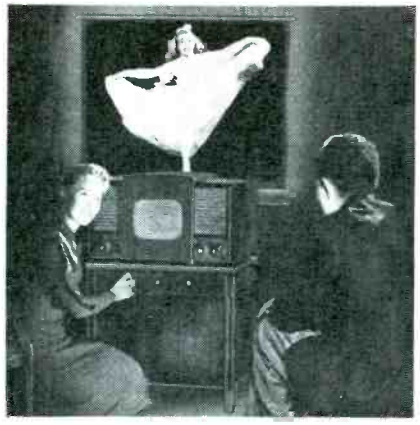
Two dark face TV picture tubes, a 16" glass rectangular (16KP4) and a 19" (19AP4A) metal-coned round-face tube, have been announced by G. E.

An offset gun structure is used in the 16KP4 which is said to permit use of a single field ion trap. The tube is said to have a useful picture area of approximately 140 square inches.

Maximum ratings of the 16KP4 are: anode voltage, 16,000 volts; grid No. 2 voltage, 410 volts; and negative bias value, 125 volts.

The 19AP4A is said to have a useful picture area of about 250 square inches. Its maximum ratings are: anode voltage, 19,000 volts; grid No. 2 voltage, 410 volts; and negative bias value, 125 volts.

* * *



Philips Duo-Vue system.

CAMBURN SALES TV TOWER

A *Jack-Up* television tower has been announced by Camburn Sales and Manufacturing Corp., 392 West Michigan Ave., Battle Creek, Michigan.

Adaptable for either ground or roof installations, the tower is said to be designed to withstand severe wind loads, even when extended to its maximum height of 47'. Tower features provision for attaching pull cords or cables to a jack-up handle and locking handle so that the upper sections can be lowered to 20' level, where they may be reached with a 10' extension ladder whenever service is required.

Mounted on a swivel base and designed for ground or roof installation.

Complete specifications of the tower are available in a bulletin, No. 132.

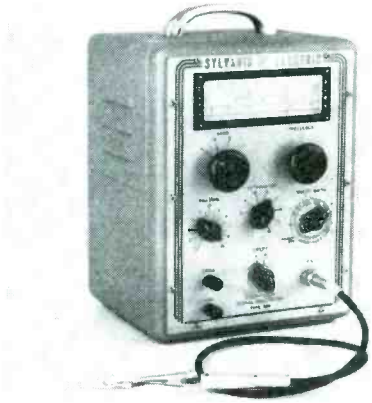
* * *

SYLVANIA SWEEP SIGNAL GENERATOR

A sweep signal generator for servicing FM and television receivers, has been announced by the Radio Tube Division, Sylvania Electric Products, Inc.

The instrument incorporates electronically controlled sweep circuits. FM sweep range is from 0 to 600 kc and television sweep, 0 to 15 mc. Fundamental output frequencies range from 2 to 230 mc in four bands.

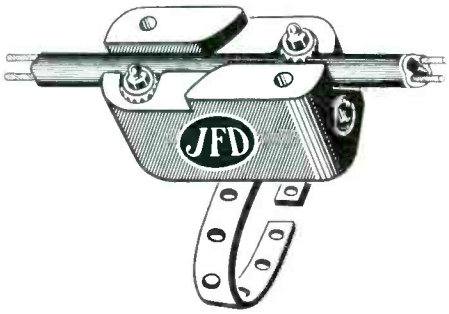
Output is said to be at least 100 millivolts on all bands controlled by an attenuator. Double shielding is said to prevent signal leakage. Wide-range phasing control is said to permit adequate adjustment for single 'scope response curve.



JFD TV LIGHTNING ARRESTER

A lightning arrester, type AT103, designed for heavy and tubular twin lead, has been announced by JFD Manufacturing Co., Inc., 6101 Sixteenth Ave., Brooklyn 4, N. Y.

Approved by Underwriters' Laboratories for outdoor-indoor use. Can be installed on masts, walls, or cold water pipes. No splicing or cutting of the lead is said to be necessary. Leadin is slipped into a slot and tightened in place.



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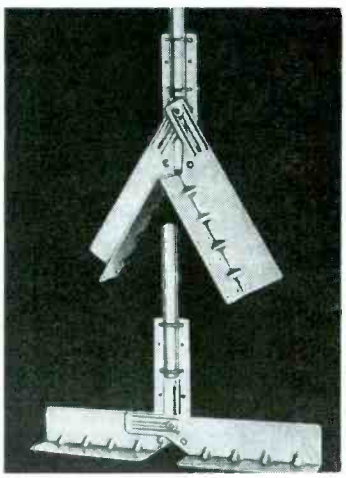
T-V PRODUCTS ROOF MOUNT

A multi-pitch roof mount, model RM-5, has been announced by T-V Products Company, 152 Sandford St., Brooklyn 5, N. Y. Features a scissors-type construction which is said to automatically hold the antenna mast in a true vertical position, regardless of pitch-angle of the roof. When the mast is inserted, the mast-holding section can be either upright or lying along the roof. Constructed of plated steel. Multiple reinforcing ribs are incorporated. Two ¼" thick ridged U-bolts are provided to clamp the mast to the bracket.



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VEE-D-X LIGHTNING ARRESTER

A lightning arrester for use with the four-wire control cable employed with antenna rotators, has been developed by The LaPointe-Plascomold Corp., Unionville, Conn.

The model, RW 204, has been designed to serve dual purposes in that it may also be used for standard 300 ohm ribbon transmission line. Supplied in a low loss, polystyrene case which will not absorb moisture nor deteriorate from weather. Pin point contacts are said to eliminate the need for wire stripping. Installation is accomplished by tightening down cover with two wing nuts.

Phono

(*Continued from page 17*)

and no attempt should be made to use the old V-7102 cut-off lever with a new lift lever. Due to the critical nature of its operation, the lift lever and the cut-off lever should be a matched assembly.

Dropping of Two LP Records at One Time

Reporting on this problem, Westinghouse states that the trouble is due entirely to the record manufacturer's product. The early production records are running below the minimum thickness specified. The thickness has been specified at 0.075" ±0.010", and some records have been measured as low as 0.044". The RMA thickness of a 12" record is 0.090" ±0.010"; therefore, the gate opening in the spindle should pass anything between the limits of 0.065" and 0.100". Any combination of record thickness that totals 0.100" or less will pass through as one record.

The recording corporations have given the industry assurance that all late production will be held to tolerance. However, the early production in the hands of dealers might cause trouble for customers. The difficulty is caused by the record rather than the record changer, and this fact should be explained to those at home. The thin records should be considered in the same light as warped records.

Bridging Power Amplifiers

A two-stage bridging power amplifier,[1] which features inverse feedback control and a voltage-regulated power supply, has become available. The unit will supply 70 watts to any one of several load impedances when bridged across a line of 3.3 volts RMS maximum. Normal power consumption is 240 watts.

Provisions have been made for adding a relay to control plate voltages. The amplifier also has provisions for supplying well-filtered *dc* plate voltage and 6.3 volts *ac* heater voltage to an external amplifier.

It is 16⅜" long, 12" wide, and 8¾" high, and can be mounted in standard cabinets, or in standard cabinet racks on shelves.

Three-Speed Automatic Record Changers

A single-turntable, one tone-arm type of three-speed automatic record player[2] has been developed.

Two interchangeable spindles accom-

Two-stage bridging power amplifier, featuring inverse feedback control and a voltage-regulated power supply. (*RCA*)

modate all records. A wide spindle for 45 rpm remains stationary when records are played, with a small collar revolving. If the user prefers, one spindle can be used throughout by plugging center holes.

Model has an interchangeable head. With this feature, any pickup can be supplied both for the standard and microgroove reproductions. Crystal, magnetic, or the variable reluctance cartridges can be installed.

Changer has a muting switch which eliminates sound while the changer operates on run-in and run-off grooves.

The tone arm, jewel mounted, is a parallel-lift type, for improved tangent tracking.

Speed is maintained throughout a wide variation in line voltage. The turntable is heavily weighted to give flywheel action so that any variations in the drive motor are not reflected in record reproduction.

[1]RCA MI-12188.
[2]Garrard RC-80; Garrard Sales Corp., 164 Duane St., New York 13.

Blast filter (model 335) recently developed for use with Electro-Voice models 630, 635 and 650 dynamic microphones. The filter is said to stop breath blasts even when the speaker must work extremely close to the microphone.

Explosion-proof type speaker assembly, employing a reflex trumpet speaker and integral 30-watt driver, with a built-in multi-tap matching transformer. Maximum power output is 30 watts; frequency response, 200-10,000 cycles; impedances 16, 500, 1000, 1500, and 2000 ohms. Overall dimensions: length, 19"; height 16". (*University Loudspeakers, Inc., 80 South Kensico Ave., White Plains, N. Y. Photo, courtesy Bakelite Division, U.C.C. Corp.*)

TV Circuitry

(*Continued from page 23*)

the full 4-mc bandwidth it is absolutely necessary to have at least three stages of *if* amplification.

A modified bandpass-filter coupled amplifier will give excellent adjacent channel selectivity and deliver a good strong video signal to the video amplifier, and it will also deliver a strong audio signal to the sound *if* stage preceding the ratio detector.

IF Sound Amplifier

In the *if* sound amplifier, the audio signal is picked up from the plate of the video amplifier and sent through a separate audio *if* stage, through a ratio detector, and on to the audio amplifier. In receivers using the intercarrier method, the sound system can use fewer tubes, since at least two of sound *if* stages are eliminated by the intercarrier system. A single stage of sound *if* in the intercarrier setup can be operated at a frequency of 4.5 mc. The use of a single sound *if* stage has been found so adequate that a number of commercial receivers now on the market are employing just this type of circuit. In Fig. 5 appears a simplified schematic of the sound *if* and ratio-detector strip.

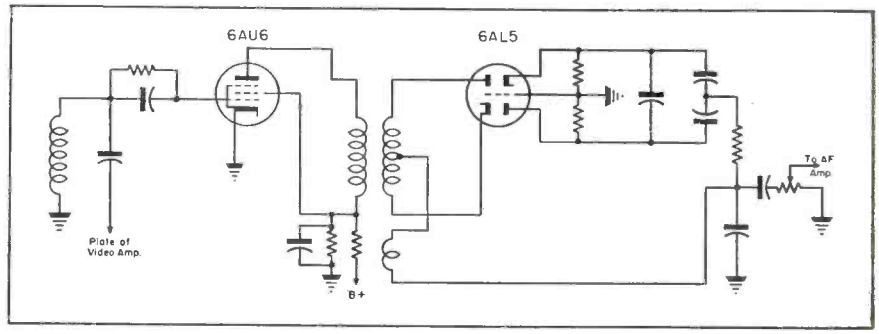
In Fig. 6 appears a response curve of the signal fed to the input of the video detector. It will be noted that the sound *if* frequency of 21.9 mc is not completely attenuated and is located at about the center of a step on the slope of the curve, at least 95% below the maximum height of the curve. This is due to the elimination of sound traps in the *if* stages.

Channel Number	Picture Carrier	Carrier Picture IF Frequency		Oscillator Frequency	Sound Carrier	Sound Carrier IF Frequency	Oscillator Frequency
5	77.25	+26.40	=	103.65	81.75	+21.90	103.65
6	83.25	+26.40	=	109.65	87.75	+21.90	109.65
7	175.25	—22.40	=	152.85	179.75	—26.90	152.85
8	181.25	—22.40	=	158.85	185.75	—26.90	158.85

Table 1

Table illustrating application of *hf* and *lf* oscillators in intercarrier type receivers.

Fig. 5. A simplified schematic of an *if* and ratio-detector strip.



One of the important requirements for the operation of this system is the shaping of the video *if* amplifier passband, so as to obtain the proper voltage ratio between the video *if* carrier and the sound *if* carrier at the input to the video detector. This input to the video detector must be properly dominated by the picture *if* carrier, as indicated in Fig. 6. When the picture carrier frequency is 50% below the maximum height of the curve, the sound *if* carrier must be attenuated not less than 95%. And this relationship must be maintained.

The output of the video detector is fed into a 6AG7 video amplifier and a 4.5-mc trap is used to pick off the FM sound signal from the plate of this video amplifier. This trap prevents the sound *if* signal from interfering with the picture signal.

Low Side Oscillators

In some circuits using the intercarrier system improved stabilized operation of the oscillator has been obtained thtrough the use of a high-frequency oscillator on channels 2 through 6, and a low-frequency oscillator for channels 7 through 13. In Table 1 are shown frequencies to illustrate this principle.

Curves of a typical *if* response, resulting from the use of the high and low side oscillator frequencies, appear in Fig. 7(*a*) and (*b*). The amplification is the same whether the sound carrier is on the high side of the curve or on the low side of the curve. The beat frequency of 4.5 mc is accepted by the sound *if* system regardless of whether the oscillator is operating above or below the carrier frequency.

Tuning a circuit containing the intercarrier system is simplified since oscillator frequency drifting during the warm-up period does not affect the sound, because only the position of the carriers on the *if* response curve will change. A variation of as much as 200 kc would not be noticeable on a 4.5-mc bandwidth. Hum modulation and local oscillator microphonics are also eliminated in the intercarrier system because both picture and sound carriers are affected simultaneously, without changing the 4.5-mc difference frequency.

The sound discriminator may be either the limiter-discriminator (or some other type), or the ratio detector. The ratio detector has been selected for the circuit illustrated because it provides a high audio-frequency output for the 25-kc FM deviation, that occurs in the sound system of the TV receiver. The ratio detector is quite stable in the tuning mechanism.

Fig. 7. Curves of a typical *if* response which result from use of high and low-side oscillator frequencies. Curve in (a) represents results of an oscillator operating above carrier frequency, while that in (b) covers an oscillator operating below a carrier frequency.

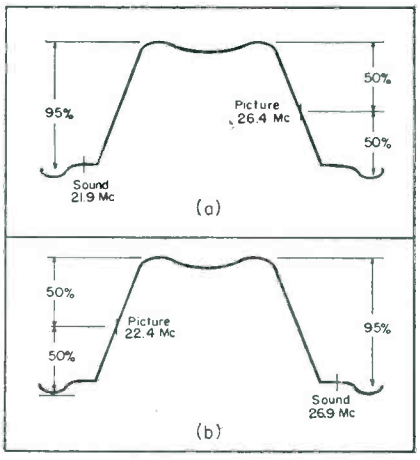
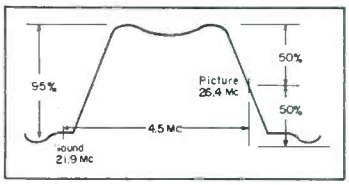
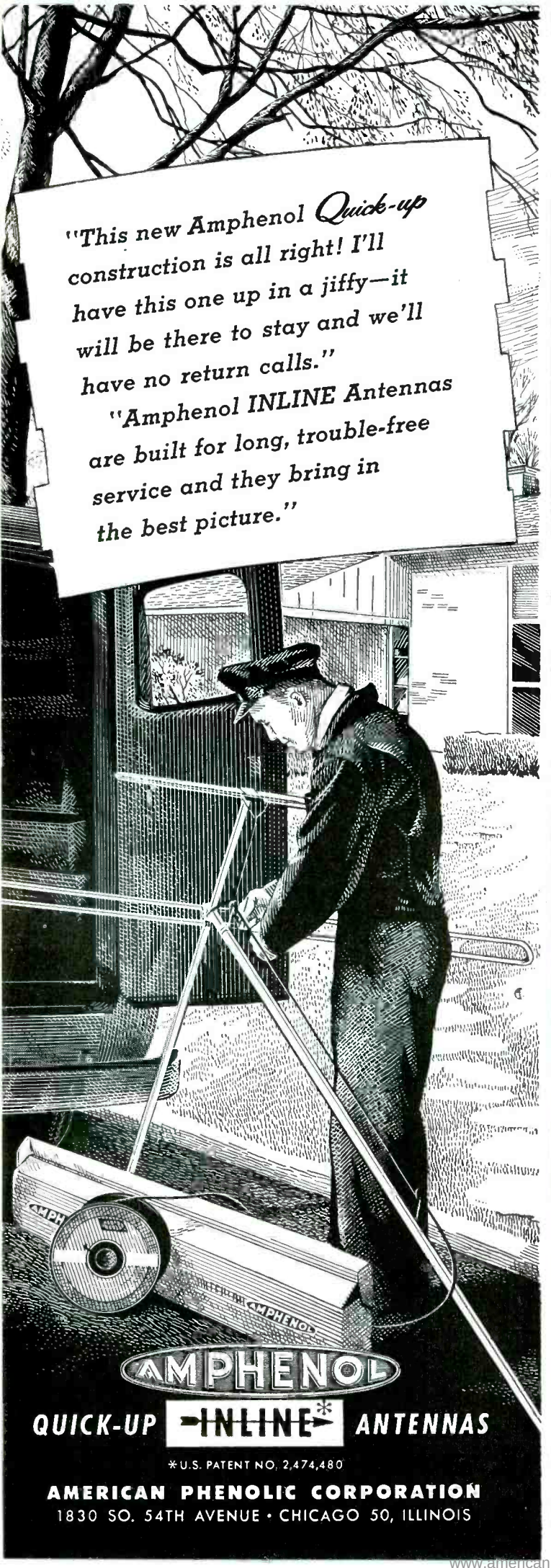


Fig. 6 (below). An *if* response curve produced in an intercarrier system.





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NOW SELETRON brings you these two new models ideally suitable in size and rating: No. 5S1 at 500 Mils — No. 8Y1, the "baby" of them all, measuring only ½" square and rated at 20 Mils, 130 volts. While these rectifiers are designed to meet television needs, engineers will find many applications for them in other electronic circuits. Other bias type rectifiers rated up to 250 volts will also be available.

A new leaflet on Bias Type 8Y1, describing its circuit possibilities is available. For a copy, write Dept. SE-3.

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New Parts . . . Instruments . . . Accessories

VACO SCREW DRIVER WITH BUILT-IN FLASHLIGHT

A screw driver which has a handle containing a flashlight bulb, battery, and directional lucite lens, has been announced by Vaco Products Co., 317 E. Ontario St., Chicago 11, Ill. The flashlight operates by turning a knurled knob in the handle dome and will remain illuminated until switched off.

Called the *Vaco Amberyl Flashlight Screw Driver*, the handle is said to be constructed of break-proof, shock-proof, fire-safe Amberyl.

Standard blade is of forged chrome vanadium.

Supplied in three sizes: Model No. FL-24, overall length of 7⅝", with a handle 1" x 3⅝" and a blade ⅛" x 4"; No. FL-34, 8⅝" in length, with a handle 1" x 3⅝", and a blade 3/16" x 5", for slotted screws, and No. PFL-1 with a 3/16" x 5" No. 1 Phillips bit for cross-slot screws.

* * *

MERIT ELECTRONIC VTVM-OHMMETER KITS

A line of measuring instruments in kit form, to be merchandised through a kit division, the *Merit Electronic Instrument Company*, has been announced by Radio City Products Co., Inc., 152 West 25th Street, N. Y. 1, N. Y.

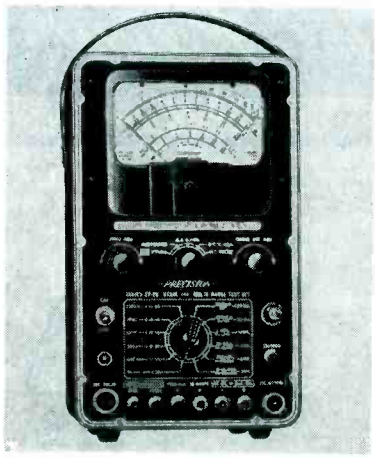
The first units to be produced are vacuum-tube voltmeter-ohmmeter kits, model HV345K, with high voltage features for TV application. Has 30 ranges including 9 *dc* vtvm ranges: 0-5-25-100-250-500-1,000-2,500-10,000-25,000 volts, with complete high voltage safety multiplier probe. Includes the conventional *ac* ranges, 5 ohmmeter ranges up to one billion ohms, *db* ranges from —20 to +62, and a zero center discriminator alignment scale.

PRECISION APPARATUS VTVM AND MULTI-RANGE TEST SET

A portable vtvm and multi-range test set, series EV-20 has been announced by Precision Apparatus Company, Inc., 92-27 Horace Harding Blvd., Elmhurst, L. I., N. Y.

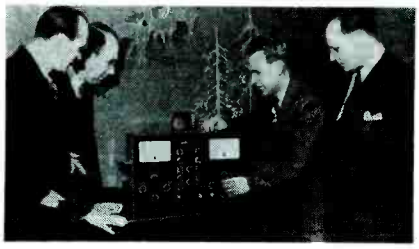
Instrument is said to be a complete *vtvm-megohmmeter*, with true zero-center on all vtvm ranges, plus direct-reading high-frequency scales. In addition it it said to provide full standard 100-ohm per volt functions. Affords 48 ranges to 1200 volts, 2000 mehogms, 12 amperes, +63 db and *dc* vtvm ranges to 12,000 and 30,000 volts, when used with the Precision TV super-high voltage test probe.

The direct-reading, all-zero center vtvm is said to indicate both polarity and magnitude without switching or test lead reversal. Unit also has a voltage-regulated bridge circuit; master range and function selectors; shielded connectors for both *dc*-vtvm and *rf*-vtvm which is said to permit simultaneous and non-interfering connection of both the *dc* circuit isolating test probe and optional high-frequency vacuum-tube probe, type *RF10A*.



* * *

SIMPSON GENESCOPE



Four of Chicago's service managers studying the recently announced Simpson Genescope, model 480, designed for FM and TV servicing: Max Schinke of Admiral, Frank Smolek of Zenith, Ed Croxen of Hallicrafters and Tim Alexander of Motorola.

The Simpson Genescope is both a signal generator and a 'scope combined, the 'scope being complete for both alignment and separate general 'scope purposes.

Model features a top center mirror which is said to eliminate the necessity for aligning the eye with a central opening for viewing. The mirror reflects from any adjusted angle, and also deflects incident light. To protect the cathode-ray tube within the 'scope, the mirror folds down when not in use.

ELECTROX VIBRATOR ANALYZER AND POWER SUPPLY TESTER

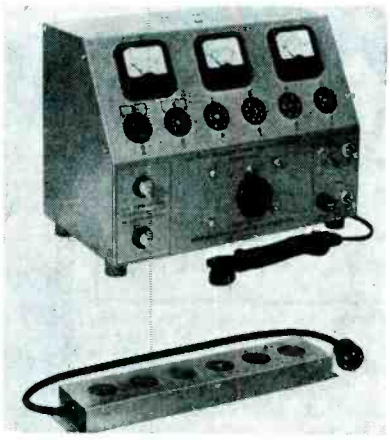
A vibrator analyzer and power supply, model AR-3, which combines an adjustable power supply that is said to provide smooth, hum-free *dc* in any voltage needed to bench test auto radios, and a vibrator analyzer that will test practically all types of synchronous and non-synchronous vibrators found in auto radios, has been announced by The Schauer Manufacturing Corp., 2060 Reading Road, Cincinnati, Ohio.

Vibrator analyzer is said to determine shorted and otherwise defective vibrators and predict vibrator failures before they occur. It measures starting voltage, current consumption, output voltage and indicates irregular or intermittent operation. Unit subjects the vibrator to voltage conditions normally encountered when connected to the electrical system of the car. In addition, provision has been made so that a standard 'scope can be attached to the vibrator analyzer for wave form observation. Over-voltage is available for starting vibrators with oxidized contacts, and rectifier tubes types 6X5 and OZ4 can also be checked.

The power-supply output is adjustable from 0 to 8 volts *dc* at 12 amperes continuous rating; 24 amperes intermittent rating. A selenium rectifier is used for full-wave rectification.

The most common types of vibrators are tested by plugging them into sockets located on the main unit. Less common types of vibrators are tested by plugging them into an adapter strip, an accessory item.

Controls provided include a control knob for adjusting the *dc* output of the power supply as well as the *dc* voltage applied to the vibrator under test. A selector switch is provided for synchronous and non-synchronous vibrators. Meters include one 0-15 ampere *dc* ammeter; one 0-10 volt *dc* voltmeter and one 0-500 volt *dc* voltmeter.



NEWS

SYLVANIA TV RECEIVER SERVICING BOOK

A 128-page loose leaf book containing information on the servicing and maintenance of television receivers has been announced by the Radio Tube Division, Sylvania Electric Products, Inc.

The book, entitled *Servicing TV Receivers*, illustrates fifty-three screen patterns which reflect poor circuit operation and need of adjustment, and describes the cause and remedy for each condition. In addition, seventeen wave-form patterns are presented which show 'scope traces as they should appear when taken from the output of tubes in key circuit components. Eight alignment response curves provide correct patterns for comparison with actual 'scope patterns traced during checking and servicing.

Chapters of the book deal with servicing precautions; how television works; test patterns; deflection circuits; video circuits; audio circuits; low and high-voltage power supply; alignment of set; ion trap magnet adjustment; deflection yoke adjustment; handling of picture tubes; and test equipment used in television servicing.

Seven schematic drawings, including one for a complete receiver, complement the text. Distribution of the book is through authorized Sylvania distributors only.

* * *

WARD TV/FM ANTENNA MANUAL

A 16-page booklet on TV and FM antennas, *The Story of the Magic Wand*, has been published by Ward Products Corp., 1523 E. 45 St., Cleveland 3, Ohio.

The booklet, which covers development and application of antennas, contains thirty-four illustrations and three pages of definitions.

Section titles of the booklet are: *Antenna Development, Theory of Propagation and Transmission, Basic Antennas, Parasitic Arrays, All-Channel Antennas, High Gain Broad-Band Antennas, Indoor Antennas, Unidirectional All-Channel Antennas, Matching and Balancing, Transmission Lines,* and *Conical Antennas.*

* * *

LEGION OF HONOR CONFERRED ON AUSTIN LESCARBOURA

For technical assistance rendered over many years and more recently to industrial missions sent here in conjunction with the rehabilitation of postwar France, Austin C. Lescarboura of Croton-on-Hudson, N. Y., has been awarded the French Legion of Honor.

This is the third French decoration to be awarded to Lescarboura. In 1919 he received the Officier d'Academie decoration, followed by his promotion to Officier de l'Instruction Publique in 1947.

* * *

CONNEEN NAMED SNYDER EASTERN FIELD REP.

George Conneen has become field rep for Snyder Manufacturing Co., and will represent Snyder in the eastern seaboard territory from Maine to Florida.

PRECISION APPARATUS SPONSORS NATIONWIDE LECTURE-DISCUSSION

The first in a series of nationwide lecture-discussions, co-sponsored by the Precision Apparatus Co., Inc., Elmhurst, N. Y., and its affiliated distributors, was held recently in Queens Village, Long Island, New York.

The opening discussion was sponsored in conjunction with Chanrose Radio Distributors, Peerless Radio, Norman Radio, Island Radio and Harrison Radio, all of Long Island. Among the distributors present were Peter Chanko, president of Chanrose Radio, and chairman of the Metropolitan New York chapter of NEDA, and Charles Shankman, president of Peerless Radio.

Sessions are being conducted by R. G. Middleton, senior engineer of the Precision design and application engineering section, under the general title of *Television Circuitry, Video IF, Alignment Practice* and *Trouble Shooting*. There is no charge for admission.

Subsequent lectures were held in Brooklyn, N. Y.; Bronx, N. Y.; Union City, N. J.; Albany, N. Y.; Toronto, Canada; Buffalo, N. Y.; Erie, Pa.; Pittsburgh, Pa.; Johnstown, Pa.; Lancaster, Pa.; Philadelphia, Pa.

The lecture-discussions will also be given in Boston, Mass.; Providence, R. I.; New Haven, Conn.; Wilmington, Del.; Baltimore, Md.; Washington, D. C.; Richmond, Va.; Cleveland, Ohio; Toledo, Ohio; Detroit, Mich.; Grand Rapids, Mich.; Milwaukee, Wisc.; Minneapolis, Minn.; Omaha, Nebr.; Kansas City, Mo.; St. Louis, Mo.; and Chicago, Ill.

R. G. Middleton conducting a Precision Apparatus lecture.

* * *

SIMPSON ELECTRIC AND AMERICAN GAGE MERGE

The American Gage and Machine Co. has merged with the Simpson Electric Co.

Ray Simpson, founder of Simpson Electric, will remain as chairman of the Simpson Electric Division.

Herbert Bernreuter has been elected a vice president of American Gage and will act as operating head of the Simpson Division. Wallace E. Carroll, founder of the parent company, will remain as president.

* * *

LOU KAHN NOW AEROVOX RESEARCH DIRECTOR

Louis Kahn has been appointed Director of Research of Aerovox Corporation, New Bedford, Mass.

Joining Aerovox in 1937, Kahn has been identified with the organization's research and engineering, first as electrical engineer and later as assistant chief engineer. During the last war he was a member of the Capacitor Industry Committee working on capacitor standards.

He is a director of Aerovox Canada, Ltd.

RIDER TV MANUAL VOLUME 4 IN PRODUCTION

Rider Television Manual Volume 4 is now being prepared by John F. Rider, Publisher, Inc., 480 Canal Street, New York 13, N. Y.

Manual will have the equivalent of 2300 pages (8½" x 11"). Factory-authorized data of more than 70 manufacturers will be represented.

A partial list of data to appear in TV 4 includes: Direct view and projection receivers, boosters, tuners, kits, test patterns, waveforms, schematics, voltages, parts lists, alignment procedures, up-to-date revisions on old models, etc.

Priced at $21.00.

BOWEN NOW CANNON ELECTRIC CHIEF ENGINEER

Roger Bowen, formerly with the U. S. Signal Corps, has been named chief engineer of Cannon Electric Development Co., Los Angeles, Calif.

D. Frank Jackson, who has been acting chief engineer since the death of Edward Neifing in 1947, will continue in the engineering department as chief assistant to Bowen.

* * *

GLOBE-UNION ADDS THIRD MILWAUKEE PLANT

Acquisition of two Milwaukee buildings with 42,000 square feet of floor space, formerly occupied by the Eclipse Molded Products Co., has been announced by Globe-Union, Inc.

Ser-Cuits

(*Continued from page 31*)

which can be tuned through the entire band by means of a trimmer placed at the end of a stub in a built-in antenna transmission line. An antenna terminal strip provides a means of connection of transmission line from an outdoor antenna.

Two types of *rf* tuner units are used, one having a turret type conctruction, and the other a fixed coil and selector switch type construction.

In the turret-type tuner channel selection is accomplished by rotation of a turret containing two sets of removable coil assemblies for each channel. The individual antenna coil sections consist of a balanced primary to minimize noise pickup on the transmission line and an *rf* grid coil which couples the incoming signal to the grid of a 6AG5 *rf* amplifier. The inductance and amount of coupliug of the tuned antenna input circuit are changed as the turret assembly is rotated, to maintain a constant input impedance of 300 ohms to the receiver. This has been found to provide maximum energy transfer to the *rf* amplifier stage, particularly when interconnection between an outdoor antenna and the antenna terminal strip is made with a transmission line of the 300-ohm type.

The second section of turret coils includes the tuned *rf* amplifier plate coil, tuned mixer grid coil, and oscillater coil. The output of the *rf* amplifier stage is coupled to the grid of the mixer stage, which utilizes one triode section of a 6J6. The other half of the 6J6 is connected as a modified Colpitts oscillator which injects oscillator voltage into the mixer stage through coupling between the oscillator coil and the mixer grid coil. Coarse oscillator tuning is accomplished by adjusting the positions of slugs in individual oscillator coils, while fine tuning is obtained when using a 3 to 5-mmfd capacitor in the oscillator plate circuit. This capacitor is composed of two fixed plates, and its capacitance is changed by the insertion of a bakelite cam between these plates.

In the fixed-coil/selector-switch tuner the inductance and amount of coupling of the antenna input coils are changed by switch sections, as a channel selector switch is rotated to maintain a constant input impedance. of 300 ohms to the receiver.

A 6AG5 is used for *rf* amplification and the plate circuit of this stage is tuned by varying its inductance. When the channel selector switch is in the channel-2 position, twelve *rf* coils are connected in series, but each time the channel selector is advanced to the

next channel higher in frequency, one coil is shorted out by a switch section.

A similar tuning arrangement is used in the grid circuit of the mixer stage, which utilizes one triode section of a 6J6. The other half of the 6J6 is connected as a modified Hartley oscillator which injects oscillator voltage into the mixer stage through a 25-mmfd capacitor and also through capacity coupling between adjacent terminals of switch sections. Oscillator tuning is accomplished in the same manner as the *rf* plate and mixer grid tuning, with the addition of a 1.2-2.5 mmfd fine tuning control in the oscillator plate circuit.

Composite Picture and Sound IF Circuits

The *if* picture and sound signals are taken off at the plate of the mixer stage and pass through four stages of *if* amplification, using four type 6AU6s. A stagger-tuned *if* system is utilized in this receiver and correct response is obtained by properly positioning the slugs in five plate-circuit coils. A sound trap is located in the cathode circuit of the first *if* amplifier stage and is used to shape correctly the response curve at the sound *if* carrier frequency.

All *if* stages contain plate and grid decoupling networks to prevent interaction between stages, and all cathode resistors are unbypassed to improve stability of the *if* system.

Detector Circuit

Both picture and sound *if* signals are injected at the cathode of one diode section of a 6AL5. This stage detects the video signal and develops a negative-going video voltage across a 6800-ohm detector load resistor. It also acts as a converter in producing the 4.5-mc difference frequency between the 26.75-mc video carrier and the 22.25-mc sound carrier.

The video detector output is directly coupled to the grid of the first wide-band video amplifier, which uses a 6AU6. This stage amplifies the composite video signal and also acts as a noise limiter. Noise peaks on the negative-going video signal drive the 6AU6 beyond cutoff, and are therefore not present in the plate circuit of this stage.

The composite video signal is coupled to the grid of a 6C4 connected as a cathode follower. The output is taken off the cathode of this stage and provides a more stable sync signal for control of the horizontal and vertical sweep circuits.

A second stage of wide-band video amplification provides a video signal of sufficient strength and correct polarity to drive the 12LP4 picture-tube grid. The contrast control is located in the cathode circuit of a 6K6GT video-output stage and controls the amount of degeneration in that stage.

Keyed AGC Circuit

The plate of a 6AU6 keyer *agc* tube is returned to ground through a coil that is coupled to a width coil and a 100,000-ohm *agc* load resistor, and a pulsating plate voltage is applied to this tube during the horizontal sweep pulse intervals. Thus, plate current flow is only possible during the brief interval (approximately 8% of a cycle) that the plate voltage is *keyed* by the sweep pulse. The amount of plate current that will flow through the keyer tube during each pulse of plate voltage is determined by the instantaneous grid voltage being applied to the tube, and that corresponds to the composite signal amplitude at the sync level as it appears in the plate circuit of the first video amplifier. Since the keyer tube grid is

(*Continued on page* 56)

Production Changes

(*Continued from page* 38)

the Tinnerman clip, which applies tension to the tuning core, carefully spread.

Another suggestion for securing the tuning core is to make a rough oscillator adjustment, then remove the oscillator channel coil and apply a small amount of fast-drying cement across the clip and the threaded shank of the core. Then the coil can be reinstalled and a fine oscillator adjustment made. The use of cement is especially recommended when many previous oscillator adjustments have been made.

In using the *channel adjuster,* it should be turned *on,* and adjusted for undistorted sound. If there is a tendency for the sound to drift and become distorted, a slight adjustment of the *channel adjuster* may be necessary during the operating period.

G.E. 12T3, 12T4, 12C107, 12C108, and 12C109 B-Version

These receivers incorporate a new type head-end which use a grounded-grid circuit in the first *rf* amplifier employing a 6AB4 and stagger tuned circuits on both high and low channels. To improve tracking, two trimmers

Fig. 9. DC restorer circuit of G. E. models 12T1, 12C101, 12C102 and 12C105 which has been modified, the 1N65 diode having been removed.

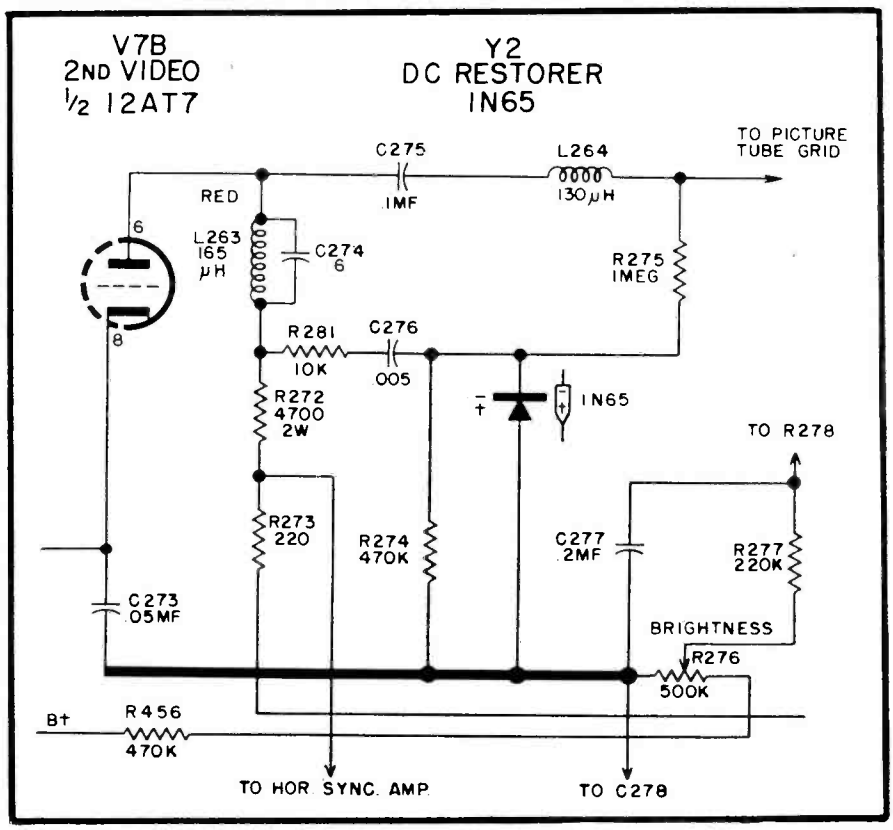


Fig. 7. Channel-adjuster circuit for Philco model 48-1000, codes 121 and 125.

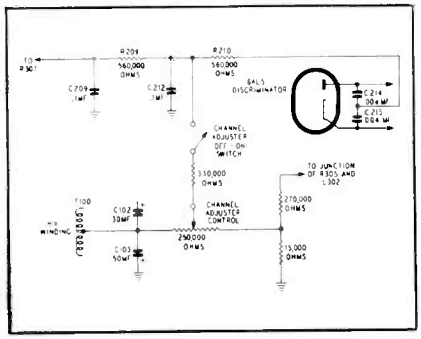
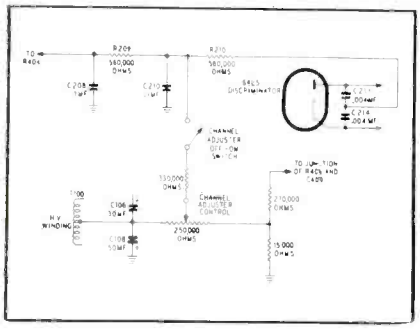


Fig. 8. The Philco model 48-2500, codes 121 and 122, channel-adjuster circuit.



are incorporated in the head-end and are accessible, from the top of the chassis. The high-channel trap has been simplified and contains only one trap circuit.

Some early production receivers had a *dc* restorer circuit incorporated. These circuits have been altered, the 1N65 diode (Y_2), resistor R_{281} (10,000 ohm, ½ w), capacitor C_{279} (0.005 mfd), and resistor R_{274} (470,000 ohm, ½ w), having been removed.

Resistor R_{456} (470,000 ohms, ½ w), was replaced by a 1-megohm resistor, ½ w.

Terminal end of the 1-megohm resistor, R_{275}, formerly connected to junction of Y_2, R_{274} and C_{276}, has been connected to B–.

The globar resistor, R_{454}, and filament bypass capacitor, R_{457}, have been removed from the filament circuit, and R_{455} has been changed to 35 ohms.

Change for Improved Filtering

To obtain improved filtering of the *dc* supply to the audio stage, resistors R_{452}, 220 ohms, and R_{420}, 100 ohms, have been changed to 680 ohms and 120 ohms, respectively.

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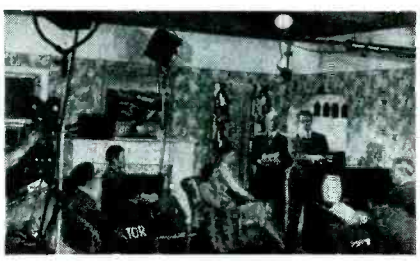
ON ASTATIC BOOSTER TV FILM SET



F. H. Woodworth, president, and W. J. Doyle, general sales manager of Astatic (standing), instructing cast and production personnel of Cinecraft Productions, Inc., on how their booster should be handled in the shooting of sound-on-film commercials for telecasting. Astatic began advertising its booster on TV a few months ago, with a series of six films.

SYLVANIA SERVICE MEETING

Clarence L. Simpson of Sylvania Electric discussing a TV servicing problem with several Service Men of a large group which recently attended a meeting sponsored by the R & R Electronic Company, Amarillo, Texas. Left to right are: Brown, R & R Electronic; Simpson, Sylvania Electric; Howard, Radio Center, Tucumcari, New Mexico; McInnish, Phillips Battery, Plainview, Texas; and Self, Self Radio Service, Clovis, New Mexico.

RECTANGULAR TV TUBE SALES CLINIC

A. J. Cole, president of National Video Corp., 3019 W. 47th Street, Chicago 32, Illinois, during a recent lecture before Stewart-Warner salesmen on the 16RP4 rectangular tube. Diagrams were used to show the advantages of the rectangular tube as compared with the round.

Ser-Cuits

(*Continued from page* 53)

directly coupled to the first video amplifier plate circuit, the negative voltage developed across the *agc* load resistor during keyer tube conduction will vary directly with the amplitude of the incoming signal across the 6800-ohm video detector load resistor. The time constant of the *agc* filter network is approximately .01 second, which has been found high enough to compensate for signal strength fluctuation or beating action caused by passing aircraft.

Noise pulses occuring during keyer tube non-conduction (92% of the time) are not injected into the *agc system.* Noise immunity of the circuit has been further improved by a clipping action of the first video amplifier.

DC Restorer Circuit

The output of the first video amplifier contains both *ac* and *dc* components of the composite video signal, but *ac* coupling between this stage and the cathode follower stage results in a loss of the *dc* component. Restoration of this *dc* component must be accomplished just before the video signal is fed into the picture tube to maintain the black elements of the picture at a constant level.

One diode section of a 6AL5 is used as a *dc* restorer to develop a positive voltage across either a 1-megohm* or 100,000-ohm** resistor, which varies with the average level of the negative-going video signal. This bias voltage is fed to the picture-tube grid to maintain the proper *black level* as the picture is reproduced on the screen.

TV Sound Circuits

The 4.5-mc difference frequency between the 26.75-mc video carrier and

the 22.25-mc sound carrier is separated from the composite video signal at the output of the video detector and fed through two transformer-coupled stages of sound *if* amplification using two 6AU6s. The plates of these tubes are fed from a + 290-volt buss and the cathodes are at approximately +160 volts. Thus plate and screen circuits operate at an effective potential of 130 volts. The second sound *if* amplifier also acts as a grid-leak limiter to clip unwanted AM interference.

Further limiting action of the positive portion of the 4.5-mc sound signal is accomplished using one diode section of a 6T8. The two other diode sections of this tube are connected in a conventional ratio-type sound-discriminator circuit. This circuit performs the function of converting a constant amplitude FM signal to a varying amplitude audio output. Sound output is thus obtained from an appropriate coupling network connected to the tertiary winding of a discriminator transformer.

6T8 as Amplifier

The audio signal is fed through a section of a band switch and is coupled to the triode section of the 6T8 through the volume control. This section of the 6T8 acts as a sound amplifier and feeds the audio signal to the 6V6GT sound output stage. The output of this stage drives the *pm* dynamic speaker.

Composite Sync Circuits

A portion of the composite video signal is removed at the output of the cathode-follower stage to control the horizontal and vertical sweep systems. The signal is first injected into the grid of one triode section of a 12AU7 acting as a sync clipper. The tube is operated at low plate voltage and is self-biased by a 270,000-ohm grid resistor. Plate current flows only when the most positive portion of the video signal is present at the tube grid, namely during the horizontal and vertical sync pulses. Plate-current saturation is reached with a further increase in signal, thus clipping the tops of the sync pulses and removing any undesirable interference.

The sync pulses are directly coupled to the grid of the other triode section of a 12AU7 which acts as a phase splitter. Positive-going pulses are removed at the cathode. Both types of horizontal sync pulses are used for *afc* control, while only the positive-going vertical pulses are used in the vertical sweep circuit.

*Used in series A chassis. ** Used in series B chassis.

Vertical Sweep Circuits

Positive-going vertical sync pulses from the output of the phase splitter are integrated in an integrator coupling unit and are used to control the frequency of a conventional type blocking oscillator. This oscillator utilizes one triode section of a 6SN7GT and its free-running frequency is determined by the capacitor and resistor components (including the vertical hold control) in its grid circuit. The sync pulses are impressed at the tube grid just before the oscillator would normally trigger and are of sufficient amplitude to drive the tube to conduction and cause the oscillator to lock in at the sync frequency. The output of this stage is controlled by a height potentiometer.

The blocking oscillator drives the other section of the 6SN7GT which is connected as a vertical scanning output stage. Adjustment of vertical linearity is accomplished in the cathode of this circuit by varying cathode bias and thus changing the operating point of the tube about its non-linear characteristic curve. Sawtooth cur-

(*Continued on page* 58)

Ser-Cuits

(*Continued from page 57*)

rent wave output is applied to the vertical deflection coils through a vertical output transformer.

Retrace-Line Surpressor Circuit

A portion of the voltage pulse across the vertical deflection coil is reshaped and coupled to the cathode of the picture tube to insure cutoff of the tube during the vertical retrace interval. This arrangement has been found to prevent the appearance of vertical retrace lines ordinarily seen with low contrast and high brightness control settings.

Horizontal AFC Circuit

An automatic-frequency-control arrangement is utilized in this receiver to improve stability of the horizontal sweep system. The two 180° displaced sync pulses from the phase splitter are fed to a 6AL5 horizontal *afc* phase detector. At the same time, a pulse of horizontal output voltage, taken off one side of the width coil, is reshaped, and its *ac* component is injected into the phase detector as a sawtooth wave. Any phase displacement between the feedback sawtooth and the horizontal sync pulses will cause the voltages across the two diode sections to differ. This will result in a *dc* control voltage injected at the horizontal scanning multivibrator grid which will change the multivibrator speed in a direction to bring its frequency *in step* with the incoming horizontal pulses. This bias voltage will be proportional to the amount of phase shift between the comparison voltage and the sync pulses, and its polarity will depend on whether the sawtooth voltage leads or lags the sync pulses.

Horizontal Sweep Circuits

The *dc* control voltage from the output of the horizontal *afc* phase detector controls the frequency of a conventional cathode-coupled horizontal scanning multivibrator, using a 12-AU7. Coarse-frequency adjustment of the multivibrator is obtained by varying the position of the slug in a horizontal lock coil while fine-frequency control is accomplished using a 50,000-ohm front-panel horizontal hold potentiometer.

The horizontal multivibrator output is used to drive a 6BG6G horizon-

(*Continued on page 62*)

(*Continued from page 27*)

gles of 66° or over will require a wide-angle deflection yoke.

Bent-Gun Ion-Trap Adjustments

In making all initial ion-trap adjustments it is necessary to use the lowest setting of the brightness control possible.

With the base end of the gun pointing up, the magnet is slid over the neck. The north pole must be to the left adjacent to pin *12* and the south pole to the right, adjacent to pin *6*. The magnet should be placed about ¼" in back of the bend in the gun for the first adjustment.

The ion trap magnet should then be rotated about an eighth of a turn each way and slid back and forth along the neck, stopping at the point of maximum brightness. It is necessary to keep reducing the brightness as the system is brought into line to avoid damage to the tube. After alignment at low brightness, a final adjustment should be made with the brightness control set to where the raster just starts to *bloom*. At this point, the raster begins to expand in size rapidly.

If no raster appears and all other conditions are normal, it is possible that the magnet polarity is reversed. The magnet should therefore be rotated through half a turn around the neck. Then make adjustments as before. If there is still no raster, another magnet should be tried before looking for other sources of trouble.

Preliminary Adjustments

Do not leave the tube on any longer than necessary when making preliminary adjustments. If the beam of electrons is operated at high intensity before being brought into line with the ion trap magnet, it may damage the internal structure of the tube. For the same reason, it is important that the final adjustment of the magnet is made for maximum screen brightness. Failure to do this may result in burning the limiting aperture or the release of gas into the tube.

Focus Coil and Deflection-Yoke Adjustment

The focus coil and deflection yoke should be carefully aligned so that the raster covers the screen properly. The ion trap magnet should not be used to get screen coverage. It should be used only to obtain maximum pattern brightness.

Indicator Gun Tube

Recently a tube, with an indicator-gun,[2] was developed to simplify ion-trap magnet adjustment. With an ion-trap magnet not properly adjusted, a bright green glow emanates from the anode of the tube. Given a high side bias control setting, the green glow becomes barely visible when the magnet is properly adjusted, but brighter as the magnet is moved out of adjustment. Hence, an exact adjustment can be made by observing the low point of glow. Lowering bias control setting allows completely extinguishing of the glow.

In adjusting the ion-trap magnet on the *indicator-gun* tube, it is therefore not necessary to watch the tube face to determine when the magnet is properly adjusted.

The indicator feature is accomplished by coating the inner side of the anode tube cap with material which fluoresces if the electron beam is permitted to strike the edge of the aperture in the anode tube cap.

[2]Rauland Corp.

Master-Antenna Systems

(*Continued from page* 15)

little influence on the performance of the other circuits.

For a more permanent type of installation, outlet plates of the type shown in Fig. 7 can be used. A dummy load is placed in this outlet plate, when no set is connected, to provide a theoretically better distribution balance of the signals transmitted from the device. Dummy loads are provided in the unit for unused circuits, in instances where only two or three sets will be fed from the distribution units shown in Figs. 4 and 5.

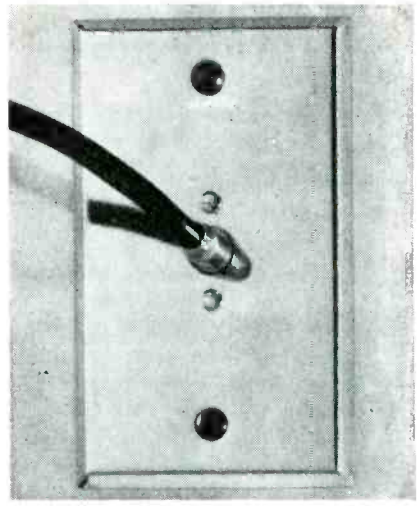


Fig. 7. Outlet plate for permanent installations suitable for use with Wiremold box or standard wall-outlet flush box.

Installation Techniques

In installing this system, the antenna must be so placed that the highest quality of signal pickup prevails. An antenna which matches a 72-ohm coaxial cable is preferred, as a shielded system will always operate better than one which uses open line and is susceptible to noise pickup.

The distribution devices must be located in some protected area like a rooftop penthouse, stairwell, attic or, in the case of the dealer installation, on a wall near the television receivers. Fig. 8 shows one typical installation with the device in the center of four table-model television receivers. This type of installation enables the dealer to change completely his sales layout without making costly new cable run installations.

An installation of the distribution device in a watertight box on a flat type roof where no other housing arrangement was possible, is illustrated in Fig. 9. Cable entrance to box must be eventually sealed with a watertight compound.

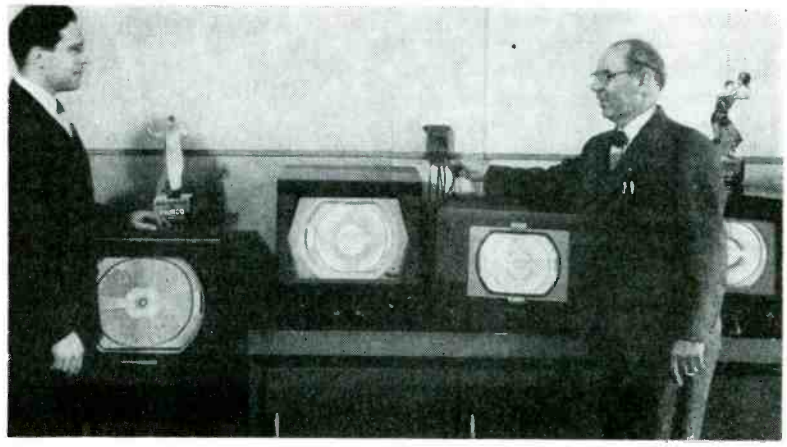
A coax cable, of the RG type, conforming to JAN specifications, must be used with the system. In connecting the coax cable, two steps should be followed:

(*1*) The center conductor of the cable should be exposed so that it extends through the straight tip end of the coax male connector and is available for soldering to the tip end.

(*2*) The shield should then be exposed sufficiently so that a crimp tool (Fig. 10) can make a pressure contact between the shell of the coax connector and the shield of the cable. The outer polyvinyl should be positioned so that it is squeezed into the coax fitting by the crimping operation, to facilitate handling of the coax cable fitting, as shown in Fig. 11.

In the event that a crimping tool is not available, both the center con-

Fig. 8. Typical dealer installation where distribution unit is installed near television receivers. (*Courtesy Merle Radio.*)



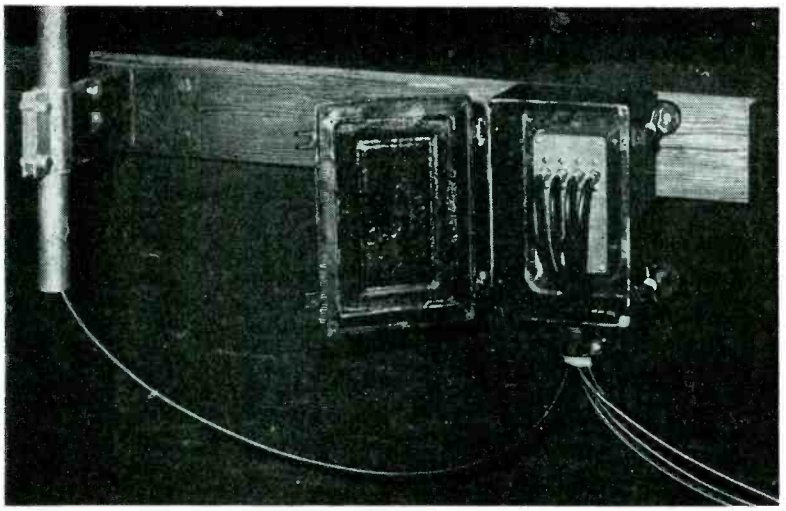


Fig. 9. Installation of distribution device in watertight box in flat-roof area where no protected location was available.

ductor and the shield connection can be made via soldering.

Distribution Device Locations

The distribution devices should be centrally located in all installations so that all sets will receive approximately the same level of signal. In all installations, the length of coax cable between the television receiver and the distribution device determines the amount of signal which will be available for the television receivers.

Installation of 72-300 Unit

In installations, where the receiver matching unit shown in Fig. 6 is required, the unit should be installed as close to the receiver as possible and the case of the unit grounded to the television receiver by a low-inductance (wide) braid strap.

Additional System Applications

It has also been found possible to use the system for:

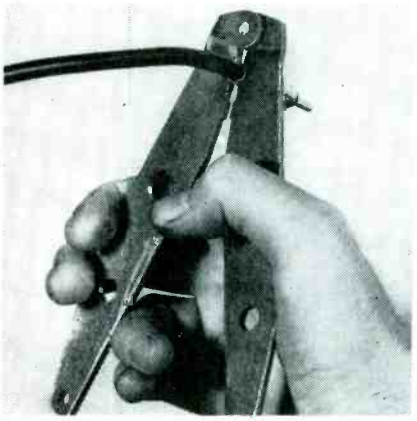
(*1*) Distribution of FM signals for FM receivers in those areas not served by TV, or distribution of signals to other types of communication receivers which operate in the 20-200-mc band.

(*2*) Feeding of two television sets in the same home without installing a second antenna on the chimney.

(*3*) In strong signal areas where more than 20 millivolts (20,000 microvolts) can be induced into the antenna from all the desired channels, it is possible in many cases to expand the distribution from one antenna to a potential of sixteen receiver circuits. This expansion, as shown in Fig. 12, is

(*Continued on page 62*)

Fig. 10. Crimping tool used to make shield connection and squeeze polyvinyl into fitting for a neat connection.



Master-Antenna Systems

(*Continued from page* 61)

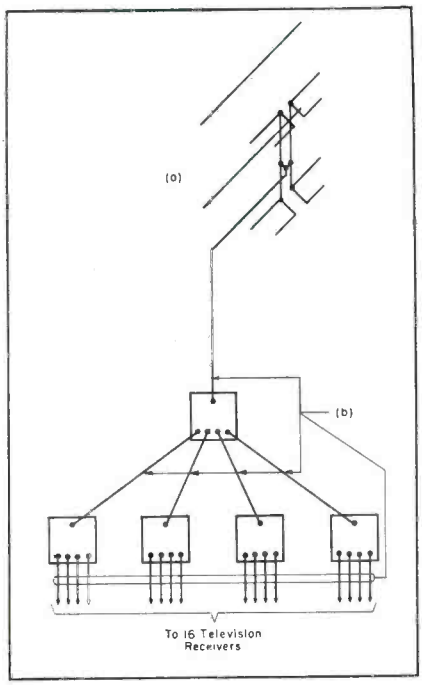
recommended for dealer installations, as most multiple dwellings do not lend themselves to this method of distribution.

Costs

Experience has shown that the cost of installing this type of system is less than one-half the cost of installing a single antenna for each of four television receivers, and materially reduces the maintenance of the roof structures.

Importance of Realistic Demonstrations

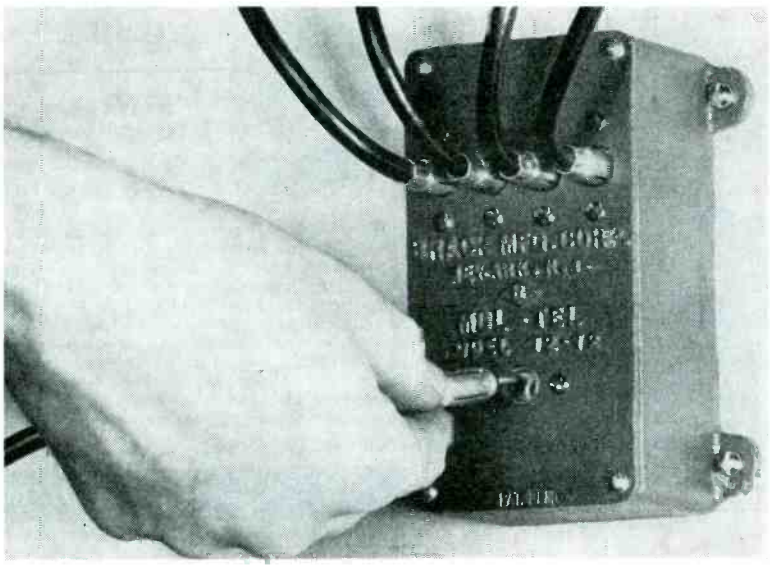
Now that TV is no longer a novelty, it is anticipated that dealers will have to provide real demonstrations for their customers, so that they can decide whether they like the round or square picture, a polaroid or non-polaroid screen, a black or grey contrast tube, or any of the many features which make an understanding public decide on a purchase. A properly-installed system, using a master-antenna feed setup, can provide such a service.



(Above)

Fig. 12. Expansion of the multiple-outlet system to drive more than four outlets in strong-signal areas. First unit drives four distribution units, which, in turn, can provide signal for sixteen outlets. The antenna (*a*) should be a stacked high-gain type, and the leaders (*b*) of *RG* low-loss coax.

Fig. 11. Closeup of coaxial connection being inserted into female fitting within the distribution device.



Ser-Cuits

(*Continued from page* 58)

tal-scanning output stage. The plate circuit of this stage is fused to protect the horizontal fly-back transformer and kill high voltage in the event the 6BG6G or the high voltage rectifier circuit draws excessive current. Signal level to the horizontal output tube is controlled by means of a 10-160 mmfd horizontal drive control. The sawtooth current wave output of this tube is applied to the horizontal deflection coils through an impedance matching horizontal-output transformer. A portion of the transformer secondary is shunted by the width coil which adjusts picture width by controlling horizontal output current waveshape.

A 6W4 horizontal-damping tube is connected across the transformer secondary to damp out oscillations created during rapid retrace of the sawtooth current wave. This circuit provides control of the horizontal linearity and also uses some of the inductive kickback voltage to supply additional B+ for the horizontal and vertical sweep systems.

High-Voltage Power Supply

High voltage is obtained by using the inductive kickback voltage induced in the horizontal-output trasformer during the retrace period. This kickback voltage is produced in the primary winding of the transformer and is increased by autotransformer action before being applied to the plate of a 1B3GT/8016 high-voltage rectifier. Filament voltage is obtained by a single loop of wire around the transformer windings. The output of the rectifier (aproximately 9,000 volts) is filtered and applied to the high voltage anode of the picture tube.

Low-Voltage Power Supply

The low-voltage power supply provides heater and plate voltages for all stages except those portions supplied by the high voltage rectifier and horizontal damping circuits. A power transformer supplies plate voltage to a 6X5GT and a 5U4G and also contains a 5-volt filament winding for the 5U4G plus a 6.3-volt winding for the parallel-filament string. The output of the 6X5GT and *RC* filter feeds the 160-volt B+ buss, while the output of the 5U4G and *LC* filter feeds the 350 volt B+ supply. This current is regulated by changing the setting of the focus potentiometer across the coil.

AM/FM/TV Diodes

(*Continued from page* 20)

dc output to control the frequency of the heterodyne oscillator as an automatic frequency control. The *dc* is applied to the oscillator in such a manner as to *lock* its frequency when the signal strength is greatest and shift its frequency up or down as the need may be if the signal or the receiving circuits change frequency. This function is identical to that used in broadcast receivers in '35 and later, during the period when competition demanded new developments and features on each new model.

Discriminators and *afc* circuits are also used to maintain the horizontal oscillator frequency of TV receivers in synchronism with the incoming video signal. An example of this may be found in the Stromberg Carlson model TV-125; chassis TV-12.

Although diodes are utilized for many varying functions, some of which may seem complicated, their use may be clearly understood if the basic principles of their rectifying action, as described, are mastered. The Service Man, realizing the need for keeping *up-to-date* on his technical knowledge as well as his practical skill, can reduce the so-called *complicated* theory to simple understandable terms and apply the basic principles in a practical way.

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Associations

(*Continued from page* 41)

weeks ago, was very successful. Over 200 attended.

Many valuable door prizes were distributed at the affair. These included a Philco pocketscope, Telechron clock and Motorola table type receiver and Rider manual.

RTG, Rochester

A PETITION opposing the recently-proposed 10% excise tax on television receivers and parts has been dispatched to members of Congress by the Radio Technicians Guild of Rochester, New York.

The petition read in part: "Resolved: Inasmuch as we indirectly derive our livelihood from the sale of television receiving sets by servicing them, we feel sure that any increase in the price of these sets, by a Federal excise tax or other means, will deprive us of part of our income. . . . We, therefore, wish to make a strenuous objection to the proposed 10% Federal excise tax on television receivers and parts."

JOTS AND FLASHES

THE TREND TO LARGER and larger picture tubes, cited on several occasions in this column, received quite a review from Dr. Allen B. DuMont recently, who forecast that 19" tubes, particularly of the rectangular type, should become quite commonplace, and tubes as large as 30" will be available, too. Discussing the 30" type, DuMont noted that this tube would provide up to 600 square inches of picture area and would initially be used in club and tavern receivers. It was learned that direct viewing tubes providing a 4' x 5' picture are also in the developmental stage. . . . Sales of large-type picture tubes to set manufacturers reached a new peak a month ago, 96% of all the picture tubes sold being 12" or larger. Over 35% were 14" or larger. . . . Built-in television receivers are also on the trend front now. According to Horace Atwood, Jr., president of Industrial Television, Inc., sixty five-room dwellings now being built on Spring Valley Road in Paramus, N. J., will feature 16" TV receivers, installed as an integral part of each home. It is reported that 12" speakers will also be built into the walls in the houses. . . . Built-in antenna systems are now also being featured on passenger ships. Liners of the American President Lines and the American Export Lines will have built-in antenna outlets for AM and short-wave reception. A single 25' whip antenna will supply the signal for over 200 outlets, according to RCA, who developed the basic master-antenna system. . . . The slogan *May is Market Month* has been adopted by Radio Parts and Electronic Equipment Shows, Inc., for their May 1950 parts distributor conference and show, which will be held at the Hotel Stevens in Chicago, May 22 to 25. . . . Arthur E. Akeroyd, 419 Commonwealth Ave., Boston 15, Mass., has been elected president of the New England Chapter of *The Representatives*. Walter T. Hannigan, 43 Leon Street, Boston 15, Mass., is the new vice president of the Chapter and Robert A. Waters, 4 Gordon Street, Waltham 54, Mass., is secretary-treasurer. . . . Radio Electric Service Company, 7th and Arch Streets, Philadelphia, Penna., have been named sole distributors for the Philadelphia-Camden area of Peerless Transformers. . . . A non-technical brochure (2R6301) describing RCA's television Antenaplex system has been published and is available from the Sound Products Section of the RCA Engineering Products Department, Camden, New Jersey. . . . Nicholas J. Laub, 5181 Division Avenue, White Bear Lake, Minnesota, will represent Oxford Electric Corp., 3911 South Michigan Avenue, Chicago 15, Illinois, in the areas of North and South Dakota and Minnesota. . . . Robert A. Starek is now field engineer for the Radio Tube Division of Sylvania Electric Products. . . . Henry D. Sarkis, 6559 Sheridan Road, Chicago, has become a sales rep for the Clarostat Manufacturing Co., Inc., and will cover the industrial accounts in metropolitan Chicago and metropolitan Milwaukee. . . . Emerson-New York Inc., 111 Eighth Avenue, New York 11, have become distributors for ATR auto radio replacement vibrators in the New York City area. . . . The Workshop Associates, Inc., will soon move into a new plant on Crescent Road, Needham Heights, Mass. . . . The 25th anniversary of the Ohmite Manufacturing Company is being celebrated this year.

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SERVICE INDEX—APRIL, 1950

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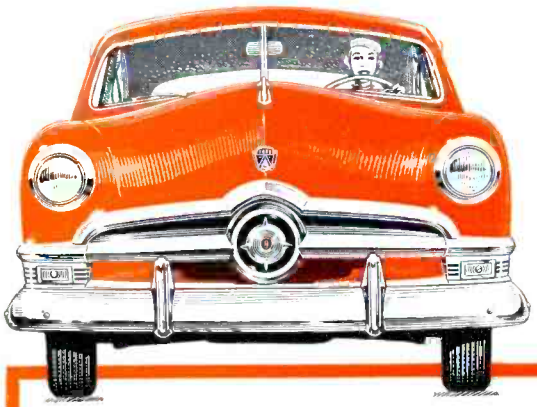

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3rd Prize $619 Drexel Dining Rm. Suite
4th Prize $450 Deep Freeze Unit, 12 Cu. Ft.
5th Prize $350 Rogers Sterling (Service for 12)
6th Prize $260 Kaufmann Travel Luggage (4 matched pcs.)
7th Prize $233 Kroydon Golf Clubs & Bag
8th Prize $145 Kaufmann Travel Luggage (2 matched pcs.)
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16th to 25th Prizes—$25 U. S. Savings Bonds

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Purpose of this contest is to encourage Battery Retailers to *Get The Facts* on why it's best to stock and sell ....

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RCA Battery Sales
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Sirs: I am a Radio Battery Retailer, but DO NOT know the name of my local RCA Battery Distributor.

Please forward this request to him for my FREE copy of the RCA Battery "Get The Facts" Official Contest Booklet containing the FREE Entry Coupon.

Signed_____

Co. Name_____

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FREE ENTRY... here's how

No purchases required—no sentences to complete! Simply get your FREE copy of the Official RCA "Get The Facts" Contest Booklet ... from your nearest RCA Battery Distributor. Then, fill out and mail the Free Entry Coupon in the Contest Booklet to the address printed thereon. Contest closes June 30, 1950. All entries must be postmarked on or before that time.

This contest is open to all radio battery retailers within the continental U. S. A. and to full-time personnel whose duties include the selling of radio batteries.

Here's how prizes will be awarded

1. All entry coupons received will be assembled at Contest Headquarters for an impartial drawing to be held July 10, 1950.

2. The retailer whose name appears on the first coupon drawn will be contacted by telephone, person-to-person. He will be asked one of the easy questions about RCA Batteries appearing in the "Get The Facts" Contest Booklet. If this contestant gives the correct answer immediately, he will be awarded first prize.

3. If the contestant fails to give the correct answer immediately, another drawing is held.

4. The above procedure will be followed in awarding all prizes.

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Complete Entry and Prize Award Rules can be found in the Official Contest Booklet.

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